

GROUP

5

Body

SECTION TITLE	Pages
5.1 Body and Accessories	
5.1.1 Front/Rear Windshield	5.1.1-1
5.1.2 Door	5.1.2-1
5.1.3 Seat.....	5.1.3-1
5.1.4 Seat Belt	5.1.4-1
5.1.5 Rearview Mirror.....	5.1.5-1
5.1.6 Instrument Panel and Console.....	5.1.6-1
5.1.7 Bumper	5.1.6-1
5.1.8 Handles, Locks and Latches.....	5.1.8-1
5.1.9Interior Trim and Ornamentation	5.1.9-1
5.1.10Exterior Trim.....	5.1.10-1
5.2 Body Repairs	
5.2.1 Body Repairs	5.2.1-1

5.1 Body and Accessories

2012 Benni Mini

Table of Contents	Pages
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5.1.1 Front/Rear Windshield

Specifications	5.1.1-1
General Specifications	5.1.1-1
Torque Specifications	5.1.1-1
Description and Operation	5.1.1-2
System Overview	5.1.1-2
Removal and Installation	5.1.1-3
Front Windshield	5.1.1-3
Rear Door Window	5.1.1-7

5.1.2 Door

Specifications	5.1.2-1
Torque Specifications	5.1.2-1
Removal and Installation	5.1.2-2
Front Door Interior Trim	5.1.2-2
Rear Door Interior Trim Panel	5.1.2-5
Front Windshield	5.1.2-8
Rear Windshield	5.1.2-9
Front Windshield Slot	5.1.2-11
Rear Windshield Slot	5.1.2-12
Front Side Windshield	5.1.2-14

5.1.3 Seat

Specifications	5.1.3-1
Torque Specifications	5.1.3-1
Description and Operation	5.1.3-2
System Overview	5.1.3-2
Removal and Installation	5.1.3-3
Front seat	5.1.3-3
Rear Seat	5.1.3-4

5.1.4 Seat Belt

Specifications	5.1.4-1
Torque Specifications	5.1.4-1

Body and Accessories

Description and Operation.....	5.1.4-2
System Overview	5.1.4-2
Removal and Installation	5.1.4-3
Front Seat Belt.....	5.1.4-3
Rear Seat Belt	5.1.4-6
Rear Waist Seat Belt.....	5.1.4-8

5.1.5 Rearview Mirror

Description and Operation.....	5.1.5-1
System Overview	5.1.5-1
Removal and Installation	5.1.5-2
Endoscopes	5.1.5-2

5.1.6 Instrument Panel and Console

Specifications	5.1.6-1
Torque Specifications.....	5.1.6-1
Removal and Installation	5.1.6-2
Instrument Panel.....	5.1.6-2
Console.....	5.1.6-6

5.1.7 Bumper

Removal and Installation	5.1.7-1
Front Bumper.....	5.1.7-1
Rear Bumper	5.1.7-3

5.1.8 Handles, Locks and Latches

Specifications	5.1.8-1
Torque Specifications.....	5.1.8-1
Description and Operation.....	5.1.8-2
System Overview	5.1.8-2
Removal and Installation	5.1.8-3
Engine Hood Lock Buckle.....	5.1.8-3
Engine Hood Lock Buckle Unlocking Handle	5.1.8-4
Ignition Lock Core.....	5.1.8-5
Door Lock Core.....	5.1.8-9
Door External Handle	5.1.8-11

5.1.9Interior Trim and Ornamentation

Removal and Installation	5.1.9-1
A-Pillar Trim Panel	5.1.9-1

Body and Accessories

B-pillar Trim Panel	5.1.9-4
C-pillar Trim Panel	5.1.9-7
Head Lining	5.1.9-10

5.1.10Exterior Trim

Removal and Installation.....	5.1.10-1
Front Fender Lining	5.1.10-1
Roof Exterior Molding	5.1.10-3

Specifications**General Specifications**

Item	Specifications
1K adhesive	WSKM-2G309-B
2K adhesive	ESK-M2G369-A1
2K hardener	ESK-M2G369-A2

Torque Specifications

Item	Nm	lb-ft	lb-in
Wiper blade nut	17	13	-

Description and Operation

System Overview

The front and the rear windshield are fixed to the body by adhesive, which form a driving space together with the body, door and other windows, and also offers a good sight for the driver. The adhesive can bond the front and the rear windshield to the car window frame, in the meantime, it can also form a tight waterproof surface on the window frame. Clear the adhesive on the window frame and reglue and fix when replacing the front and the rear windshield.

 **CAUTION: If the environment temperature is below 100°C, warming the adhesive with hot air gun will be certain influenced and the adhesive processing time will be influenced by the temperature and relative humidity. The processing time in warm and wet environment is shorter than that in cold and dry environment.**

The back door glass is fixed by two glass mounting plates. Since the mechanical parameters of the gas spring is various under different temperature conditions, it's necessary to apply some more force to close the door to ensure to lock the door.

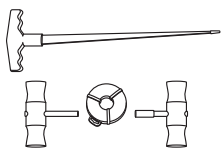
 **CAUTION: The back door glass is a 5mm thick tempered glass with a good rigidity and don't have to worry about broken glass.**

Removal and Installation

Front Windshield

Removal

Special Tool

 CA501-001	Windshield Adhesive Remover, CA501-001
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General Equipments

Heat Gun
Glass Cement Cutter
Glue Gun

CAUTION: If the ambient temperature is below 10 °C , heat the PU adhesive for about 15 minutes in the stove or use heat gun to heat it to 25 °C .

1. Disconnect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the front cover decoration and the wiper arms.

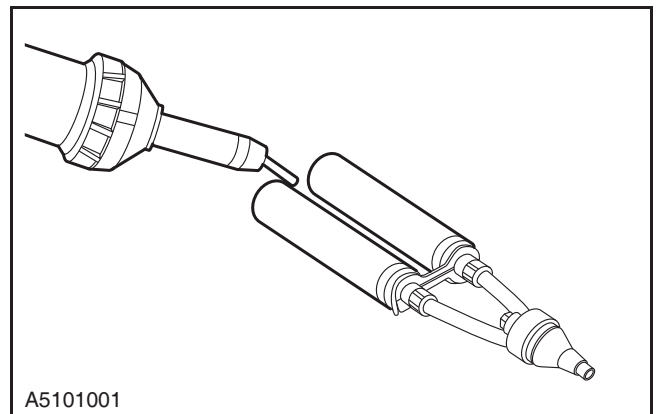
Refer to: Wiper Motor and Drive Arm (4.3.8 Wipers and Washers, Removal and Installation).

3. Remove inside rearview mirror.

Refer to: Rearview Mirror (5.1.5 Rearview, Removal and Installation).

4. Remove the left and right trim panels of A pillar.

Refer to: A-pillar Trim Panel (5.1.9 Interior Trim and Ornamentation, Removal and Installation).

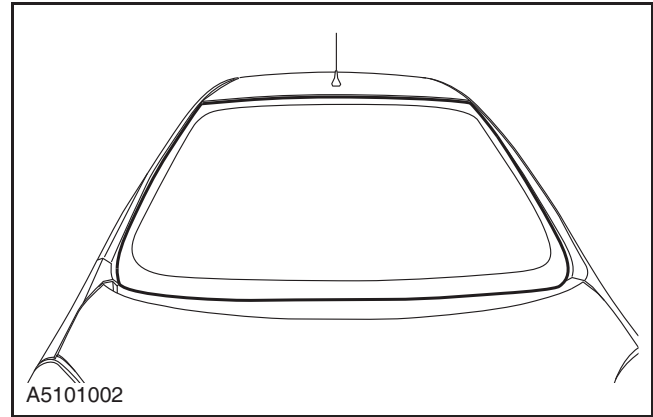


5. Use special tools to remove the front windshield.

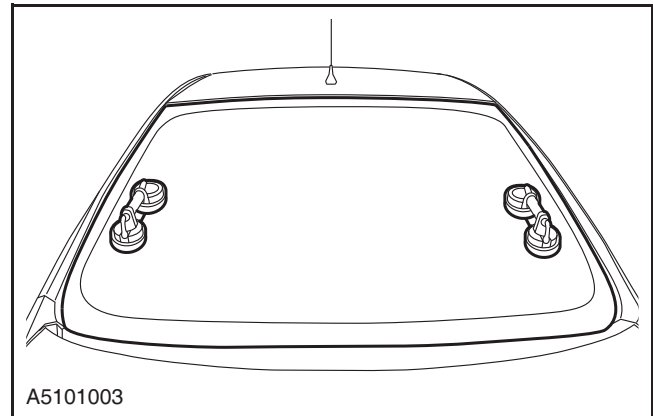
Special Tool: CA501-001

WARNING: Please wear gloves and goggles when using the special tools to protect against the fragments generated in the cutting. Wear earplugs when cutting. Failure to follow the instructions may cause personal injury.

CAUTION: Be careful in the cutting process so as to avoid damage to the body and the trim panel.



6. Use glass sucker to remove the front windshield with the help from other technicians.



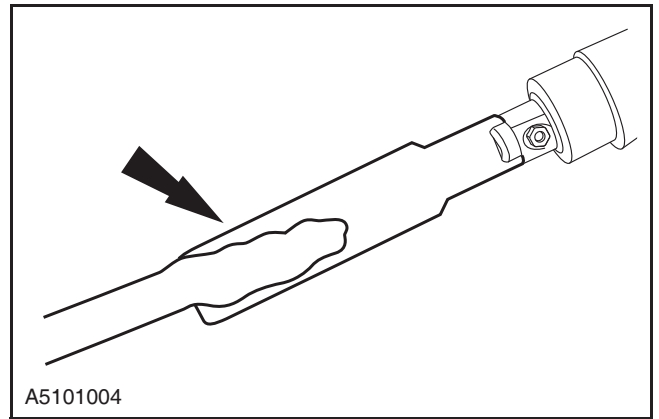
Installation

WARNING: Please keep the door open when using the PU adhesive in case it may affect the bonding effect due to an increase in the carrier pressure if the door is closed.

WARNING: Please avoid touching the cleaned surface as it will affect the bonding effect.

CAUTION: Scrape the excessive adhesive overflowed in the groove and flange.

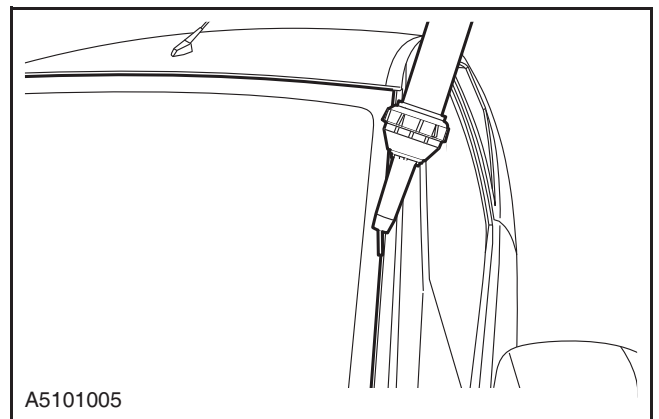
1. Clear up the remained adhesive in the flange of the front windshield.
2. Inspect the spoiled mental fragments, iron rust, or any other irrelevant materials in the weld sealed area which tend to cause the damage to the glass. They shall move freely.



3. Make the temperature of the heat gun below 25 °C , remove moisture in the tank flange of front windshield and the glass glue.

CAUTION: Remove all the moisture in adhesive surface to ensure the adhesive's effect.

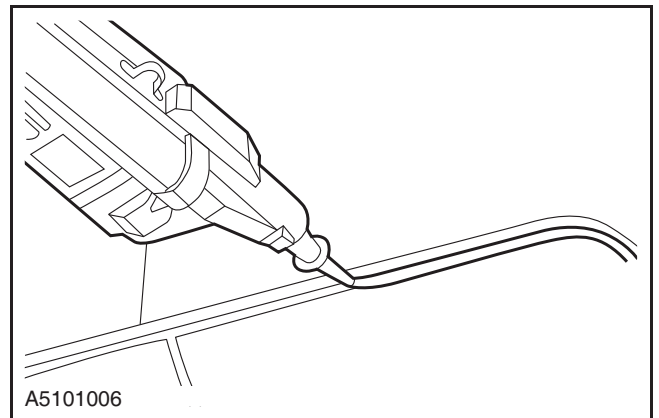
4. Prepare PU adhesive and front windshield.



5. Paint PU adhesive for about 8-10mm along the adhesive line in the edge of the windshield frames.

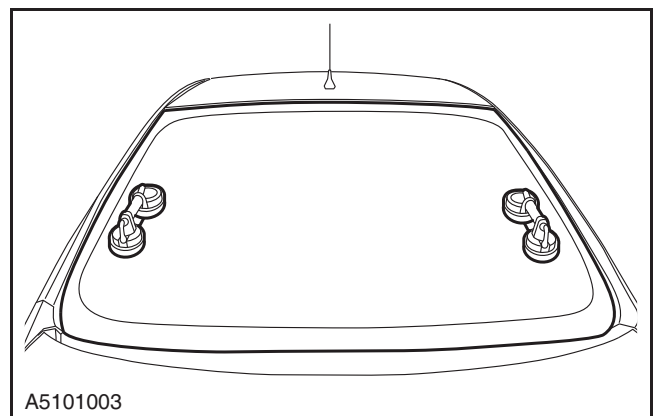
CAUTION: Paint again and again for 20 mm where has no adhesive tape in order to protect against water leakage.

CAUTION: In order to reduce the working time, the first 100 mm of the PU adhesive can be abandoned.



6. Use glass sucker to install the front windshield with other technician assist.

CAUTION: Press every part of the glass evenly, so that the glass can bond firmly with the adhesive.



7. If the normal temperature is below 10 °C , heat the surface in a distance of about 50mm for 15mins (inside or outside the car) by using the heat gun.

8. Install the left and right trim panels of A pillar.

Refer to: A-pillar Trim Panel (5.1.9 Interior Trim and Ornamentation, Removal and Installation).

9. Install inside rearview mirror.

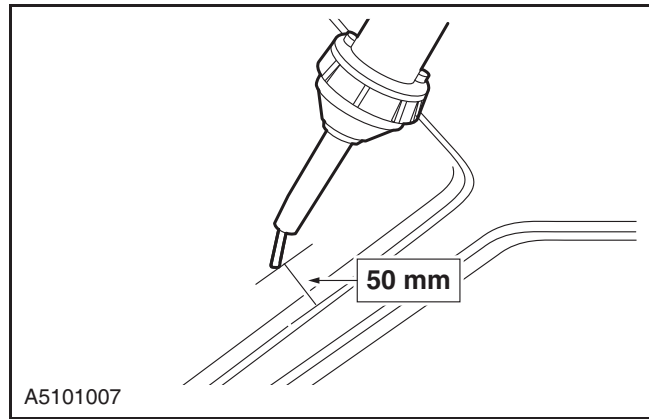
Refer to: Rearview Mirror (5.1.5 Rearview, Removal and Installation).

10. Install the front cover decorations and wiper arms.

Refer to: Wiper Motor and Drive Arm (4.3.7 Wipers and Washers, Removal and Installation).

11. Connect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).



Rear Door Window

Removal

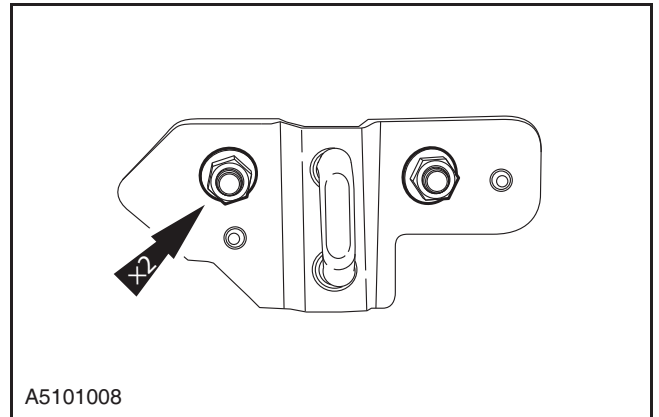
1. Disconnect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

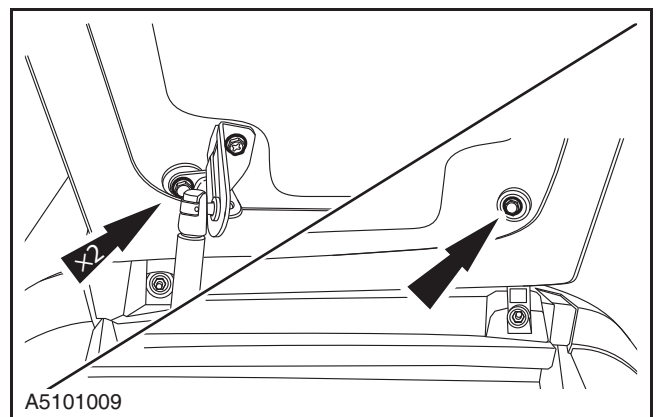
2. Open the rear door.
3. Remove the rear wiper arm and the rear wiper motor.

Refer to: Rear Wiper Motor (4.3.7 Wipers and Washers, Removal and Installation).

4. Disconnect the rear defrost wiring harness connector.
5. Remove the rear door buckle.



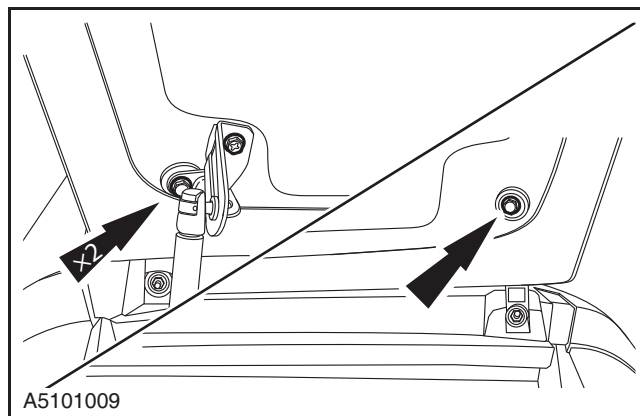
6. Remove the two retaining bolts of the left side of the rear door glass strut mounting board and the retaining bolts of the right side of the rear door glass with other technicians.
7. Detach the rear door glass.



Installation

1. Install the rear door glass with other technicians.
2. Install the two retaining bolts of the left side of the rear door glass strut mounting board and the retaining bolts of the right side of the rear door glass.

Torque: 19 Nm

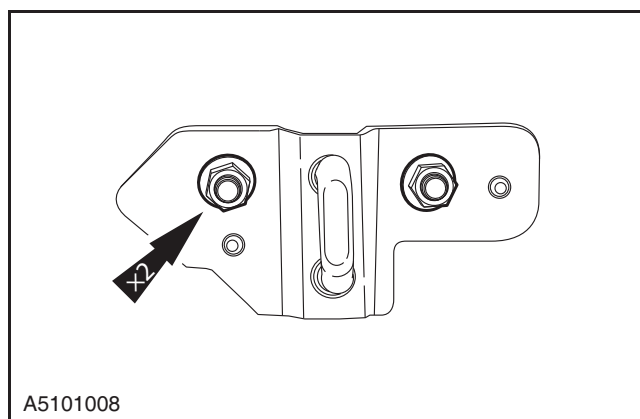


3. Install the back door buckle.
Torque: 19 Nm
4. Connect the rear defrost wiring harness connector.
5. Install the rear wiper arm and the rear wiper motor.

Refer to: Rear Wiper Motor (4.3.7 Wipers and Washers, Removal and Installation).

6. Close the rear door.
7. Connect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).



Specifications**Torque Specifications**

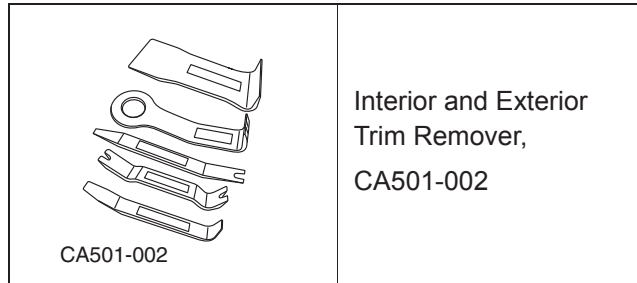
Item	Nm	lb-ft	lb-in
Door glass retaining nut	5	-	44
Window regulator motor retaining nut	8	-	71

Removal and Installation

Front Door Interior Trim

Removal

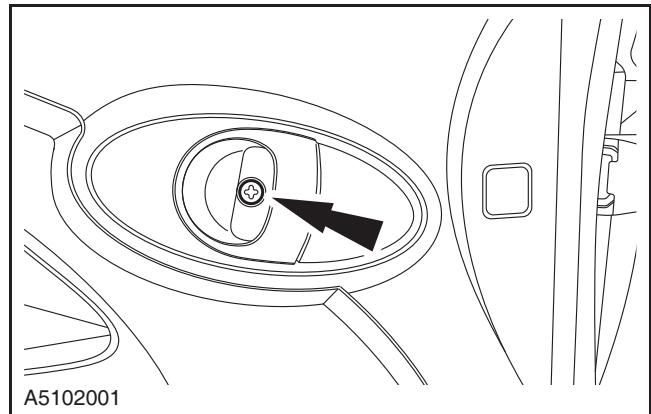
Special Tool



1. Disconnect the battery negative cable.

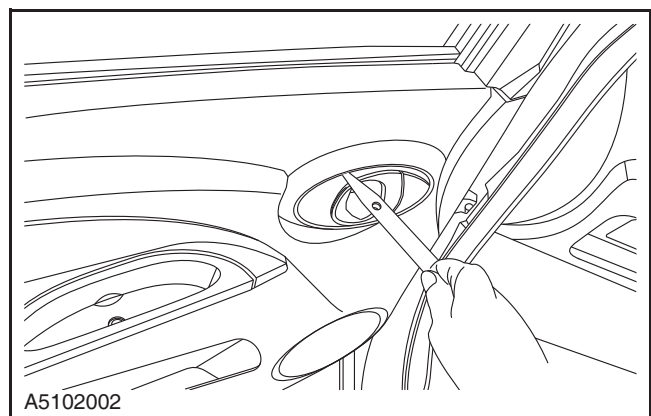
Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the retaining screw of the front door open handle.

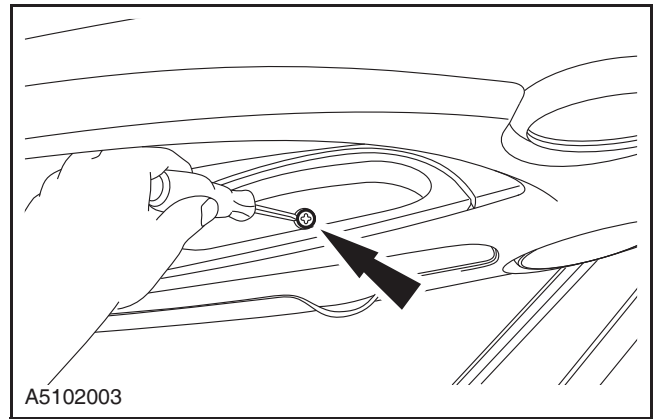


3. Use special tools to remove the front door inner handle switch and disconnect the handle switch cable.

Special Tool: CA501-002

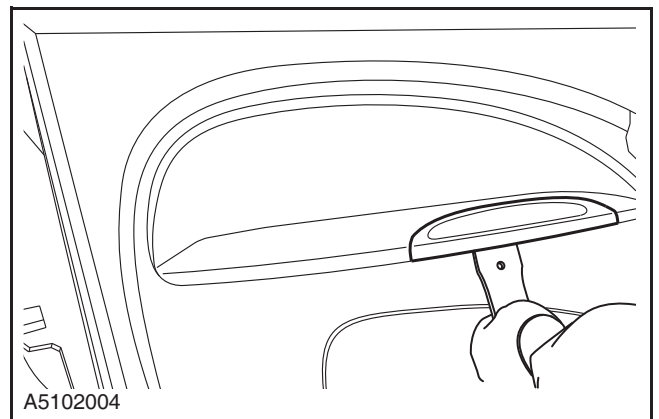


4. Remove the retaining screw of the inside handle cover of the front door.



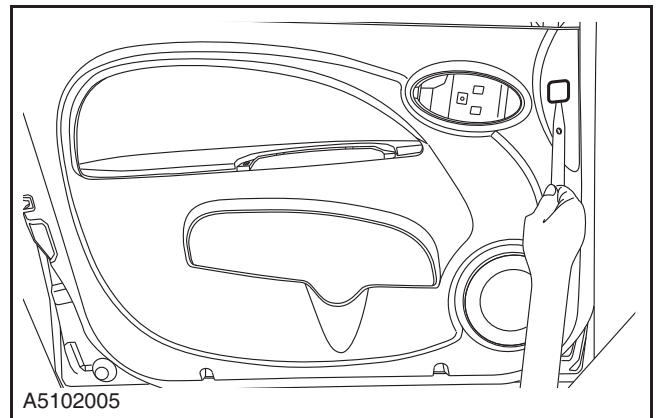
5. Use a special tool to remove the inside handle cover.

Special Tool: CA501-002

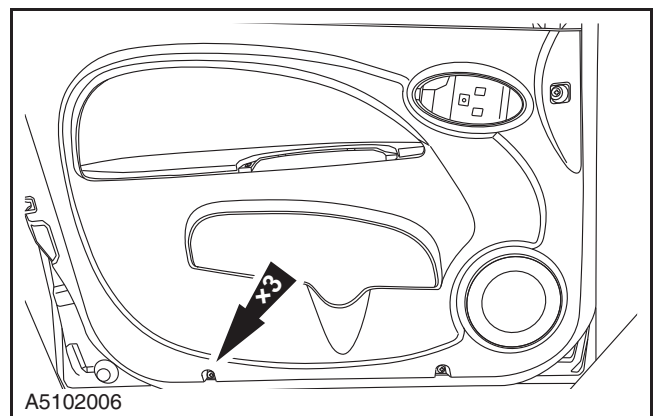


6. Use a special tool to remove the upper retaining screw cover of the front door interior trim panel.

Special Tool: CA501-002

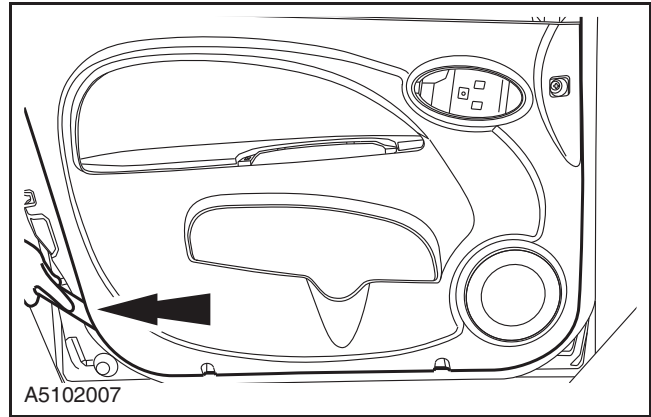


7. Remove the retaining screw of the front door interior trim panel.

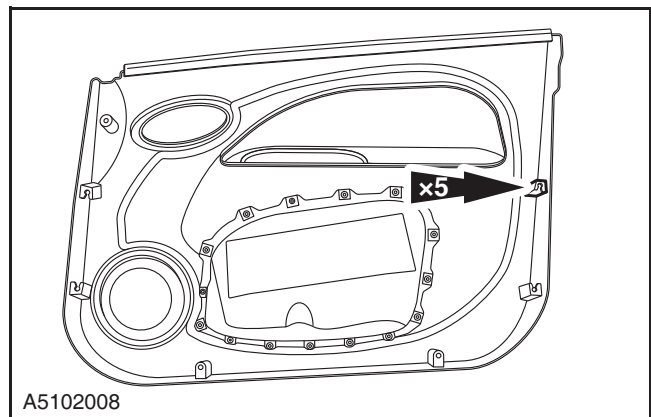


8. Use a special tool to remove front door interior trim panel.

Special Tool: CA501-002



9. Remove the front door interior trim panel and the buckle position is shown in the illustration.



Installation

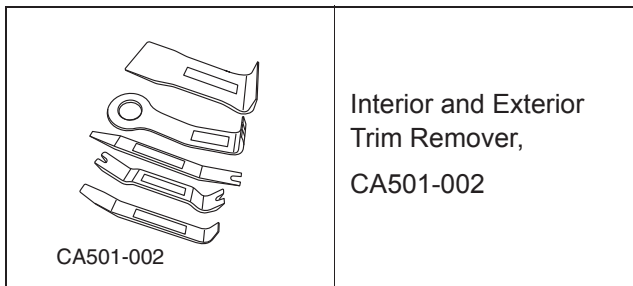
1. To install, reverse the removal procedure.

 **CAUTION:** Front door interior trim panel buckle is disposable component, install a new one.

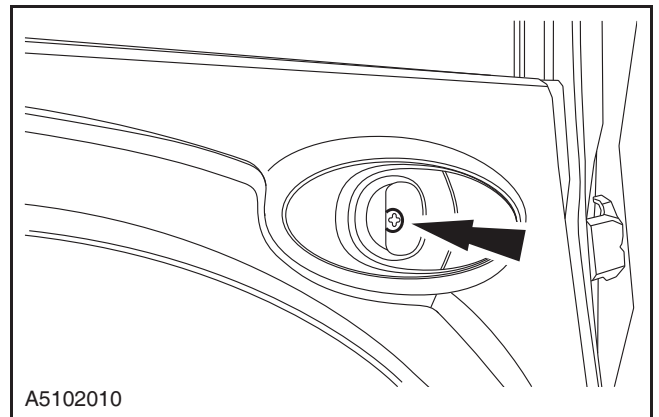
Rear Door Interior Trim Panel

Removal

Special Tool

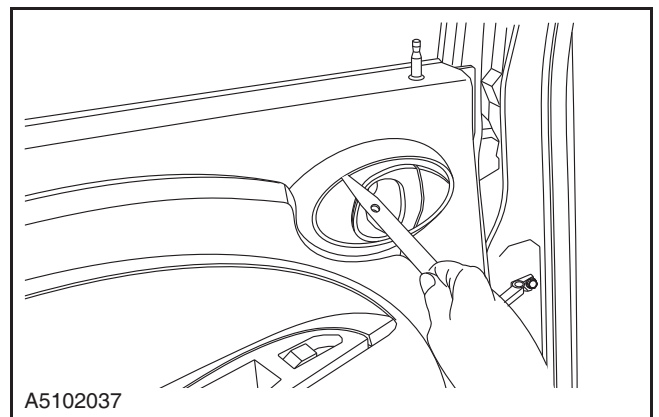


1. Disconnect the battery negative cable.
Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).
2. Remove the retaining screw of the rear door inside handle switch.

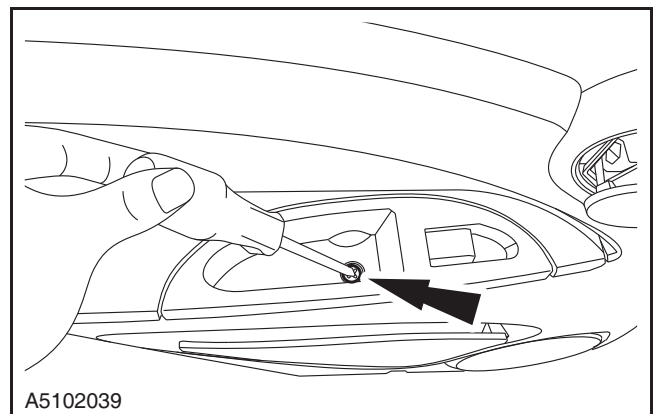


3. Use special tools to remove the rear door inner handle switch and disconnect the handle switch cable.

Special Tool: CA501-002

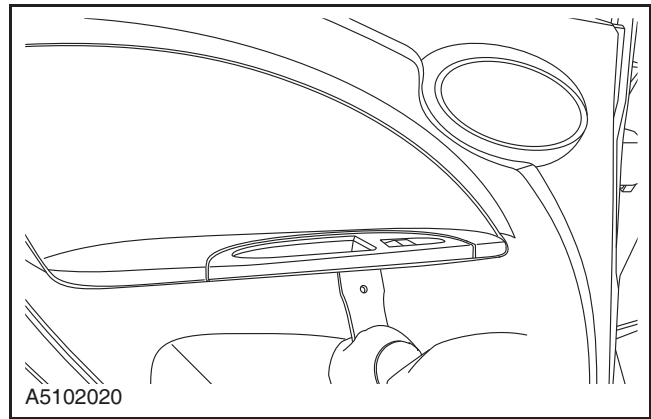


4. Remove the retaining screw of the inside handle cover of the rear door.

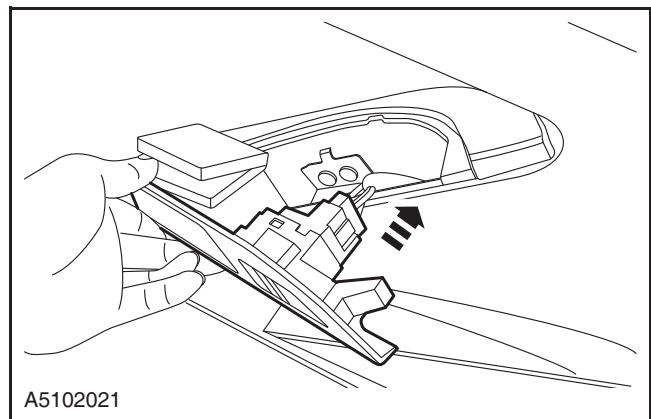


5. Use a specific tool to remove rear door inside handle.

Special Tool: CA501-002

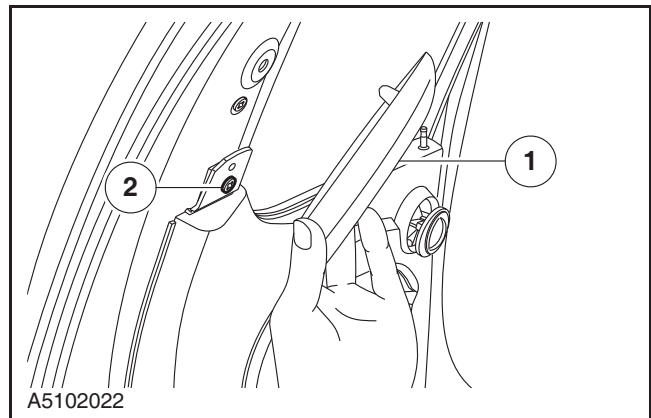


6. Disconnect the rear door power window switch wiring harness connector.

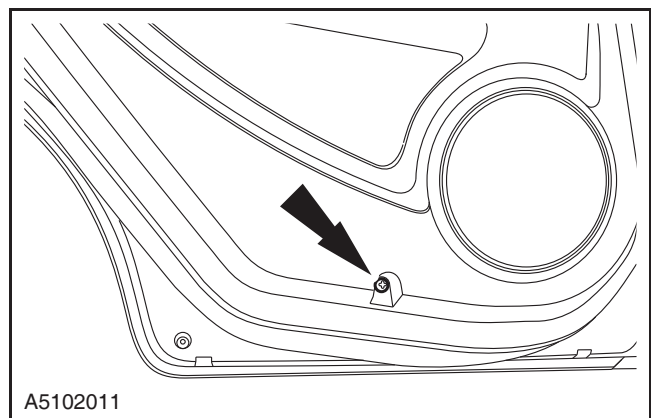


7. Remove the upper retaining screw of the rear door interior trim panel.

1. Remove the rear door triangular ornament.
2. Remove the upper retaining screw of the rear door interior trim panel.

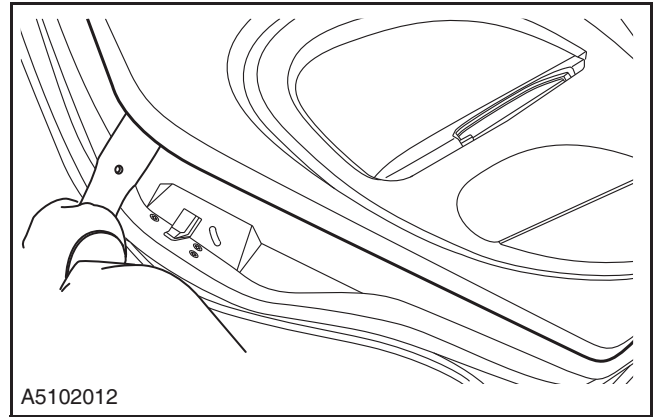


8. Remove the lower retaining screw of the rear door interior trim panel.

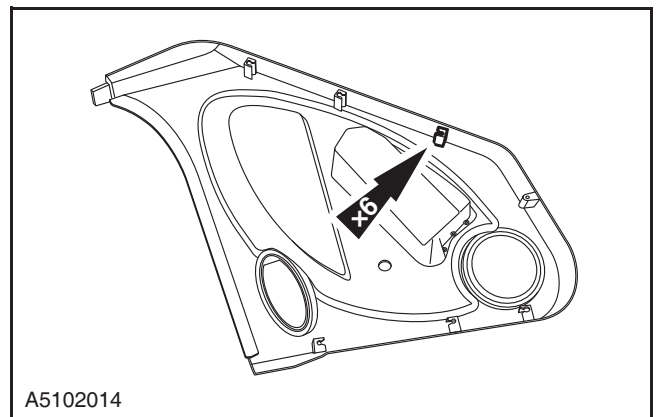


9. Use a specific tool to remove rear door interior trim panel.

Special Tool: CA501-002



10. Remove the interior trim panel of rear door. The buckle position is shown in the illustration.



Installation

1. To install, reverse the removal procedure.



CAUTION: Rear door interior trim panel buckle is one-off component, install a new rear door interior trim panel buckle.

Front Windshield

Removal

1. Remove front door interior trim panel.

Refer to: [Front door interior trim \(5.1.2 Door, Removal and Installation\)](#).

2. Uncover the waterproof membrane.

⚠ CAUTION: Do not touch with a sticky surface to avoid weaken viscosity when reloading.

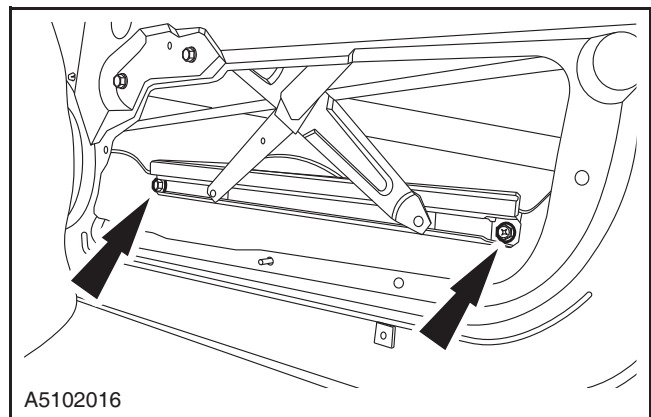
3. Remove front windshield retaining bolt.

1. Adjust the front window height for easy installation and removal.

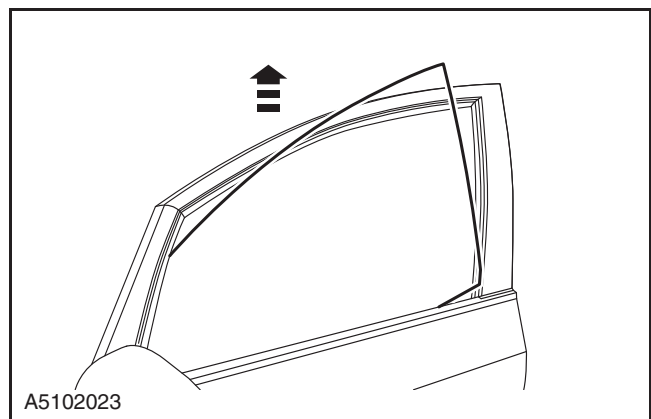
2. Remove front windshield retaining bolt.

Torque: 8 Nm

⚠ CAUTION: Support the windshield to prevent the dropping, causing damage.



4. Remove the front windshield.



Installation

1. To install, reverse the removal procedure.

Rear Windshield

Removal

1. Remove the rear door interior trim panel.

Refer to: Rear Door Interior Trim (5.1.2 Door, Removal and Installation).

2. Uncover the rear door waterproof membrane.

⚠ CAUTION: Do not touch with a sticky surface to avoid weaken viscosity when reloading.

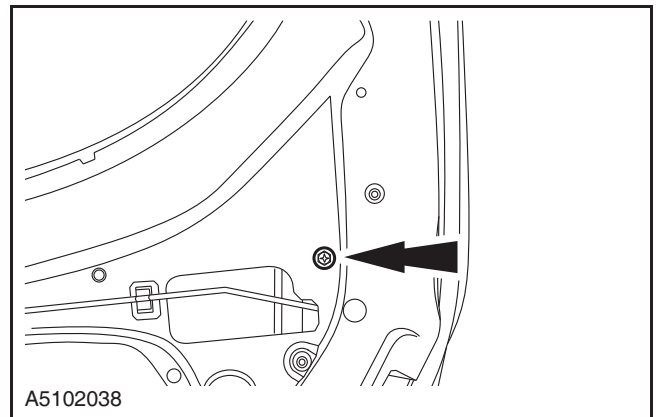
3. Remove the rear windshield dash groove.

Refer to: Rear Windshield Dash Groove (5.1.2 Door, Removal and Installation).

4. Remove the retaining bolt of the rear window dash groove holder and detach the rear window dash groove holder.

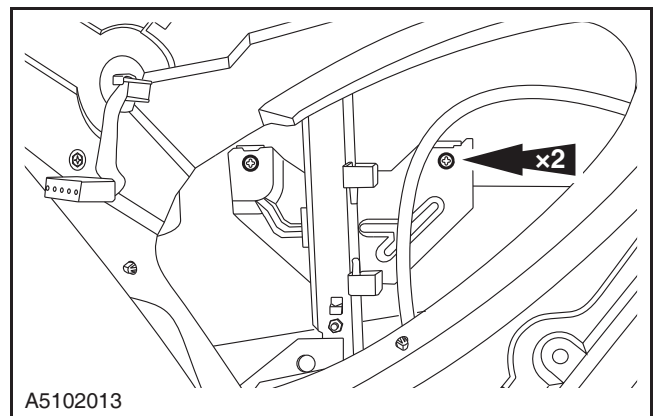
Torque: 8 Nm

5. Adjust the rear window height for easy installation and removal.

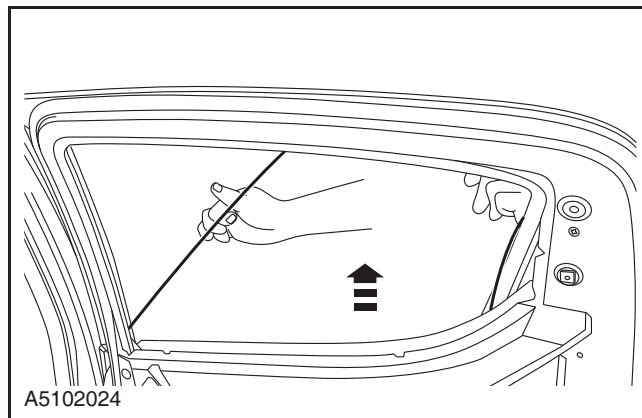


6. Remove the rear windshield retaining screw.

⚠ CAUTION: Support the windshield to prevent the dropping, causing damage.



7. Remove the rear windshield.



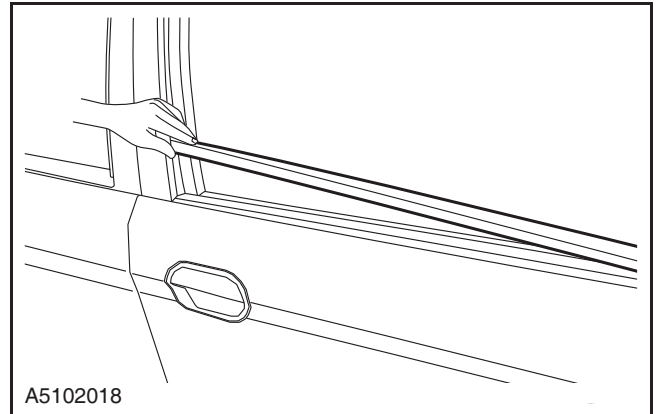
Installation

1. To install, reverse the removal procedure.

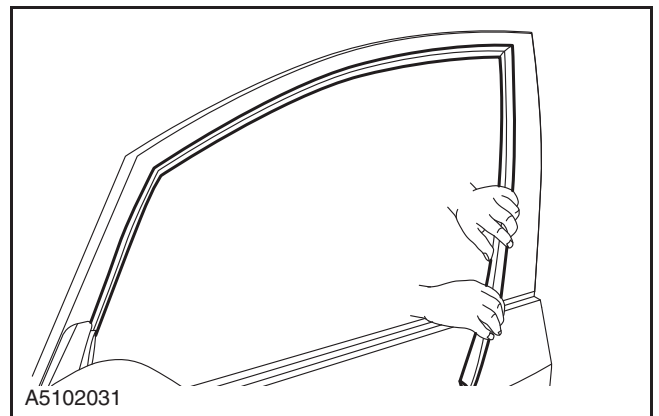
Front Windshield Slot

Removal

1. Remove the front windshield sealing strip.



2. Remove the front windshield dash groove along the window frame.



Installation

1. To install, reverse the removal procedure.

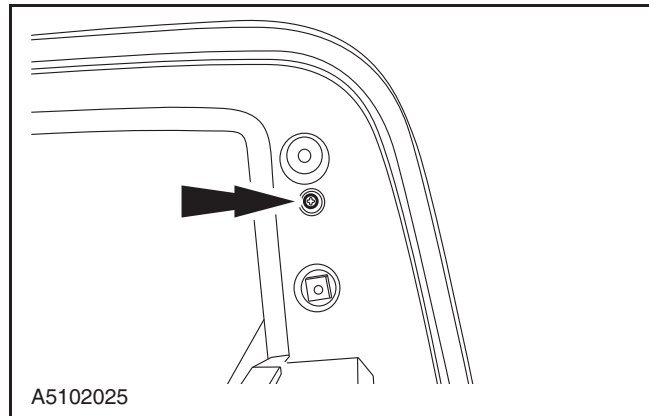
Rear Windshield Slot

Removal

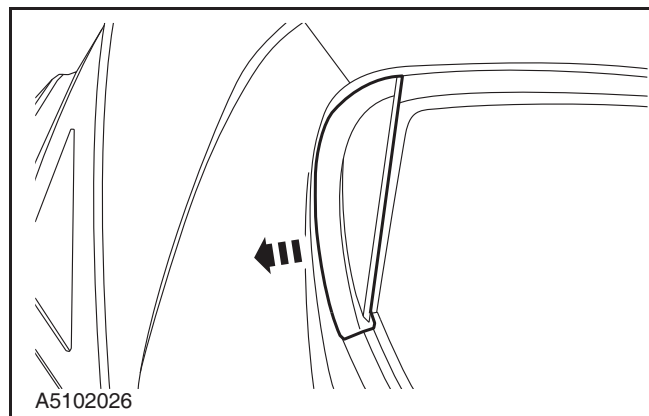
1. Remove the rear door interior trim panel.

Refer to: Rear Door Interior Trim (5.1.2 Door, Removal and Installation).

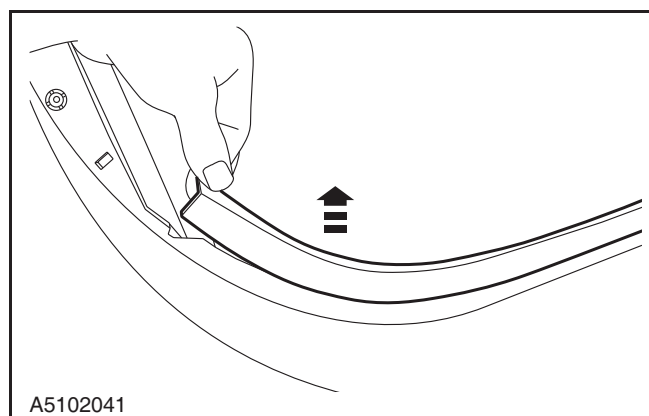
2. Remove the retaining screw of the rear window exterior trim panel.



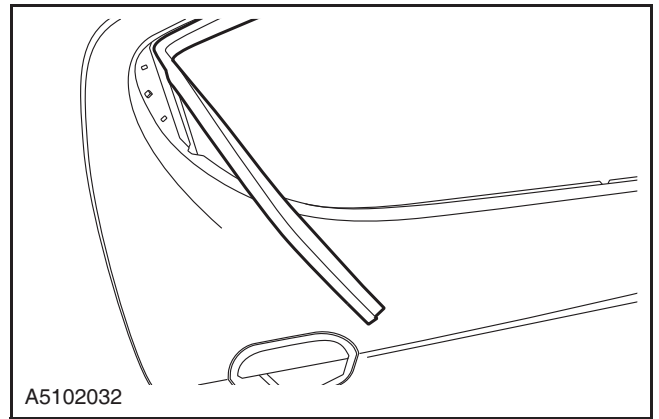
3. Remove the rear window exterior trim panel.



4. Remove the rear window sealing strip.



5. Remove the rear windshield dash groove along the window frame.



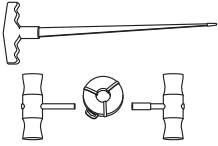
Installation

1. To install, reverse the removal procedure.

Front Side Windshield

Removal

Special Tool

 CA501-001	Windshield Adhesive Remover CA501-001
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General Equipments

Heat Gun
Glass Cement Cutter
Gluer

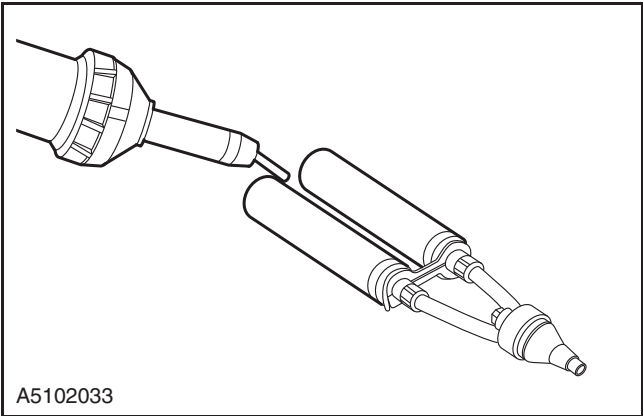
CAUTION: If the ambient temperature is below 10 °C , heat the PU adhesive for about 15 minutes in the stove or use heat gun to heat it to 25 °C .

1. Remove the A-pillar trim.

Refer to: A-pillar Trim Panel (5.1.9 Interior Trim and Ornamentation, Removal and Installation).

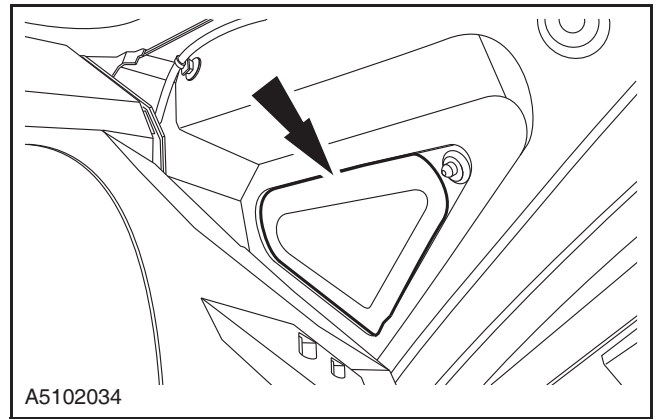
WARNING: Please wear gloves and goggles when using a glass glue cutting machine to protect against the fragments generated in the cutting. Otherwise, it may cause personal injury.

CAUTION: Be careful in the cutting process so as to avoid damage to the body and the trim panel.



2. Use special tools to remove the front side windshield.

Special Tool: CA501-001



Installation

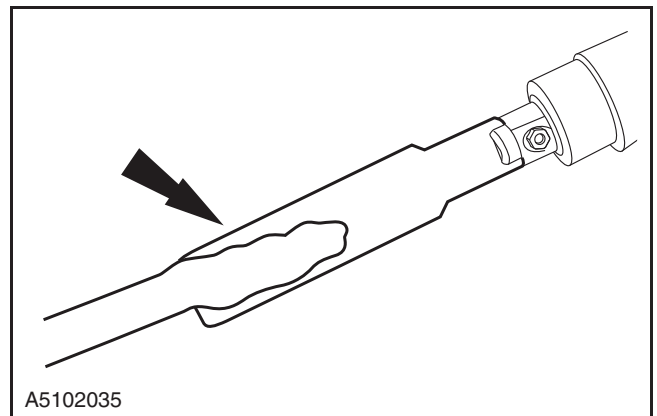
⚠ WARNING: Please keep the door open when using the PU adhesive in case it may affect the bonding effect due to an increase in the carrier pressure if the door is closed.

⚠ WARNING: Please avoid touching the cleaned surface as it will affect the bonding effect.

⚠ CAUTION: Scrape the excessive adhesive overflowed in the groove and flange.

1. Clear up the remained adhesive in the flange of the front side windshield.
2. Inspect the spoiled mental fragments, iron rust, or any other irrelevant materials in the weld sealed area which tend to cause the damage to the glass.
3. Make the temperature of the heat gun below 25 °C , remove moisture in the tank flange of front side windshield and the glass cement.

⚠ CAUTION: Paint again and again for 20 mm where has no adhesive tape in order to protect against water leakage.



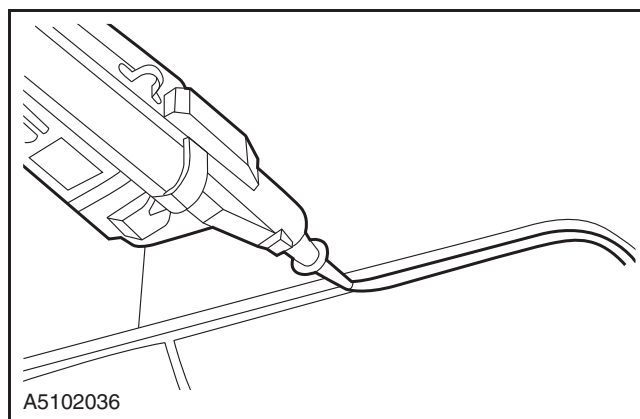
4. Paint a thin layer of adhesive on the front side windshield edge.
5. Install the front side windshield into the window frame in the buckle.

⚠ CAUTION: If the normal temperature is below 10 °C , use the heat gun to heat the surface (25 °C) in a distance of about 50mm for 15mins (inside or outside the car).

⚠ CAUTION: Open the door or touch with the windshield is prohibited before the adhesive is completely solidified.

6. Install A-pillar trim panel after the is completely solidified.

Refer to: A-pillar Trim Panel (5.1.9Interior Trim and Ornamentation, Removal and Installation).



Specifications**Torque Specifications**

Item	Nm	lb-ft	lb-in
Front seat retaining bolt	40	30	-
Rear seat belt retaining bolt	39	29	-
Rear seat retaining bolt	35	26	-

Description and Operation

System Overview

The vehicle is equipped with two rows of seats. The front seats can all move forward and backward and can adjust the backrest angle and head height. The rear seat is the 100% integral backrest in utility model and fashion model, and it is the 4/6 split backrest in luxury model and value model with folding function, to increase the trunk space. It is both convenient for riding and goods transportation.

Removal and Installation

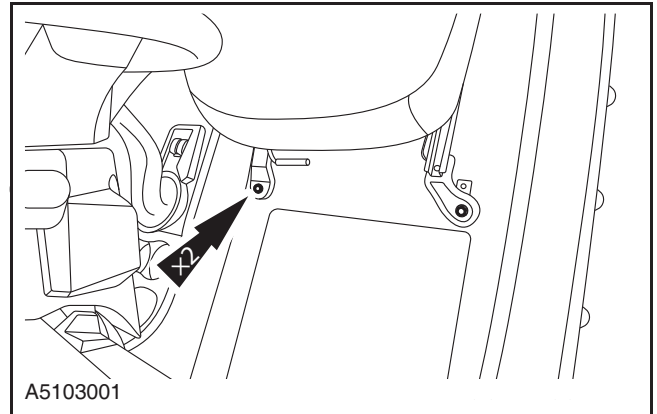
Front seat

Removal

1. Remove the front retaining bolts of front seat.

1. Move the seat to the rear position.
2. Remove the seat front retaining bolt.

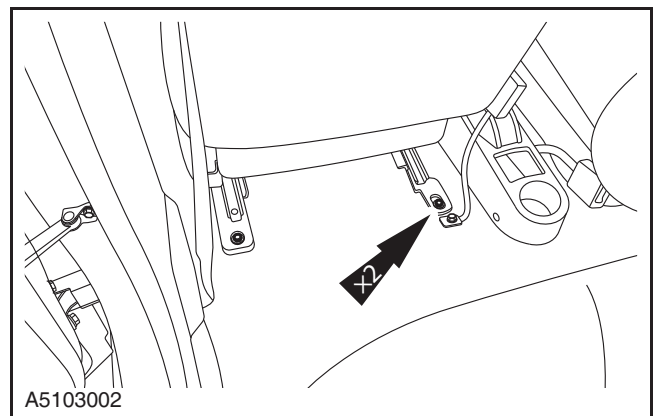
Torque: 40 Nm



2. Remove the rear retaining bolts of front seat.

1. Move the seat to the most forehand position.
2. Remove the rear retaining bolts of front seat.

Torque: 40 Nm



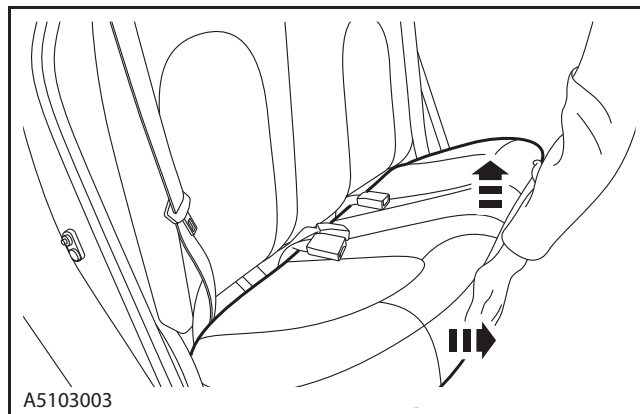
Installation

1. To install, reverse the removal procedure.

Rear Seat

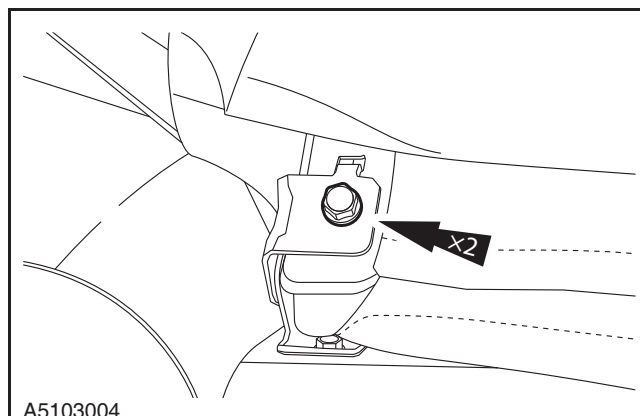
Removal

1. Remove the rear seat cushion.
 1. Withdraw the front cushion from the clip.
 2. Detach the cushion forward the vehicle.
2. Press the unlocking buttons at both sides of the rear seat, and lower the seat backrest forward.

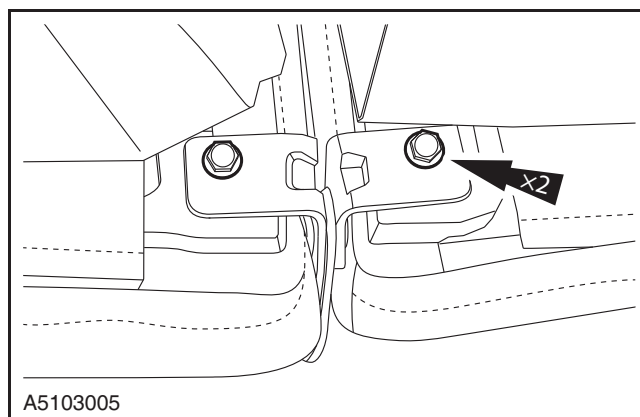


3. Remove the retaining bolts at both sides of rear seat backrest.

Torque: 35 Nm



4. Remove the rear seat backrest intermediate retaining bolts and detach the rear seat backrest.



Installation

1. To install, reverse the removal procedure.

Specifications**Torque Specifications**

Item	Nm	lb-ft	lb-in
Seat belt retractor retaining bolt	39	29	-
Front seat belt buckle retaining bolt	39	29	-
Rear seat belt retaining bolt	39	29	-
Seat belt upper anchor bolt	39	29	-
Seat belt lower anchor bolt	39	29	-
Seat belt height adjuster retaining bolt	39	29	-
Seat belt ribbon-oriented bracket retaining bolt	15	11	-

Description and Operation

System Overview

The seat belt is the major device to protect the driver. The front and the rear seats are equipped with safety belts. The side seats of the front and the rear row use three-diagonal-surrounding seat belt, while the middle seats of the rear row use two-point seat belt .

The front seat belt buckles are installed on the chair framework of each seat. The rear seat belt buckles are installed on the floor.

The seat belt is equipped with a retractor with emergent locking function. The locking function will be activated when the seat belt is completely pulled out from the retractor quickly. The locking function can prevent the seat belt from being pulled out to an excessive length. When the seat belt is rolled back to the retractor, you can cancel this function. After cancelling the locking function, the seat belt is unlocked safely. After cancelling the locking function, the seat belt can be pulled out from the retractor. The driver seat belt indicator is on the instrument cluster, to remind the driver to fasten the seat belt. The vehicle is also equipped with supplemental restraint system.

Refer to: 4.2.1 Supplemental Restraint System.



WARNING: The children seat can only be used in forward position, please install and fix the children seat strictly following the manufacturer's instruction.



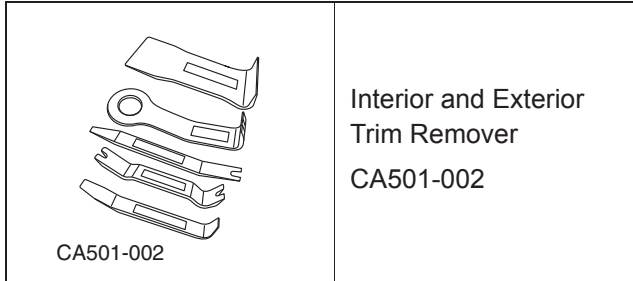
WARNING: Inspect the seat belt system carefully after every collision. The newly installed seat belt can only be used after a professional technician's inspection to make sure there is no malfunction.

Removal and Installation

Front Seat Belt

Removal

Special Tool

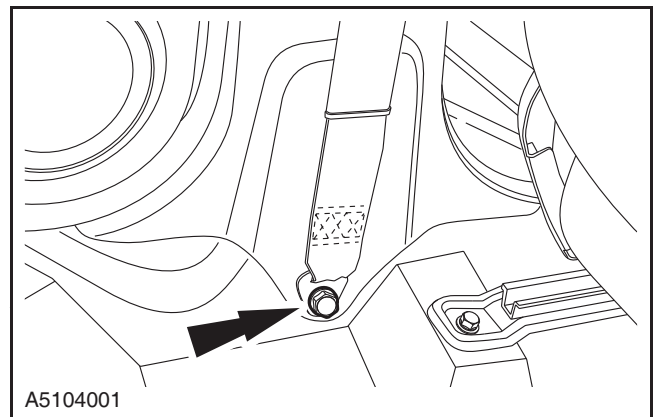


1. Remove the seat belt lower anchor retaining bolt.

Torque: 39 Nm

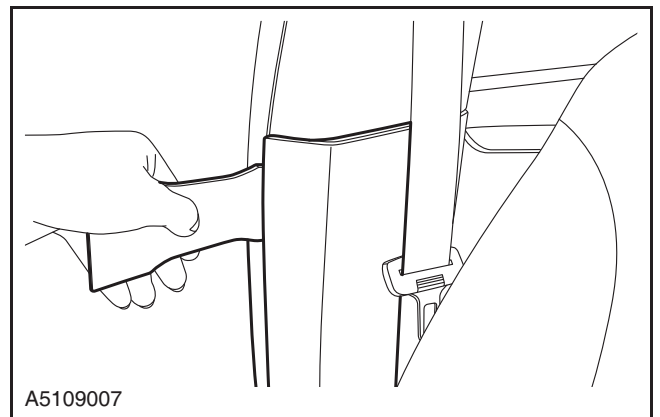


CAUTION: There is a protective paper washer on the seat belt anchor retaining bolt. Please ensure that the septa and the paper washer always on the anchor in the removal and installation process.



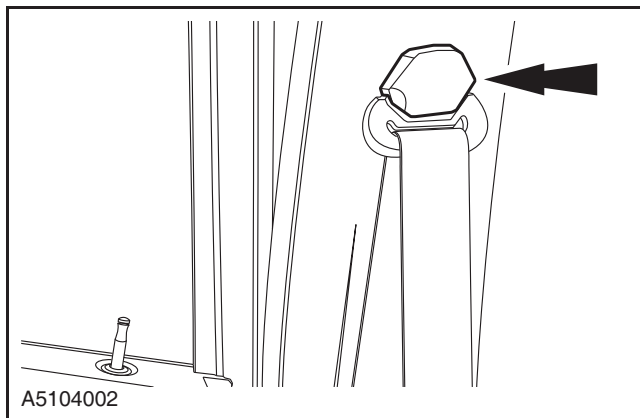
2. Use a special tool to remove B-pillar lower trim panel.

Torque: CA501-002



3. Remove the front seat belt decorative cover.

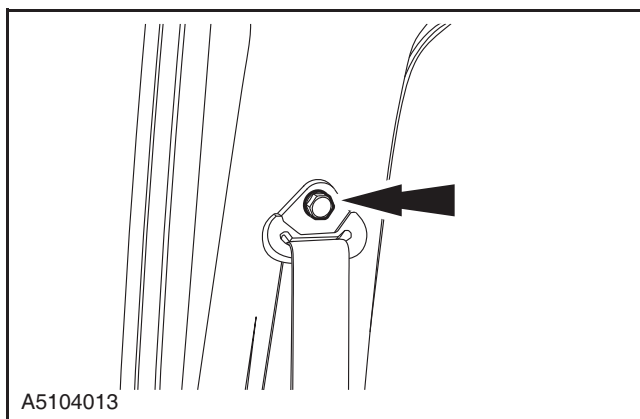
Torque: 39 Nm



4. Remove the safety belt upper anchor retaining bolt.

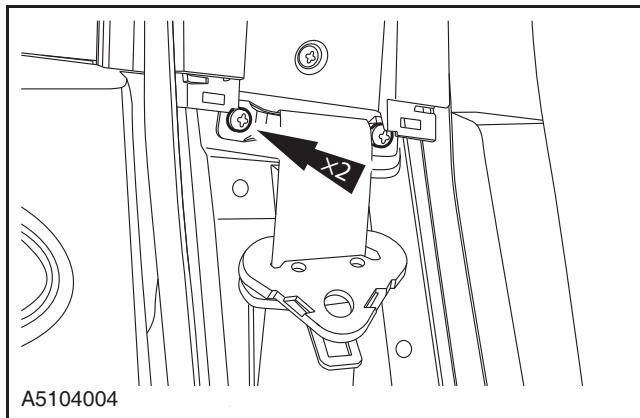
Torque: 39 Nm

CAUTION: There is a protective paper washer on the seat belt anchor retaining bolt. Please ensure that the septa and the paper washer always on the anchor in the removal and installation process.



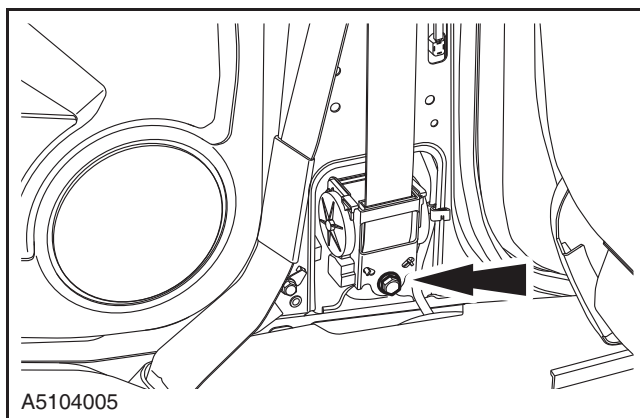
5. Remove the webbing limit bracket.

Torque: 15 Nm



6. Remove the front seat belt retractor retaining bolts and detach the front seat belt retractor.

Torque: 39 Nm



Installation

1. To install, reverse the removal procedure.

Rear Seat Belt

Removal

1. See chart:

1. Remove the rear seat belt lower anchor retaining bolt.

Torque: 39 Nm

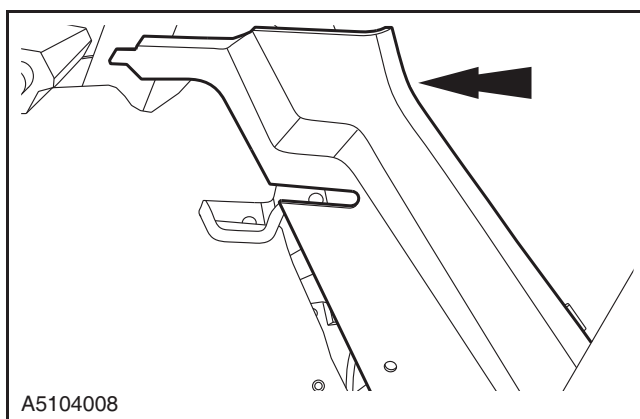
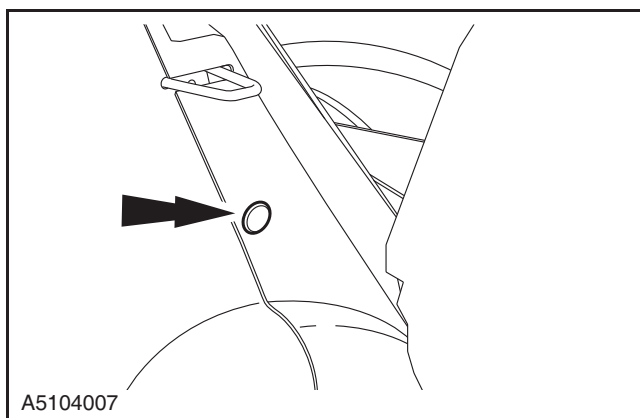
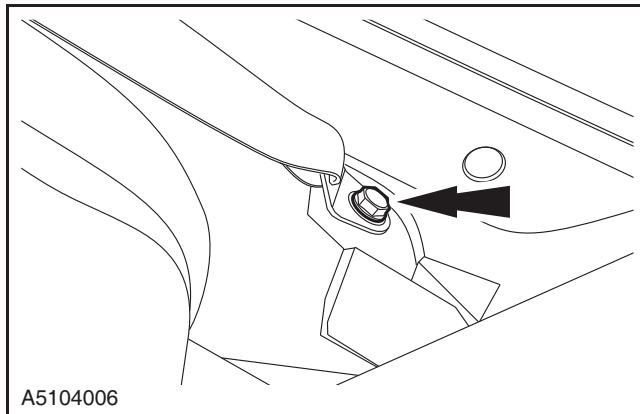
! CAUTION: There is a protective paper washer on the seat belt anchor retaining bolt. Please ensure that the septa and the paper washer always on the anchor in the removal and installation process.

2. Remove the C-pillar lower trim retaining screw.

2. Remove the C-pillar lower trim retaining clamp.

3. Detach the rear door sealing strip and C-pillar lower trim.

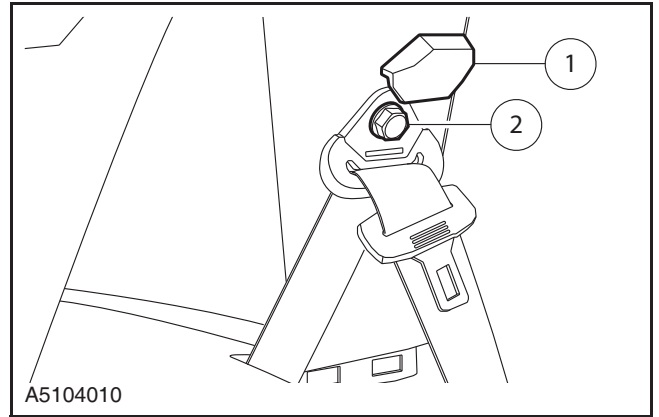
4. Remove the C-pillar lower trim with hands.



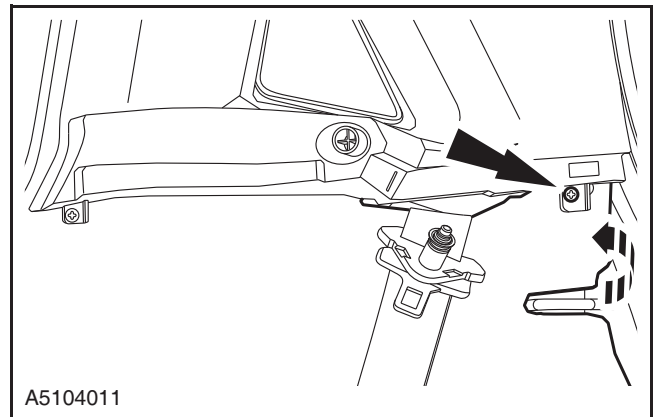
5. See chart:
 1. Remove the rear seat belt decorative cover.
 2. Remove the rear upper anchor retaining bolt.

Torque: 39 Nm

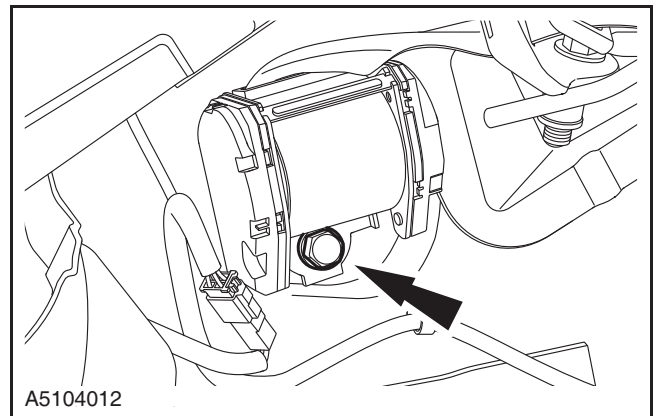
6. Press unlocking button at both sides seat cushion and open the seat cushion forward.



7. Remove the C-pillar upper trim retaining screw.
8. Uncover C-pillar interior trim blanket.



9. Remove the rear seat belt retractor retaining bolts and detach the rear seat belt retractor.
- Torque: 39 Nm



Installation

1. To install, reverse the removal procedure.

Rear Waist Seat Belt

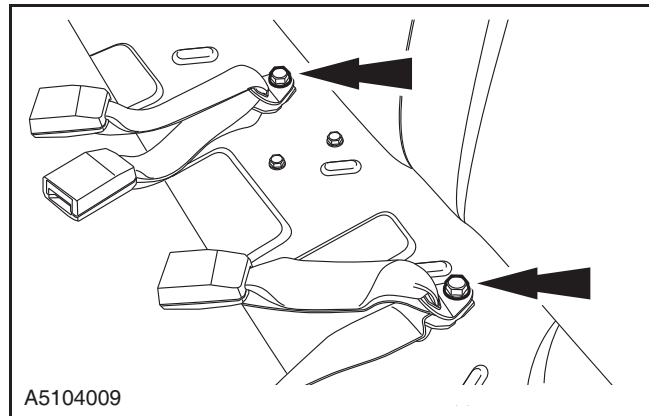
Removal

1. Remove the rear seat cushion.

Refer to: Rear Seat (5.1.3 Seat, Removal and Installation).

2. Remove the rear waist seat belt clamp retaining bolts and detach the rear waist seat belt clamp.

Torque: 39 Nm



Installation

1. To install, reverse the removal procedure.

Description and Operation

System Overview

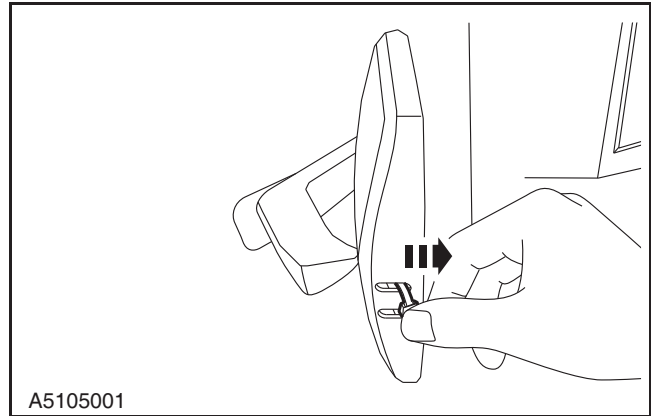
The rearview mirror includes interior rearview mirror and exterior rearview mirror. The interior rearview mirrors are all manually adjusted. The exterior rearview mirror integrates the side turn signal, adjust the mirror manually or automatically according to different vehicle configurations. Adjust the rearview mirror manually by using the rearview mirror adjusting handle inside the front door, and adjust automatically by using the button on the left side of instrument panel.

Removal and Installation

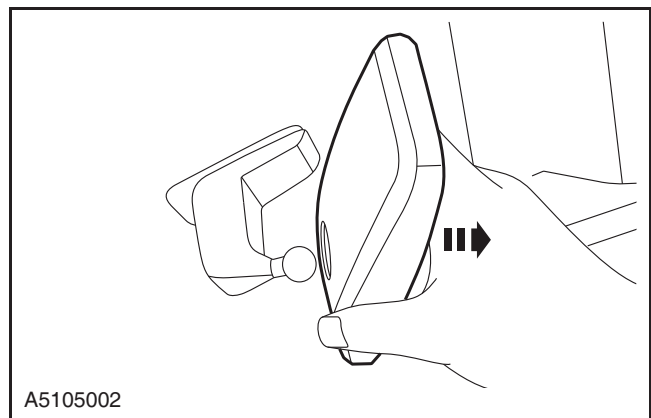
Endoscopes

Removal

1. Uncover endoscopes retaining clamps.



2. Remove the endoscopes backwards.



Installation

1. To install, reverse the removal procedure.

 **CAUTION:** Smear greases in the endoscopes ball bowl when installing the endoscopes for easy installation.

Specifications**Torque Specifications**

Item	Nm	lb-ft	lb-in
Instrument panel upper retaining bolt	9	-	9
Instrument panel side retaining bolt	9	-	9
Instrument panel lower retaining bolt	9	-	9

Removal and Installation

Instrument Panel

Removal

Special Tool



⚠ WARNING: Disconnect the battery negative wiring harness for over 60 s before repairing the air-bag system in order to keep safe.

1. Put the steering wheel at horizontal position.

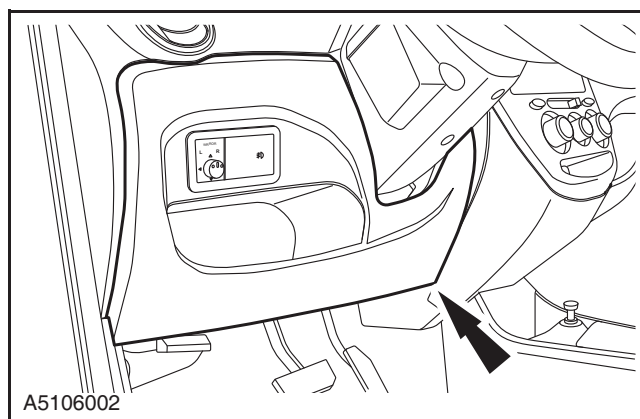
⚠ CAUTION: Make sure the steering wheel is locked.

⚠ CAUTION: Make sure the wheel is in the right ahead position.

2. Disconnect the battery negative cable.

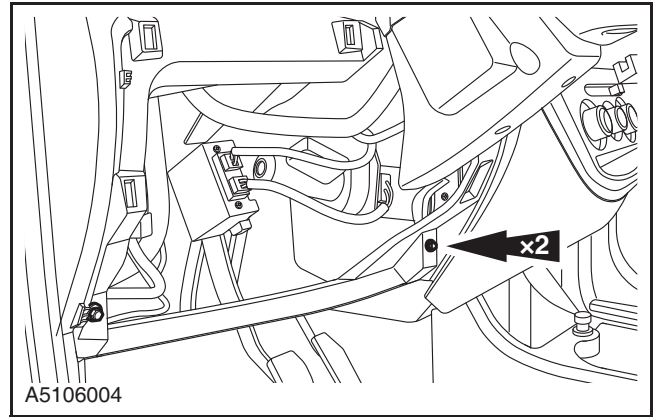
Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

3. Remove the driver side protect panel.
4. Disconnect the power rearview mirror adjustment switch wiring harness connector.



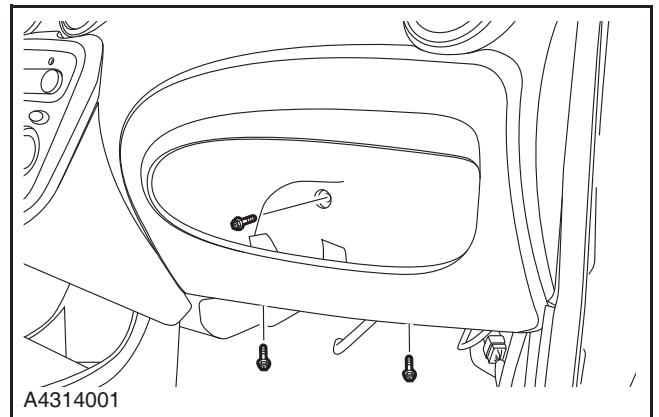
5. Remove the instrument left lower retaining bolts.

Torque: 9 Nm



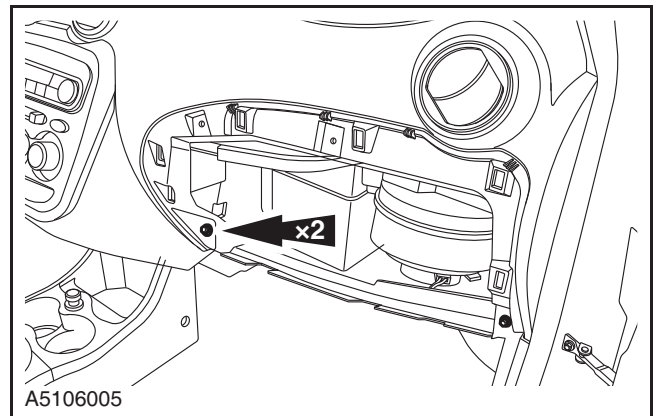
6. Remove three retaining bolts on the glove box and detach the glove box.

Torque: 9 Nm



7. Remove the instrument panel right side retaining bolts.

Torque: 9Nm



8. Remove the left and right trim panels of A-pillar.

Refer to: A-pillar Trim Panel (5.1.9 Interior Trim and Ornamentation, Removal and Installation).

9. Remove driver airbag and the steering wheel.

Refer to: Driver Airbag and Steering Wheel (4.2.1 Supplementary Restraint System, Removal and Installation).

10. Remove the steering lock case.

11. Remove the wiper combination switch.

Refer to: Wiper Combination Switch (4.3.8 Wipers and Washers, Removal and Installation).

12. Remove the light combination switch.

Refer to: Lighting Combination Switch (4.3.7 Lighting System, Removal and Installation).

13. Remove the instrument panel assembly.

Refer to: Instrument Assembly (4.3.2 Instrument, Removal and Installation).

14. Remove the air conditioning control panel.

Refer to: Air Conditioner Control Panel (4.1.1 Heating, Ventilation and Air Conditioning System, Removal and Installation).

15. Remove the radio.

Refer to: Radio (4.3.6 Information and Entertainment System, Removal and Installation).

16. Remove the hazard warning lamp switch.

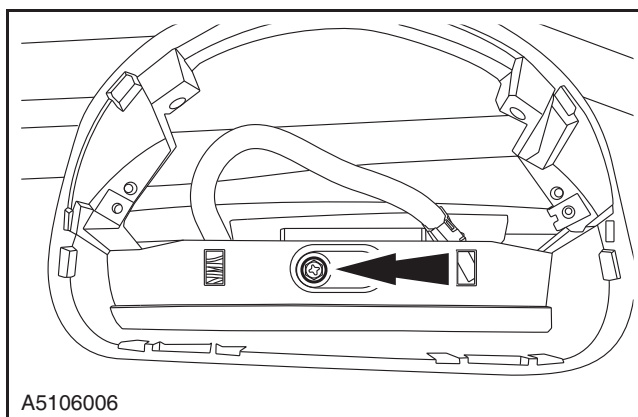
Refer to: Hazard Warning Lamp Switch (4.3.7 Lighting System, Removal and Installation).

17. Remove the console.

Refer to: Console (5.1.6 Instrument Cluster and Console, Removal and Installation).

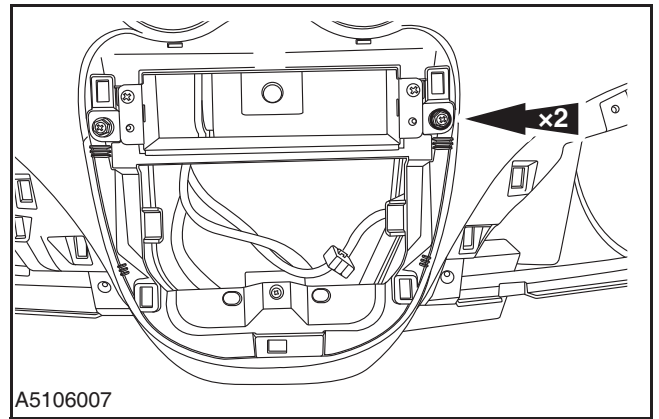
18. Remove the instrument rear retaining bolt on the instrument panel.

Torque: 9 Nm



19. Remove the radio rear retaining bolt on the instrument panel.

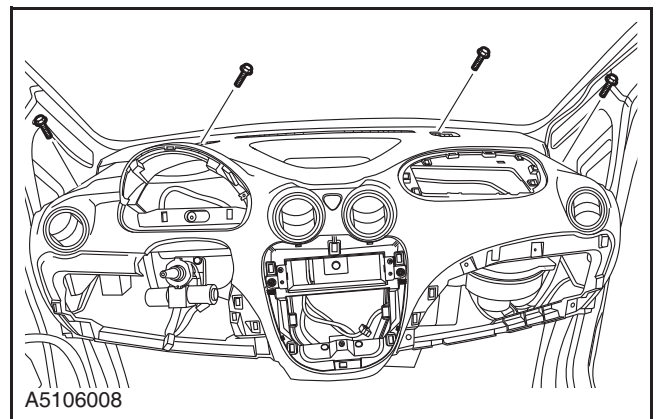
Torque: 9Nm



20. Remove the front and both sides retaining bolts on the instrument panel.

Torque: 9Nm

21. Remove the instrument assembly.



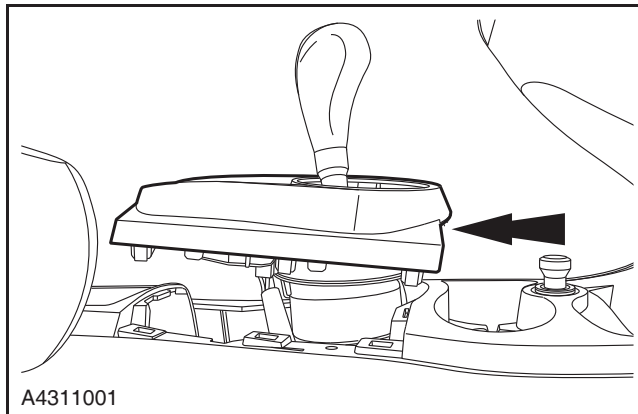
Installation

1. To install, reverse the removal procedure.

Console

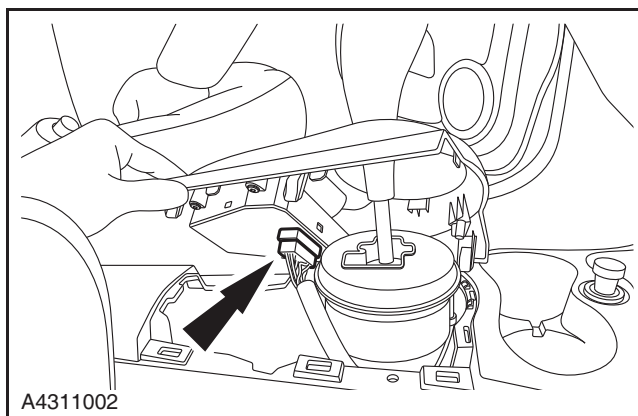
Removal

1. Remove the gearshift control mechanism trim panel.

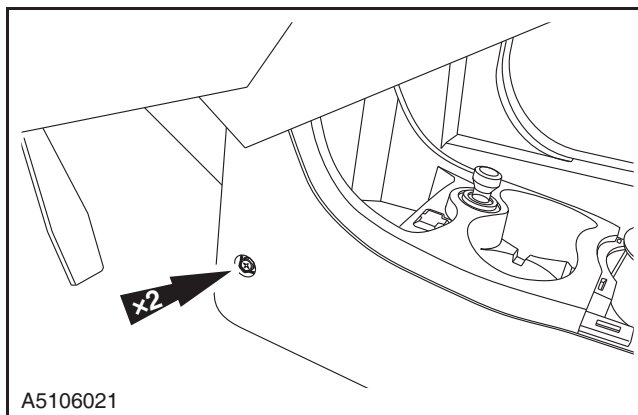


2. Disconnect the power window switch wiring harness connector.

CAUTION: This step is limited to Model 2011 and please subject to the actual vehicle.

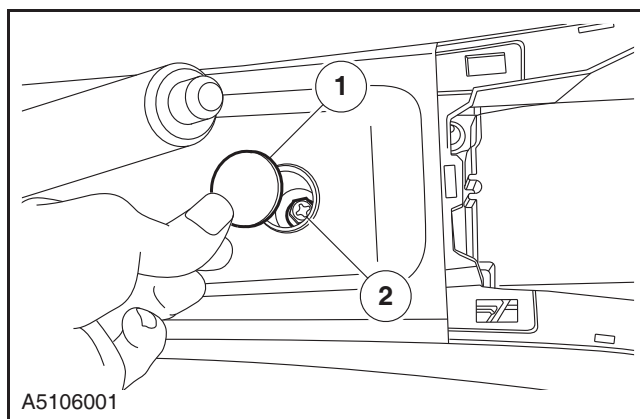
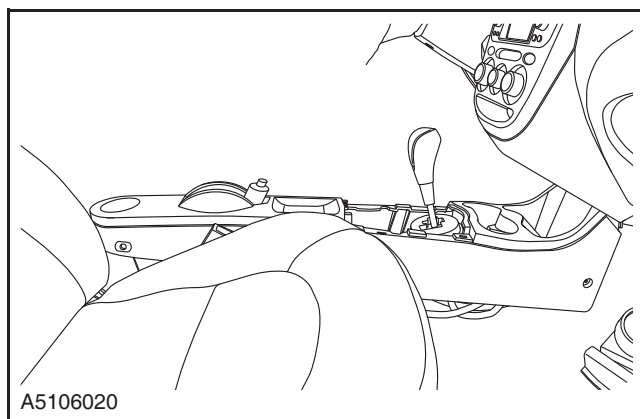


3. Remove the console front retaining bolts at both sides.

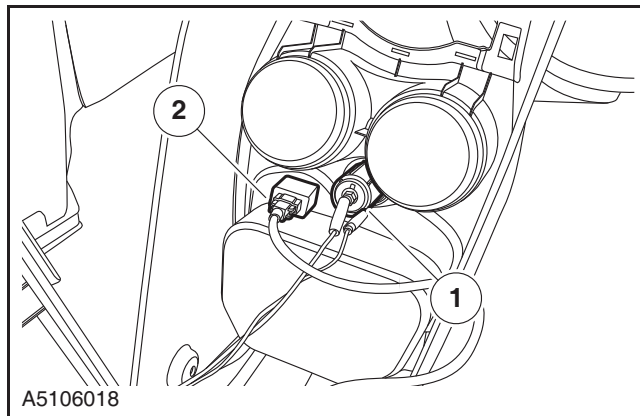


4. See chart:

1. Remove the console intermediate retaining screw decorative cover.
2. Remove the console intermediate retaining screw.

**5.** Uncover the console.**6.** See chart:

1. Disconnect the cigarette lighter wiring harness connector.
2. Disconnect USB wiring harness connector.



Removal and Installation

Front Bumper

Removal

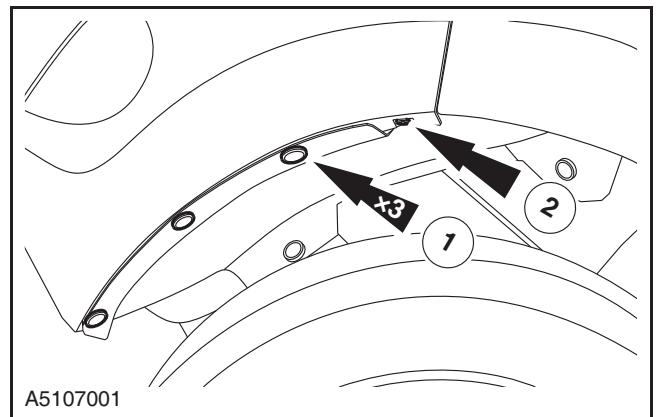
1. Disconnect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

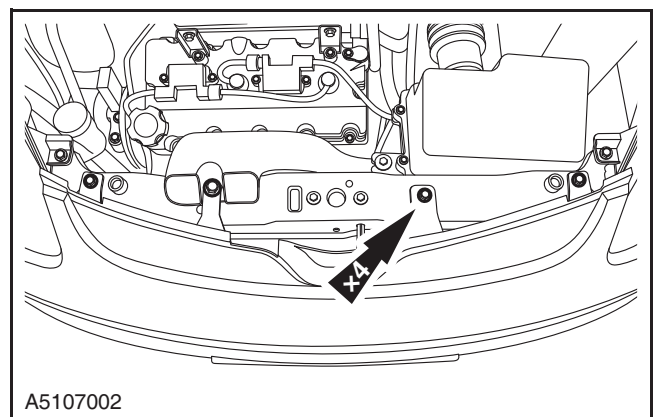
2. See chart.

1. Remove the connection retaining bolts at both left and right sides of the front fender lining and the front bumper.

2. Remove the retaining screws at left and right sides of bumper.

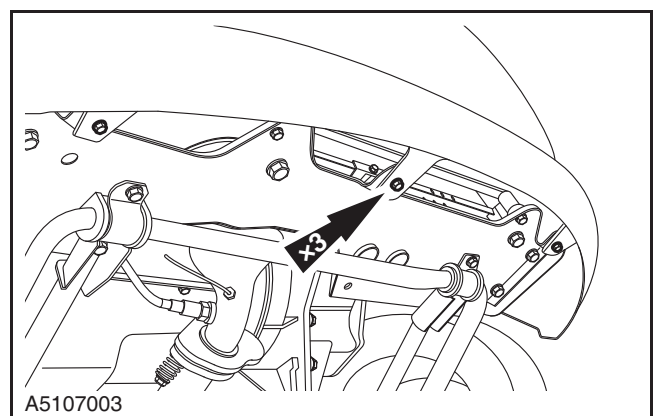


3. Remove the upper retaining bolts on the bumper.

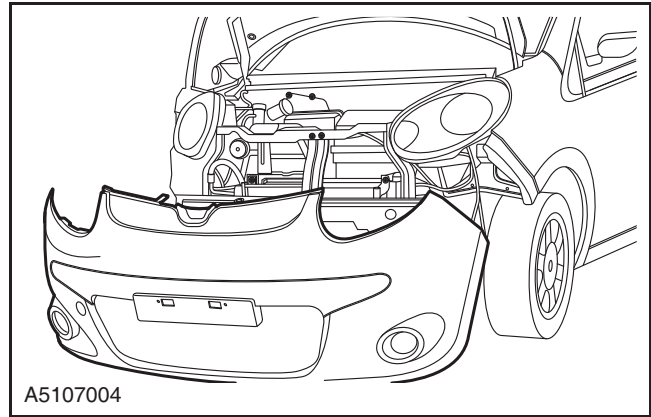


4. Remove the lower retaining bolts on the bumper.

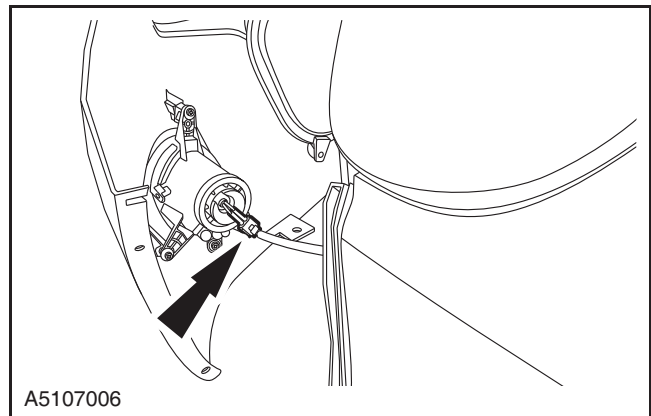
Torque: 9 Nm



5. Pull out the bumper from the bumper bracket.



6. Disconnect both the left and right front fog lamp wiring harness connectors.



Installation

1. To install, reverse the removal procedure.

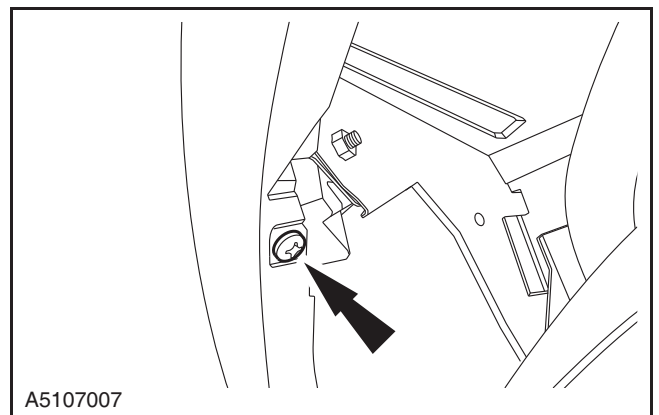
Rear Bumper

Removal

Special Tool

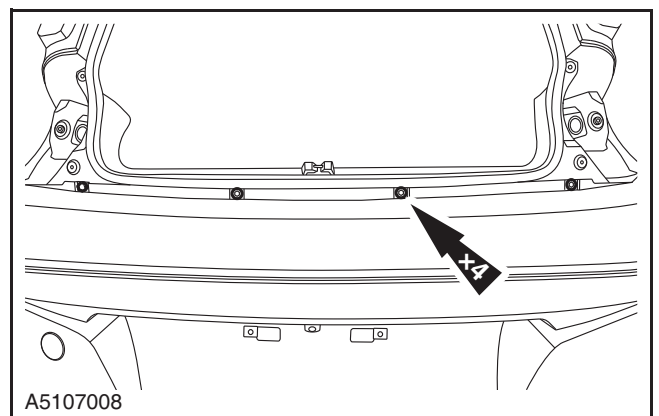


1. Disconnect the battery negative cable.
Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).
2. Remove both the left and right rear tail lamps.
Refer to: Rear Tail Lamp (4.3.7 Lighting System, Removal and Installation).
3. Remove the retaining screws at both left and right sides of rear bumper.



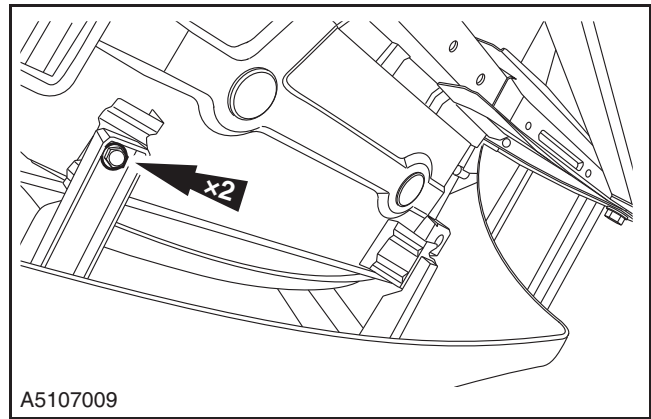
4. Remove the upper retaining bolts on the rear bumper.

Torque: 9 Nm

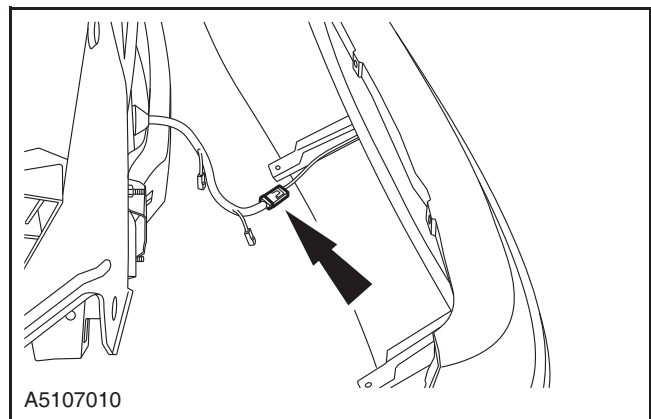


5. Remove the retaining bolts at both left and right sides of rear bumper.

Torque: 9 Nm



6. Disconnect the visual reverse radar camera and license lamp wiring harness connector.



Installation

1. To install, reverse the removal procedure.

Specifications**Torque Specifications**

Item	Nm	lb-ft	lb-in
Engine hood lock buckle retaining bolt	10	-	89
Tailgate retaining bolt	10	-	89

Description and Operation

System Overview

The front and rear door locks are usually controlled by handle lever system of outside handle and remote door lock system. And the left front door lock is connected to door lock cylinder. The remote door lock device has a control rod to control the lock the unlock inside. The engine hook is controlled by its inside handle, and the tailgate door lock is controlled by its inside handle.

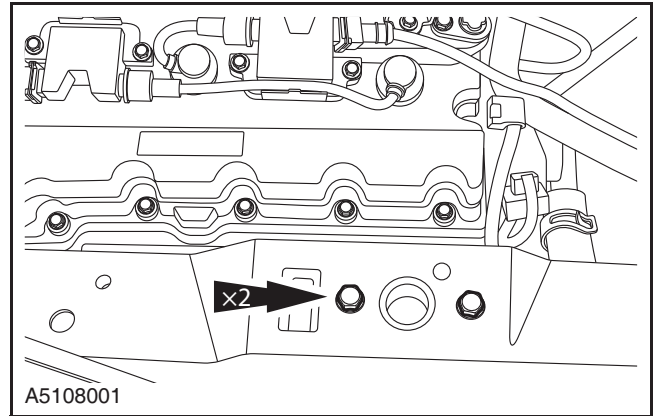
Removal and Installation

Engine Hood Lock Buckle

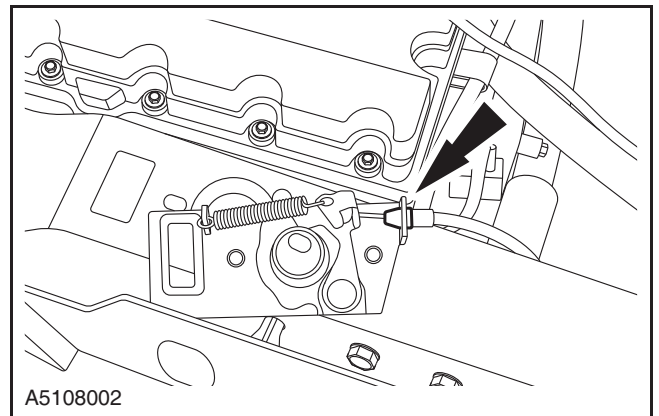
Removal

1. Remove the air filter assembly.
2. Remove the engine hood lock buckle retaining bolt.

Torque: 10 Nm



3. Remove the engine hood releasing cable and detach the engine hood lock buckle.



Installation

1. To install, reverse the removal procedure.

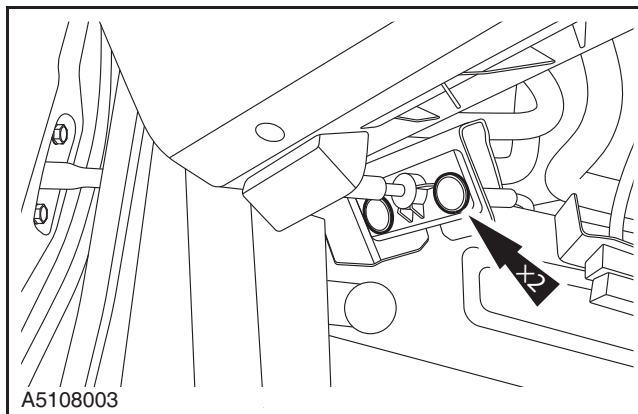
Engine Hood Lock Buckle Unlocking Handle

Removal

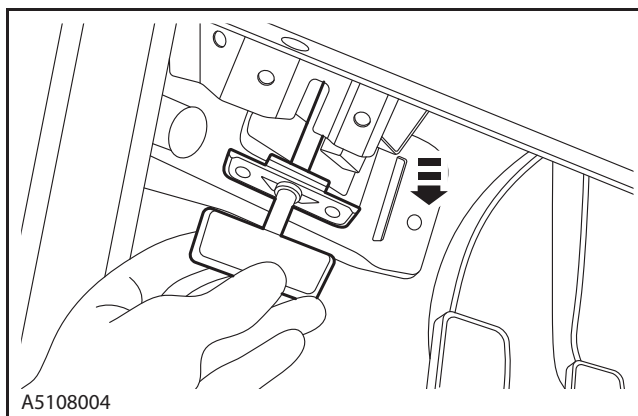
1. Remove the engine hood lock buckle assembly.

Refer to: Engine Hood Lock Buckle (5.1.8 Handle, Lock, Latch, Removal and Installation).

2. Remove the fixed buckle of the engine hood releasing cable and the fore cabin.
3. Remove the fixed buckle of the engine hood lock buckle unlocking handle.



4. Remove the engine hood lock buckle unlocking handle.
 1. Detach the engine hood lock buckle unlocking handle from the console.
 2. Pull out the engine hood lock buckle unlocking handle and the engine hood releasing cable.



Installation

1. To install, reverse the removal procedure.

Ignition Lock Core

Removal

1. Disconnect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the driver side air bag and the steering wheel.

Refer to: Airbag System (4.2.1 Supplementary Restraint System, Removal and Installation).

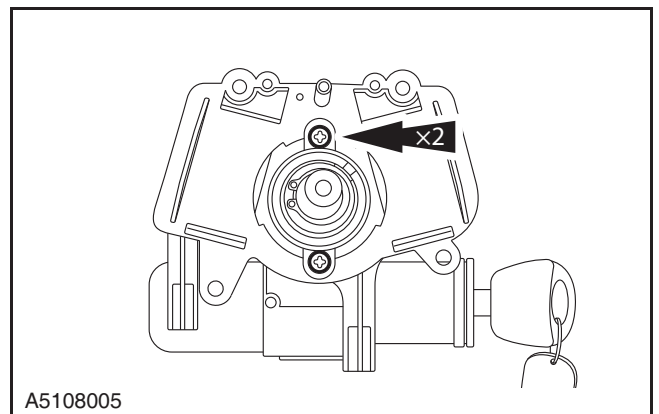
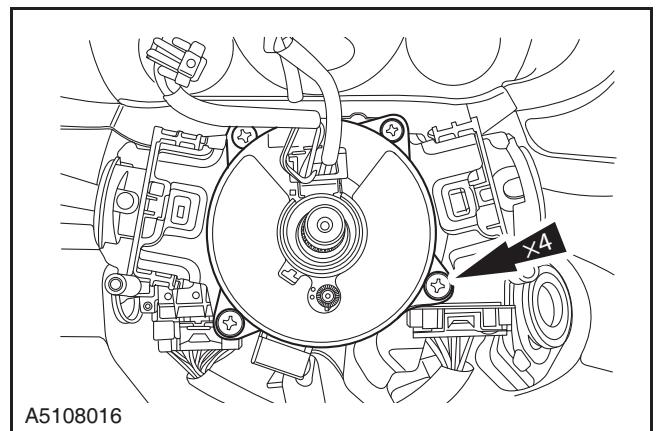
3. Remove the steering lock case.
4. Remove the clock spring retaining screw and detach the clock spring.
5. Remove the light combination switch.

Refer to: lighting Combination Switch (4.3.7 Lighting System, Removal and Installation).

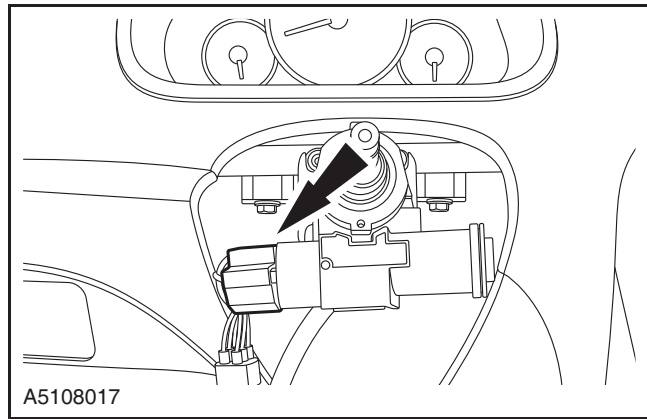
6. Remove the wiper combination switch.

Refer to: Wiper Combination Switch (4.3.8 Wipers and Washers, Removal and Installation).

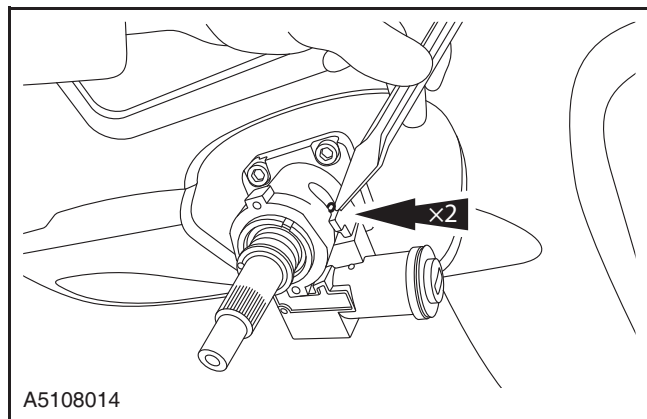
7. Remove the combination switch base.
 1. Remove the retaining screws of the combination switch base.
 2. Take out the combination switch base.



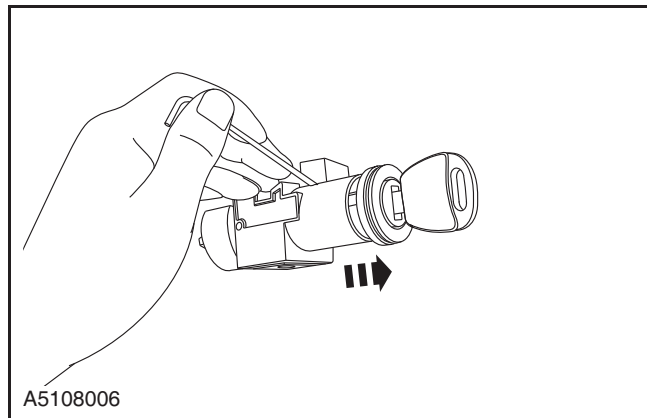
8. Disconnect the ignition switch wiring harness connector.



9. Remove the ignition lock assembly.
1. Use a proper tool to remove the two retaining bolts of the ignition lock.
 2. Detach the ignition lock assembly.

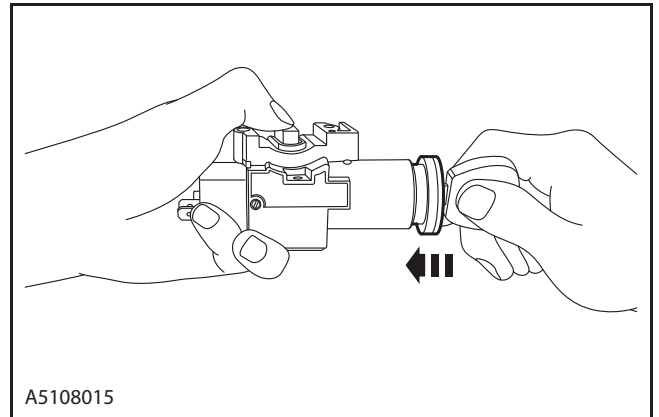


10. Remove the ignition lock core.
1. Use a proper tool to press the ignition lock core locking device.
 2. Pull out the ignition lock core.

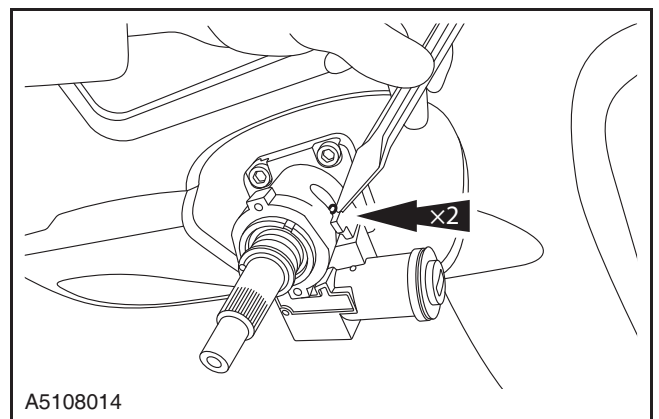


Installation

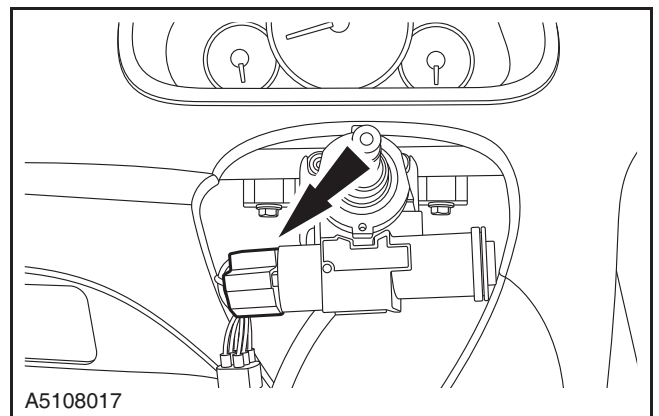
1. Install the ignition lock core.
 1. Press the ignition lock latch locking device.
 2. Install the ignition lock core in the direction of the arrow.



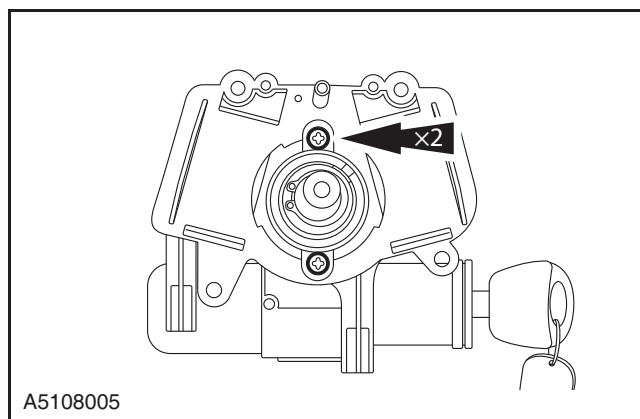
2. Install the ignition lock assembly.
 1. Install the ignition lock assembly.
 2. Use a proper tool to install the two retaining bolts of the ignition lock assembly.
- Torque: 15 Nm



3. Connect the ignition switch wiring harness connector.



4. Install the combination switch base.
 1. Install the combination switch base.
 2. Install the retaining screws of the combination switch base.

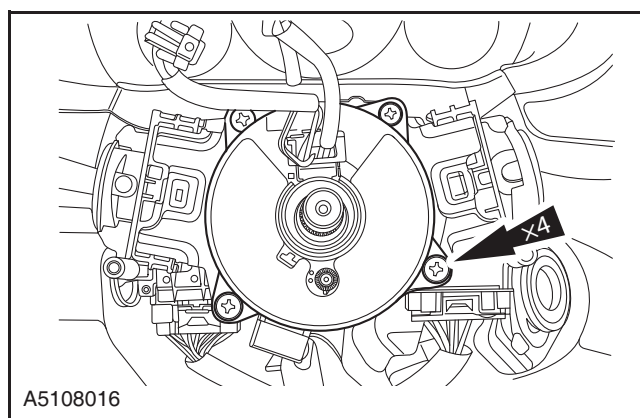


5. Install the retaining screws of the clock spring and the clock spring.
6. Install the light combination switch.

Refer to: lighting Combination Switch (4.3.7 Lighting System, Removal and Installation).

7. Install the wiper combination switch.

Refer to: Wiper Combination Switch (4.3.8 Wipers and Washers, Removal and Installation).



8. Install the steering lock case.
9. Install the driver side air bag and steering wheel.

Refer to: Airbag System (4.2.1 Supplementary Restraint System, Removal and Installation).

10. Connect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

Door Lock Core

Removal

Special Tool



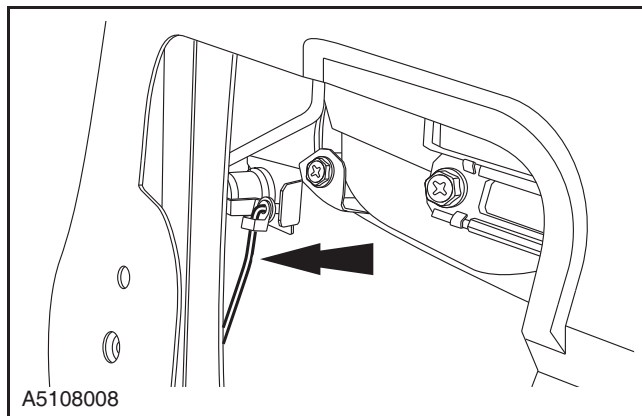
1. Remove the trim panel of front door.

Refer to: Front Door Interior Trim (5.1.2 Door, Removal and Installation).

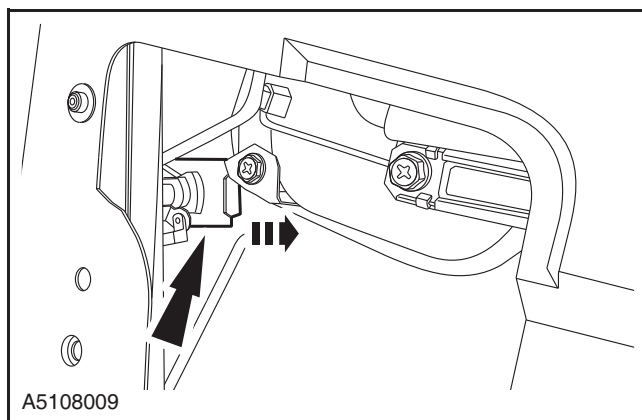
2. Uncover the waterproof membrane.

⚠ CAUTION: Do not touch with a sticky surface to avoid weaken viscosity when reloading.

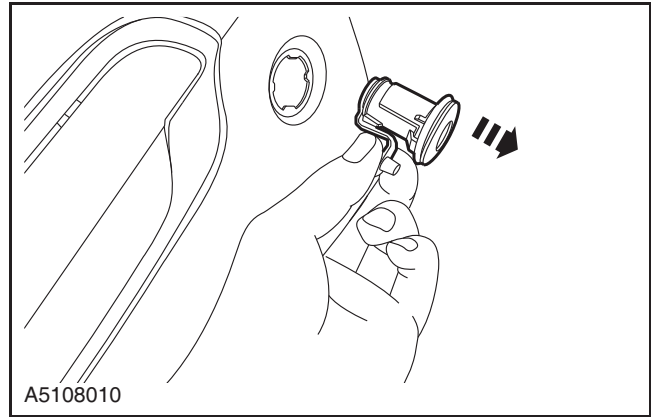
3. Remove the door lock latch lever.



4. Use proper tools to remove the lock core limit card.



5. Remove the lock core.



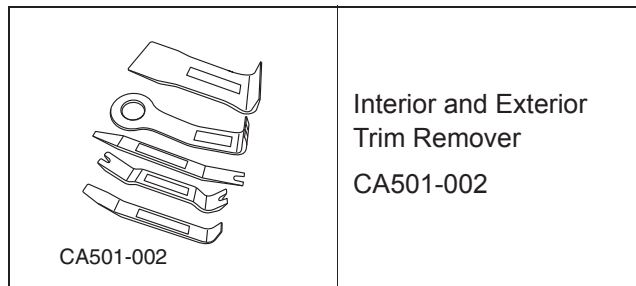
Installation

1. To install, reverse the removal procedure.

Door External Handle

Removal

Special Tool



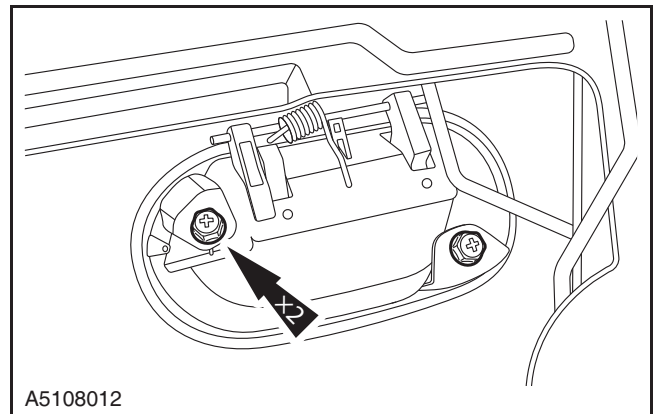
1. Remove the trim panel of front door.

Refer to: Front Door Interior Trim (5.1.2 Door, Removal and Installation).

2. Uncover the waterproof membrane.

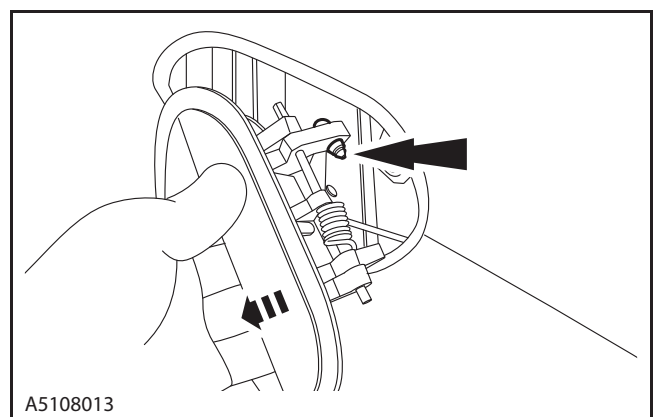
⚠ CAUTION: Do not touch with a sticky surface to avoid weaken viscosity when reloading.

3. Remove the retaining bolt of door external handle.



4. Remove the door external handle.

1. Remove the door external handle in the direction of arrow.
2. Use proper tools to detach the door external handle lever.



Installation

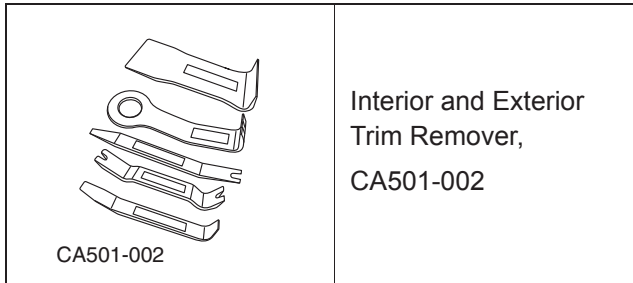
1. To install, reverse the removal procedure.

Removal and Installation

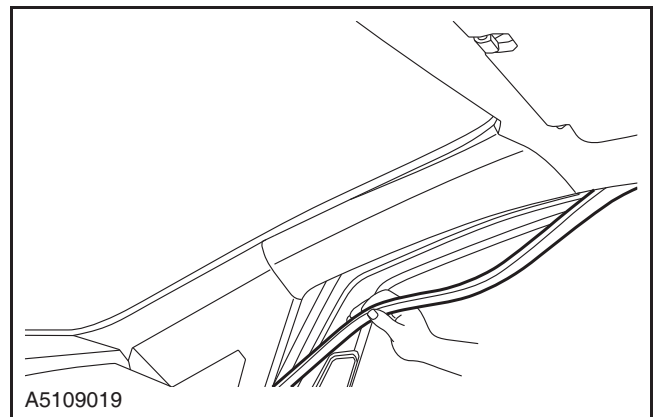
A-Pillar Trim Panel

Removal

Special Tool

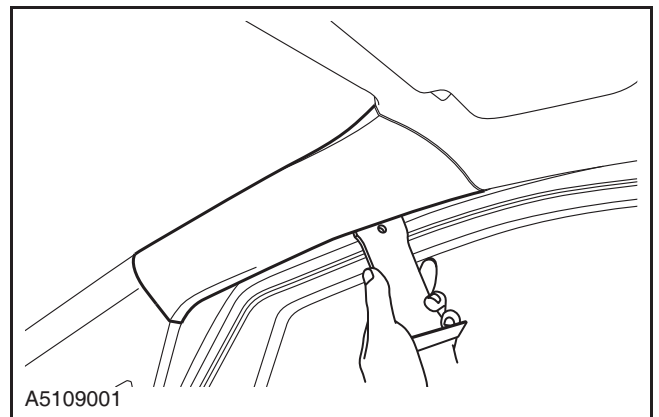


1. Detach the front door sealing strip and A-pillar trim panel.

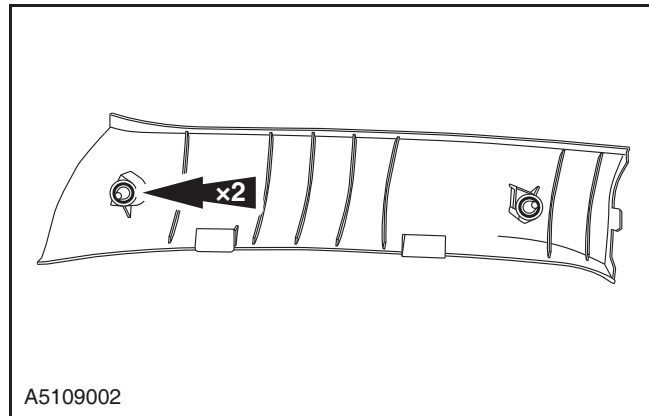


2. Use a special tool to remove A-pillar upper trim panel.

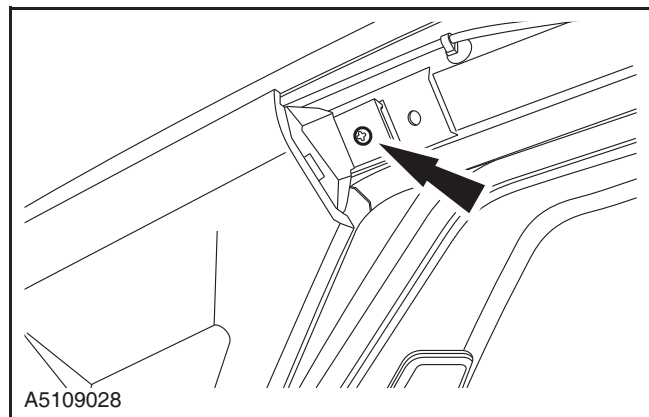
Special Tool: CA501-002



3. Picture of A-pillar upper trim panel clamps position.

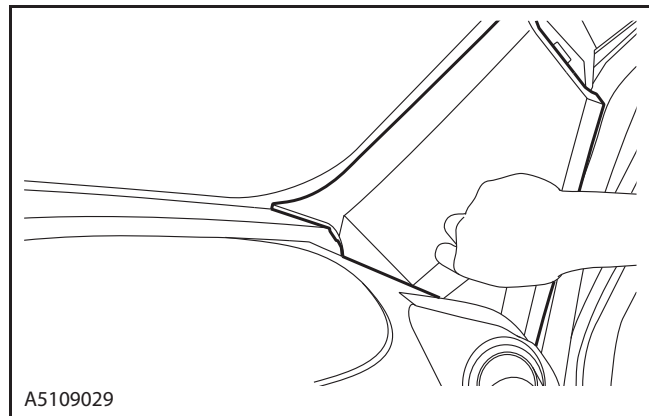


4. Remove the retaining screw of the A-pillar triangular trim panel.



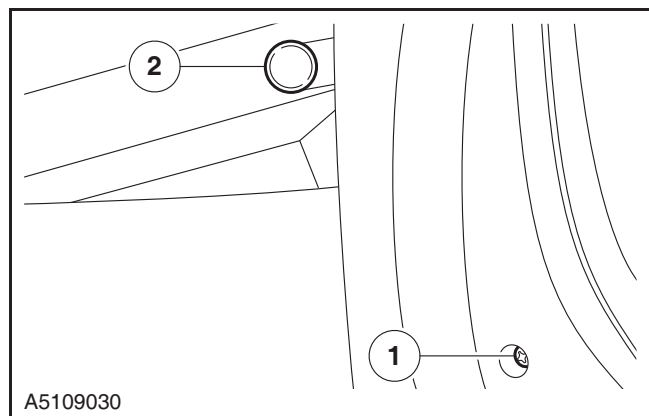
5. Use special tools to remove the A-pillar triangular trim panel from the bottom of the slot.

Special Tool: CA501-002

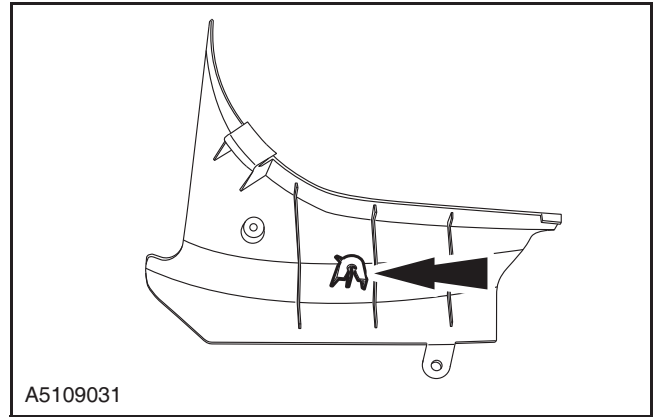


6. Remove the A-pillar lower trim panel.

1. Remove the retaining screw of the A-pillar lower trim panel.
2. Remove the retaining clamp of the A-pillar lower trim panel.



7. The clamps position of A-pillar lower trim panel is shown in the illustration.



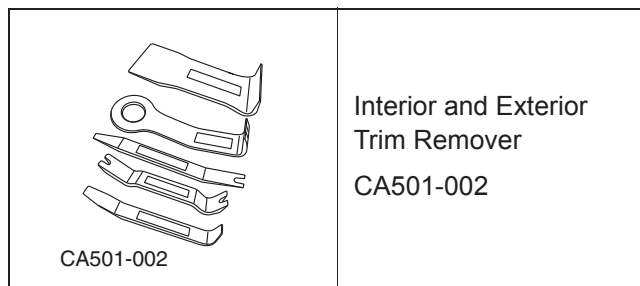
Installation

1. To install, reverse the removal procedure.

B-pillar Trim Panel

Removal

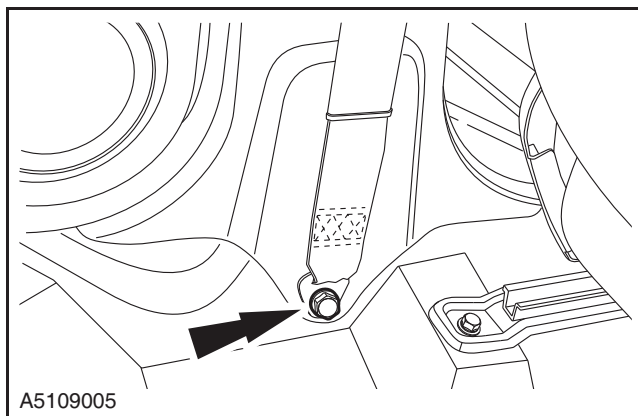
Special Tool



1. Remove the front seat belt lower anchor retaining bolt.

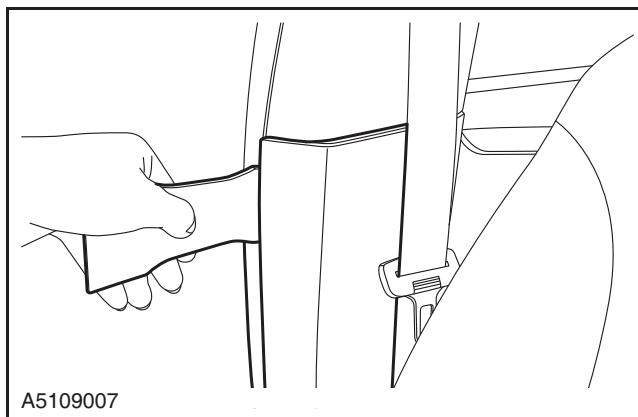
CAUTION: There is a protective paper washer on the seat belt anchor retaining bolt. Please ensure that the septa and the paper washer always on the anchor in the removal and installation process.

Torque: 39 Nm

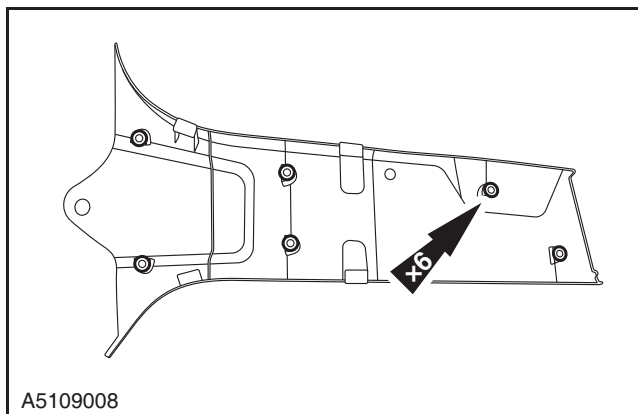


2. Use a special tool to remove B-pillar lower trim panel.

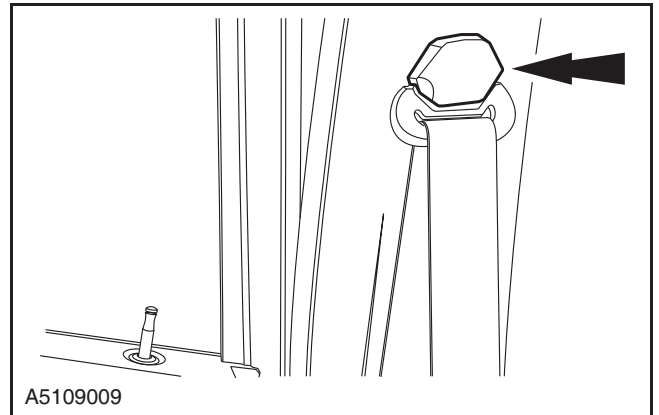
Special Tool: CA501-002



3. Picture of B-pillar lower trim panel clamps position.

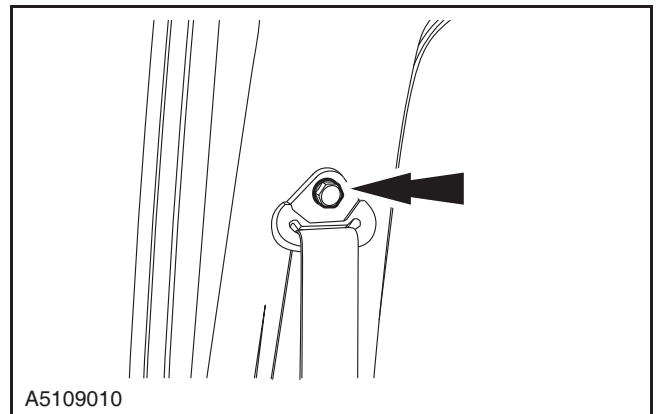


4. Remove the front seat belt decorative cover.

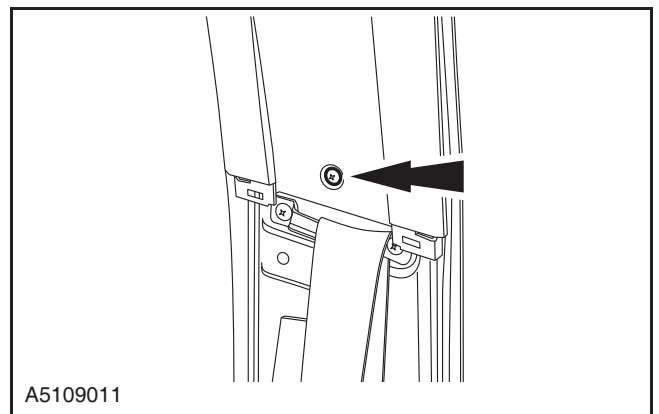


5. Remove the safety belt upper anchor retaining bolt .

Torque: 39Nm

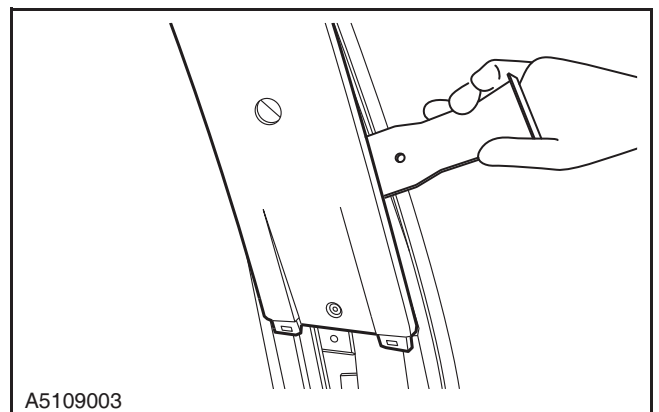


6. Remove the B-pillar upper trim retaining screw.

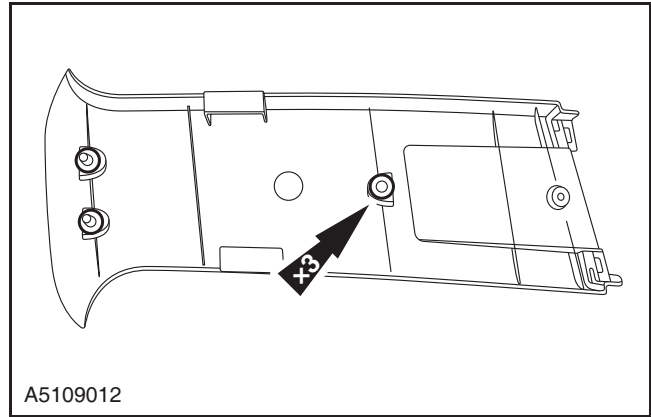


7. Use a special tool to remove B-pillar upper trim panel.

Special Tool: CA501-002



8. Picture of B-pillar upper trim panel clamps position.



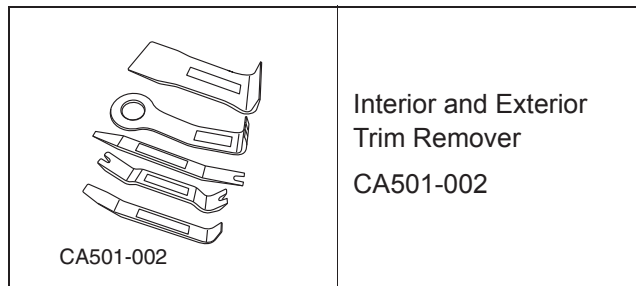
Installation

1. To install, reverse the removal procedure.

C-pillar Trim Panel

Removal

Special Tool



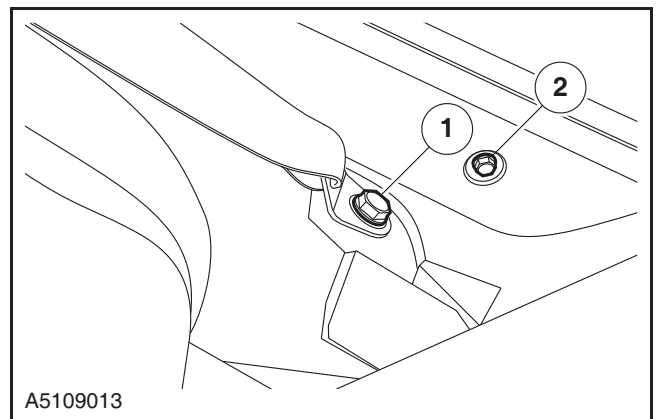
1. See chart:

1. Remove the rear seat belt lower anchor retaining bolt.

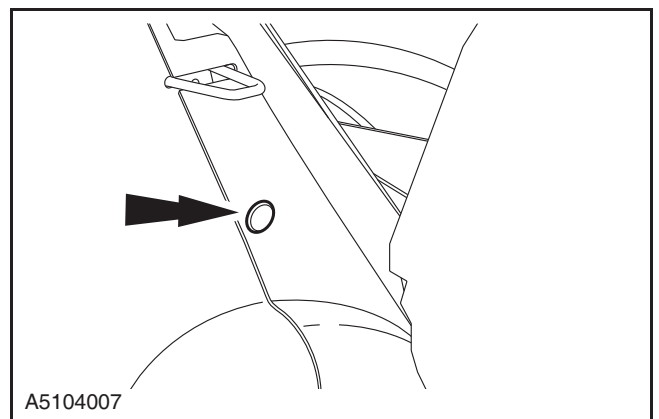
Torque: 39 Nm

⚠ CAUTION: There is a protective paper washer on the seat belt anchor retaining bolt. Please ensure that the septa and the paper washer always on the anchor in the removal and installation process.

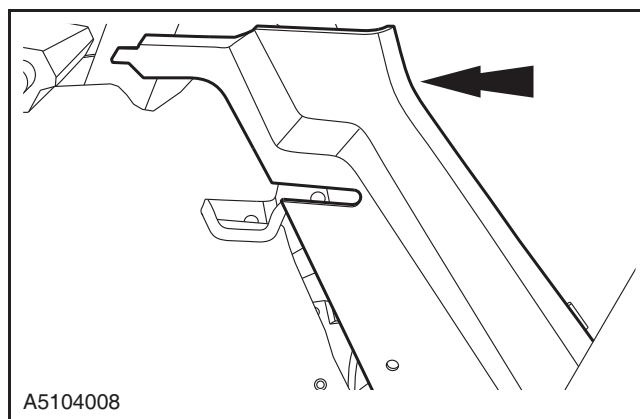
2. Remove the retaining screw of the C-pillar lower trim panel.



2. Remove the C-pillar lower trim retaining clamp.
3. Detach the rear door sealing strip and C-pillar trim.
4. Press the buttons at both sides of the rear seat backrest, and lower the rear seat backrest forward.



5. Remove the C-pillar lower trim with hands.

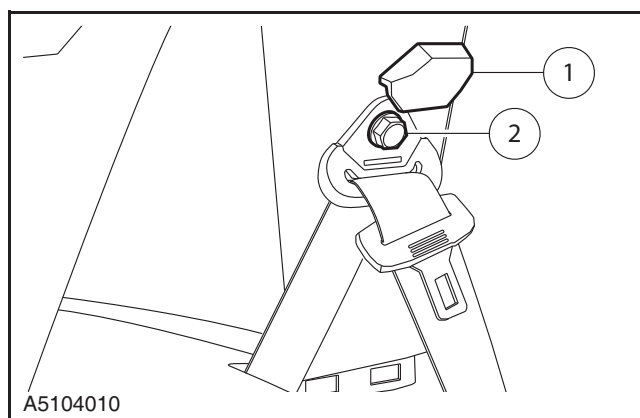


6. See chart:

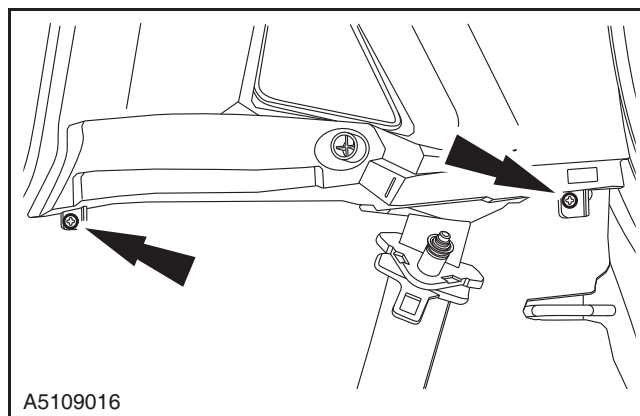
1. Remove the rear seat belt decorative cover.
2. Remove the rear upper anchor retaining bolts.

Torque: 39 Nm

CAUTION: There is a protective paper washer on the seat belt anchor retaining bolt. Please ensure that the septa and the paper washer always on the anchor in the removal and installation process.

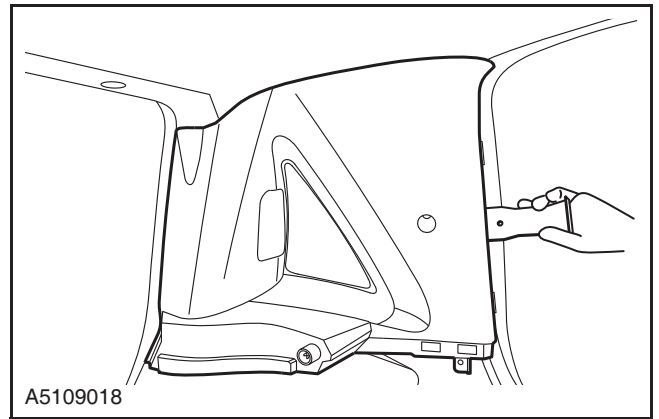


7. Remove the two retaining screws of the C-pillar upper trim.

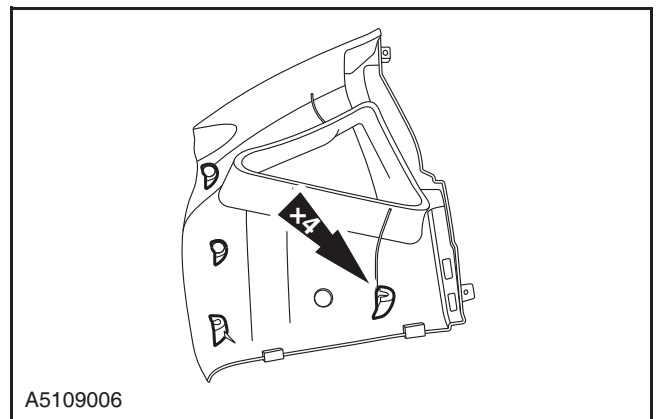


8. Use a special tool to remove C-pillar upper trim panel.

Special Tool: CA501-002



9. Picture of C-pillar upper trim panel clamps position.



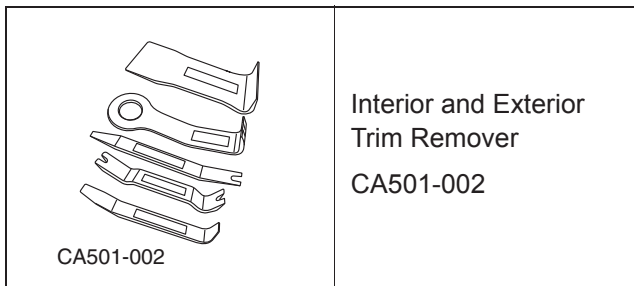
Installation

1. To install, reverse the removal procedure.

Head Lining

Removal

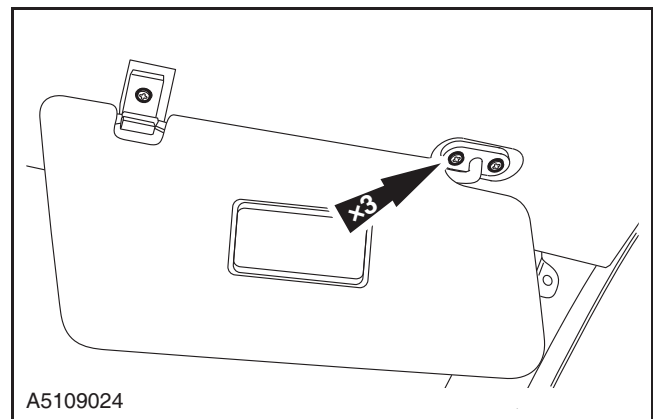
Special Tool



1. Disconnect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the sun visor retaining screw.
3. Remove the sun visor.



4. Remove the inside handle retaining screw.
5. Remove the inside handle.
6. Remove the dome lamp.

Refer to: Dome Lamp (4.3.6 Lighting System, Removal and Installation).

7. Remove the A-pillar trim.

Refer to: A-pillar Trim Panel (5.1.9 Interior Trim and Ornamentation, Removal and Installation).

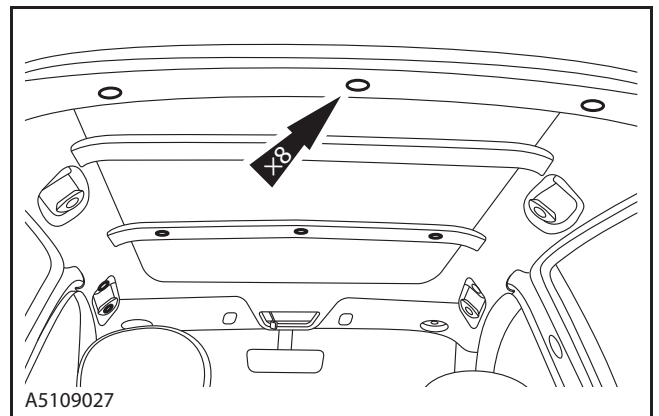
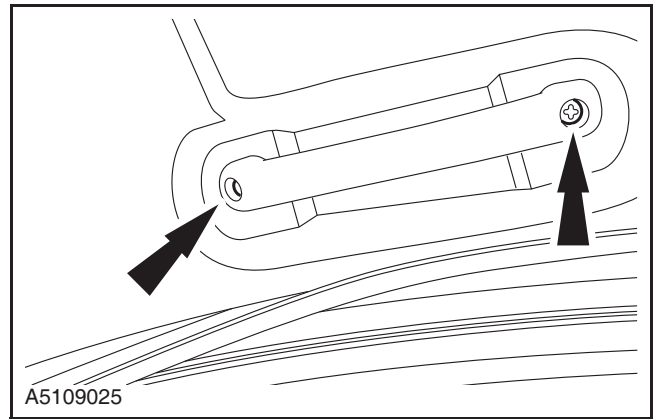
8. Remove the B-pillar trim.

Refer to: B-pillar Trim Panel (5.1.9 Interior Trim and Ornamentation, Removal and Installation).

9. Remove the C-pillar trim panel.

Refer to: C-pillar Trim Panel (5.1.9 Interior Trim and Ornamentation, Removal and Installation).

10. Remove the retaining clips of the head lining with special tools.
11. Remove the head lining.



Installation

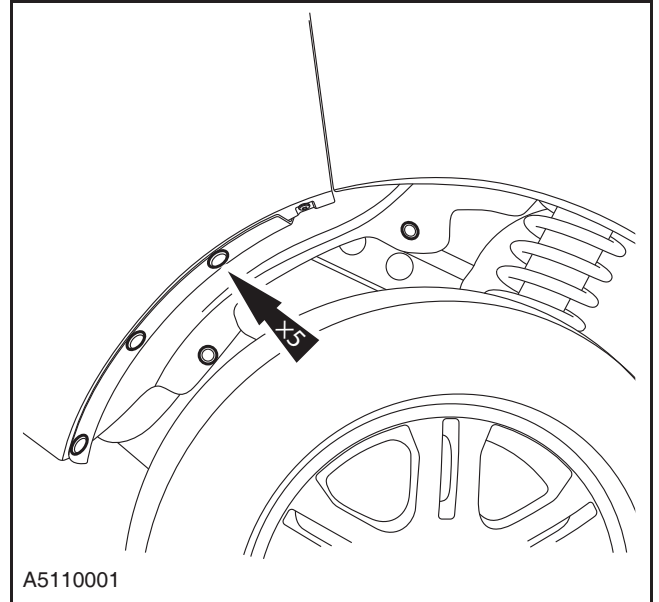
1. To install, reverse the removal procedure.

Removal and Installation

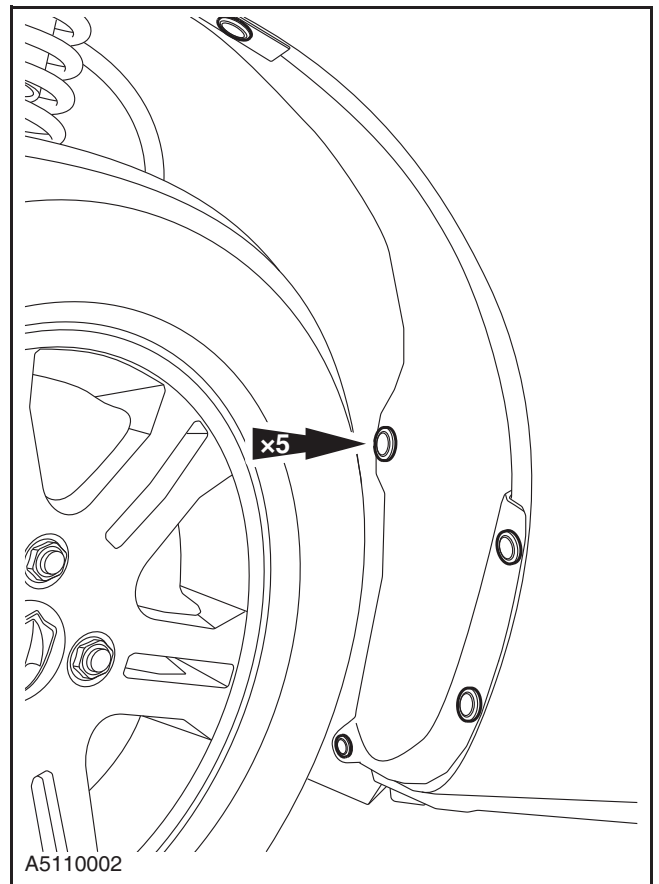
Front Fender Lining

Removal

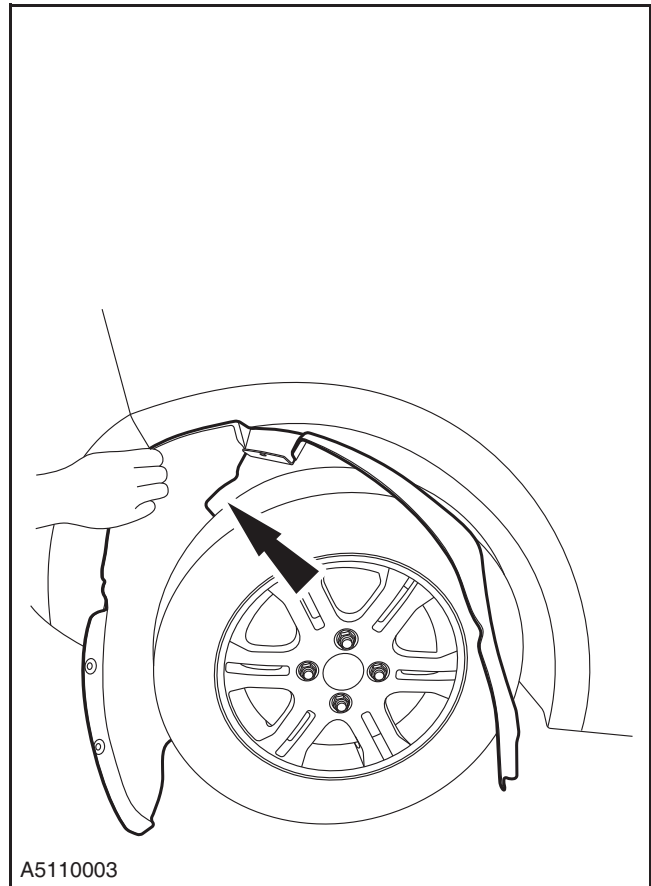
1. Remove the front end of the front fender lining and the front bumper connecting buckle.



2. Remove the rear end of the front fender lining and the front fender connecting buckle.



3. Detach the front fender lining.



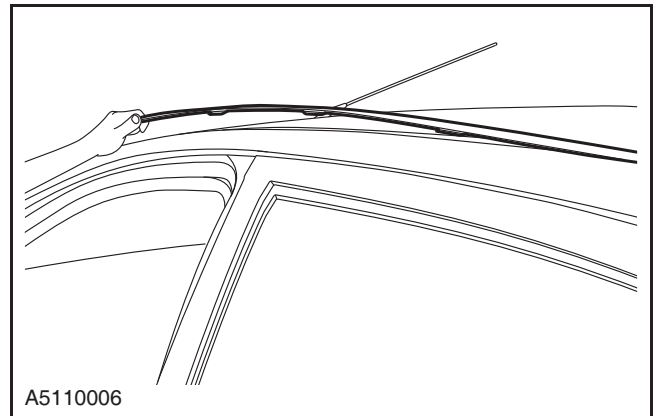
Installation

1. To install, reverse the removal procedure.

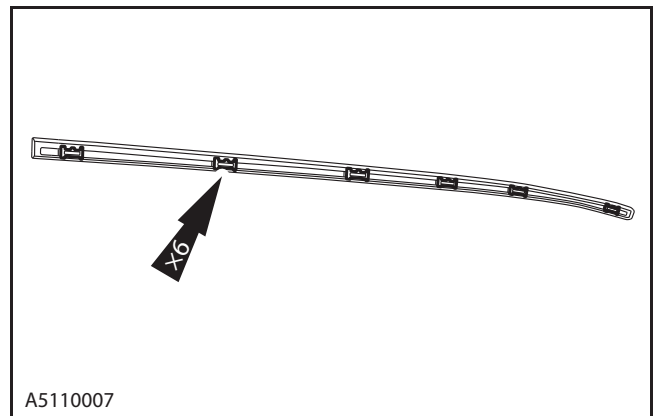
Roof Exterior Molding

Removal

1. Remove the roof exterior molding.



2. The position of the retaining bolts on the roof exterior molding is as shown in the illustration.



Installation

1. To install, reverse the removal procedure.

5.2 Body Repairs

2012 Benni Mini

Table of Contents	Pages
5.2.1 Body Repairs	
Description and Operation	5.2.1-1
Noise, Vibration and Harshness	5.2.1-1
Integral Body	5.2.1-3
Plastic Components Type	5.2.1-4
Component State	5.2.1-4
Welding Type	5.2.1-4
Diagnosis of the Vehicle in Accident.....	5.2.1-5
Symptom Diagnosis and Testing.....	5.2.1-5
Drop Pit Repair Without Painting.....	5.2.1-6
Removal and Installation.....	5.2.1-6
Crash Repair	5.2.1-7
Anti-corrosion Treatment	5.2.1-8
Plastic Components Repair	5.2.1-10
Body Water Leakage Repair.....	5.2.1-13

Description and Operation

Noise, Vibration and Harshness

Meaning of NVH in Automotive Engineering

N=Noise-audible unpleasant sound.

V=Vibration-perceptible vibration.

H=Harshness-audible and perceptible jittering and vibration.

Noise Type in Automotive Engineering

According to the sound intensity, the noise in the automotive engineering can be classified as following: slight noise, moderate noise and strong noise. Slight noise mostly comes from the engine and the road surface, especially on the rough road surface. Strong noise is commonly generated by airflow or accessories (such as alternator, power steering pump and drive belt). Chatter sound can be heard when vehicle runs on tough road. The unstable noise is usually caused by the shock absorber, chassis components or loose components inside the vehicle.

Requirements of NVH for Vehicle Body

The vehicle body is one of the most important part involving NVH. The vehicle body not only causes air noise, but also causes solid noise. The main components of NVH in the vehicle body are the roof steel plate, the side panel and the floor. The vibration or noise shall be increased greatly due to the structure, just as an amplifier. NVH engineering raise higher requirements for vehicle body:

- The vehicle body must absorb vibration from all components, and try to ensure the vibration is not transmitted to the passenger compartment.
- The structure must not only ensure the body rigidity requirement, but also provide excellent damping performance in crash.
- Spacious passenger compartment.
- Corrosion resistance.
- Light weight.
- Excellent aerodynamic appearance.

Methods of Sound Transmission

The sound can be transmitted through air or substances. The sound travel speed in the liquid or the solid (such as the vehicle body) depends on the material features of the substance. Generally, the speed of sound is 5 times in liquid or solid than in the air. The noise can transmit in the vehicle via air and substance.

Vibration

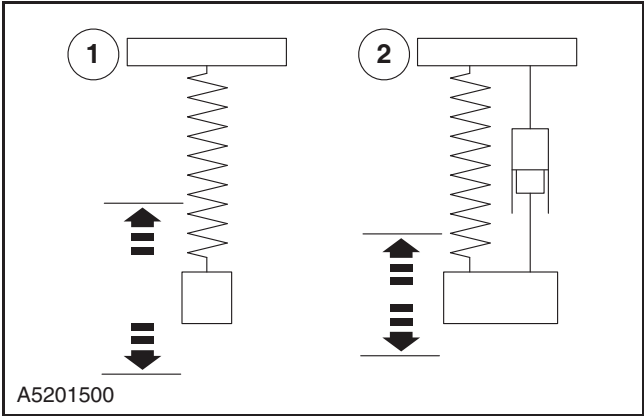
The vibration is a form of physical movement commonly found in the nature. Vibration waves with a frequency lower than 20 Hz (low frequency) or higher than 20,000 Hz (20 kHz, high frequency) can not be heard by human ears. Generally, the low frequency vibration is visible. The high-frequency vibration is palpable through the floor and the steering wheel. The engine with the flexible installation can relieve the vibration when the vehicle runs on the uneven road surface. When flexible installation of engine is in trouble, vibration will be transmitted from engine to vehicle body and even cab.

Resonance

Each object has its inherent vibration frequency. If a certain system vibrates with its inherent vibration frequency, it will cause resonance. For example, When engine reaches resonance frequency, it will become unstable (engine critical speed). Once the engine speed exceeds the critical point, the engine will run stably at once.

Damping Vibration

Damping has influence on the vibration of the objects or systems. The vibration can be reduced if a damper is connected with spring in parallel. The vehicle shock absorber is made based on this principle to reduce the body vibration through damping.



Item	Description
1	Non-damping vibration
2	Damping vibration

Sound Insulation

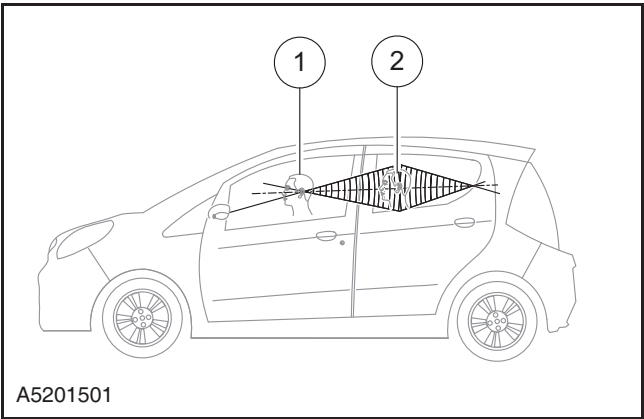
The sound insulation and noise reduction technologies are adopted in automotive engineering to minimize the noise. For example, the engine is installed on elastic supporting seat, so that the vibration is transmitted into the vehicle body as little as possible.

Absorption and Refelection of Sound Waves

Sound is reflected when meeting hard surface. and absorbed when meeting a soft surface. The effect depends on the material and the thickness of the absorbing object.

Noise and Vibration on Vehicle

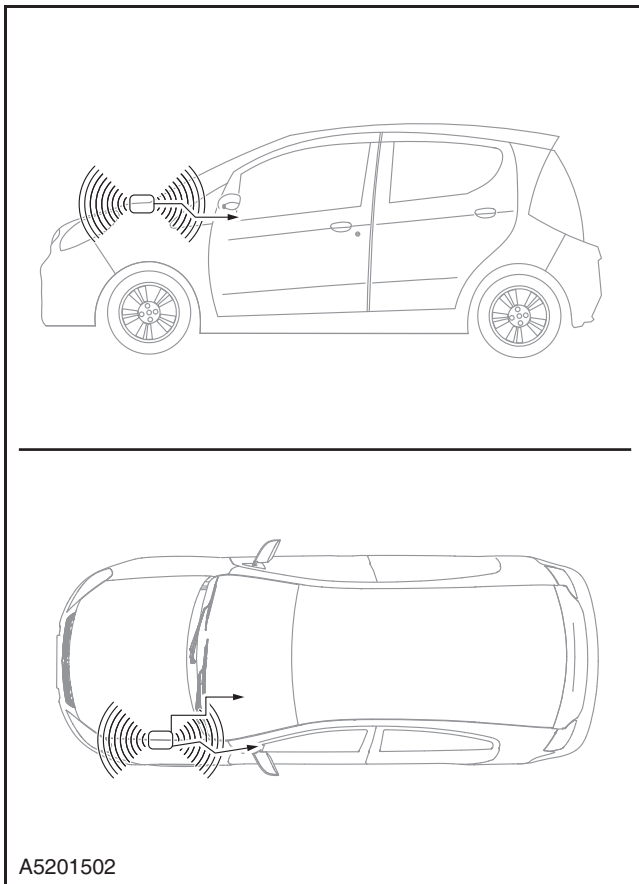
The noise and vibration will be generated in driving continuously. The noise that passenger feel varies according to different positions of the vehicle.



Item	Description
1	Driver is at the wave trough
2	Rear passengers are at the wave peak

Noise and Vibration Caused by Intake and Exhaust System

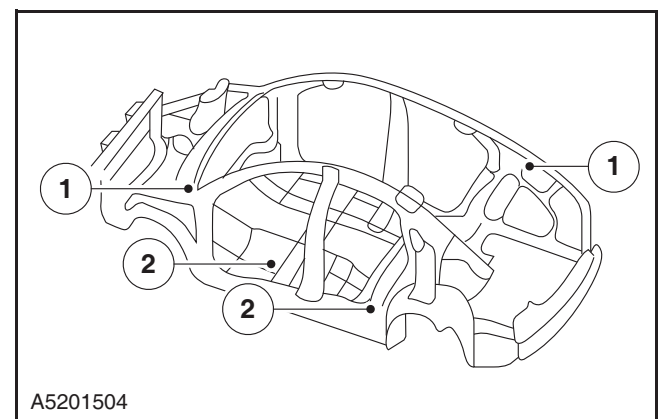
The transmission ways of the noise generated by the intake and exhaust system are shown as in the illustration below. In addition to air noise, the solid noise in the intake and exhaust system is also the main source. In order to minimize the noise, the sound insulation cushion must be installed firmly. The exhaust system is a typical vibrating component, and a good sound insulation device is required in the installation. The system layout, trends and connecting points of the vehicle body shall be properly selected to reduce the solid noise.



Integral Body

The integral vehicle body frame is characterized in:

- Maximum safety for the passenger (s) and the driver.
- Greatly reduced weight.
- Robust passenger spaces.
- Firm column, door sill and profile made of low alloy high-strength steel.
- Integral lateral protection of the vehicle door.
- The door is so designed that it can be opened even in case of extreme distortion.
- Safe passenger space is protected by well-designed front and rear distortion area.
- Additional lateral soundness.
- High tensional rigidity.
- High flexural strength.



Item	Description
1	Distortion area
2	Safe passenger space

Plastic Components Type

It is important to know the material property of the plastic components in repair. The plastic components can be generally divided into two basic categories according to different materials: thermoplastic plastic and thermosetting plastic.

Thermoplastic Plastic Components

The thermoplastic plastic components turn soft when heated and harden when cooled. The process is reversible and can be proceeded repeatedly. Therefore, the thermoplastic plastic components can be formed and solidified repeatedly by heating. The thermoplastic plastic components can be recycled. Most of the interior and exterior trim vesture are made of thermoplastic plastics.

Thermosetting Plastic Components

The thermosetting plastic components will turn soft when first heated. However, it will become solidify when heated to certain temperature. This process is irreversible. The component can not become soft when heated again. The thermosetting plastic components are formed with this feature. Using the plastifying flow in the first heating, the material fills the cavity full to solidify the components with the preset shape and dimension under the pressure. The thermosetting plastic components are harder and more fragile than the thermoplastic components, and the state doesn't change when heating. The thermosetting plastic components may be damaged if the heating temperature is higher than the critical point. The thermosetting plastic components are widely used as structure components in electrical and safety components with the purpose of heat isolation, anti-wear, insulation and high voltage.

Component State

The surface must be flat with caulking and polished with sand paper before the vehicle or component is delivered to the workshop for painting after repair. The metaler should be responsible to prepare this process. The body and the floor are formed by cold stamping with steel sheet. Therefore, the damaged part should be recovered using the same method after the accident. If the damaged component can not be recovered as the original shape, remove and replace the damaged

component as per its integrity after calibrating the adjacent part. Never cut the component unit; otherwise, the vehicle rigidity, driving safety and repair feasibility may be influenced.

Welding Type

The general welding includes spot welding, gas shielded welding and braze welding. It is not allowed to reduce the spot quantity when spot welding. If the spot welding device is unavailable, apply gas shielded welding to plug after drilling. When applying spot welding, the spot must be on the original one if only external plate is replaced for the three-layer plate. Single welding line, double welding lines and double offset welding lines can be formed in spot welding. Related welding line, continuous welding line and intermittent welding line can be formed in gas shielded welding. Braze welding is generally to weld and repair the area with weak tension strength and low thickness.

Symptom Diagnosis and Testing

Diagnosis of the Vehicle in Accident

The professional technicians should use beam calibrator, electrical measuring system, sheet metal repair machine, spot welder and other grinding tools when repairing the body to recover its geometrical dimension and performance to the original state. However, symptom that will lead to serious fault of the driving system and suspension may not be found in repairing the vehicle in accident. Special attention must be paid to the following components besides the geometrical dimension inspection of the body:

- Ensure that the steering gear and the steering column can work normally within the steering wheel turning range. Visually inspect components for any bending and crack.
- Inspect all the components (for example: Y-tube/trailing arm, suspension arm, steering knuckle, stabilizer bar, frame and mountings) in the driving system for bending, twist and crack.
- Inspect the wheel and tire for damage, concentric rotation and unbalancing. Inspect the tire tread and wall for cut; inspect the tire pressure.
- Inspect the engine/transmission/exhaust system for damage.

Carry out road test to guarantee the driving performance after the body repair before the vehicle delivery to the customer.

Removal and Installation

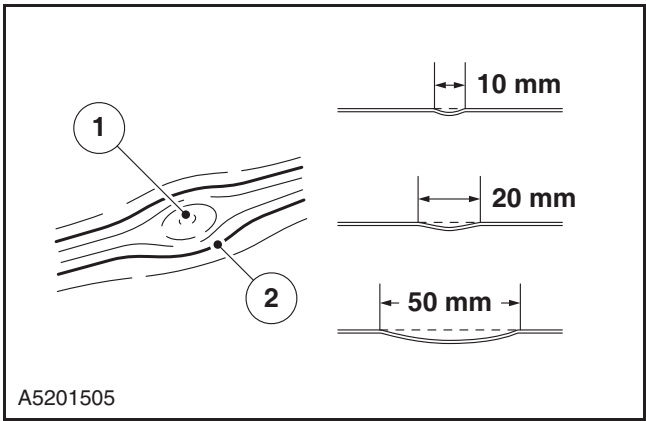
Drop Pit Repair Without Painting

Damage Assessment

Slight pit can be repaired with no impact on the painting. The pit can be eliminated from inside with special lever tool (pressure tool). The repair requires rich experience and knowledge of using special tool and material. The pit should meet the following requirments:

- Only for the body with access from both sides, this technology is uncommon for the dual-coating structure or closed section.
- Only shallow and small pit can be repaired perfectly. This method is applicable for the damage in caused by hail, parking or shipment.
- The pit diameter should be less than 50 mm and the damage can be judged by the pit size.

CAUTION: The material of the pit center can not exceed the deformation limit.

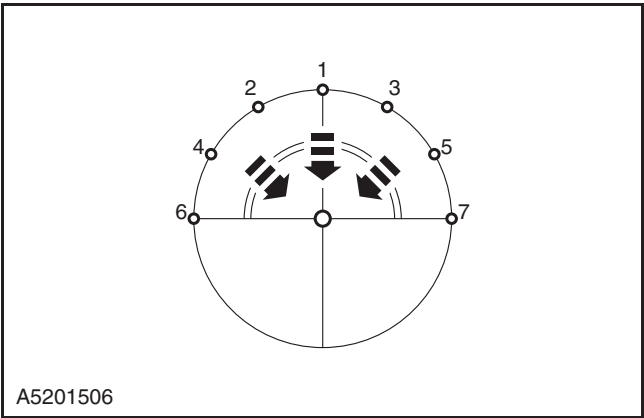


Item	Description
1	Pit center
2	Put edge

Working Principle of The Pressure Correction

- In order to restore the surface shape, all the treatment must be completed for the semicircle of the pit.
- The operation collectively forms a semicircular shape. Operate in the specified order.
- The untreated semicircle of the pit is automatically restored through the stress generated in the pressing process.

CAUTION: Do not correct the shape from the center of the pit. If so, the edge shall rise and retain the protruding state (the material is drawn to be longer). Once a bulging edge is formed, it requires a long time to repair it.



Repair Procedures:

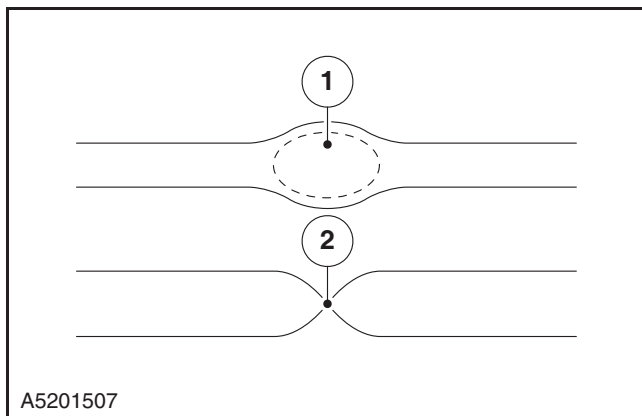
1. Verify the repair method.
2. The labeling of the pit is helpful to the identification.

CAUTION: Do not use pens with dissolvability that can damage the paint.

3. Prepare the repair area.
 - It is unnecessary to open a hole for repair if the inner side of the pit can be touched.
 - Clean the damaged area of the vehicle body. The careful inspection is important for successful repair.
 - Polishing the repair surface if it is rough because it is can be confirmed only when the reflected light is strong enough.

4. Install and adjust the illumination lamp.

- Arrange and adjust the illumination lamp so that the pit (Oval) can be seen clearly in the reflected light of the paint surface.
- If the elliptical shape is changed in cross lines when pressing the pit, the crossing point is the working point for the pressure tool.



Item	Description
1	No pressure is applied on the pit
2	Pressure is applied on the pit

5. Pressure tool position.

- Place the peak of the pressure tool on the edge of the pit.
- Slightly press the pit with the peak of the pressure tool, move the pressure tool back and forth, and the reflected light can show the pressure tool position.

6. Restore the anti-corrosion protection.

Crash Repair

Precaution in Crash Repair

Pay attention to the following when repairing the body metal sheet:

- Wear protective clothes, goggles, gloves and shoes when welding, cutting and grinding the body.
- Good ventilation is required for the welding area.
- Disconnect the battery and cover the terminal before welding.
- Remove the battery if spark may appear when working near the battery.

- Fix the vehicle on the lift before removing the components to keep the gravity center stable to ensure the operation safety.
- Directly connect the grounding wire of the welder to the components to be welded. No conductive component is allowed between the grounding point and welding point when operation.
- The grounding wire or the welding electrode is not allowed to contact the electrical control unit and wire.
- The vehicle without any protection should not be parked in the repair area. The splashed spark will cause fire and damage the painting and glass.
- Be careful when grinding and welding the fuel tank or other components filled with fuel. Remove all the suspicious components that may influence the safety.
- Do not weld, hard or soft braze weld any component of the AC system with refrigerant, as well as other components that may increase the temperature of the AC system. It may cause explosion of the AC system. The refrigerant must be recycled if welding is required near the refrigerant hose. The refrigerant will deteriorate due to the invisible ultraviolet ray generated in welding.
- Disconnect the battery negative cable when repairing the airbag or calibrating the body; the ambient temperature of the airbag shall not exceed 100 °C .



CAUTION: Calibrate the body with the general body calibrator to determine the damaged component before replacing the key components of the body.



CAUTION: Precise component alignment is required before welding, then, measure to confirm the body dimension before welding.



CAUTION: Measure frequently to ensure the correct assembling in welding.

 **CAUTION:** Learn the welding assembling relationship of the body metal sheet before removal. It is not recommended to cut the component unit; otherwise, the vehicle rigidity, driving safety and repair feasibility may be influenced.

Removal

1. Remove all the sheets and components related to the components to be replaced.
2. Clear the sealant and anti-corrosion material as necessary.
3. Align, mark and drill all the welding spots of the components to be replaced.
4. Remove the damaged components.
5. Eliminate the remaining material.

Installation

1. Pretreat the matching surface as necessary.
2. Choose a correct welding method according to the original state of the vehicle. Apply protective welding in the area where resistance welding is unavailable. Drill holes on the new components for the welding line if choosing plug welding. The diameter and interval of the holes should be determined by the original welding spot.
3. Put new component on the vehicle temporarily.
4. Assemble and fix the new components with calibrate retainer (correct alignment repair plate).
5. Measure the new components positions to ensure the correct assembling dimension.
6. Weld.
7. Clear the welding surface.
8. Paint the coating.
9. Smear some sealant and anti-corrosion coating.
10. Install all the related components.

Anti-corrosion Treatment

Precaution for Anti-corrosion Treatment:

- Protective measures must be taken when painting sound isolation or anti-corrosion materials to avoid the painted component opening (such as lock, window slot, window regulator and seat belt coiler) and wire drawing for any moving and rotating component, especially the parking brake. All the relief holes of the body must be open after painting.
- The foam sound isolation material of the repaired component must be removed when repairing the body with open fire. Do not breathe in the harmful dust when reinstalling the sound isolation material.
- Wear special goggles and gloves to avoid injury in operation.
- The body metal sheet is treated by electrophoresis and coating when exfactory. All the exposed metal surfaces must be coated with anti-rust painting after repairing and/or replacing the components.
- If the original cladding or the anticorrosion material is burnt in welding or heating, clear the surface and carry out corrosion resistance treatment.
- The metal may be exposed in crash repair. Paint the surface with special anticorrosion material.

Anti-corrosion Treatment Principle

- The standard anti-corrosion coating must be formed with approved material after repair.
- The coating must be painted inside and outside the welding line before sealing.
- Smear sealant on the coated metal sheet.
- Seal the joint metal sheet, edge, even joint welding line and welding seam with sealant.
- Smear long-term protective solute at the bottom of the body.
- Repair the cavity with the protective material in the repair area after painting.

- Clean the drain port after the protective material becomes dry.

Anti-corrosion Protection of the New Components

Inspect all the new components for any scraps or bruises. The following operations are required according to the damage:

Undamaged new components:

Do not burnish the cathode electrophoretic coating. Completely clean the new components with the silicone cleaning agent and wipe them dry.

Slightly damaged new components:

1. Scrape off the scratching.
2. Slightly wipe the outer surface.
3. Use the cleaning agent silicone to completely clear and dry.
4. Carry out the anti-corrosion pretreatment for exposed areas.

Damaged components (damaged through collision and pressing):

1. Level the bruised area and grind exposed metal.
2. Scrape polyester putty (only for the exposed metal).
3. Scrape the putty (further fill).
4. Slightly grind the whole component.
5. Use the cleaning agent silicone to completely clear and dry.
6. Carry out anti-corrosion pretreatment for exposed areas.

Anti-corrosion Treatment of the Welding Component

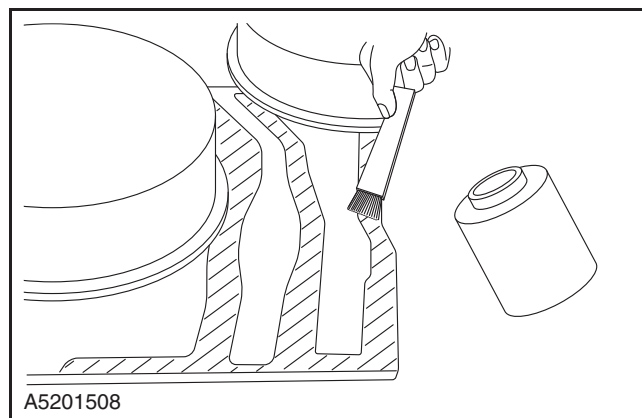
1. Clear the dip coat in the welding inner and outer areas with a rotary steel wire brush, and be careful not to damage the zinc coat.

CAUTION: The grounding area should be as small as possible, and the anticorrosion protection (cathode coating) should be preserved as much as possible.

2. Thoroughly clear the repairing area (with silicone).

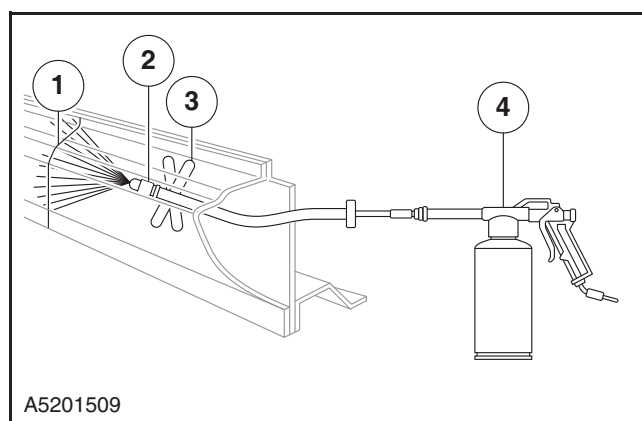
3. Use the welding primer component for all the welding seams (new or old components).

CAUTION: The welding primer should be thoroughly stirred before being used.



4. The welding operation can not be performed until the welding priming is dried.
5. Remove the welding slag after the welding is completed, and be careful not to destroy the strength of the material.
6. All the scallops in welding seams are treated with lead containing material filling method.
7. Clear and fill the sealed inner areas.
8. Seal all welding areas and joints with vehicle bottom protection.

Cavity Protection (Protect the Cavity for the Doorsill after Local Repair)



Item	Description
1	Welding seam
2	Nozzle
3	Distant positioning
4	Spray gun

Drill a hole at a proper position when injecting cavity protecting wax for areas that can not reach, and the diameter of the hole is defined according to the available hole sealing plug. It is important to remove the scrap iron from the cavity, for any residual scrap iron may cause rust. The edge of the hole should be treated with hole sealing wax, and finally, the bottom is sealed with a plug or sealant.

Plastic Components Repair

Precautions in Plastic Component Repair

- Smear protective cream on the naked skin to avoid irritation.
- Wear rubber gloves.
- Wear goggles when using compressed air and sanding.
- Immediately eliminate any mixture on the skin since it becomes solid rapidly.
- Wear dust-proof mask and goggles when grinding or sanding.
- Wash the skin with cold water to relieve the slight irritating caused by resin dust.
- Keep the repair materials away from the clothes.
- Use the repair materials in place with good ventilation, because the materials may produce toxic dust and pollution.
- Close all the repair material containers after using. The dust and moisture may cause pollution to the materials and impact on the repair.

Plastic Components Repair

This chapter introduces the repair method for the plastic components only, but not recommend to repair.

Thermoplastic Plastic Component Rectification (Slight Deformation)

The bumper is usually deformed at the elastic part, such as pit and bending. Most of the deformation can be recovered by the hot air gun. The damaged component can be heated up to 200 °C with the hot air gun. Heat the component from both sides if possible. The wooden hammer and plastic wedge can be used for the rectification.

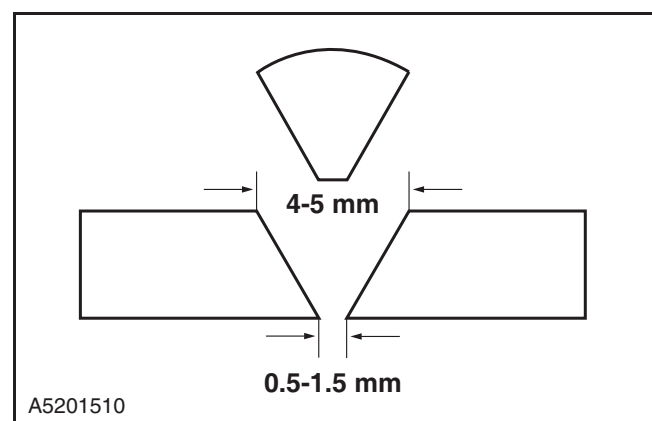
Thermoplastic Plastic Component Welding

Plastic welding is the best way to repair thermoplastic plastic component, for example: section with edge and corner, square section and small round section in the reinforced area.

Taking the bumper crack as example:

1. Cut the crack into V section for welding.

- Use the scraper to cut the V welding seam with opening of 60 to 70 degrees.
- Use 3 mm driller to drill holes at the end of the crack to prevent extension. Repair the crack beginning with caliper before welding if the seam edge is tough. Then, drill holes at the end of the crack.

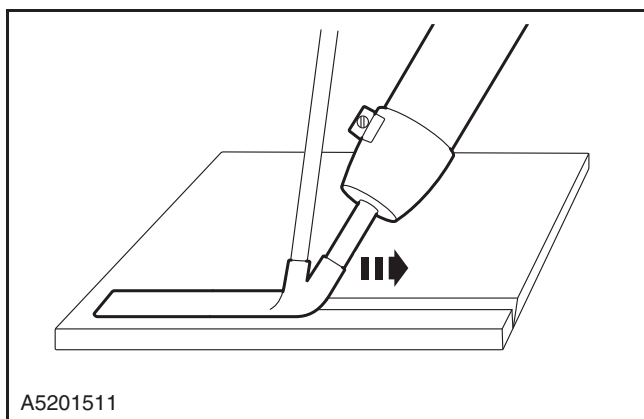


- #### 2. Set the welding temperature according to the manufacturer specification (200 °C ~700 °C).
- The welding temperature is determined by the thickness of the plastic material and welding rod.

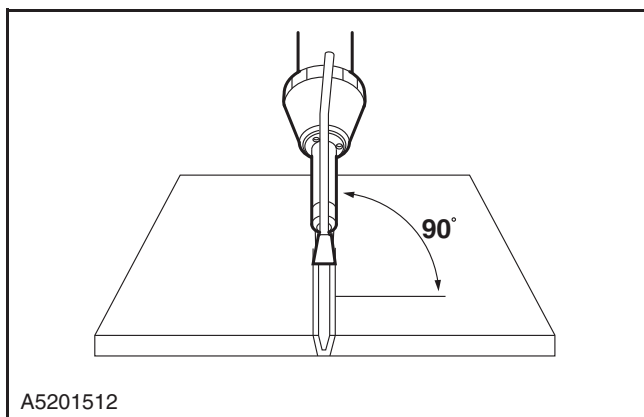
- Preheat the welder for 3~4 min to reach the preset welding temperature.
- Cut the welding front end incline and fill the welding seam from the starting position.

3. Welding

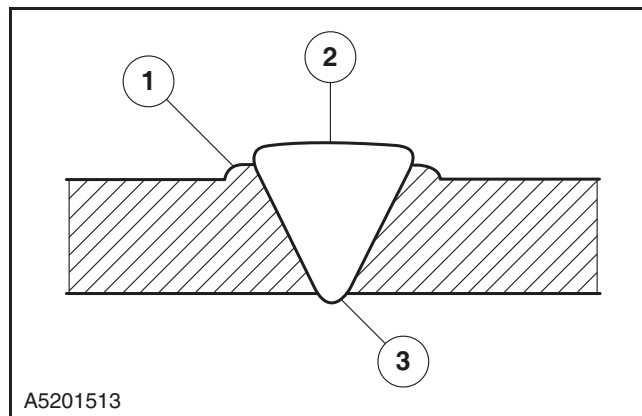
- Push the welding rod with incline front end into heated quick welding nozzle cavity until the rod appears at the bottom. When the welding rods and the components to be welded are in the plastic state, start to weld. Stable welding speed and pressure are required when welding plastic components. Pressure is only exerted to the welding rods when welding.
- The lower end of the quick welding nozzle shall move in parallel with the repairing surface. Parallel moving along longer the length direction is achieved through suitable incline of the welding device.



- When moving the plastic welding gun, keep the welding rods vertical with the welding seams.



4. Inspect the welding connector.



Item	Description
1	Edge bulge of the welding seam
2	Welding seam remaining height
3	Welding seam root

The welding is good if only small or smooth bulge is formed when welding the seam edge. It is important for welding of the bevel seam. Inspect the seam from back for the following defects. Reweld it again as necessary.

Item	Description
Distortion	The repaired position is excessively hot.
	The material is stretched when welding is performed.
	The plastic material is excessively thin.
Poor welding joint	The welding temperature is excessively low.
	The welding speed is excessively fast.
	Welding different materials together.
The welding seam plastic filled surface is excessively low	The welding seam is excessively wide.
	The welding temperature is excessively high.

5. Reprocessing of the welding seam.

- After cooling, use the angle grinding machine to burnish the bulging part of the welding seam. Sand paper type: P80 rough Sand paper. Then, use the track grinding machine to burnish the surface. Sand paper type: P120-P220 fine sand paper.
- Use the plastic cleaning brush to clean and repair the surface.
- Spray the plastic primer on the repaired surface.

Plastic Adhesive Bonding

It is applicable for the thermoplastic and thermo-setting plastic components. All thermoplastic plastic components must adopt the binder containing polyurethane. The reinforced belts can be used for the welding seam and the broken seam to ensure the initial extensibility.

1. Clean the area to be repaired

- Before repairing, use the high pressure water cleaner to clean two sides of the plastic components, and then perform drying.
- Use the plastic cleaner to clean the surface of the components to be repaired.

2. Pretreatment

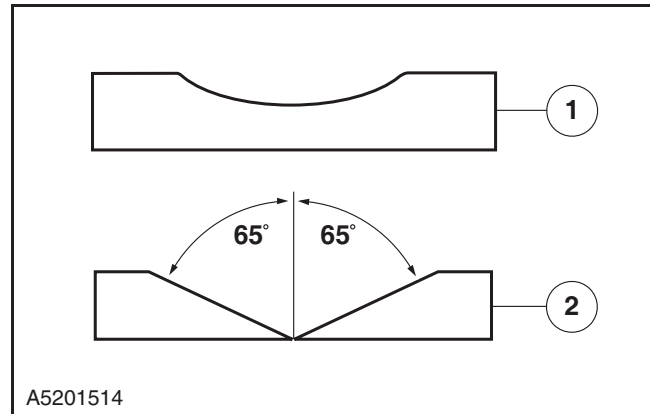
Pretreatment of scratches:

- Use the track grinding machine and the P80-P120 sand paper to thoroughly burnish the scratches into flatness.
- Use the track grinding machine and the P120 sand paper to perform fine burnish.
- Use the plastic cleaner or tissue to thoroughly clean the surface to be repaired.
- Evenly spray the plastic primer on the surface to be repaired.

Pretreatment of crack:

- Use the angle grinding machine or the belt type grinding machine to burnish the front side of the crack. The width of the grinding surface is 40~60 mm.
- Use the track grinding machine to burnish again. Sand paper type: P120.

- Drill holes (3 mm) at the end of the crack to prevent the crack from extending.
- Burnish along the inner side of the crack.
- Use the plastic cleaner or tissue to clean the position to be repaired.
- Paint the plastic primer at the position to be repaired.



Item	Description
1	Scratching preparation
2	Crack preparation

3. Adhesive Bonding

Scratch bonding:

- Use the binder to fill the crack after the crack is cleaned and the primer is painted.
- Use a flexible plastic clearance gauge to lay open and flatten the binder.
- Use the infrared heater or the dryer to perform drying.

Adhesive bonding and repairing crack:

Reinforce the position to be repaired to improve the anti-twisting intensity for large area of crack or breaking. Therefore, suitable reinforcing material (such as metal strip and reinforced fiber) is attached at the back of the components.

- Use the PE flake or adhesive tape to cover the front side of the crack.
- Use the plastic binder to stuff the welding seam from the inner side.
- Simultaneously, a wider reinforced fiber and the binder are stuffed into the welding crack.

- Reinforce the end of the crack by adding the metal strips embedded in the plastic components.
- Repair the upper surface of the reinforcing material to have the same height as the whole surface to be repaired.
- Use the infrared heater or the dryer to perform drying.
- Use the PE flake to prevent the binder from spilling out of the front side of the crack.
- Take down the PE flake after the binder is dried.
- Smear the binder at the front side of the position to be repaired.
- Use the infrared heater or the dryer to perform drying.
- Cool the binder to be at the room temperature to prevent the binder from falling off and prevent the sand paper from being excessively heated in the burnishing progress.

4. Grinding

- Use the track grinding machine to grind off the bulging part of the binder.

Sand paper type: P120~P220 rough sand paper

- Manually repair the sunken and bent areas.
- Use the grinding pads to rub the paint surface.
- Thoroughly clean the plastic components.
- Paint the plastic primer after it is thoroughly dried.

Body Water Leakage Repair

Water Leakage Diagnosis

 **CAUTION:** All the leakages must be found for next step. Random repair might block up the leakage temporarily, but it might cause a more difficult repair in the future. Continue partially testing in the overall range and ensure that you find all the leakages.

Have correct testing and diagnosis on the vehicle when repairing body water leakage. Adjust any incorrectly positioned components and use the right repair materials for the water leakage fault. Firstly, you should confirm which condition causes leakage. For example: It leaks only when the vehicle stops on a steep ramp. In addition, if you find out the probable leakage area, confirm the leakage point with a water hose or gas hose. If the leakage area is not so evident, confirm its specific position with the raining test stand. You might have to remove a part of the interior trim paneling or interior components, and then you can find out the specific leakage position.

Preparation for Water Leakage Test

1. The vehicle is designed for driving under normal conditions.
2. Designing standards of the vehicle seal materials and its components have already taken the compulsory seal strength in the natural environment into account. However, these specifications or standards cannot take anthropogenic conditions into account.
3. The leakage testing program is related to natural environmental factors, and it can determine the vehicle driving performance under normal conditions.
4. The first step to diagnosing leakages is to confirm which conditions cause leakage. If you can confirm the probable leakage area, you can isolate the correct intake point with a water hose or a gas hose. You might have to remove a part of the trim paneling or components in order to make repairs.

5. If leakage occurs in the door, the luggage compartment door, the car windows or the door window lifting, it might not be caused by an adverse seal. Maybe leakage can be repaired if you adjust those parts.

Water Hose Test

 **CAUTION: Do not use the water hose with a nozzle.**

1. Ask your assistant to confirm the specific leakage position inside the vehicle.
2. Start checking from the windows or the bottom of the front windshield.
3. Move the hose upward slowly until it gets through the whole roof.

Gas-channel Test

 **CAUTION: The gas hose test can only be used on the complete, solidified adhesives. Otherwise, use of this checking method will damage the adhesive coating and cause more leakage points.**

1. Fill the liquid cleaning agent diluted by a certain percentage into the spray bottle. Spray from the bottom gradually to the upper part then through the whole roof.

 **CAUTION: Compressed air pressure must be under 205 kPa (29.75 psi).**

2. Ask an assistant to get into the vehicle with the air hose.
3. Ask an assistant to aim the compressed air to the probable leakage position. You will find bubbles from the liquid cleaning agent if this part leaks.

Body Water Leakage Repair

When repairing leakages, you might have to remove some trim paneling or some components according to the water leakage position.

1. From inside or outside of the vehicle, cut out the joint adhesives in the leakage area.
2. Clean up and eliminate all remaining old adhesives on the leakage parts.

3. Paint the body and joint adhesives on the cleaned leakage part.
4. Wait for several hours to allow the joint adhesives to completely solidify.
5. Check whether leakage still exists.
6. Remove trim components before installing.

Window-mounted Water Leakage Repair

When repairing leakages, you might have to remove some trim panels or some components according to the water leakage position.

1. Confirm the specific water leakage position.
2. If the edge of the front windshield leaks, use special adhesives to repair the leakage position or replace it with the newly-sealed front wind window.
3. If the window-mounted side leaks, use special adhesives to repair or replace it with the newly sealed window.

