



MG4 EV

Body Repair Manual

How to Use this Manual

Overview

To help you with the use of this Manual, we divided the Manual into several chapters and sections. The title of each chapter is outside each page header, and the title of the corresponding section is inside the page header.

The contents of the chapter and section are at the beginning of the Manual, which are divided by chapters and sections. Page numbers start with the first page of the text, which are outside the footer of the page.

All the repair operation steps must be arranged in the order they normally appear in. The serial number in the illustration refers to the corresponding text.

The instructions for adjustment and repair operations include the service tool number to be applied, and the corresponding illustration also reflects the use status of the tool. The instructions for adjustment and repair operations also involve wear limits, torque values, guide information and useful assembly details. Each adjustment or repair operation has an unique repair operation number.

The meanings of "Warning", "Note" and "Prompt" are as follows:

"Warning" requires you to take necessary measures or not to take prohibited measures. If a "Warning" is neglected, the following consequences may occur:

- Serious injury to a technician
- Serious injury to other technical staff in the work area
- In case of improper vehicle repair, serious injury to the driver and/or passengers in the vehicle will be caused.

"Note" requires to pay special attention to necessary measures or prohibited measures. If a "Note" is neglected, the following consequences may occur:

- Damage to the vehicle
- Unnecessary vehicle repairs
- Unnecessary parts replacement
- Improper operation or performance of the system or component under repair
- Damage to any system or component which is dependent upon the proper operation or performance of the system or component under repair
- Improper operation or performance of any system or component which is dependent upon the proper operation or performance of the system or component under repair
- Damage to fasteners, basic tools, or special tools
- Leakage of coolant, lubricating oil or other main fluid

"Description" emphasizes the necessary features of certain diagnostic or service procedure. It is for the following purposes:

- Clarify a procedure
- Provide additional information for the execution of procedure
- Provide internal reasons why to operate according to recommended procedures
- Provide information which can help to execute the procedures more effectively
- Present information that gives the technician the benefit of past experience in accomplishing a procedure with greater ease

"Prompt" provides some help information.

Reference

LH or RH in this manual is viewed from the rear of vehicle.

Operations involved in this manual do not include tests after service. This is especially important after the component related to safety is serviced or replaced.

Dimensions

Dimensions referenced here are based on design engineering specifications. This manual includes all the available service limits.

The company will continuously improve the vehicle specification, design and manufacturing. So there will be some changes in vehicle frequently. Although we try our best to make the manual be correctly written, we cannot guarantee there is no little error between the specification and description in this manual as for the vehicle in any particular situation.

Service and Replacement Instructions

Components

In case of replacement, use components recommended by the Company only.

Pay particular attention to the following points related to the service or replacement and accessories:

- Use of other components instead of those recommended by the SMC may impair vehicle safety and anti-corrosion measures.
- Apply the torque value given by this Manual.
- Fit the clamp device on the specified location. If the clamping effect of the clamp device is impaired by the remove operations, then replace it.
- Use of other components instead of those recommended by the SMC will make the warranty invalid.

All components recommended by the SMC enjoy the right for warranty.

Dealers of the SMC shall only supply components recommended by the SMC.

Special Tools

Use of the special tools helps to prevent possible component damage.

Part of the operations in the Manual cannot be fulfilled without related special tools.

All the special tools described in the Manual are available from:

Shanghai Runyue Industry Development Co., Ltd.

Address: Annex Building, Lotus Building, No. 159, Tianzhou Road, Shanghai

Postal code: 200233

Tel: 021-64853663

Fax: 021-64853639

General

General Precautions

Dangerous Substances

Modern vehicles contain many materials or liquids which if not handled with care can be hazardous to both personal health and the environment.

Warning : *Many liquids and other substances used in vehicles are poisonous and should under no circumstances be consumed and should, as far as possible, be kept from contact with the skin. These liquids and substances include acid, antifreeze, brake fluid, fuel, windscreen washer additives, lubricants, refrigerants and various adhesives.*

Warning : *Always read carefully the instructions printed on labels or stamped on components and obey them implicitly. Such instructions are included for reasons of your health and personal safety. Never disregard them.*

Many O rings, seals, hoses, flexible pipes and other similar items which appear to be natural rubber, are in fact, made of synthetic materials called Fluoroelastomers. Under normal operating conditions this material is safe and does not present a health hazard. However, if the material is damaged by fire or excessive heating, it can break down and produce highly corrosive Hydrofluoric acid.

Contact with Hydrofluoric acid can cause serious burns on contact with skin. If skin contact does occur:

- Remove any contaminated clothing immediately.
- Irrigate affected area of skin with a copious amount of cold water or limewater for 15 to 60 minutes.
- Obtain medical assistance immediately.

Should any material be in a burnt or overheated condition, handle with extreme caution and wear protective clothing (seamless industrial gloves, protective apron etc.).

Decontaminate and dispose of gloves immediately after use.

Lubricating Fluids

Avoid excessive skin contact with used lubricating oils and always adhere to the health protection precautions.

Warning : *Avoid excessive skin contact with used engine oil. Used engine oil contains potentially harmful contaminants which may cause skin cancer or other serious skin disorders.*

Warning : *Avoid excessive skin contact with mineral oil. Mineral oils remove the natural fats from the skin, leading to dryness, irritation and dermatitis.*

Precautions

The following precautions should be observed at all times:

- Wear protective clothing, including impervious gloves when practicable.
- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Do not put oily rags in pockets.
- Avoid contaminating clothes (particularly those next to the skin) with oil.
- Overalls must be cleaned regularly. Discard heavily soiled clothing and oil impregnated footwear.
- First aid treatment should be obtained immediately for open cuts and wounds.
- Apply barrier creams before each work period to help prevent lubricating oil from contaminating the skin.
- Wash with soap and water to ensure all oil is removed (proprietary skin cleansers and nail brushes will help).
- Use moisturisers after cleaning; preparations containing lanolin help replace the skin's natural oils which have been removed.
- Do not use petrol/gasoline, kerosene, diesel fuel, oil, thinners or solvents for cleaning skin.
- Where practicable, degrease components prior to handling.
- If skin disorders develop, obtain medical advice without delay.
- Wear eye protection (e.g. goggles or face shield) if there is a risk of eye contamination. Eye wash facilities should be provided in close vicinity to the work area.

Safety Instructions**Jacking**

Caution : *It is best to use the lift when working under the vehicle. Be sure to hold the wheels with chocks and apply parking brake.*

Always use the recommended jacking points.

Always ensure that any lifting apparatus has sufficient load capacity for the weight to be lifted.

Ensure the vehicle is standing on level ground prior to lifting or jacking.

Apply the parking brake and chock the wheels.

Warning : *Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.*

Do not leave tools, lifting equipment, spilt oil, etc. around or on the work bench area. Always keep a clean and tidy work area.

Brake Shoes and Pads

Always use the correct gear and brake pads. When renewing brake pads and brake shoes, always replace as complete axle sets.

Brake Hydraulic System

Observe the following recommendations when working on the brake system:

- Apply two spanners to loosen or tighten brake pipes or pipe fittings.
- Ensure that hoses run in a natural curve and are not twisted or deformed.
- Fix brake pipes securely with retaining clips and ensure that the pipe cannot contact a potential chafing point.
- Containers used for brake fluid must be kept absolutely clean.
- Do not store brake fluid in an unsealed container, it will absorb water and in this condition would be dangerous to use due to a lowering of its boiling point.
- Do not allow brake fluid to be contaminated with mineral oil, or put new brake fluid in a container which has previously contained mineral oil.
- Do not re-use the brake fluid removed from the system.
- Always use clean brake fluid or a recommended alternative to clean hydraulic components.
- After disconnection of brake pipes and hoses, immediately fit suitable blanking caps or plugs to prevent the ingress of dirt.
- Only use the correct brake fittings with compatible threads.

- Observe absolute cleanliness when working with hydraulic components.

Cooling System Caps and Plugs

Remove expansion tank caps and coolant drain pipe or bleed screws with great care when the cooling system is hot, especially if it is overheated. To avoid the possibility of scalding, allow the cooling system to cool before attempting removal.

Precautions for High Voltage

Basic Requirements

Basic requirements for related precautions for high voltage in vehicle are as follows:

- Non-related personnel are forbidden to come into contact with the vehicle during vehicle repair.
- Do not touch the components with the high-voltage warning sign at will.
- If it is necessary to dismantle the relevant high voltage components, the dismantling personnel need to undergo high voltage safety training.
- When operating high voltage components, the operator must wear protective equipment as well as insulating gloves.
- When operating exposed high voltage system components, the operator must use a multimeter to measure if there is high voltage, and don't do anything before making sure that there is no high voltage.
- When the driving is over, turn off the start switch. If there is a need to disassemble the high voltage system, wait for 5 minutes before proceeding.
- When disassembling or assembling electrical components, the 12V power supply and the MSD on the high-voltage battery pack must be disconnected.
- After removing the high voltage components, it is necessary to check the assembling and connection of all high voltage components and ensure their reliability before reconnecting the high voltage power supply.
- All high voltage components should be grounded well.

Warning : *Make sure the maintenance personnel of the high-voltage system have the special operation permit of electrician produced by the safety supervision bureau.*

Warning : *It is forbidden for maintenance personnel who have not participated in the knowledge training of high voltage system of this model to dismantle the high voltage system (including high-voltage battery pack, drive motor, PEB, high voltage harness, electric A/C compressor, on-board charger, charging port and AC charging cable).*

Warning : *Prior to opening any high voltage circuits the systems MUST be checked using a suitable multi meter to ensure they carry no high voltage current. Where there is need to work with the high voltage system is essential that the correct 'make safe' procedure is followed - see Manual Service Disconnect procedure in the Service Repair manual. After disconnecting the Manual Service Disconnect (MSD), always wait 5 minutes prior to commencing any checks for residual voltage etc.*

Caution : *In the process of installation and dismantling, brake fluid, washer fluid, coolant and other liquids shall be prevented from entering or splashing onto high voltage components.*

Environmental Precautions**Overview**

This section provides general information which can help to reduce the environmental impacts from the activities carried out in workshops.

Emissions to Air

Many of the activities that are carried out in workshops emit gases and fumes which contribute to global warming, depletion of the ozone layer and/or the formation of photochemical smog at ground level. By considering how the workshop activities are carried out, these gases and fumes can be minimised, thus reducing the impact on the environment.

Exhaust Fumes

Running car engines is an essential part of workshop activities and shall be carried out in a well ventilated environment. However, the amount of time engines are running and the position of the vehicle should be carefully considered at all times, to reduce the release of poisonous gases and minimise the inconvenience to people living nearby.

Solvents

Some of the cleaning agents used are solvent based and will evaporate to atmosphere if used improperly, or if containers are left unsealed. All solvent containers should be firmly closed when not needed and solvent should be used sparingly. Suitable alternative materials may be available to replace some of the commonly used solvents. Similarly, many paints are solvent based and the spray should be minimised to reduce solvent emissions.

Refrigerant

Discharge and replacement of refrigerant from air conditioning units should only be carried out by using the correct equipment.

Engine

Always adhere to the following:

- Don't leave engines running unnecessarily;
- Minimise testing times and check where the exhaust fumes being blown.

Diluent:

- Keep lids on containers of solvents;
- Only use the minimum quantity;
- Consider alternative materials;
- Minimise over-spray when painting.

Gases:

- Use the correct equipment for collecting refrigerants;
- Don't burn rubbish on site.

Discharges to Water

Oil, petrol, solvent, acids, hydraulic oil, antifreeze and other such substances should never be poured down the drain and

every precaution must be taken to prevent spillage reaching the drains.

Handling of such materials must take place well away from the drains and preferably in an area with a kerb or wall around it, to prevent discharge into the drain. If a spillage occurs, it should be soaked up immediately. Having a spill kit available will make this easier.

Checklist

Always adhere to the following disposal and spillage prevention instructions.

- Never pour anything down a drain without first checking that it is environmentally safe to do so, and that it does not contravene any local regulations.
- Store liquids in a walled area.
- Make sure that taps on liquid containers are secure and cannot be accidentally turned on.
- Protect bulk storage tanks from vandalism by locking the valves.
- Transfer liquids from one container to another in an area away from open drains.
- Ensure lids are replaced securely on containers.
- Have spill kits available near to points of storage and handling of liquids.

Spill Kits

Special materials are available to absorb a number of different substances. They can be in granular form, ready to use and bought in convenient containers for storage. Disposal of used spill-absorbing material is dealt with in 'Waste Management' section.

Land Contamination

Oils, fuels, solvents, etc. can contaminate any soil that they are allowed to contact. Such materials should never be disposed of by pouring onto soil and every precaution must be taken to prevent spillage reaching soil. Waste materials stored on open ground could also leak, or have polluting substances washed off them that would contaminate the land. Always store these materials in suitable robust containers.

Checklist

Always adhere to the following:

- Don't pour or spill anything onto the soil or bare ground.
- Don't store waste materials on bare ground.

Local Issues

A number of environmental issues will be of particular concern to residents and other neighbors close to the site. The sensitivity of these issues will depend on the proximity of the site and the layout and amount of activity carried on at the site.

Car alarm testing, panel beating, hammering and other such noisy activities should, whenever possible, be carried out

indoors with doors and windows shut or as far away from residential area as possible.

Be sensitive to the time of day when these activities are carried out and minimise the time of the noisy operation, particularly in the early morning and late evening.

Another local concern will be the smell from the various materials used. Using less solvent, paint and petrol could help prevent this annoyance.

Local residents and other business users will also be concerned about traffic congestion, noise and exhaust fumes, be sensitive to these concerns and try to minimise inconvenience from deliveries, customers and servicing operations.

Checklist

Always adhere to the following:

- Identify where the neighbors who are likely to be affected are situated;
- Minimise noise, smells and traffic nuisance.
- Prevent waste pollution by disposing of waste in the correct container.
- Have waste containers emptied regularly.

Waste Management

One of the major ways that pollution can be reduced is by the careful handling, storage and disposal of all waste materials that occur on sites. This means that it is necessary to not only know what the waste materials are, but also to have the necessary documentation and to know local regulations that apply.

Handling and Storage of Waste

They should be stored in such a way as to prevent the escape of the material to land, water or air.

They must also be segregated into different types of waste e.g. oil, metals, batteries, used vehicle components. This will prevent any reaction between different materials and assist in disposal.

Disposal of Waste

Disposal of waste materials must only be to waste carriers who are authorized to carry those particular waste materials and have all the necessary documentation. The waste carrier is responsible for ensuring that the waste is taken to the correct disposal sites.

Dispose of waste in accordance with the following guidelines:

- Fuel, hydraulic fluid, anti-freeze and oil: keep separate and dispose of to specialist contractor.
- Refrigerant: collect in specialist equipment and reuse.
- Detergents: safe to pour down the foul drain if diluted.
- Paint, thinners: keep separate and dispose of to specialist contractor.

- Components: send back to supplier for refurbishment, or disassemble and reuse any suitable parts. Dispose of the remainder in ordinary waste.
- Small parts: reuse any suitable parts, dispose of the remainder in ordinary waste.
- Metals: can be sold if kept separate from general waste.
- Tyres: keep separate and dispose of to specialist contractor.
- Packaging: compact as much as possible and dispose of in ordinary waste.
- Asbestos material: keep separate and dispose of to specialist contractor.
- Oily and fuel wastes (e.g. rags, used spill kit material): keep separate and dispose of to specialist contractor.
- Air filters: keep separate and dispose of to specialist contractor.
- Rubber/plastics: dispose of in ordinary waste.
- Water pipes: dispose of in ordinary waste.
- Batteries: keep separate and dispose of to specialist contractor.
- Airbags - explosives: keep separate and dispose of to specialist contractor.
- Electrical components: send back to supplier for refurbishment, or disassemble and reuse any suitable parts. Dispose of the remainder in ordinary waste.
- Catalysts: can be sold if kept separate from general waste.
- Used spill-absorbing material: keep separate and dispose of to specialist contractor.

General Fitting Instructions**Component Remove**

Whenever possible, clean components and surrounding area before removing.

- Blank off openings exposed by component removal.
- Immediately seal fuel, oil or hydraulic lines when apertures are exposed; use plastic caps or plugs to prevent loss of fluid and ingress of dirt.
- Close the open ends of oilways exposed by component removal with tapered hardwood plugs or conspicuous plastic plugs.
- Immediately a component is removed, place it in a suitable container; use a separate container for each component and its associated parts.
- Clean bench and provide marking materials, labels and containers before removing a component.

Remove

Observe scrupulous cleanliness when removing components, particularly when brake, fuel or hydraulic system parts are being worked on. A particle of dirt or a cloth fragment could cause a serious malfunction if trapped in these systems.

- Blow out all tapped holes, crevices, oilways and fluid passages with compressed air. Ensure that any O-rings used for sealing are correctly replaced or renewed, if disturbed during the process.
- Use marking ink to identify mating parts and ensure correct reassembly. Do not use a centre punch or scriber to mark parts, they could initiate cracks or distortion in marked components.
- Wire together mating parts where necessary to prevent accidental interchange (e.g. roller bearing components).
- Attach labels to all parts which are to be renewed, and to parts requiring further inspection before being passed for reassembly; place these parts in separate containers from those containing parts for rebuild.
- Do not discard a part due for renewal until after comparing it with a new part, to ensure that its correct replacement has been obtained.

Cleaning Components

Always use the recommended cleaning agent or equivalent. Ensure that adequate ventilation is provided when volatile degreasing agents are being used. Do not use degreasing equipment for components containing items which could be damaged by the use of this process.

General Inspection

All components should be inspected for wear or damage before being refitted.

- Never inspect a component for wear or dimensional check unless it is absolutely clean; a slight smear of grease can conceal an incipient failure.
- When a component is to be checked dimensionally against recommended values, use the appropriate measuring equipment (surface plates, micrometers, dial gauges etc.). Ensure the measuring equipment is calibrated and in good serviceable condition.
- Reject a component if its dimensions are outside the specified tolerances, or if it appears to be damaged.
- A part may be refitted if its critical dimension is exactly to its tolerance limit and it appears to be in satisfactory condition. Use 'Plastigauge' for checking bearing surface clearances.

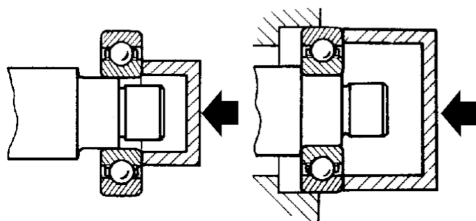
Ball and Roller Bearings

Overview

When removing and refitting bearings, ensure that the following practices are observed to ensure component serviceability.

- Remove all traces of lubricant from bearing under inspection by cleaning with a suitable degreasant; maintain absolute cleanliness throughout operations.
- Hold inner ring of bearing between finger and thumb of one hand and spin outer ring to check that it revolves absolutely smoothly. Repeat, holding outer ring and spinning inner ring.
- Rotate outer ring gently with a reciprocating motion, while holding inner ring; feel for any check or obstruction to rotation. Reject bearing if action is not perfectly smooth.
- Lubricate bearing with generous amounts of lubricant appropriate to refitting.
- Inspect shaft and bearing housing for discoloration or other markings which indicate movement between bearing and housing.
- Ensure that shaft and housing are clean and free from burrs before fitting bearing.
- If one bearing of a pair shows an imperfection, it is advisable to replace both with new bearings; an exception could be if the faulty bearing had covered a low mileage, and it can be established that damage is confined to only one bearing.
- Never refit a ball or roller bearing without first ensuring that it is in a fully serviceable condition.
- When hub bearings are removed or displaced, new bearings must be fitted; do not attempt to refit the old hub bearings.
- When fitting a bearing to a shaft, only apply force to the inner ring of the bearing. When fitting a bearing into a housing, only apply force to the outer ring of the bearing.

- In the case of grease lubricated bearings (e.g. hub bearings) fill the space between bearing and outer seal with the recommended grade of grease before fitting seal.
- Always mark components of separable bearings (e.g. taper roller bearings) when removing, to ensure correct reassembly. Never fit new rollers in a used outer ring; always fit a complete new bearing assembly.

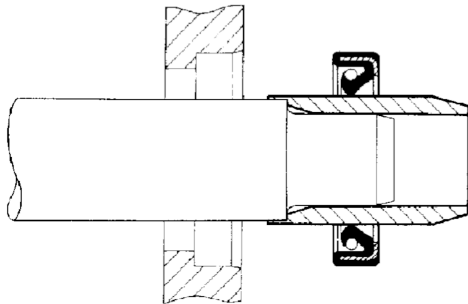


Oil Seals

Overview

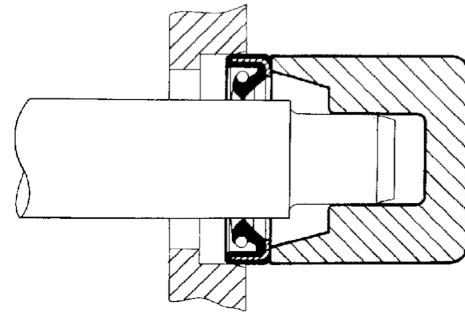
Always renew oil seals which have been removed from their working location (whether as an individual component or as part of an assembly). NEVER use a seal which has been improperly stored or handled, such as hung on a hook or nail.

- Carefully examine seal before fitting to ensure that it is clean and undamaged.
- Ensure the surface on which the new seal is to run is free of burrs or scratches. Renew the component if the original sealing surface cannot be completely restored.
- Protect the seal from any surface which it has to pass when being fitted. Use a protective sleeve or tape to cover the relevant surface.
- Lubricate the sealing lips with a recommended lubricant before use to prevent damage during initial use. On dual lipped seals, smear the area between the lips with lubricant.
- If a seal spring is provided, ensure that it is fitted correctly. Place lip of seal towards fluid to be sealed and slide into position on shaft. Use fitting sleeve where possible to protect sealing lip from damage by sharp corners, threads or splines. If a fitting sleeve is not available, use plastic tube or tape to prevent damage to the sealing lip.



S003041

- Grease outside diameter of seal, place square to housing recess and press into position using great care, and if possible a 'bell piece' to ensure that seal is not tilted. In some cases it may be preferable to fit seal to housing before fitting to shaft. Never let weight of unsupported shaft rest in seal.



S003042

- Use the recommended service tool to fit an oil seal. If the correct service tool is not available, use a suitable tube approximately 0.4 mm (0.015 in.) smaller than the outside diameter of the seal. Use a hammer VERY GENTLY on drift if a suitable press is not available.
- Press the oil seal to the bottom of housing with sealing lip facing the lubricant. Lubricate the shaft shoulder of the sealing surface to ensure that seal is not tilted in the housing.

Joints and Joint Faces**Overview**

Keep joints dry unless specified otherwise.

- Always use the correct gaskets as specified.
- When adhesive is used, apply in a thin uniform film to metal surfaces; take care to prevent adhesive from entering oilways, pipes or gaps.
- If washers and/or adhesive are recommended for use, remove all traces of old adhesive prior to refitting. Do not use a tool which will damage the joint faces and smooth out any scratches or burrs using an oil stone.
- Prior to refitting, blow through any oilways, pipes or gaps with compressed air.

Locking Devices**Overview**

Always replace locking devices with one of the same design.

Tab Washers

Always release locking tabs and fit new tab washers. Do not re-use locking tabs.

Locking Nut

Always use a torque wrench when refitting or removing locking nuts, brake and other pipe connectors.

Locating Pins

Always fit new locating pins for the hole.

Circlips

Always fit new circlips of the correct size for the groove.

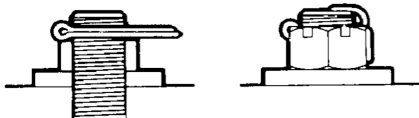
Keys and Keyways

Remove burrs from edges of keyways with a fine file and clean thoroughly before attempting to refit key.

Clean and inspect key closely; keys are suitable for refitting only if indistinguishable from new, as any indentation may indicate the onset of wear.

Split Pins

Always fit new split-pins of the correct size for the hole in the bolt or stud.



S003043

Screw Threads

Overview

Metric threads to ISO standards are used.

Damaged nuts, bolts and screws must always be discarded. Cleaning damaged threads with a die or tap impairs the strength and fit of the threads and is not recommended.

Always ensure that replacement bolts are at least equal in strength to those replaced.

Castellated nuts must not be loosened to accept a split-pin, except in recommended cases when this forms part of an adjustment.

Do not allow oil or grease to enter blind threaded holes. The hydraulic action on screwing in the bolt or stud could split the housing.

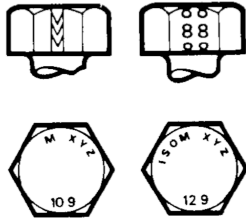
Always tighten a nut or bolt to the recommended torque value. Damaged or corroded threads can affect the torque value.

To check or re-tighten a bolt or screw to a specified torque value, first loosen a quarter of a turn, then re-tighten to the correct torque value.

Oil thread lightly before tightening to ensure a free running thread, except in the case of threads treated with sealant/lubricant, and self-locking nuts.

Fasteners Identification

Bolt Identification

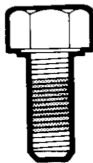


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An ISO metric bolt or screw made of steel and larger than 6 mm in diameter can be identified by either of the symbols ISO M or M embossed or indented on top of the bolt head.

In addition to marks identifying the manufacturer, the top of the bolt head is also marked with symbols indicating the strength grade, e.g. 8.8; 10.9; 12.9; 14.9. As an alternative, some bolts and screws have the M and strength grade symbol stamped on the flats of the hexagon.

Encapsulated Bolts and Screws



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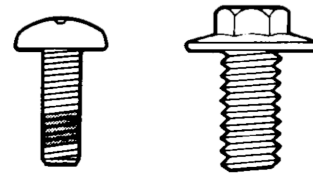
Encapsulated bolts and screws have a locking agent pre-applied to the thread. They are identified by a coloured section which extends 360° around the thread. The locking agent is released and activated by the assembly process and is then chemically cured to provide the locking action.

Unless a specific repair procedure states otherwise, encapsulated bolts may be reused providing the threads are undamaged and the following procedure is adopted:

- Remove loose adhesive from the bolt and housing threads.
- Ensure threads are clean and free of oil and grease.
- Apply an approved locking agent.

An encapsulated bolt may be replaced with a bolt of equivalent specification provided it is treated with an approved locking agent.

Self-locking Bolts and Screws



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Self-locking bolts and screws, i.e. nylon patched or trilobular thread can be reused providing resistance can be felt when the locking portion enters the female thread.

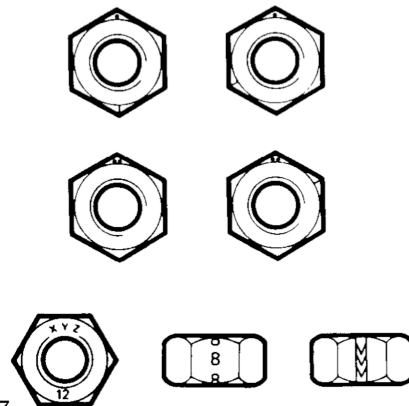
Nylon patched bolts and screws have a locking agent pre-applied to the threads. They are identified by the presence of a coloured section of thread which extends for up to 180° around the thread.

Trilobular bolts (i.e. Powerlok) have a special thread form which creates a slight interference with the thread of the hole or nut into which it is screwed.

DO NOT reuse self-locking bolts or screws in critical locations. Always use the correct replacement self-locking nut, bolt or screw.

DO NOT fit non self-locking fasteners in applications where a self-locking nut, bolt or screw is specified.

Nut Identification



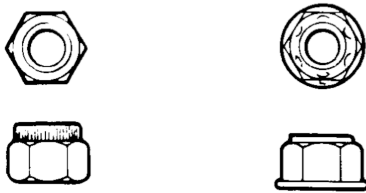
S003047

A nut with an ISO metric thread is marked on one face or on one of the flats of the hexagon with the strength grade symbol 8, 12, or 14. Some nuts with a strength grade 4, 5 or 6 are also marked and some have the metric symbol M on the flat opposite the strength grade marking.

When tightening a slotted or castellated nut, never loosen it to insert a split pin except where recommended as part of an adjustment. If difficulty is experienced, alternative washers or nuts should be selected, or the washer thickness reduced.

Where bearing preload is involved, nuts should be tightened in accordance with special instructions.

Self-locking Nuts



S003048

Self-locking nuts can be reused providing resistance can be felt when the locking portion of the nut passes over the thread of the bolt or stud.

Where self-locking nuts have been removed, it is advisable to replace them with new ones of the same type.

Don't use non self-lock nuts in the area where self-lock nuts must be used.

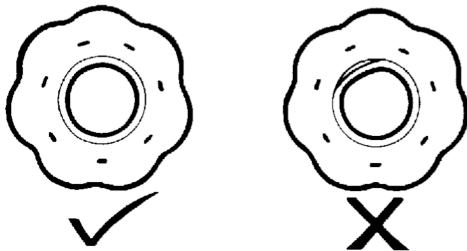
Flexible Pipes and Hoses

Overview

When removing and refitting flexible hydraulic pipes and hoses, ensure that the following practices are observed to ensure component serviceability.

- Clean end fittings and the area surrounding them as thoroughly as possible.
- Obtain appropriate plugs or caps before detaching hose end fittings, so that the ports can be immediately covered to prevent the ingress of dirt.
- Clean hose externally and blow through with compressed air. Examine carefully for cracks, separation of plies, security of end fittings and external damage. Reject any faulty hoses.
- When refitting a hose, ensure that no unnecessary bends are introduced, and that hose is not twisted before or during tightening of union nuts.
- Fit a cap to seal a hydraulic union and a plug to its socket after removal to prevent ingress of dirt.
- Absolute cleanliness must be observed with hydraulic components at all times.
- After any work on hydraulic systems, carefully inspect for leaks underneath the vehicle.

Flexible Pipes



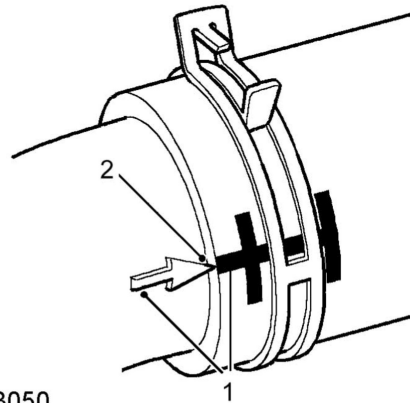
S003049

All flexible pipes are made up of two laminations, an armoured rubber outer sleeve and an inner viton core. If any of the flexible pipes has been disconnected, it is imperative that the internal bore is inspected to ensure that the viton lining has not become separated from the armoured outer sleeve. A new flexible pipe must be fitted if separation is evident.

Cooling System Hoses

The following precautions MUST be followed to ensure that integrity of cooling system hoses and their connections to system components are maintained.

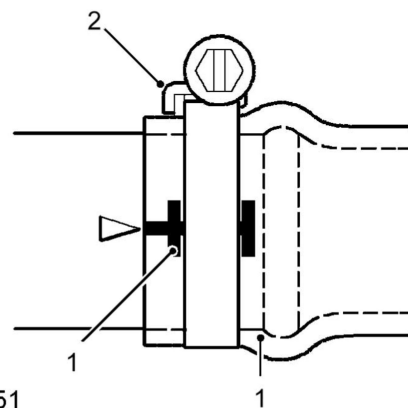
Hose Orientation and Connection



S003050

Correct orientation of cooling hoses is important in ensuring that the hose does not become scratched or damaged through contact with adjacent components. Where 'timing' marks (1) are provided on the hose and corresponding connection, these must be used to ensure correct orientation. Hoses must be pushed fully onto their connection points. Usually, a marking (2) on the pipe end provides a positive indicator.

Hose Clip



S003051

Markings (1) are usually provided on the hose to indicate the correct clip position. If no markings are provided, position the clip directly at the location as shown in above figure. Worm drive clips should be oriented with the crimped side of the clip bracket (2) facing towards the end of the pipe, or the hose may become pinched between the clip and the pipe. Worm drive clips should be tightened to 3 Nm unless otherwise stated. Ensure that hose clips do not foul adjacent components.

Heat Protection

Always ensure that heatshields and protective sheathing are in good condition. Replace if damage is evident. Particular care must be taken when routing pipelines close to hot components. Hoses will relax and deflect slightly when hot; ensure this movement is taken into account when routing and securing hoses.

Electrical Precautions

Overview

The following guidelines are intended to ensure the safety of the operator while preventing damage to the electrical and electronic components fitted to the vehicle. Where necessary, specific precautions are detailed in the individual procedures of this manual.

Equipment

Prior to commencing any test procedure on the vehicle ensure that the relevant test equipment is working correctly and any harness or connectors are in good condition. It is particularly important to check the condition of the lead and plugs of mains operated equipment.

Polarity

Never reverse connect the vehicle battery and always ensure the correct polarity when connecting test equipment.

High Voltage Circuits

Whenever disconnecting live HT circuits always use insulated pliers and never allow the open end of the HT lead to contact any components.

Connectors and Harnesses

The engine compartment of a vehicle is a particularly hostile environment for electrical components and connectors:

- Always ensure electrically related items are dry and oil free before disconnecting and connecting test equipment.
- Ensure disconnected multiplugs and sensors are protected from being contaminated with oil, coolant or other solutions. Contamination could impair performance or result in catastrophic failure.
- Never force connectors apart using tools to prise apart or by pulling on the wiring harness.
- Always ensure locking mechanism is disengaged before disconnection, and match orientation to enable correct reconnection.
- Ensure that any protection (covers, insulation etc.) is in good condition and replaced if damaged.

Having confirmed a component to be faulty:

- Switch off the ignition and disconnect the battery negative.
- Remove the component and support the disconnected harness.
- When replacing the component, keep oily hands away from electrical connection areas and push connectors home until any locking tabs fully engage.

Battery Disconnection

Before disconnecting the battery, disable the alarm system and switch off all electrical equipment.

Caution : *To prevent damage to electrical components, always disconnect the battery when working on the vehicle electrical system. The ground lead must be disconnected first and reconnected last.*

Caution : *Always ensure that battery leads are routed correctly without any potential hazards.*

Battery Charging

Always ensure any battery charging area is well ventilated and that every precaution is taken to avoid naked flames and sparks.

Disciplines

Turn off the ignition system prior to making any connection or disconnection in the system to prevent electrical surges caused by disconnecting 'live' connections damaging electronic components.

Ensure hands and work surfaces are clean and free of grease, swarf, etc. Grease collects dirt which can cause electric leakage (short circuits) or open circuit.

Connectors should never be subjected to forced removal or refit, especially internal connectors. Damaged circuits can cause short-circuit and open-circuit fault conditions.

Prior to commencing test, and periodically during a test, touch a good vehicle body to discharge static electricity. Some electronic components are vulnerable to the static electricity that may be generated by the operator.

When handling printed circuit boards, treat with care and hold by the edges only; note that some electronic components are susceptible to body static.

Electrical Connectors Lubrication

In order to prevent corrosion, some connectors under bonnet and vehicle body are coated with special lubricant in factory. If these are destroyed in maintaining, repair and replacing process, special lubricant should be newly wiped.

Supplementary Restraint System Precautions

General Precautions

The SRS system contains components which could be potentially hazardous to the service engineer if not serviced and handled correctly. The following guidelines are intended to alert the service engineer to potential sources of danger and emphasise the importance of ensuring the integrity of SRS components fitted to the vehicle.

Warning : *It is imperative that before any work is undertaken on the SRS system the appropriate information is read thoroughly.*

Warning : *It is imperative that the appropriate information is read thoroughly before any work is undertaken on the SRS system.*

Warning : *The airbag module contains sodium azide which is poisonous and extremely flammable. Contact with water, acid or heavy metals may produce harmful or explosive compounds. Do not dismantle, incinerate or bring into contact with electricity, before the airbag is deployed.*

Warning : *When a seat belt has withstood the strain of a severe vehicle impact or shows signs of wear, immediately replace it with a new one.*

Warning : *Always disconnect the vehicle battery before carrying out any electric welding on a vehicle fitted with an SRS system.*

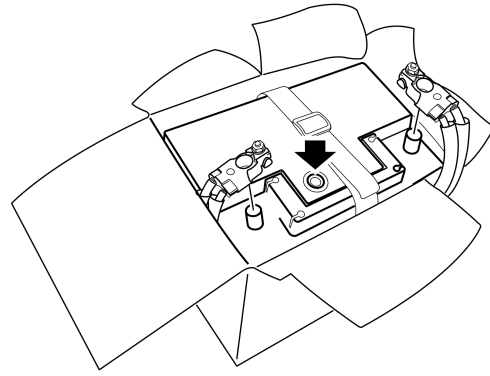
Caution : *Do not expose an airbag module or seat belt pre-tensioner to heat exceeding 85 °C.*

It should be noted that these precautions are not restricted to operations performed when maintaining the SRS, the same care must be exercised when working on ancillary systems and components located in the vicinity of the SRS components. These include, but are not limited to:

- Steering system - driver front airbag module, rotary coupler.
- Instrument panel - passenger front airbag module.
- Interior trim - IC Shead curtain airbags ('A' pillar trim, 'B' pillar trim, grab handles, headlining above front doors); SRS diagnosis control unit (beneath centre console); side impact crash sensors (inside the body sill frame)
- Seats - side airbags; front seat belt pre-tensioners
- Electrical system - SRSharnesses, connecting wires and connectors

Making the System Safe

Before working on or in the vicinity of the SRS components, ensure the system is rendered safe by performing the following procedures:



S003092

- Remove the key from the ignition switch.
- Disconnect the negative battery terminal first, and the positive.
- Wait 10 minutes for SDM back-up power circuit to discharge.

The SRS uses energy reserve capacitors to keep the system active in the event of electrical supply failure under crash conditions. It is necessary to allow the capacitor sufficient time to discharge (at least 10 minutes) in order to avoid the risk of accidental deployment.

Caution : *Disconnect the battery before starting the SRS operation. Disconnect the negative battery cable first. DO NOT disconnect the battery in the reverse order.*

Refit

In order to ensure system integrity, it is essential that the SRS is regularly checked and maintained so that it is ready for effective operation in the event of a collision. Carefully inspect SRS components before installation. Do not fit a part that shows signs of being dropped or improperly handled, such as dents, cracks or deformation.

Warning : *The integrity of the SRS system is critical for safety reasons.*

Ensure the following precautions are always adhered to:

- Never fit used SRS components from another vehicle or attempt to repair an SRS component.
- Never use the SRS components without a clear identification label.
- Never use an airbag or SRSECU that has been dropped.
- When repairing the SRS, only use genuine new parts.
- Never apply electrical power to an SRS component unless instructed to do so as part of an approved test procedure.
- Ensure the screws are tightened to the correct torque. Always use new fasteners when replacing SRS components.
- Ensure that the SRSECU is fitted correctly. There must not be any gap between the SRSECU and the bracket

to which it is mounted. An incorrectly mounted SRSECU could cause the system to malfunction.

- Do not supply power to the SRSECU before all SRS components are connected.

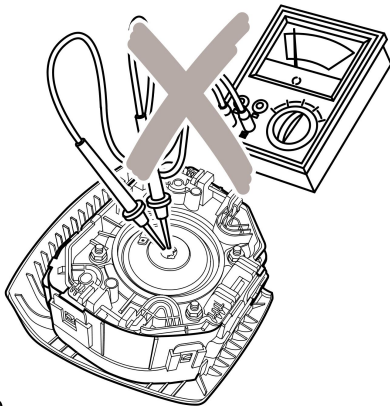
Caution : Ensure SRS components are not contaminated by oil, grease, detergent or water.

Caution : Torque wrenches should be regularly checked for accuracy to ensure that all fasteners are tightened to the correct torque.

Caution : After seat belt pre-tensioner works, the seat belts can still be used as conventional seat belts, but will need to be replaced as soon as possible to re-establish full SRS protection.

Caution : If the SRS component is to be replaced, the bar code of the new component must be recorded.

SRS Component Test Precautions



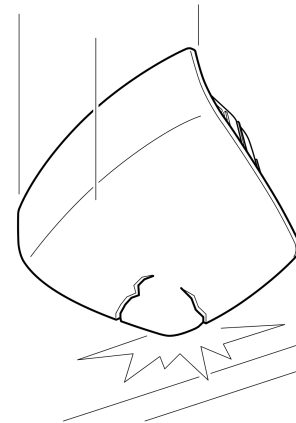
S003080

SRS components are triggered using relatively low operating currents, always adhere to the following precautions:

Warning : Do not use a multi-meter or other general purpose test equipment on SRS system components, or accidental deployment may occur. Only use the recommended diagnostic equipment to diagnose system faults.

Warning : Do not use electrical test equipment on the SRS harness while it is connected to any of the SRS system components. It may cause accidental deployment and personal injury.

Handling and Storage



S003081

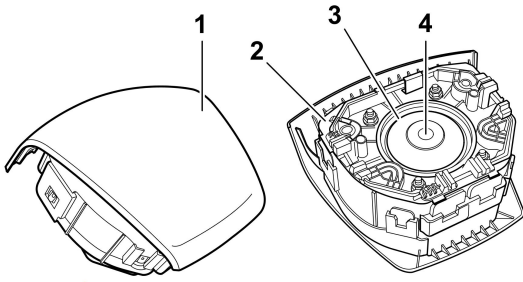
Always comply with the following handling precautions:

Warning : The SRS components are sensitive and potentially hazardous if not handled correctly; always comply with the following handling precautions:

- SRS ECU and airbag module must be stored in a dry environment at normal temperature not exceeding 85 °C. Ensure heat source, fire source, water and other corrosive chemical substances are kept away from the stored SRS components.
- For safety, inflammable objects shall not be placed around the airbag module.
- New airbag module shall be kept in original packaging state until fitted.
- The storage area must comply with all legal requirements. Enough fire extinguishers or other extinguishing devices must be provided.
- It is forbidden to use the dropped airbag module and SRS ECU at will. An airbag module and SRS ECU dropped on the ground must be scrapped.
- Do not hold the airbag module wire or connector with hands when handling undeployed airbag module.
- It is forbidden to disassemble the undeployed airbag module or damage the sealed airbag module metal case.
- Never carry airbag module or seat belt pre-tensioner in the compartment.

Warning : Never attach anything to an airbag cover or any object to an airbag module. Do not allow anything to rest on top of an airbag module.

Caution : Do not apply grease or cleaning solvents to seat belt pre-tensioner units, otherwise it may cause component failure.



S003082

Warning : Store the airbag module with the deployment side facing up. If it is stored with the deployment side facing down, accidental deployment of airbag will cause personal injury.

Warning : Airbag modules and seat belt pre-tensioners are classified as explosive devices. For overnight and longer term storage, they must be stored in a secure steel cabinet which has been approved as suitable for the purpose and has been registered by the local authority.

Warning : When recycling or handling the seat belt pre-tensioner, DO NOT aim the piston pipe at yourself or others. Keep the pistons facing the ground. Hold the case instead of the seat belt.

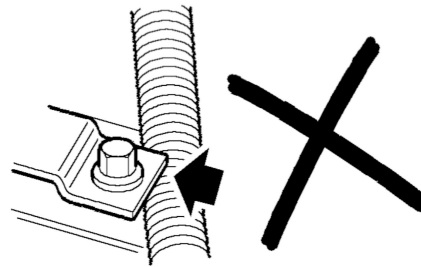
Warning : Store the airbag module or seat belt pre-tensioners in a designated storage area.

Caution : Improper handling or storage can internally damage the airbag module, making it inoperative. If you suspect the airbag module has been damaged, fit a new module and refer to the Deployment/Disposal Procedures for disposal of the damaged module.

SRSHarnesses and Connectors

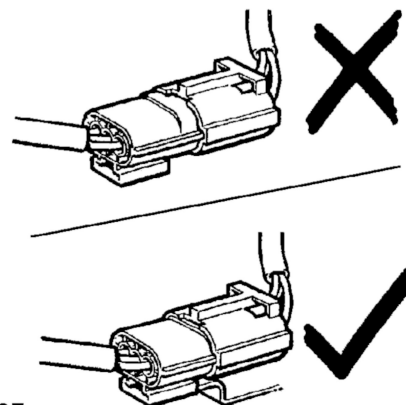
- Never fit extra electronic equipment (such as a mobile telephone, two-way radio or in-car entertainment system) in such a way that it could generate electromagnetic interference in the airbag circuit. Seek specialist advice when fitting such equipment.

Note : SRS harness can be identified by a special yellow sleeve which plays the role of protecting the harness (black with yellow stripe protective sleeve is sometimes used).



S003006

Warning : Always ensure SRS harness is routed correctly. Be careful to avoid trapping or pinching the SRS harness. Do not leave the connectors hanging loose or allow SRS components to hang from their harnesses. Check for possible points of chafing.



S003007

Precautions for Vehicle Owners

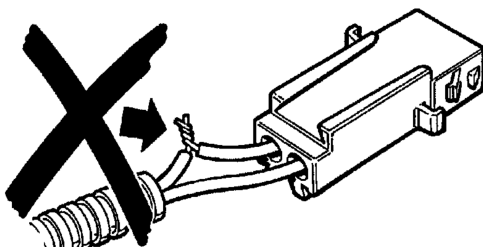
For the airbag to work effectively and protect vehicle owners, follow the precautions listed below.

Driver and passengers must use seat belts correctly. Correctly using the seat belts can protect the body and reduce injuries in the event of an accident.

Never fit any accessory that obstructs or impairs the operation of the seat belt pre-tensioners or airbags.

Do not place any object on the steering wheel or instrument panel that could penetrate an inflating airbag or be a thrown item likely to cause injury.

Never fit cover on seat which fitting side airbag.



S003005

Always observe the following precautions with regards to SRSharnesses:

- Never attempt to modify, splice or repair SRSharnesses.

Children under 12 years old should not sit in the front seat.

Only genuine accessory parts are allowed to be fitted.

Only authorised people can remove airbag modules, SRSECU, SRSharnesses and connectors.

If the airbag and seat belt pre-tensioner are deployed during an accident, SRSmust be replaced and discarded.

Every SRSon every car has been paired and identified, illegally adding or modifying the SRSand harnesses could cause injuries.

Modifying the vehicle structure or SRSis strictly prohibited and may cause wrong airbag deployment or failure to deploy when required.

Rotary Coupler Precautions

Caution : *Always follow the procedure for fitting and checking the rotary coupler as instructed in the SRS repairs section. Comply with all safety and installation procedures to ensure the system functions correctly.*

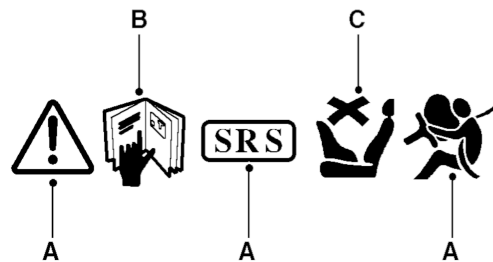
Observe the following precautions:

- Do not unlock and rotate the rotary coupler when it is removed from the vehicle.
- Do not turn the wheels when the rotary coupler is removed from the vehicle.
- Always ensure the rotary coupler is removed and refitted in its centred position and with the front wheels in the straight ahead position - refer to the SRSrepair section for the correct removal and refit procedure.
- If a new rotary coupler is being fitted, ensure the locking tab holding the coupler's rotational position is not broken; units with a broken locking tab should not be used.

Warning Labels

Warning labels are displayed at various positions in the vehicle. SRScomponents have additional warning labels displayed on them to indicate that particular care is needed when handling them. These include airbag modules, SRSECU, seat belt pre-tensioners and the rotary coupler.

The following warning symbols may be displayed at various locations on the vehicle:



S003008

A. Be careful when working in close proximity to SRScomponents.

B. Refer to the publication where the procedures, instructions and advice can be found (usually Workshop Manual or Owner's Manual) for working on the SRS.

C. Do not use rear facing child seats in the front passenger seat of vehicles fitted with passenger airbags.

Warning : *It is imperative that the appropriate information is read thoroughly before any work is undertaken on the SRS system.*

The following figure indicates possible locations and content for warning labels. Exact positions and content may vary dependent on model year, legislation and market trends.

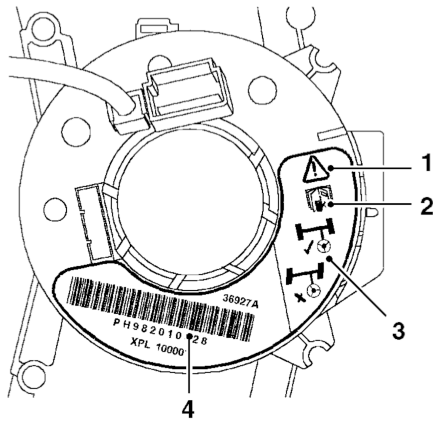


S003009

Do not use rear facing child seats in the front passenger seat of vehicles fitted with passenger airbags.

Rotary Coupler

1. Be careful when working in close proximity to SRScomponents.
2. Refer to Workshop Manual for detailed instructions.
3. Ensure the wheels are in the straight ahead position before removal and refitting.
4. Bar code. The code number must be recorded if the rotary coupler is to be replaced.



S003011

Bar Codes

Bar codes are fitted to SRS components and components which are critically related to SRS operation. The code number(s) must be recorded if the component is to be replaced.

Components featuring bar codes include the following:

- Driver front airbag module – label attached to rear of airbag module housing
- Passenger front airbag module – label attached at side of airbag module housing
- SRSECU– including label on top of SRSECU.
- Rotary coupler - several labels on front face.

Roadside Assistance

Traction - SRS component not deployed

Normal towing procedures are unlikely to cause an airbag to deploy. However, as a precaution, turn off the ignition switch and disconnect both battery leads. Disconnect the negative '-' lead first.

Traction - SRS component not deployed

Once the driver airbag has been deployed, the vehicle must have a suspended tow. However, as a precaution, turn off the ignition switch and disconnect both battery leads. Disconnect the negative '-' lead first.

SRS components deployed

If a vehicle is to be scrapped and contains an undeployed airbag module, the module must be manually deployed.

Always observe the following precautions:

Warning : Only personnel who have undergone the appropriate training should undertake deployment of airbag and seat belt pre-tensioner modules.

Warning : A deployed airbag or seat belt pre-tensioner is very hot, which should be cooled down for at least 30 minutes.

Warning : Only use approved deployment equipment, and only deploy SRS components in a well-ventilated area. Ensure SRS components are not damaged or ruptured before deployment.

Warning : Contact with chemicals from deployed and damaged SRS components could present a health hazard; wear protective clothing when handling them. DO NOT eat, drink or smoke when handling SRS components.

Warning : Deployment of airbag modules and seat belt pre-tensioners can cause injury to personnel in the close vicinity of the deploying unit. In case of injury, seek urgent medical advice. Possible sources of injury include:

- Impact - due to component deployment caused by operation on airbag module or seat belt pre-tensioner.
- Hearing damage - due to noise produced by deploying airbag module or seat belt pre-tensioner.
- Burns - due to hot component parts and gases.
- Irritation to eyes and lungs - due to gases or combustion residue during deployment.

Warning : The following precautions MUST be followed:

- Only use approved deployment tool to carry out this operation.
- Before commencing any deployment procedure, ensure the deployment tool functions properly.
- Deployment of any airbag/pre-tensioner modules should be performed in a well ventilated area which has been designated for the purpose.
- Ensure the airbag/pre-tensioner modules are not damaged or ruptured before deployment.
- Notify the relevant authorities of intention to deploy airbag and pre-tensioner units.
- When deploying any airbag and seat belt pre-tensioner units, ensure that all personnel are at least 15 metres away from the deployment zone.
- When deploying seat belt pre-tensioners in the vehicle, ensure the pre-tensioner unit is fully secured to its fixing point.
- When removing deployed airbag and seat belt pre-tensioner modules, wear protective clothing. Use gloves and seal deployed units in a plastic bag.
- After any component of the SRS system is deployed, all SRS components must be replaced. DO NOT re-use or repair any parts of the SRS system.
- Do not lean over airbag modules or seat belt pre-tensioner units when connecting deployment equipment.

SRS Component Replacement Policy

Impacts Which Do Not Deploy the Airbags or Pre-tensioners

Check for structural damage in the area of the impact, paying particular attention to bumpers, longitudinal beams, anti-collision beams and bracketry.

Impacts Which Deploy the Airbags or Pre-tensioners

The replacement and inspection policy is dependent on the type and severity of the crash condition. The following guidelines are the basic precautions for deployment of SRS components:

Front Seat Side Airbag Deployment (driver and passenger)

If the front seat side airbags are deployed, the following parts must be replaced:

- Driver Seat Side Airbag Module
- Passenger Seat Side Airbag Module
- Cables connecting front seat airbag modules to SRSharness
- Seat Belt Pre-tensioners
- Driver Seat Belt Retractor
- Rotary Coupler
- SDM

In addition, the following should be inspected for damage and replaced as necessary:

- Front passenger's seat belt retractor (webbing, tongue latching, 'D' loop, body anchorage point)
- Rear seat belt buckles (webbing, buckle covers, body anchorage and tongue latching function)
- Instrument panel adjacent to passenger airbag module
- Steering wheel (if damage is evident)
- Front seat frames and head restraints (if there is evidence of damage to the seat frame or cushion pan)
- Steering column (if adjustment is lost or there are signs of collapse)
- Seat belt height adjusters on 'B' pillar
- Rear seat belt escutcheons in parcel shelf trim

Side (Thorax) Airbags

If the side (thorax) airbags are deployed, the following parts must be replaced, on the side of the vehicle on which the deployment occurred:

- Seat (Thorax) Airbag Module
- Seat Cushion Foam
- Seat Cushion Cover
- Front Seat Belt Buckle Pre-tensioners
- SDM

- Side Impact Crash Sensors (both sides of vehicle)

In addition, the following should be inspected for damage and replaced as necessary:

- Front seat belts (retractors, webbing, tongue latching, 'D' loop and body anchorage points)
- Rear seat belt buckles (webbing, buckle covers, tongue latching and body anchorage points)
- Front seat frame (if there is evidence of external or airbag deployment damage to seat frame)
- 'B' Pillar Interior Trims and Fasteners
- Door Casings
- Seat belt height adjusters on 'B' pillar
- Rear seat belt escutcheons in parcel shelf trim

Inflatable Curtain Structure (ICS) Airbag Modules

If the ICS airbag modules are deployed, the following parts on the side of the vehicle for which deployment occurs must be replaced:

- ICS Airbag Modules
- Connecting wire between the airbag gas generator and the SRSharness
- Airbag retaining clips above window aperture
- 'A' Pillar Interior Trims
- Front Seat Belt Buckle Pre-tensioners
- SDM
- Side Impact Crash Sensors (both sides of vehicle)

In addition, the following should be inspected for damage and replaced as necessary:

- Headlining
- ICS Mounting Bracket
- Alarm Sensor
- Front seat belts (retractors, webbing, tongue latching, 'D' loop and body anchorage points)
- Rear seat belt buckles (webbing, buckle covers, tongue latching and body anchorage points)
- 'B' Pillar Upper Trims and Fasteners
- Door Casings
- Seat belt height adjusters on 'B' pillar
- Rear seat belt escutcheons in parcel shelf trim

Rear Impacts

Rear impacts may cause the seat belt pre-tensioners to deploy. If this occurs, all pre-tensioner units must be replaced. In addition, the following components should be inspected for damage and replaced as necessary:

- Front Seat Frames
- Seat belt height adjusters on 'B' pillar

- Front seat belts (retractors, webbing, tongue latching, 'D' loop and body anchorage points)
- Rear seat belt buckles (webbing, buckle covers, tongue latching and body anchorage points)
- Rear seat belt escutcheons in parcel shelf trim
- SDM

Periodic Replacement of SRS Components

The performance of the propellants within airbags and pre-tensioners will deteriorate over a period of time. As a result, it is essential that the airbags and pre-tensioners are periodically replaced to maintain occupant safety. The airbag, seat belt pre-tensioner and rotary coupler shall be replaced every 10 years.

Air Conditioning System Precautions

Overview

The air conditioning system contains fluids and components which could be potentially hazardous to the service engineer or the environment if not serviced and handled correctly. The following guidelines are intended to alert the service engineer to potential sources of danger and emphasise the importance of ensuring the integrity of the air conditioning operating conditions and components fitted to the vehicle.

Where necessary, additional specific precautions are detailed in the relevant sections of this Manual which should be referred to prior to commencing repair operations.

Warning : *Servicing must only be carried out by personnel familiar with both the vehicle system, the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.*

Warning : *Air conditioning refrigerant is a hazardous liquid, and when handled incorrectly, it can cause serious injury. Suitable protective clothing, consisting of face protection, heat proof gloves, rubber boots and rubber apron or waterproof overalls, must be worn when carrying out operations on the air conditioning system.*

Remedial Actions

If an accident involving the refrigerant should occur, conduct the following remedial actions:

- If the A/C refrigerant liquid enters the eye, do not rub it. Gently run large quantities of eye wash over affected eye to raise the temperature. If an eye wash is not available, cool clean water may be used to flush the eye. After rinsing, cover the eye with a clean pad and seek immediate medical attention.
- If the A/C refrigerant liquid is splashed onto the skin, run large quantities of water over the affected area to raise the temperature. Implement the same action if the skin comes in contact with discharging cylinders. Wrap the contaminated body parts in blankets (or similar materials) and seek immediate medical attention.
- If the debilitating effects of inhalation of the A/C refrigerant vapour is suspected, seek fresh air. If the affected person is unconscious, move them away from the contaminated area to fresh air and apply artificial respiration and/or oxygen and seek immediate medical attention.

Warning : *Due to its low evaporating temperature, air conditioning refrigerant must be handled with care. Air conditioning refrigerant splashed on any part of the body will cause immediate freezing of that area. Also, refrigerant tanks and replenishment trolleys when discharging will freeze skin if skin contacts with discharged fluid.*

Service Precautions

Observe the following precautions when handling components used in the air conditioning system:

- Air conditioning units must not be lifted by their hoses, pipes or capillary lines.
- Hoses and lines must not be subjected to any twist or stress; the efficiency of the system will be impaired by kinks or restrictions. Ensure that hoses are correctly positioned before tightening couplings, and ensure that all clips and supports are utilised.
- Flexible hoses should not be positioned close to the hot components (no less than 100 mm) unless protected by heat shielding.
- Completed assemblies must be checked for refrigeration lines touching metal panels. Any direct contact of components and panels may transmit noise and so must be eliminated.
- The appropriate torque wrench must be used when tightening refrigerant connections to the stipulated value. An additional spanner must be used to hold the union to prevent twisting of the pipe when tightening connections.
- Before connecting any hose or pipe, ensure that refrigerant oil is applied to the seat of the new O-rings, BUT NOT to the threads of the connection.
- All air conditioning system components must be stored under seal until immediately prior to connection.
- Ensure components are at room temperature before uncapping, to prevent condensation of moisture from the air that enters it.
- Components must not remain uncapped for longer than 15 minutes. In the event of a delay, the sealing component must be fitted.
- When disconnecting, immediately cap all air conditioning pipes to prevent ingress of dirt and moisture into the system.
- The receiver/drier contains desiccant which absorbs moisture. It must be positively sealed at all times. A receiver/drier that has been left uncapped must not be used, and fit a new unit.
- The receiver/drier should be the last component connected to the system to ensure optimum dehydration and maximum moisture protection of the system.

- Whenever the refrigerant system is opened, the desiccant must be renewed immediately before refilling the refrigerant.
- Use alcohol and a clean lint-free cloth to clean dirty connections.
- Ensure that all new parts fitted are marked for use with A/C refrigerant.

Warning : *The system refrigerant must be evacuated immediately before recharging commences. Delay between evacuation and recharging is not permitted.*

Refrigerant Oil

Refrigerant oil easily absorbs water and must not be stored for long periods. Do not pour unused refrigerant oil back into the container. Always use an approved refrigerant oil.

When replacing components in the A/C system, drain the refrigerant oil from the component being replaced into a graduated container. On assembly, add the quantity of lubricating oil drained to the new component.

Compressor

A new compressor is sealed and pressurized with Nitrogen gas. When fitting a new compressor, slowly release the sealing cap; gas pressure should be heard to vent as the seal is broken.

Warning : *Do not open the seal cover prior to connecting the air conditioning pipes to the compressor.*

Rapid Refrigerant Discharge

If the air conditioning system is involved in accident damage and the system is punctured, the refrigerant will discharge rapidly. The rapid discharge of refrigerant will also result in the loss of most of the oil from the system. While removing the compressor, drain the remaining oil, and service as instructed in the air conditioning section of this manual.

Precautions for Refrigerant Recovery, Recycling and Recharging

When the air conditioning system is recharged, any existing refrigerant is first recovered from the system and recycled. The system is then charged with the required weight of refrigerant and volume of A/C lubricating oil.

Warning : *Refrigerant must always be recycled before re-use to ensure that the purity of the refrigerant is high enough for safe use in the air conditioning system.*

Warning : *Recycling should always be carried out with equipment whose design is certified for compliance with SAE J1991. Other equipment may not recycle refrigerant to the required level of purity.*

Warning : *Air conditioning refrigerant Recovery Recycling Recharging Station shall not use any other type of refrigerant.*

Warning : *Air conditioning refrigerant from domestic and commercial sources shall not be used in motor vehicle air conditioning systems.*

Air Conditioning Compressor Replacement

Replacement Instructions

A new compressor is filled with A/C lubricating oil. The new compressor must be drained and an equivalent quantity of oil added before fitting. To calculate the quantity of oil to be added, carry out the following procedure:

1. Remove the filler/drain plug from the old compressor.
2. Invert the compressor and drain the oil into a calibrated measuring cylinder. Ensure that the compressor is completely drained.
3. Record the quantity of oil drained, and discard the oil.
4. Remove the filler/drain plug from the new compressor.
5. Invert the compressor and drain the oil into a calibrated measuring cylinder. Ensure that the compressor is completely drained.
6. Add the same amount of oil drained from the old compressor to the new compressor.
7. Discard the remaining oil drained from the new compressor.
8. Fit and tighten the compressor filler/drain plug.

Controller maintenance precautions

Warning : Please strictly follow the service manual and diagnostic tool's tips. In order to ensure the normal function of the vehicle, it must be ensured that the controller module is successfully refreshed before delivery.

Lifting and Towing

Lifting & Towing Lifting Vehicle

Description

Before lifting the vehicle, note the following:

- The vehicle must be parked on a level and firm ground.
- Ensure the EPB is OFF.
- Ensure P or N is selected.

To avoid damage to the underbody parts, please follow the procedures below:

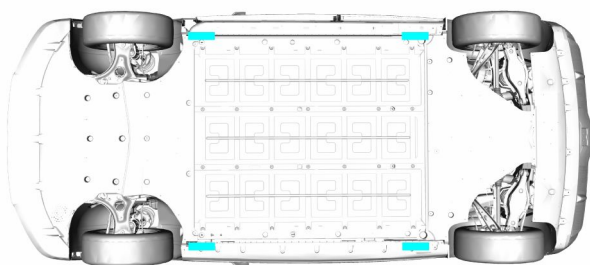
DO NOT place a jack or axle stand where it may contact any of the following parts:

- Vehicle Body Structural Part
- Bumper
- Brake Line
- Front Suspension Arm
- Steering Connection Mechanism
- Rear Suspension Arm
- High-voltage Battery Module
- High-voltage Drive Motor
- Transmission Housing
- Rear Towing Eye

Note : *Jacking and supporting the front of the vehicle should only be done under the customer front jacking points and/or the jacking bracket on the front section of the front subframe.*

Front/Rear Supporting Point of the Vehicle

The jack supplied with the vehicle should only be used to replace wheels in emergency.



S0000160

Warning : *Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.*

Warning : *Do not commence work on the underside of the vehicle until suitable safety supports have been positioned under the sill reinforced brackets.*

Lifting and Supporting the Vehicle

Place the head of the jack on the approved lifting point at the front and rear of the vehicle - see image

Caution : *Do not jack or support the vehicle on any points other than those indicated, otherwise it may cause damage to the body or chassis components.*

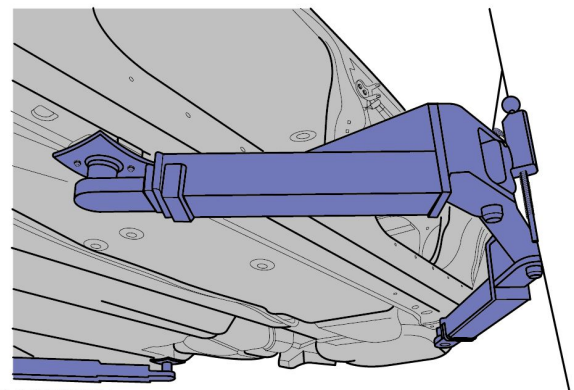
Warning : *Do not commence work on the underside of the vehicle until suitable safety supports have been positioned under the sill reinforced brackets.*

Warning : *Always chock the wheels when jacking.*

Hydraulic Jack

Any hydraulic jack to be considered must have a bearing capacity of at least 1,500kg (3,300lbs).

Wheel Free Ramp



S0000005

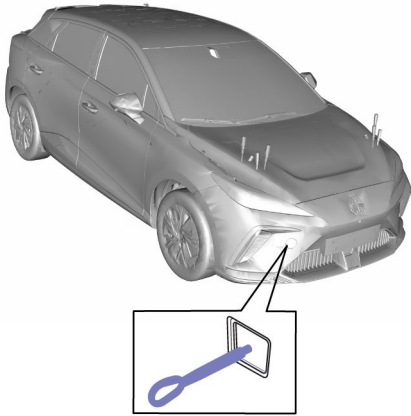
Put the mat of the lifting arm of the ramp under the jacking point on the sill.

Roadside Assistance

Towing Vehicle

Towing eye

Warning : *DO not use a tow rope that is twisted - or the towing hook may be unscrewed.*



S0000163

The car is equipped with two towing holes each at the front and the rear, which are used for fitting the towing eyes stored in the tool kit in the spare wheel beneath the loadspace carpet.

To fit the front towing eye, remove the small cover on the bumper, and screw the towing eye into the threaded hole in the bumper beam through the small square hole. Ensure the towing eye is fully tightened!

If the car needs to be towed, most qualified recovery specialists will use wheel lift equipment to suspend the driving wheels, so as to protect the drive motor from damage. The parking brake must be released, the hazard warning lamps should be switched on, and all the passengers should leave the vehicle being towed.

Towing for Recovery

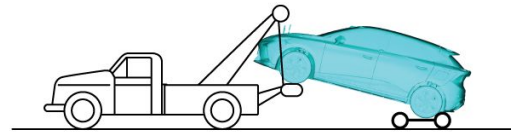
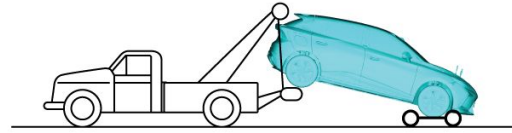
Warning : *If, due to an electrical fault, potential safety hazards may exist, it is not allowed to put the start switch in 'ON' position.*

Warning : *DO not suddenly start the towing car with great acceleration or accelerate to avoid damaging the car.*

Warning : *The towing speed of the vehicle shall not exceed 30km/h, the towing distance shall not exceed 50km.*

Suspended Towing

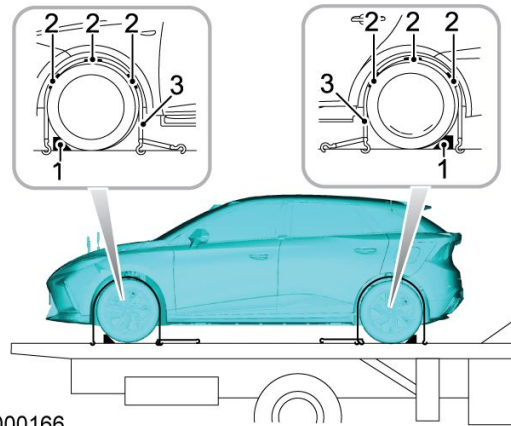
If the car needs to be towed, most qualified recovery specialists will use wheel lift equipment to suspend the driving wheels, so as to protect the drive motor from damage. The parking brake must be released, the hazard warning lamps should be switched on, and all the passengers should leave the vehicle being towed.



S0000165

Transporter or Trailer with Rope

If your car is to be transported on the back of a trailer or transporter, it must be secured as illustrated:



S0000166

- Apply parking brake, and place the electric drive system gear in 'P' position.
- Place the wheel chocks (1) as shown in the figure, and place the anti-slip rubber pads (2) around the wheels.
- Fit the lashing strap (3) around the wheel and secure it to the towing vehicle. Tighten the strap to secure the vehicle.

Identification Code

Vehicle Identification Number

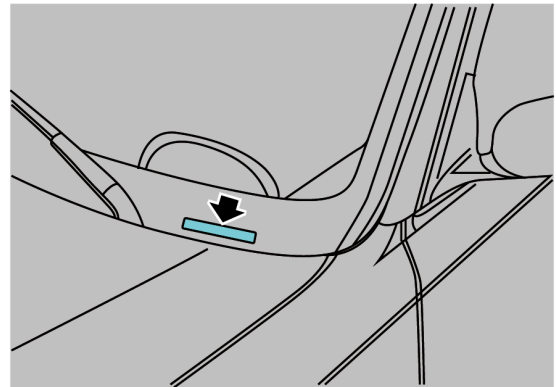
VIN(VIN)

Example:LSJWH4098NN998125

Digit	Code	Description
1-3	LSJ	Geographic area, country, vehicle manufacturer
4-5	WH	Vehicle Model/ Series
6	4	Vehicle Body Structural Characteristics, 4 = Hatchback, 5 Doors
7	0	Drive Motor 0 = Peak Power > 60 KW
8	9	9 = Seat Belt, Front Airbags for Driver and Front Passenger, Seat Side Airbags, and Front/Rear Side Curtain Airbags
9	8	Check Bit (represented by any figure from 0 to 9 or letter X)
10	N	Model Year N= 2022
11	N	Assembly Plant, GN = Ningde (Fujian)
12-17	XXXXXX	6 figures = Serial number

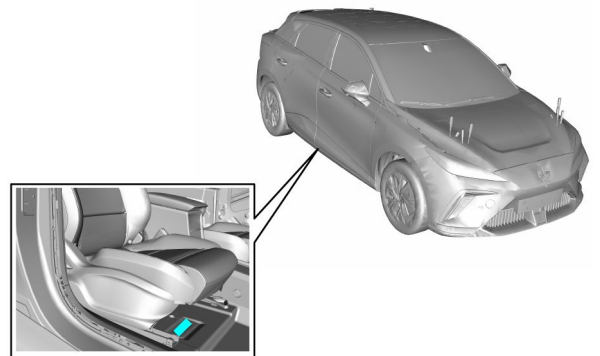
VINis also stamped in the following location:

On a plate behind the LH lower corner of the windshield.



S0000006

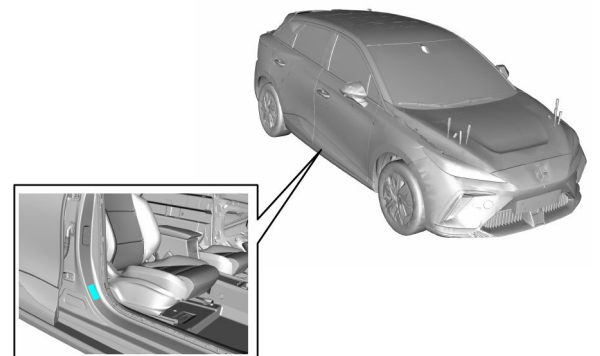
Printed on the seat beam under the right seat.



S0000161

Location of Vehicle Identification Label

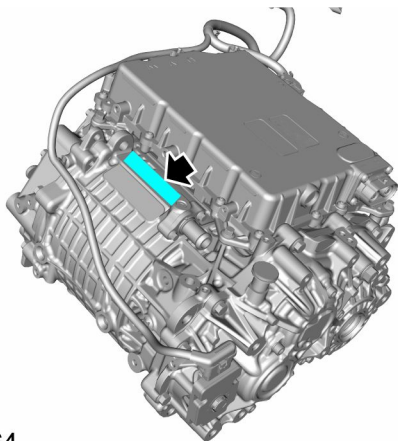
The identification plate is located at the lower side of the right B pillar. For details, please refer to the specific vehicle identification plate.



S0000162

Position of Important ID Numbers Drive Motor Number**Electric Drive System**

On the upper left side of the electric drive system housing, as shown in the figure



S0000164

Maintenance and Lubrication

Capacity

Fluid capacity

The following capacity values are merely approximate value for the corresponding system.

Component/ System	Capacity	
	2WD	4WD
Front Electric Drive Transmission Oil:	—	1.1L
Rear Electric Drive Transmission Oil (125kW&150kW) :	0.85L	—
Rear Electric Drive Transmission Oil (170kW&180kW) :	0.9L	
Electric Drive Transmission coolant:	5.6L	6.4L
High-voltage battery pack coolant:	4.0L	
Brake System Brake Fluid:	0.8L	
Windshield Washer Reservoir:	2.5L	

Fluid**Coolant**

Only use the coolant recommended and approved by MG Motor. Glycol (OAT) coolant is recommended.

In an emergency, a small amount of clean water may be added to the coolant reservoir. However, it should be noted that this will weaken the anti-freeze and corrosion protection function and reduce the service life of the coolant. DO NOT refill the cooling system with anti-freeze of different formulations.

The addition of corrosion inhibitors or other additives to the cooling system of this car may severely disrupt the efficiency of the system and cause electric drive system(EDS) and high voltage battery pack(ESS) damage. It is recommended to use additives approved by MG Motor.

Brake Fluid

Use brake fluid DOT-4 only.

Lubricating Fluids**Transmission Fluid**

Failure to use the specified transmission fluid may result in serious damage to the transmission.

Refill or fill up with Shell E-Fluids E6 iX (SL2808) oil.

General lubricating grease

Use produced FN745/94 lubricating grease.

Lock, Lock Body and Hinge

Do not apply any lubricating grease on the fixed end of the door hinge torsion bar spring, however, Isoflex Topas L32CN lubricating grease is recommended for its rotating end.

Washer Fluid

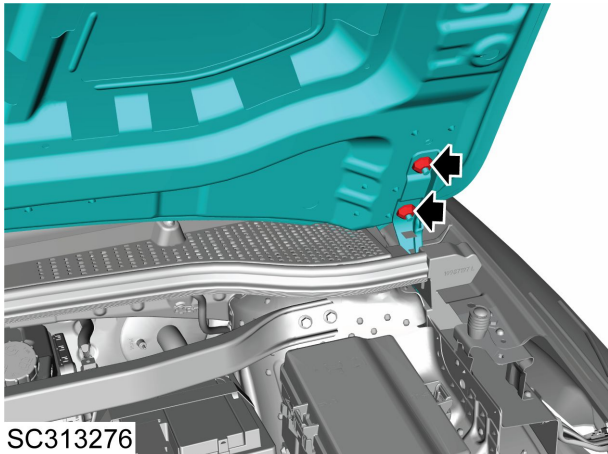
Use ZY-VIII washer fluid.

Front Compartment Coverings and Weatherstrips

Service Guide

Bonnet Adjustment

1. Mark the profiles of the bonnet with a non-permanent marker.
2. Loosen 4 nuts fixing the tail gate hinge flaps on both sides to the bonnet.



3. Adjust the bonnet to uniformise the clearances between the bonnet and the front bumper fascia, the headlamp and the front fender (for clearance information, please refer to "Body Dimension" in the "Body Panel and Painting" section), and to make it fit with the front bumper fascia, the headlamp and the front fender in size.

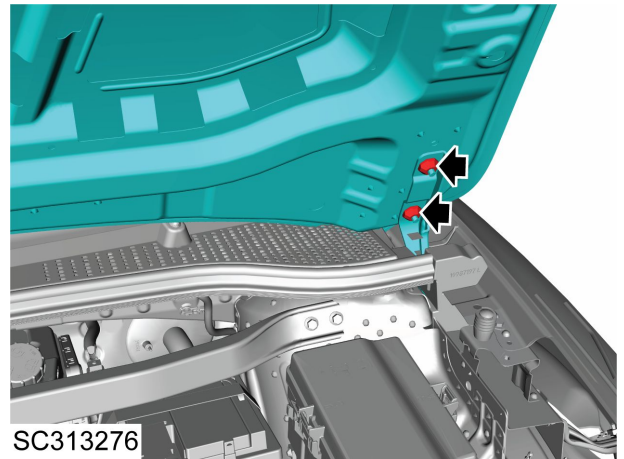
Front End Information

4. For clearance information, please refer to "Body Dimension" in the "Body Panel and Painting" section.
5. Tighten the nuts of the tail gate hinge flap to **19-25Nm**, and check the torque.

Bonnet Assembly Remove

Warning : *Special attention should be paid to avoid vehicle damage and personal injury.*

1. Open and support the bonnet properly.
2. Remove 4 nuts fixing the hinges on both sides to the bonnet.



3. With assistance, remove the bonnet assembly.

Refit

Warning : *Bonnet will drop off due to its own weight during removing and fitting, therefore, ensure that bonnet is safely supported during removing and fitting.*

1. With assistance, locate the bonnet onto the vehicle.

Caution : *DO NOT damage the thread on the bolt when inserting the bolt into the mounting hole.*

2. Fit 4 nuts fixing the hinges on both sides to the bonnet, but do not tighten them to the specified torque.
3. Check if the bonnet is properly positioned, and adjust the gap and flush between the front compartment lid and the front fender carefully to meet DTS (dimension technical specification) requirements.

Front End Information

4. After adjustment, tighten 4 nuts to **19-25Nm**, check the torque and close the bonnet.

Door & Lid System

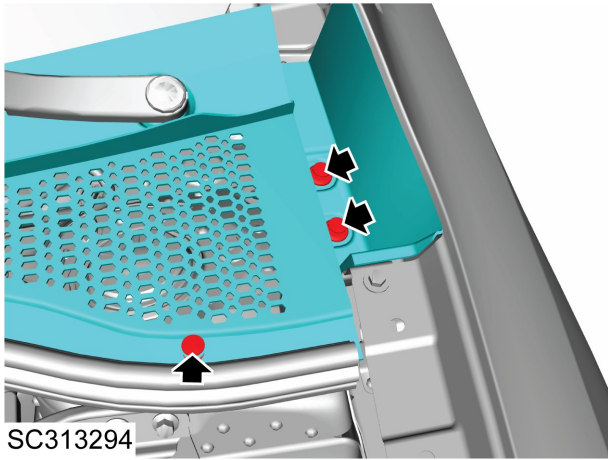
Bonnet Hinge Assembly Remove

Warning : Special attention should be paid to avoid vehicle damage and personal injury.

1. Mark the position of the hinges relative to the bonnet for positioning during refitting.
2. Remove the bonnet assembly.

Bonnet Assembly Remove

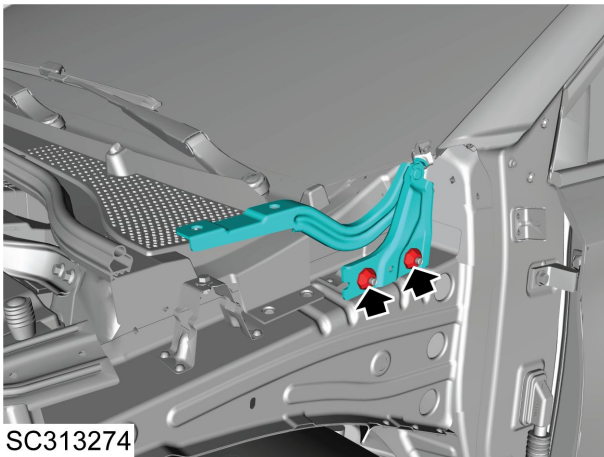
3. Remove the A/C air inlet grille panel side seals.
4. Pry off 2 clips fixing the A/C air inlet grille side baffle to the fender, remove 1 clip fixing the A/C air inlet grille assembly to the body, and remove the A/C air inlet grille side baffle.



5. Remove the fender.

Fender Remove

6. Remove 4 nuts fixing the hinges on both sides to the front end of the body, and remove the hinges on both sides.



7. Remove the hinges on both sides.

Refit

1. Properly locate the hinges on both sides to the front-end of the body and align the positions marked at the time of removal.
2. Fit 4 bolts fixing the hinges on both sides to the front end of the body, tighten them to **19-25Nm**, and check

the torque.

3. Fit the fender.

Fender Refit

4. Fit 2 clips fixing the A/C air inlet grille side baffle to the fender, fit 1 clip fixing the A/C air inlet grille to the body, and press the clip in place.
5. Fit the A/C air inlet grille panel side seal.
6. Fit the bonnet assembly.

Bonnet Assembly Refit

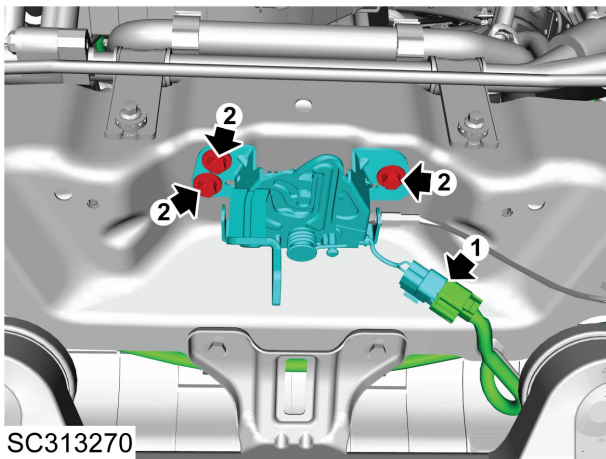
Warning : Bonnet will drop off due to its own weight during removing and fitting, therefore, ensure that bonnet is safely supported during removing and fitting.

Bonnet Lock Assembly Remove

1. Open and support the bonnet properly.
2. Remove the front bumper and bracket.

Front Bumper and Bracket Remove

3. Mark the lock position on the front-end module bracket so that proper location can be found for refit.
4. Disconnect the harness connector (1) of the bonnet lock.
5. Remove 3 bolts (2) fixing the bonnet lock to the bonnet lock mounting panel.



6. Separate the bonnet cable assembly from the lock to remove the bonnet lock assembly.

Refit

1. Connect the bonnet lock release cable assembly and the lock assembly firmly, i.e. fit the spherical end of the cable core wire into the hook slot of the bonnet lock, put the core wire into the long slot of the bonnet lock case, and align the circular groove of the main cable pipe connector with the mounting slot of the lock case, then press it hard until it clicks.
2. Fit the bonnet lock assembly on the plate and align it with the position marked during removal.
3. Fit 3 bolts fixing the lock assembly to the mounting panel, and do not tighten the bolts to the specified torque at this step.
4. Close the bonnet, observe the relative position of the lock and lock catch, adjust the lock and allow the lock catch to enter into the lock tongue.
5. After adjustment, tighten 3 bolts to **7-10Nm**, and check the torque.
6. Connect the harness connector.
7. Fit the front bumper and bracket.

Front Bumper and Bracket Refit

8. Close the bonnet.

Bonnet Release Cable Remove

1. Open the bonnet and support it with a rod firmly.
2. Remove the bonnet lock assembly.

Bonnet Lock Body Remove

3. Remove the instrument panel lower closure panel.

Instrument Panel Lower Closure Panel Remove

4. Release the bonnet release cable assembly from the bonnet lock.
5. Loosen the retaining clips of the bonnet release cable in turn.
6. Release the bonnet release cable from the engine compartment.
7. Release the bonnet release cable assembly from the release handle.
8. Drag the bonnet release cable assembly from the engine compartment.

Refit

1. Locate the bonnet release cable assembly to the engine compartment, fit the flat blade end to the driver compartment through the bulkhead hole of the front engine compartment, and secure it in the bulkhead hole with the rubber seal ring of the cable assembly.
2. Place the ball end of the bonnet release cable assembly into the slot.
3. Fit the retaining clip of bonnet release cable.
4. Fit the instrument panel lower closure panel.

Instrument Panel Lower Closure Panel Refit

5. Fit the bonnet lock assembly.

Bonnet Lock Body Refit

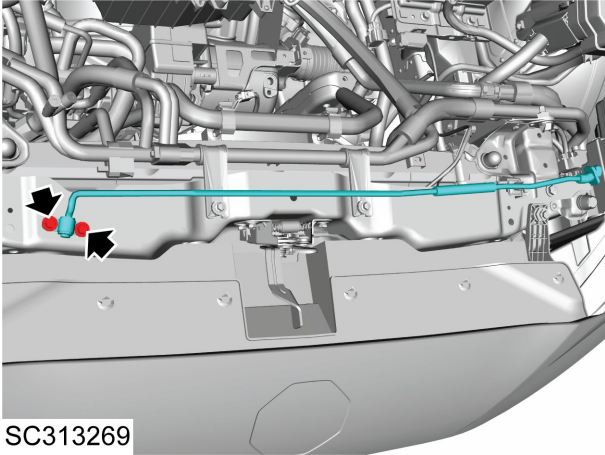
6. Pull the release handle of the bonnet in the driver compartment, and check if the bonnet works properly when it is opened.

Door & Lid System

Bonnet Strut Rod Remove

Warning : *Special attention should be paid to avoid vehicle damage and personal injury.*

1. Open and support the bonnet properly.
2. Remove 2 bolts fixing the bonnet support rod to the body.



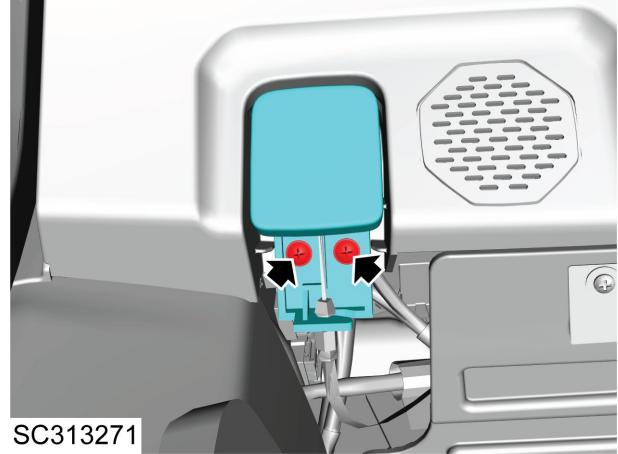
Refit

Warning : *Bonnet will drop off due to its own weight during removing and fitting, therefore, ensure that bonnet is safely supported during removing and fitting.*

1. Fix the bonnet support rod to the body, fit 2 bolts, tighten them to **7-10Nm**, and check the torque.
2. Close the bonnet.

Bonnet Release Handle Remove

1. Pull up the bonnet release handle.
2. Remove 2 self-tapping screws fixing the bonnet release handle assembly to the instrument panel lower closure panel.



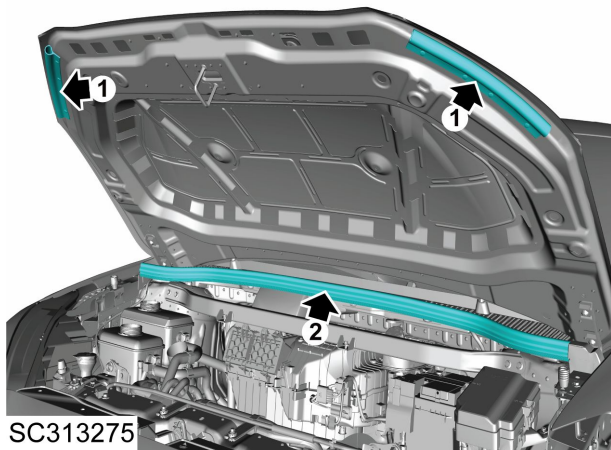
3. Release the bonnet release cable assembly from the release handle to remove the bonnet release handle assembly.

Refit

1. Place the ball end of the bonnet release cable into the handle slot.
2. Align the handle with the mounting hole.
3. Fit 2 self-tapping screws fixing the release handle to the lower trim panel, tighten them to **1.3-1.9Nm**, and check the torque.
4. Pull the release handle of the bonnet in the driver compartment, and check if the bonnet works properly when it is opened.

Bonnet Weatherstrips (Front, Rear) Remove

1. Open and support the bonnet firmly.
2. Remove the clip fixing the front bonnet weatherstrip to the bonnet, and remove the front bonnet weatherstrip (1).
3. Remove the rear bonnet weatherstrips from the A/C air inlet grille (2).

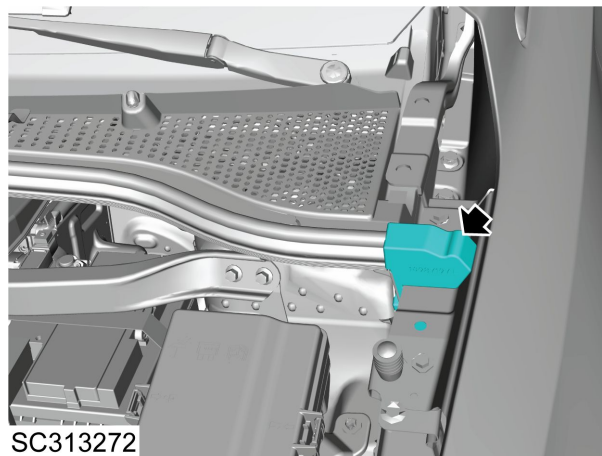


Refit

1. Fit the rear bonnet weatherstrip along the A/C air inlet grille, and clamp it.
2. Fix the front bonnet weatherstrip to the bonnet, and press the clip in place.
3. Close the bonnet.

A/C Air Inlet Grille Panel Side Seals Remove

1. Remove the A/C air inlet grille panel side seals.



Refit

1. Fit the A/C air inlet grille panel side seal.

Door and Weatherstrip

Specification

Torque

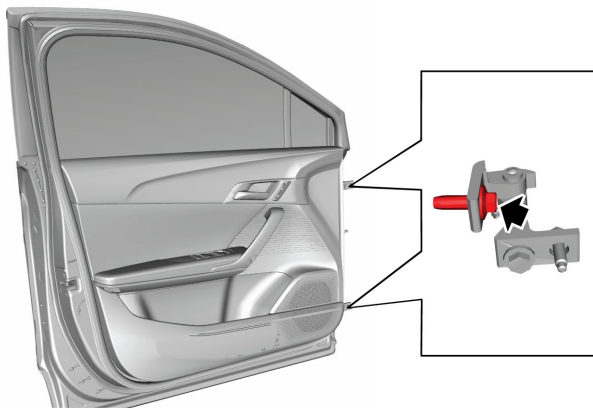
Description	Value
Bolt-door hinge to door	40-50Nm
Bolt-door lock catch to body	19-25Nm
Screw-stop screw	20-26Nm
Bolt-door checker to body	19-25Nm
Bolt-door hinge to body	30-36Nm
Screw-glove box window trim frame to instrument panel frame	1.4-1.8Nm
Screw-outer handle liner assembly to lock cylinder	2-2.5Nm
Bolt-door lock to door	7-10Nm
Screw-door outer handle panel to door	2-2.5 N.m
Bolt-rear door hinge to door	40-50Nm
Bolt-rear door checker to body	19-25Nm
Bolt-rear door hinge to body	30-36Nm
Bolt-rear door lock to door	7-10Nm
Screw-rear door outer handle panel to door	2-2.5Nm

Service Guide

Front Door Adjustment

Front Door Hinge Adjustment

1. Open the front door.
2. Put the wood block on the jack, and put the jack below the door to support the front door.
3. Unscrew 2 bolts fixing the upper and lower front door hinges to the front door.



SC114531

4. Use the jack to support and adjust the front door.
5. Pre-tighten the hinge bolts.
6. Remove the jack, and close the door to check the adjustment.
7. When the desired adjustment is achieved, tighten the bolt fixing the hinge on the door side to the specified torque of **40-50Nm**, and check the torque.

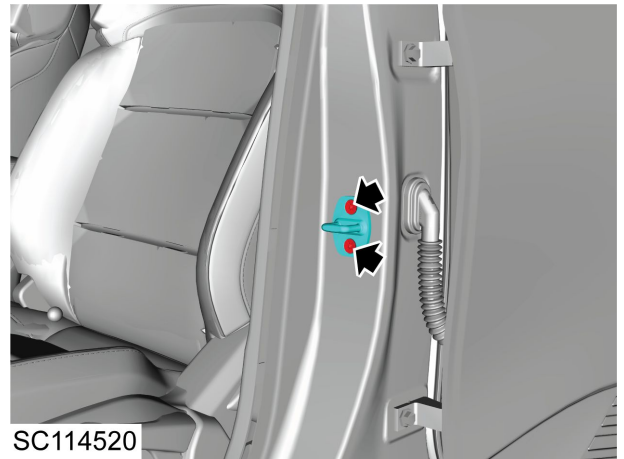
Front Door Striker Adjustment

The front door striker is a latch with two screws. In most cases, it is necessary to adjust the striker upward/downward or inward/outward:

- Frame damage resulting from a collision.
- Fit a new door weatherstrip.
- The customer complains that the wind noise is too loud.

Adjust the striker upward/downward or inward/outward according to the following procedures:

1. The door must be positioned correctly.
2. Open the front door.
3. Loosen 2 striker bolts. Adjust the striker to align the door pin, then pre-tighten the bolts.

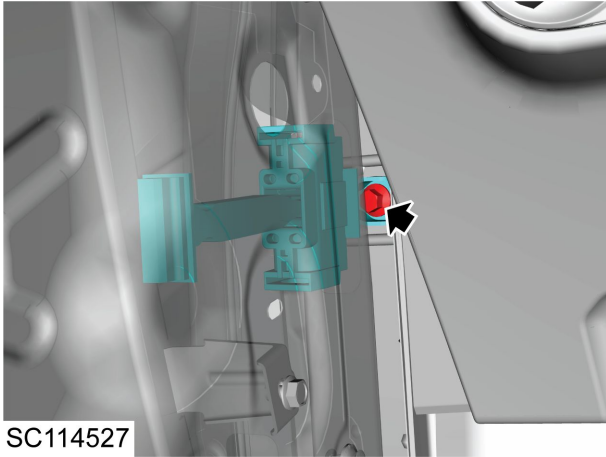


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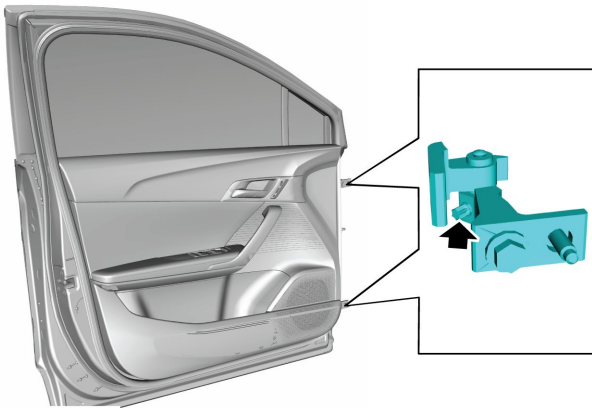
4. Close the door, and check if the rear of the door is flush with the sheet metal of the body side panel and if the door can open and close normally.
5. After the adjustment, open the door, tighten the bolts fixing the strikers to the body to **19-25Nm**, and check the torque.
6. Close the door.

**Front Door Assembly
Remove**

1. Disconnect the negative battery cable.
2. Open the front door.
3. Remove and discard 1 bolt fixing the door check to the body side.

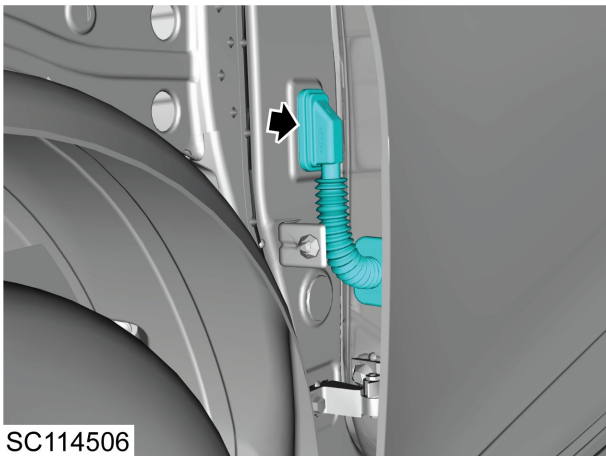


4. Remove the anti-rotation bolts fixing the two hinge flaps in the middle of the upper and lower hinges.



Caution : *Protect the paint from scratch when removing or fitting the door assembly.*

5. Pry off the rubber seal ring on the body side, pull out the connector, and disconnect the harness connector.



6. Lift the front door up, separate the flaps of the upper

and the lower hinges, and remove the front door assembly.

Refit

1. Fix the upper and lower hinge flaps to the door, fit 2 bolts, and leave them untightened for now.
2. With assistance, fit the door to the body through the assembly of hinge flaps and body hinge flap, fit 2 anti-rotation bolts, tighten them to **20-26Nm**, and check the torque.
3. Connect the harness connector, and insert the rubber seal ring into the mounting hole in the body.
4. Fit 1 new bolt fixing the door check to the body side, tighten it to **19-25Nm**, and check the torque.
5. Adjust the opening and closing performance of the door.



Front Door Hinge Adjustment

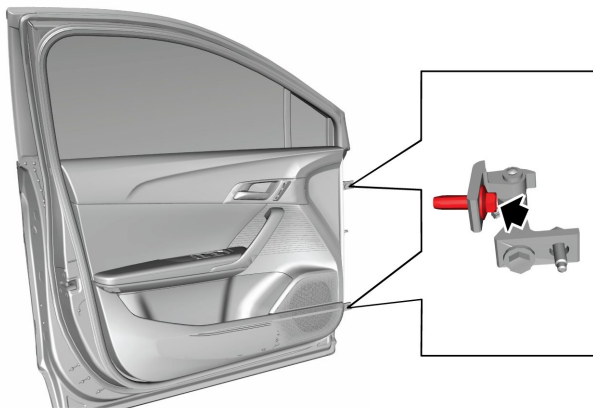
6. Connect the negative battery cable.

Front Door Hinge Assembly Remove

1. Open the front door.
2. Remove the front door assembly.

Front Door Assembly Remove

3. Remove and discard 2 bolts fixing the upper hinge to the door side from the outside of the door, and remove the front door upper hinge.



SC114531

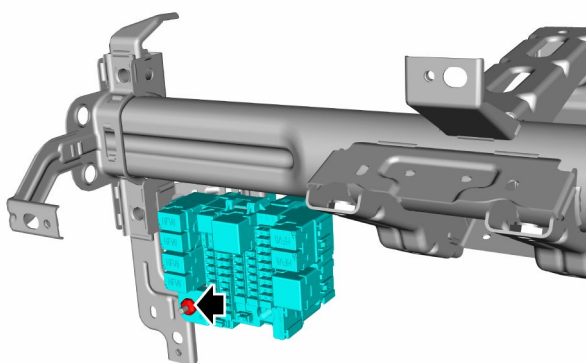
4. Remove the front door hinge assembly - driver side.
 - a. Remove the driver side lower trim panel assembly.

Driver Side Lower Trim Panel Assembly Remove

- b. Remove the A pillar lower trim panel.

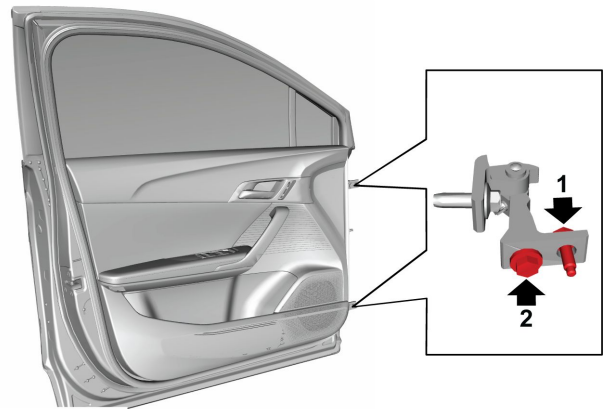
A Pillar Lower Trim Panel Remove

- c. Remove 1 nut fixing the driver compartment fuse box to the instrument panel beam and remove the driver compartment fuse box.



S4114579

- d. Tear off the screw hole gasket to expose the tool hole.
- e. Remove 2 bolts (1) fixing the lower hinge to the body side from the outside of the body and discard them.
- f. Remove and discard 2 bolts (2) fixing the lower hinge to the body side from the inside of the body, and remove the driver door lower hinge.

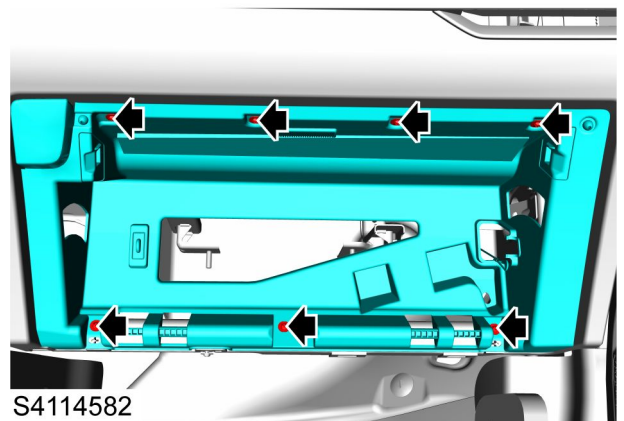


SC114532

5. Remove the front door hinge assembly - passenger side.
 - a. Remove the glove box assembly.

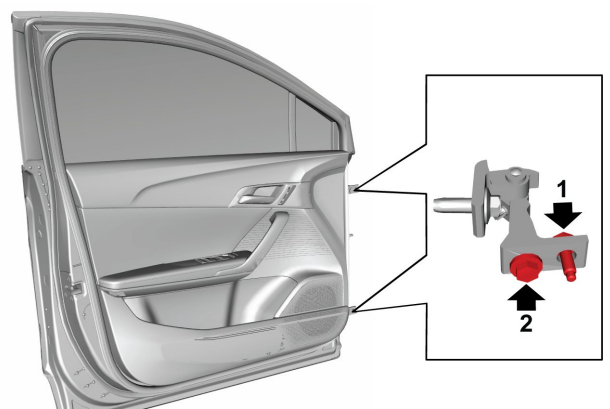
Glove Box Assembly Remove

- b. Remove 7 screws fixing the glove box frame to the instrument panel frame, loosen the clips and remove the glove box frame.



S4114582

- c. Tear off the screw hole gasket to expose the tool hole.
- d. Remove 2 bolts (1) fixing the lower hinge to the body side from the outside of the body and discard them.
- e. Remove and discard 2 bolts (2) fixing the lower hinge to the body side from the inside of the body, and remove the driver door lower hinge.



SC114532

Refit

1. Fit the front door hinge assembly - driver side.
 - a. Fit 2 bolts fixing the lower hinge of the front door to the body from the inside of the body, tighten them to **30-36Nm**, and check the torque.
 - b. Fit 2 bolts fixing the lower hinge of the front door to the body from the outside of the body, tighten them to **30-36Nm**, and check the torque.
 - c. Restore the screw hole gasket.
 - d. Fit 2 bolts fixing the upper hinge to the door side from the outside of the body, tighten them to **40-50Nm**, and check the torque.
- e. Fit the front door assembly.

 **Front Door Assembly Refit**

- f. Remove the jack, and check if the door can work properly.
- g. Fit the driver side lower trim panel assembly.

 **Driver Side Lower Trim Panel Assembly Refit**

- h. Fit the A pillar lower trim panel.

 **A Pillar Lower Trim Panel Refit**

- i. Fit and tighten 1 nut fixing the driver compartment fuse box to the beam.
2. Fit the front door hinge assembly - passenger side.
 - a. Fit 2 bolts fixing the lower hinge of the front door to the body from the inside of the body, tighten them to **30-36Nm**, and check the torque.
 - b. Fit 2 bolts fixing the lower hinge of the front door to the body from the outside of the body, tighten them to **30-36Nm**, and check the torque.
 - c. Restore the screw hole gasket.
 - d. Fit 2 bolts fixing the upper hinge to the door side from the outside of the body, tighten them to **40-50Nm**, and check the torque.
 - e. Fit the front door assembly.

 **Front Door Assembly Refit**

- f. Remove the jack, and check if the door can work properly.
- g. Press the clip, fit 7 bolts fixing the glove box frame to the instrument panel body, tighten them to **1.4-1.8Nm**, and check the torque.
- h. Fit the glove box assembly.

 **Glove Box Assembly Refit**

3. Close the front door.

Front Door Outer Handle and Lock Cylinder Assembly - Keyless Entry Remove

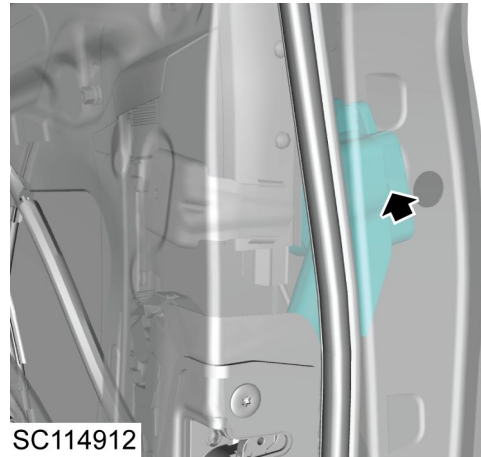
1. Open the driver door and raise the window to the highest position.
2. Remove the front door interior trim panel.

 **Front Door Interior Trim Panel Remove**

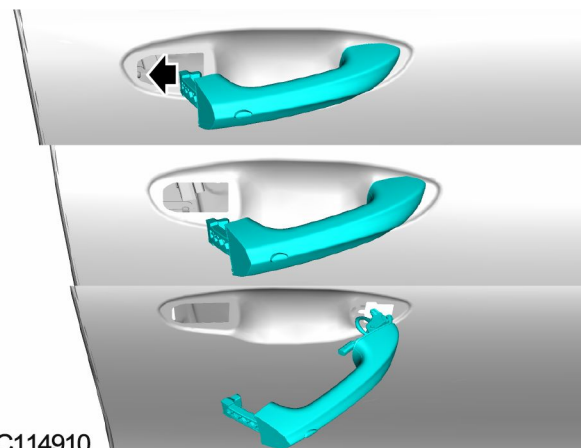
3. Remove the front door waterproof membrane.

 **Front Door Waterproof Membrane Remove**

4. Remove the lock cylinder retaining screw plug at the end of the front door, to access the screws that secure the door lock cylinder to the outer door handle panel.
5. Loosen the screw, but do not remove the screw, because it is clamped inside.



6. Pull the rear end of the front door outer handle, pry off the lock cylinder trim cover and remove the front door lock cylinder.
7. Disconnect the harness connector of the PEPS antenna from the door cavity.
8. Move the outer handle towards the rear body, pull the rear of the outer handle outwards to separate it from the outer handle bracket, remove the outer handle assembly.



Refit

1. Insert the antenna through the hole on the front handle

of the door from the outside of the door, and connect the harness connector.

2. Clip the front end of the driver side door outer handle into the front hole of the door, and move the outer handle towards the rear of the vehicle.
3. Clamp the rear end of the outer handle into the slot of the outer handle bracket.
4. Fit the rear shim of the door outer handle.
5. Fully pull up the rear end of the door handle, fix the front door lock cylinder assembly to the outer door handle liner, and tighten to **2-2.5Nm**, and check the torque.
6. Press the plug into the round hole on the side of the door to ensure that the snap on the plug is fully engaged to ensure sealing.
7. Pull up the rear end of the handle and install the lock core trim cover.
8. Fit the front door waterproof membrane.

 **Front Door Waterproof Membrane Refit**


9. Fit the front door interior trim panel.

 **Front Door Interior Trim Panel Refit**

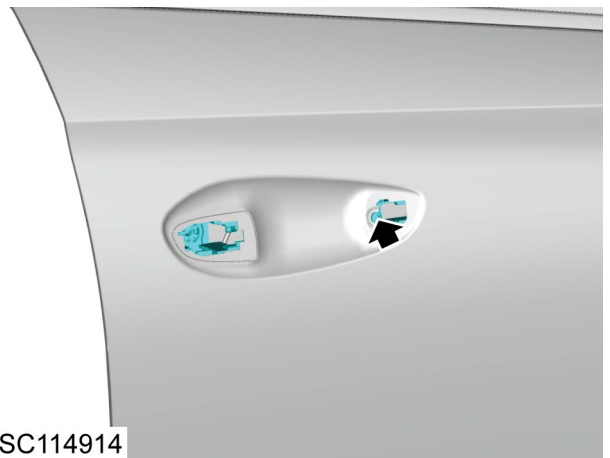
10. Close the door and check if the outer door handle can work properly.

Driver Side Door Outer Handle Liner and Lock Assembly Remove

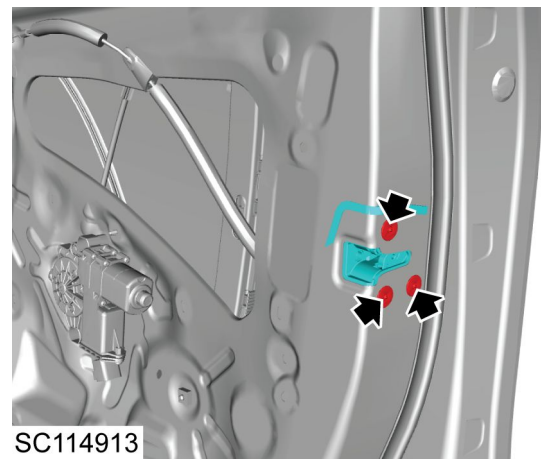
1. Open the front door, and ensure that the front door window glass is fully lifted.
2. Remove the front door outer handle and lock cylinder trim cover.

 **Front Door Outer Handle and Lock Cylinder Trim Cover Remove**

3. Remove 1 screw fixing the exterior front door handle bracket to the door panel.



4. Disconnect the harness connector on the front door lock, and remove 3 bolts fixing the front door lock to the door.



5. Remove the exterior front door handle bracket and lock assembly, and pry off the clamp fixing the harness clip to the exterior front door handle bracket.
6. Separate the front door inner handle cable from the lock body assembly.
7. Disconnect the front door outer handle link from the front door lock, and disconnect it from the outer handle bracket.
8. Disconnect the front door lock cylinder link from the front door lock, and disconnect it from the outer handle bracket.

Refit

1. Connect the front door outer handle link to the front door lock and the front door outer handle bracket respectively.
2. Fix the front door lock cylinder link to the front door lock and the front door outer handle bracket respectively.
3. Connect the front door inner handle cable to the front door lock body.
4. Fix the front door outer handle bracket and lock assembly to the door panel from the inside of the door.
5. Fit 3 bolts fixing the front door lock to the front door panel, tighten them to **7-10Nm**, and check the torque.
6. Fit 1 screw fixing the front door outer handle bracket to the front door panel, tighten it to **2-2.5 N.m** , and check the torque.
7. Fix the harness clip to the front door outer handle bracket, and connect the front door lock connector.
8. Fit the front door outer handle and lock cylinder trim cover.

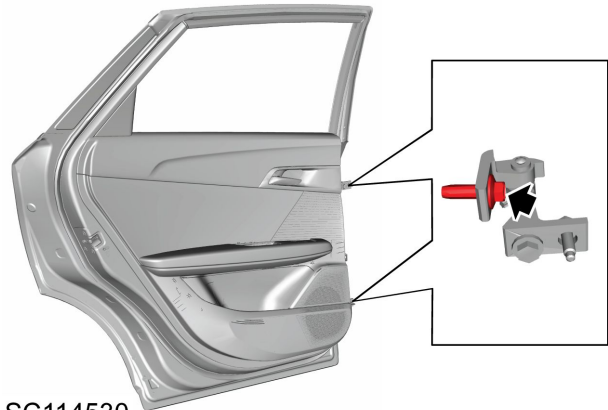
 **Front Door Outer Handle and Lock Cylinder Trim Cover Refit**

9. Try to open the door through the outer handle, and ensure all parts are correctly fitted.
10. Close the front door.

Rear Door Adjustment

Rear Door Hinge Adjustment

1. Open the rear door.
2. Put the wood block on the jack, and put the jack under the door to support the rear door.
3. Unscrew 2 bolts fixing the upper and lower rear door hinges to the rear door side.



SC114530

4. Use the jack to support and adjust the rear door.
5. Pre-tighten the bolts fixing the hinge to the door side.
6. Remove the jack, and close the door to check the adjustment.
7. When the desired adjustment is achieved, tighten the bolt fixing the hinge on the door to **40-50Nm**, and check the torque.

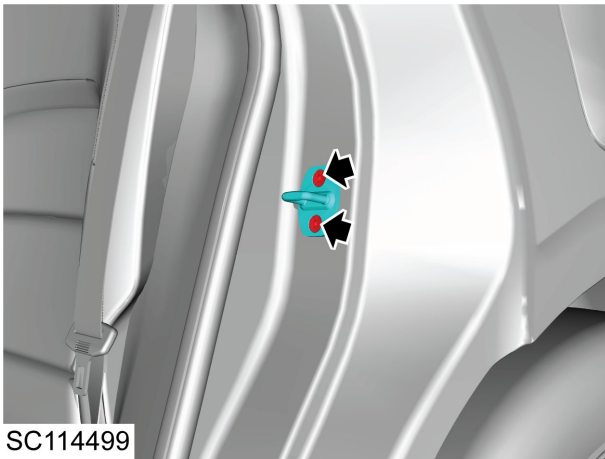
Rear Door Striker Adjustment

The rear door striker is a latch with two screws. In most cases, it is necessary to adjust the striker upward/downward or inward/outward:

- Frame damage resulting from a collision.
- Fit a new door weatherstrip.
- The customer complains that the wind noise is too loud.
- It is difficult to open or close the door.

Adjust the striker upward/downward or inward/outward according to the following procedures:

1. The door must be positioned correctly.
2. Open the rear door.
3. Loosen 2 striker bolts. Adjust the striker to align the door pin, then pre-tighten the bolts.

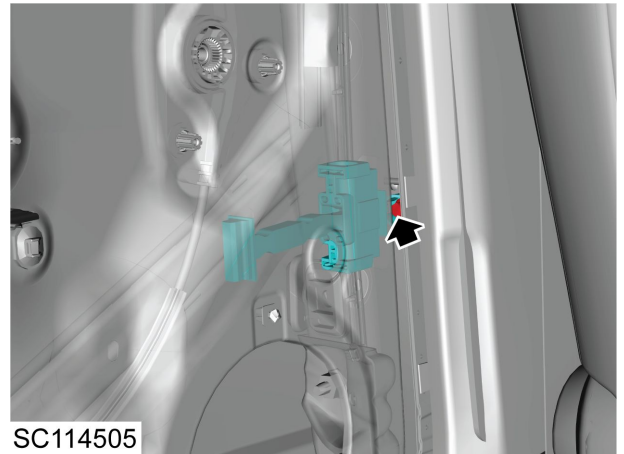


SC114499

4. Close the door, and check if the front and rear of the door are flush with the sheet metal of the body side panel and if the door can open and close normally.
5. After the adjustment, open the door, tighten the bolts fixing the strikers to the body to **19-25Nm**, and check the torque.
6. Close the door.

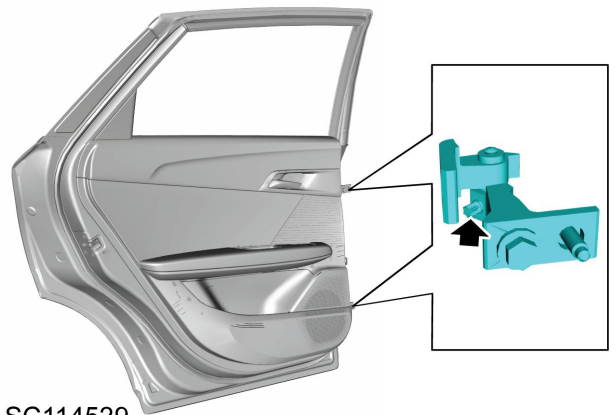
Rear Door Assembly Remove

1. Disconnect the negative battery cable.
2. Open the rear door.
3. Put the wood block on the jack, and put the jack under the door to support the rear door.
4. Remove 1 bolt fixing the door check to the body side.



SC114505

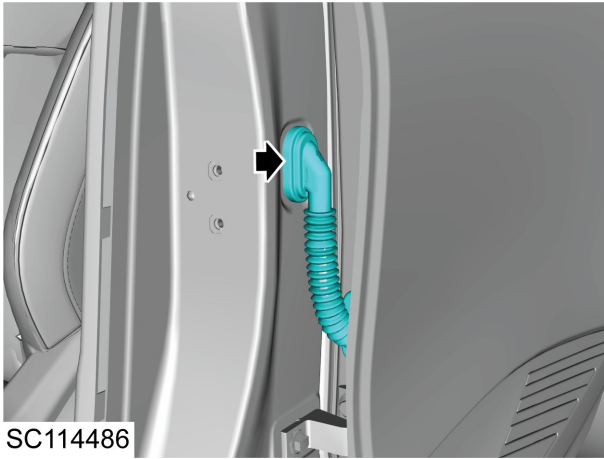
5. Pry off the anti-rotation bolt trim cover, and remove the anti-rotation bolt fixing the two hinge flaps between the upper hinge and the lower hinge.



SC114529

Caution : *Protect the paint from scratch when removing or fitting the door assembly.*

6. With the help of an assistant, pry off the rubber seal ring on the body side, and pull out the connector to disconnect the harness connector.



SC114486

7. Lift the rear door up, separate the flaps of the upper and the lower hinges, and remove the rear door assembly.

Refit

1. With the help of an assistant, locate the door to the body.
2. Connect the harness connector, and insert the rubber seal ring into the mounting hole in the body.
3. Fit the anti-rotation bolts fixing the upper and lower hinges of the rear door to the door side, tighten them to **20-26Nm**, check the torque, and fit the anti-rotation bolt trim covers.
4. Fit 1 new bolt fixing the door check to the body side, tighten it to **19-25Nm**, and check the torque.
5. Adjust the opening and closing performance of the door.

Rear Door Hinge Adjustment

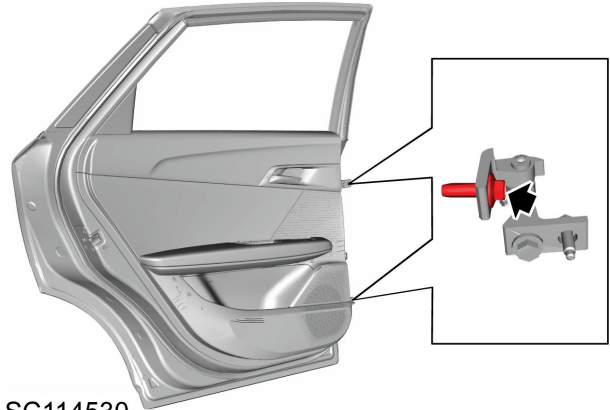
6. Connect the negative battery cable.

Rear Door Hinge Assembly Remove

1. Open the rear door.
2. Remove the rear door assembly.

Rear Door Assembly Remove

3. Remove and discard 2 bolts fixing the rear door upper hinge to the rear door.

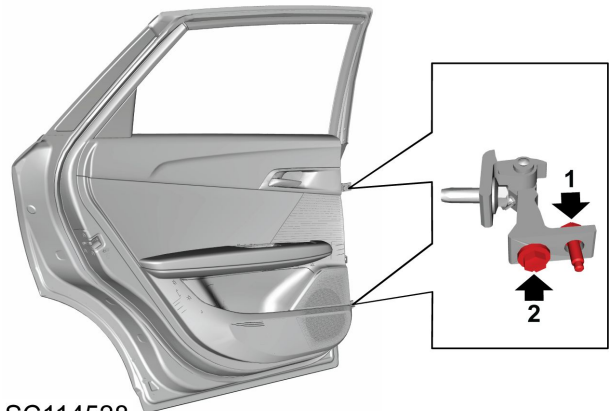


SC114530

4. Remove the B pillar lower trim panel.

B Pillar Lower Trim Panel Remove

5. Remove and discard 2 bolts (1) fixing the rear door lower hinge to the body side from the outside of the B pillar.
6. Remove and discard 2 bolts (2) fixing the rear door lower hinge to the body side from the inside of the B pillar.



SC114528

7. Remove the upper and lower hinges of the rear door.

Refit

1. Locate the lower hinge of the rear door to the B pillar.
2. Fit 2 new bolts locating the lower hinge to the body side from the inner side of the B pillar, tighten them to **30-36Nm**, and check the torque.
3. Fit 2 new bolts locating the lower hinge to the body side from the outer side of the B pillar, tighten them to **30-36Nm**, and check the torque.
4. Fit the B pillar lower trim panel.

 **B Pillar Lower Trim Panel Refit**

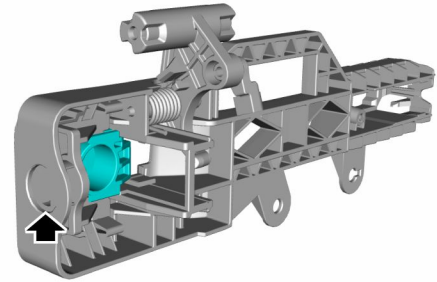
5. With the help of an assistant, fit 2 new bolts locating the upper hinge of the rear door to the door side, tighten them to **40-50Nm**, and check the torque.
6. Fit the rear door assembly.

 **Rear Door Assembly Refit**

7. Close the rear door.

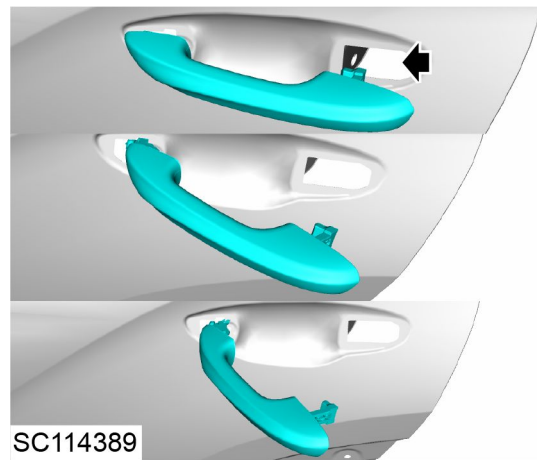
Rear Door Outer Handle Remove

1. Remove the slide valve plug on the side of the rear door to gain access to the slide valve fixing the lock cylinder trim cover to the door outer handle bracket.
2. Use the right tool to open the slide valve.



SC114342

3. Pull up the rear end of the outer handle, and remove the outer handle lock cylinder trim cover.
4. Move the outer handle towards the rear body, pull the rear of the outer handle outwards to disconnect it from the outer handle bracket, then remove it.



SC114389

Refit

1. Clip the front end of the rear door outer handle into the front mounting hole of the door, and move the outer handle towards the front of the vehicle.
2. Fit the rear shim of the outer handle.
3. Fit the rear door lock cylinder trim cover.
4. Pull up the rear end of the rear door outer handle completely, fix the rear door lock cylinder trim cover to the door outer handle bracket, and push in the slide valve to ensure that it is clamped in place.
5. Press the slide valve plug into the round hole on the door side and secure the plug clip firmly so that seal can be achieved.
6. Check if the door outer handle can work properly.

**Rear Door Lock Assembly
Remove**

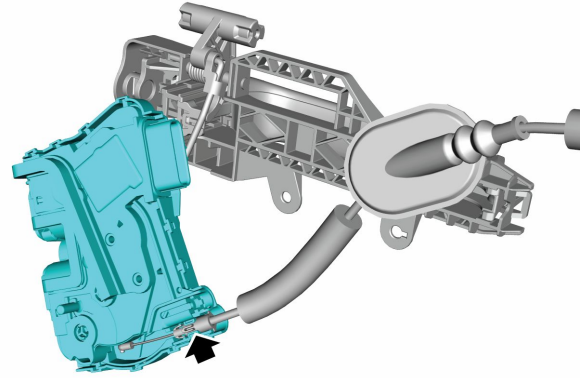
1. Open the rear door and ensure that rear door windows rise to the highest position.
2. Remove the rear door interior trim panel.

 **Rear Door Interior Trim Panel Remove**

3. Remove the rear door waterproof membrane.

 **Rear Door Waterproof Membrane Remove**

4. Remove the clip between the rear door outer handle link and the lock.



SC114501

Refit

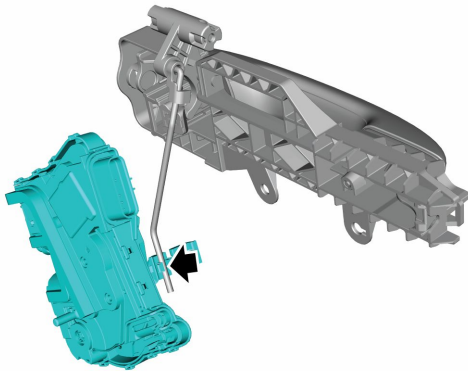
1. Fit the inner handle cable of the rear door to the lock.
2. Locate the lock to the mounting position from the door cavity, fit 3 bolts, tighten them to **7-10Nm**, and check the torque.
3. Connect the harness connector of the lock.
4. Connect the rear door outer handle release link to the lock, and secure with clips.
5. Fit the rear door waterproof membrane.

 **Rear Door Waterproof Membrane Refit**

6. Fit the rear door interior trim panel.

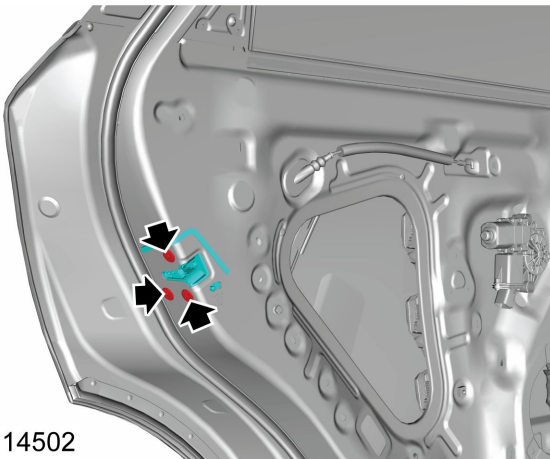
 **Rear Door Interior Trim Panel Refit**

7. Check if the outer and inner handles of the rear door can work properly.



SC114500

5. Disconnect the harness connector on the rear door lock, and remove 3 bolts fixing the rear door lock to the door.



SC114502

6. Carefully separate the interior handle cable of the rear door from the lock, and completely remove the rear door lock.

Rear Door Outer Handle Liner Assembly Remove

1. Open the rear door, and ensure that the rear door window glass is fully lifted.
2. Remove the rear door outer handle and lock cylinder trim cover.

Hand **Rear Door Outer Handle and Lock Cylinder Trim Cover Remove**

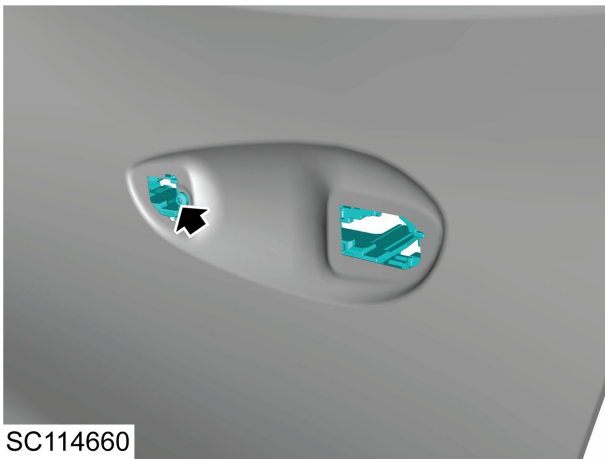
3. Remove the rear door interior trim panel.

Hand **Rear Door Interior Trim Panel Remove**

4. Remove the rear door waterproof membrane.

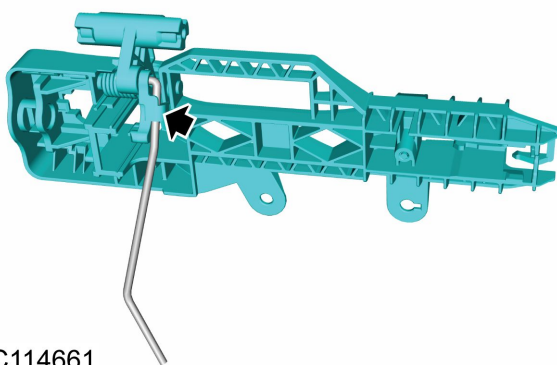
Hand **Rear Door Waterproof Membrane Remove**

5. Remove 1 screw fixing the rear door outer handle bracket to the door.



SC114660

6. Separate the outer handle link from the rear door outer handle bracket, and remove the rear door outer handle bracket assembly from the door cavity.



SC114661

Refit

1. Fit the rear door outer handle bracket assembly from the rear door cavity, and locate it to the corresponding mounting position on the door outer panel.
2. Fit the rear door outer handle link to the rear door outer handle bracket.
3. Fit 1 screw fixing the outer handle bracket to the door

from the outside of the door, tighten it to 2-2.5Nm , and check the torque.

4. Fit the rear door waterproof membrane.

Hand **Rear Door Waterproof Membrane Refit**

5. Fit the rear door interior trim panel.

Hand **Rear Door Interior Trim Panel Refit**

6. Fit the rear door outer handle and lock cylinder trim cover.

Hand **Rear Door Outer Handle and Lock Cylinder Trim Cover Refit**

7. Try to open the door through the outer handle, and ensure all parts are correctly fitted.

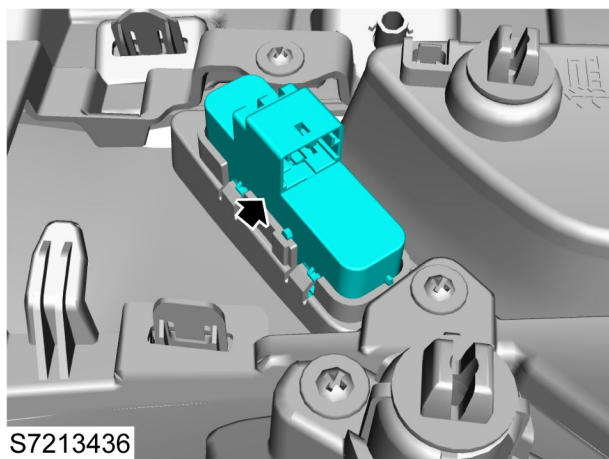
Door Lock Switch

Remove

1. Disconnect the negative battery cable.
2. Remove the driver side door interior trim panel.

Door Interior Trim Panel Remove

3. Disconnect the harness connector of the door lock switch.
4. Loosen the clip and remove the door lock switch.



Refit

1. Fix the door lock switch to the door interior trim panel and ensure the clips are fully engaged.
2. Connect the harness connector of the door lock switch.
3. Fit the driver side door interior trim panel.

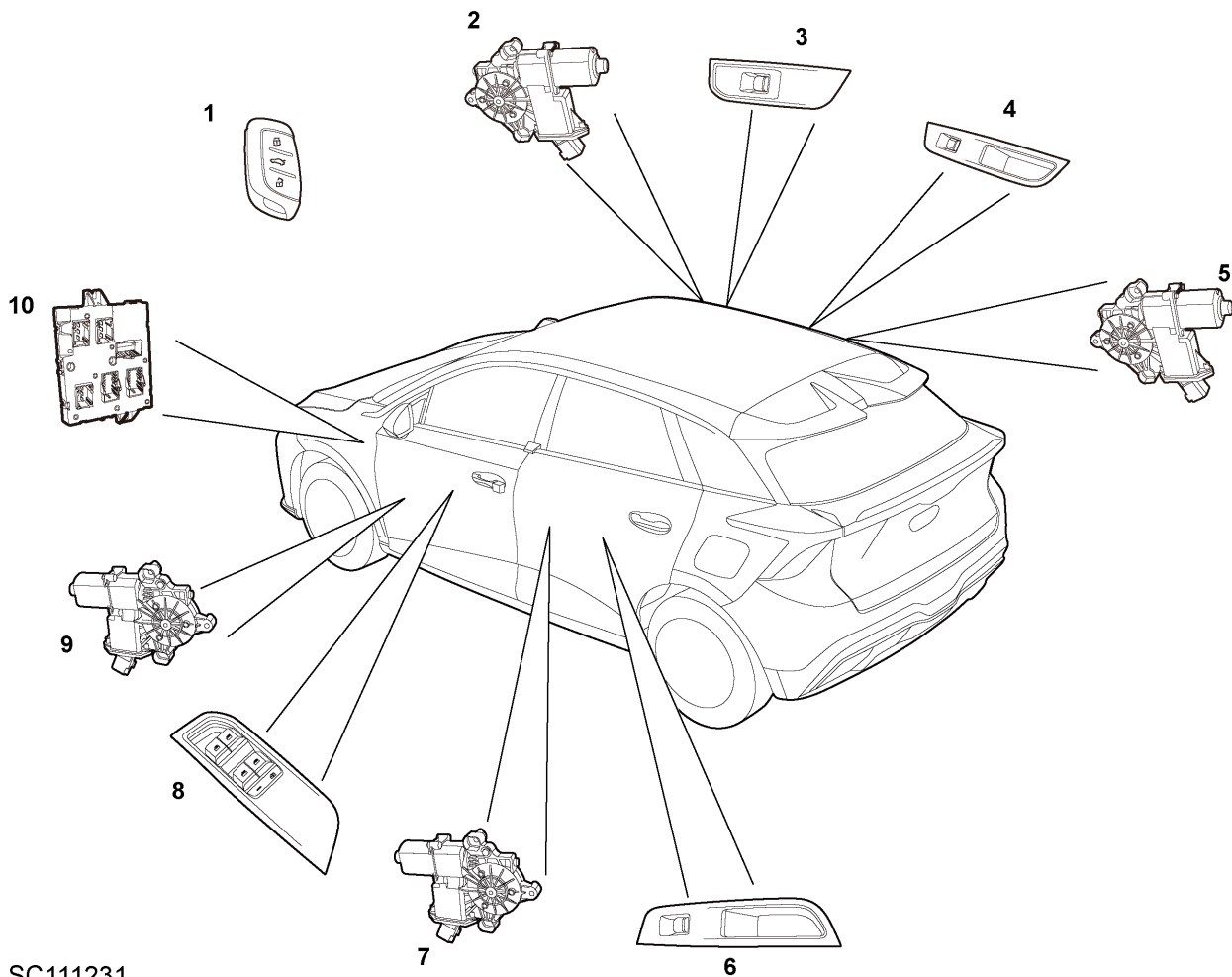
Door Interior Trim Panel Refit

4. Connect the negative battery cable.

Window Glass and Weatherstrip**Specification****Torque**

Description	Value
Nut-winder regulator guide rail to door	7-10Nm
Bolt-winder regulator motor to door	3-4Nm
Screw-front door sill outer sealing strip to door	1-2Nm
Bolt-door checker to body	19-25Nm
Bolt-front door partition pillar to door	7-10Nm
Screw-front door partition pillar to door	1-1.5Nm
Nut-rear winder regulator guide rail to door	7-10Nm
Bolt-rear winder regulator motor to door	3-4Nm
Bolt-rear door checker to body	19-25Nm
Bolt-rear door sill outer sealing strip to door	7-10Nm
Screw-rear door winder frame trim to door	0.8-1.8Nm

Description and Operation System Layout

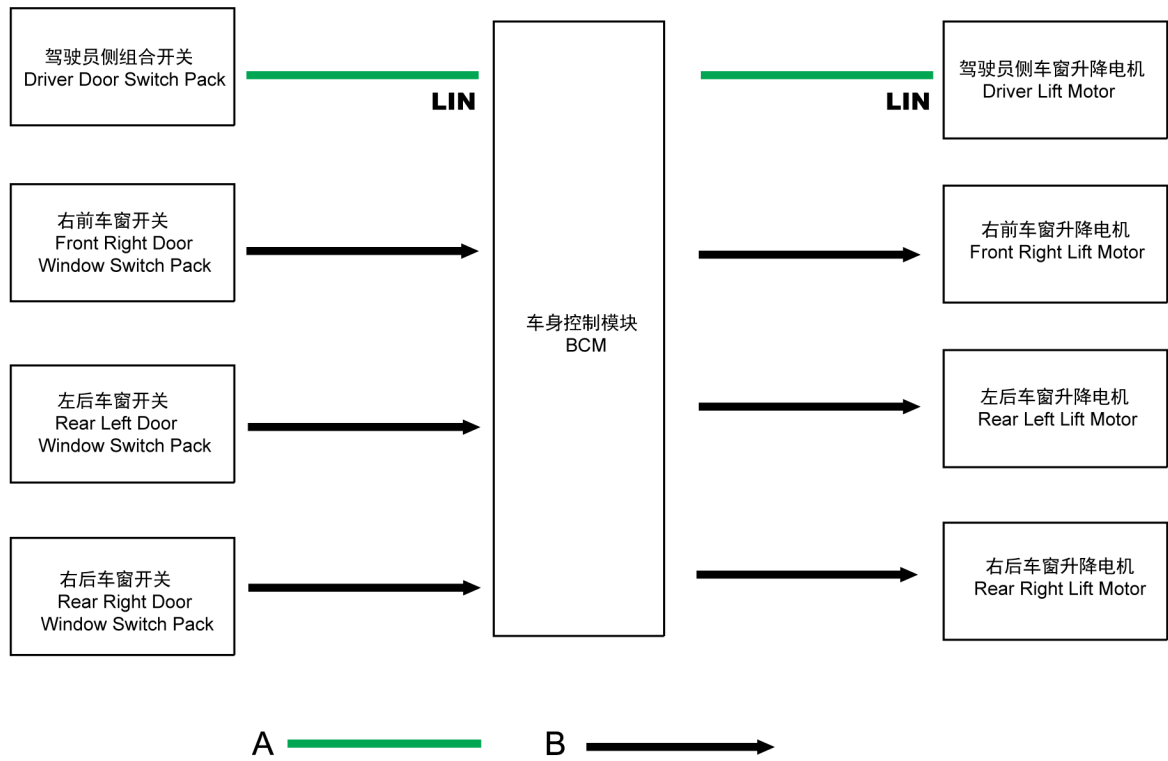


SC111231

1. Smart Key
2. Front Passenger Window Regulator Motor
3. Front Passenger Window Switch
4. Rear Right Window Switch
5. Rear Right Window Regulator Motor
6. Rear Left Window Switch
7. Rear Left Window Regulator Motor
8. Driver Window Switch
9. Driver Window Regulator Motor
10. Body Control Module (BCM)

System Control Diagram

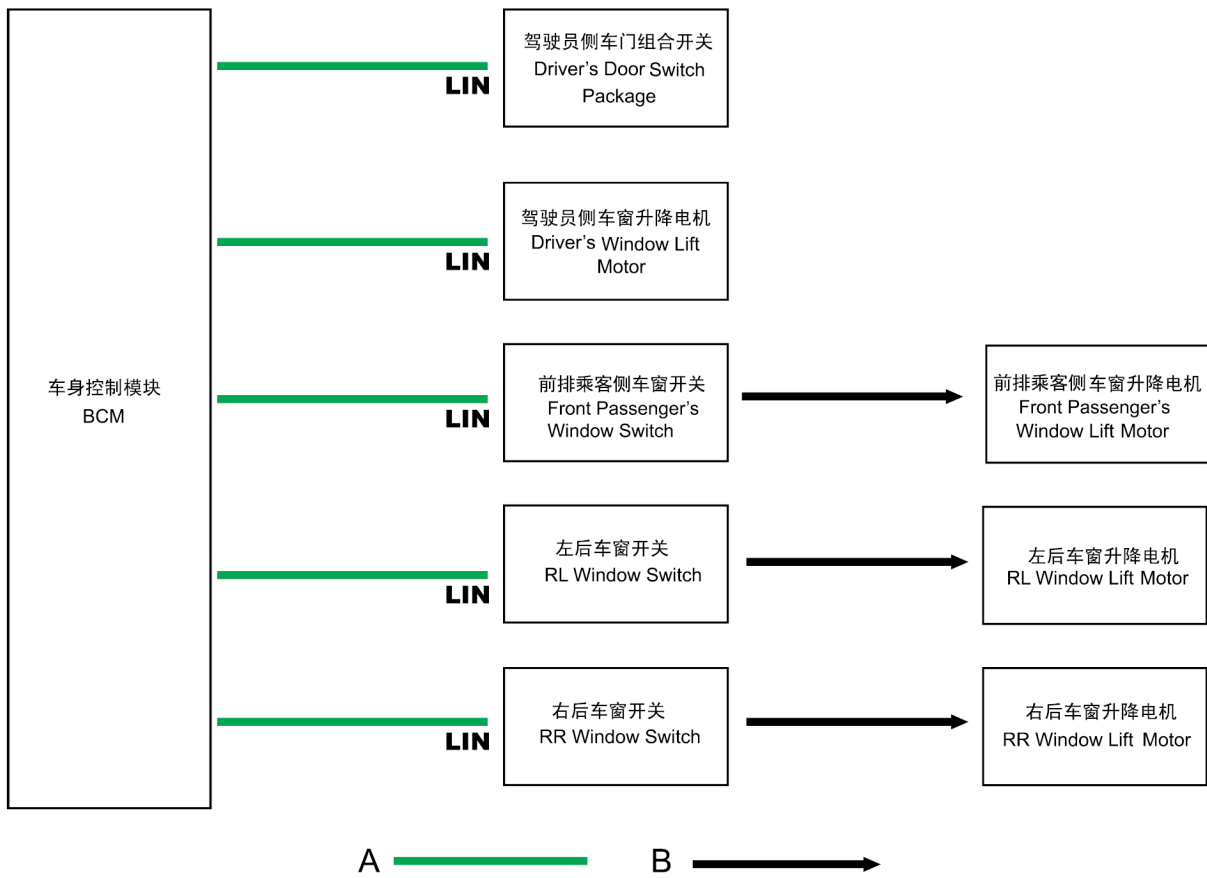
Glass Regulator System Control Diagram - Only Driver Door with Anti-pinch



S7211102

A = LIN Bus; B = Hard Wire

Glass Regulator System Control Diagram - Four
Doors with Anti-pinch



S7211107

A = LIN Bus; B = Hard Wire

Description

Overview

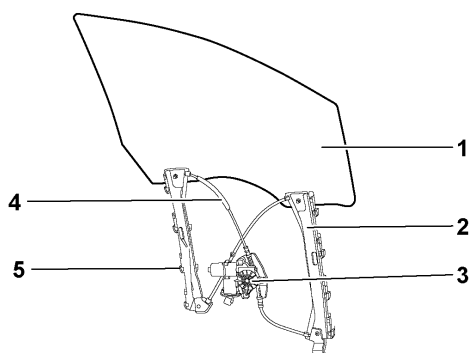
All vehicle models are equipped with the front and rear power window systems. The power window system includes:

- Front and rear window glass on left and right sides
- Driver door switch package (DDSP)
- Individual switches on the front and rear passenger doors
- Window regulator motor and regulator mechanism
- Body Control Module (BCM)

Each door interior trim panel is equipped with a lift/press type switches which control the power window of the corresponding door. DDSP is equipped with 4 power window switches and 1 rear window disable switch for the driver to control the operation of all windows. When the vehicle is powered on, or within 30s after the vehicle is powered off and no door is opened, it is allowed to operate the power window.

The power window system with one-touch down function is fitted on the doors of all models as standard configuration. The anti-pinch and one-touch up functions can only be realized on the front and rear doors of some models.

Front Power Window



SC114654

1. Front Door Window Glass
2. Rail
3. Motor Assembly
4. Cable
5. Slide Block

The front power window can be operated by the separate switch on the door or DDSP. The common front window motor is controlled by the BCM located on the side of driver side lower trim panel, and the driver window motor with anti-pinch and one-touch up function is jointly controlled by the BCM and the anti-pinch module at the motor. The BCM controls the upward or downward movement of the window glass by reversing the supply polarity of the window motor.

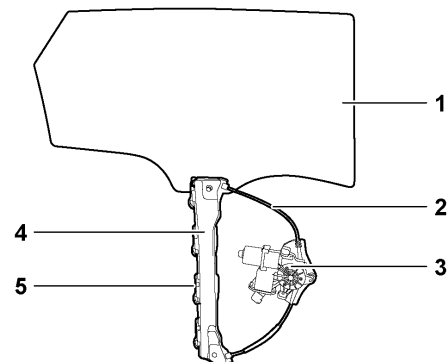
The front window regulator and motor assembly consists of 2 guide rails, 3 cables, 1 motor, 1 speed change mechanism

(winding drum) and 2 slide blocks. The guide rail is fixed on the door interior panel with 4 nuts and the window motor is fixed on the door interior panel with 3 bolts. The window glass is connected to the slide block on the guide rail through clips. The slide block is clamped on the flanging of the rail to move up and down along the rail for clearance fit.

The ascending/descending of the window glass is controlled by 3 cables. One end of the upper cable is connected to the slide block. The cable moves upward along the rail to wind around the pulley on the top of the rail and downward along the diagonal to arrive at the winding drum connected with the motor. One end of the lower cable is connected to the slide block bottom. The cable moves downward along the rail to wind around the pulley at the bottom of the rail and moves along the diagonal to arrive at the winding drum connected with the motor.

When the motor is operating, the slide block slides on the rail along the direction as required under the lead of the cable to drive the window glass to move up and down.

Rear Power Window



SC114653

1. Rear Door Window Glass
2. Cable
3. Motor Assembly
4. Rail
5. Slide Block

The rear power window can be controlled by the individual switch on each rear door or DDSP. The common front window motor is controlled by the BCM located on the side of driver side lower trim panel, and the driver window motor with anti-pinch and one-touch up function is jointly controlled by the BCM and the anti-pinch module at the motor. The BCM controls the upward or downward movement of the window glass by reversing the supply polarity of the window motor.

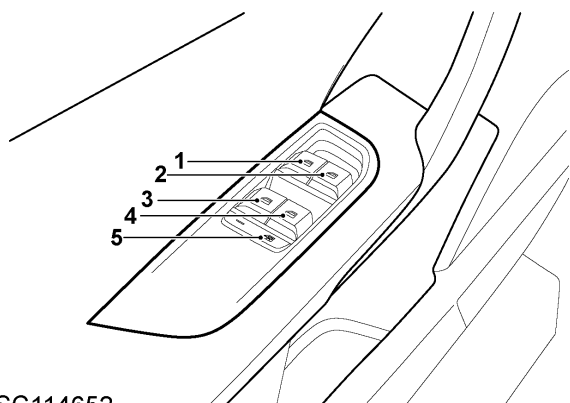
The rear window regulator and motor assembly consists of 1 rail, 2 cables, 1 motor, 1 speed change mechanism (winding drum) and 1 slide block. The guide rail is fixed on the door interior panel with 4 nuts and the window motor is fixed on the door interior panel with 3 bolts. The window glass is

connected to the slide block on the guide rail by bolts. The slide block is clamped on the flanging of the rail to move up and down along the rail for clearance fit.

The ascending/descending of the window glass is controlled by 2 cables. One end of the upper cable is connected to the slide block. The cable moves upward along the rail to wind around the pulley on the top of the rail and downward along the diagonal to arrive at the winding drum connected with the motor. One end of the lower cable is connected to the slide block bottom. The cable moves downward along the rail to wind around the pulley at the bottom of the rail and moves along the diagonal to arrive at the winding drum connected with the motor.

When the motor is operating, the slide block slides on the rail along the direction as required under the lead of the cable to drive the window glass to move up and down.

Driver Door Switch Package



SC114652

1. Driver Door Power Window Switch
2. Front Passenger Door Power Window Switch
3. Left Rear Door Power Window Switch
4. Right Rear Door Power Window Switch
5. Rear Window Disable Switch

Operation

Power Window

Control of the window regulator can be achieved by the following operations:

- Operate the switch on the DDSP to move up/down each power window and disable the rear power window.
- Operate the front/rear passenger side switch to move up/down the corresponding power window.
- Lazy Lock feature: long press the Lock/Unlock button on the remote key for several seconds until the windows start to move, to close/open all windows (if equipped).

Window Regulator Switch

The DDSP sends the control commands to the window motor through the BCM, including such request signals as open, close, one-touch open/close, etc. The DDSP is fitted with the rear window disable switch, when the disable switch is activated, the rear passenger window switch will be disabled.

Independent Passenger Window Switch

The independent passenger window switch controls the up/down of the corresponding passenger window glass. When the rear window disable function is active, the rear window switch cannot perform the up/down operation of this window glass.

Window Regulator Control Mode

Manual Mode

Lift/press the window switch to execute manual mode. The window will continue ascending/descending until the switch is released.

One-button Control

Only the driver window switch or the four door window switches are provided with one-touch up/down function.

- One-button Open (One-touch Down): press the window control switch to the 2nd position, and the window will automatically open. Operate the window control switch again during the descending, and the window will stop descending.
- One-Button Close (One-touch Up): lift the window control switch to the 2nd position, and the window will automatically close. Operate the window control switch again during the ascending, and the window will stop ascending.

Anti-pinch Function

For the switch with one-touch up function, when the function is applied, if there is any object in the ascending path of window glass, the window glass will stop at the obstacle and descend automatically so that the obstacle can be removed.

Heat Protection and Self-learning

Heat Protection

Window regulator motors without "one-button up" and "anti-pinch" functions realize heat protection through the opening and closing of the temperature-sensitive patch. When consecutive and repeated operation of the window regulator switch within a short time causes a hot motor, the temperature-sensitive patch will disconnect, cutting off the power of the regulator motor and realizing heat protection for the regulator motor. Then, the power window switch will become disabled temporarily, please wait for a short time, after the motor is slightly cooled, it will resume the function of the window regulator.

The window regulator motors with "one-touch up" and "anti-pinch" functions has a motor control module which realizes the ascending/descending, anti-pinch and thermal protection functions of the window. Consecutive and repeated operation of the power window with the "one-touch up" and "anti-pinch" functions within a short time can cause the BCM to determine that the window regulator motor is too hot and that the thermal protection is required. In this case, the power window switch will be disabled, and the regulator motor will stop, please wait for a short time, after the motor is slightly cooled, it will resume the function of the window regulator.

Self-learning

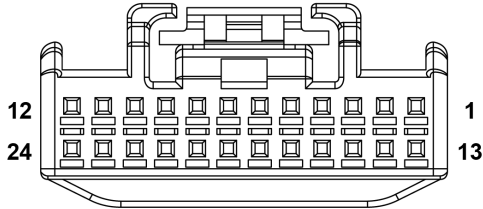
For window regulators with "one-touch up" and "anti-pinch" functions, if the power is off during the operation of regulators, these functions will be disabled; when the power is on, these functions can be resumed by the initialization of regulators.

The window will resume the "one-touch up" and "anti-pinch" functions by fully opening the window, continually lifting the switch to fully close the window, and lifting and holding the switch for about 5s.

After the completion of above procedures, the self-learning of the window is finished.

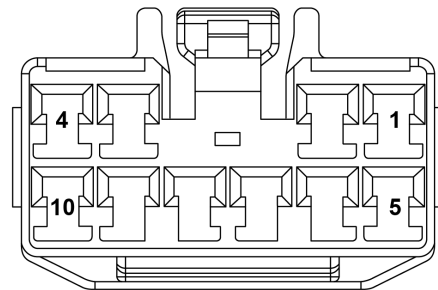
Detailed Information List of Component Pins

End View and Pin Information of Driver Window One-touch Up/Down Switch Harness Connector DD006 (With Anti-pinch)



Pin No.	Description
1	Ground
2	Power Supply
3	Window Up Switch Signal
4	LINI
5	Window Automatic Switch Signal
6	-
7	Window Down Switch Signal

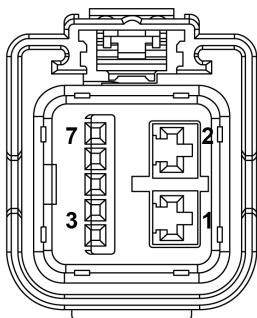
End View and Pin Information of Front Passenger Window Switch Harness Connector PD006



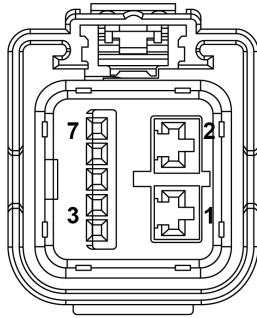
Pin No.	Description
1 - 10	-
11	Exterior Rearview Mirror Folding Switch
12	-
13	Exterior Rearview Mirror Unfolding Motor
14	Exterior Rearview Mirror Folding Motor
15-20	-
21	LIN7
22	Ground
23	-
24	Power Supply

Pin No.	Description
1	Front Passenger Window Up Motor
2	Front Passenger Window Up Relay
3	Backlight Brightness
4	Power Supply
5	Front Passenger Window Down Motor
6	Front Passenger Window Switch Up Signal
7	Front Passenger Window Down Relay
8	Front Passenger Window Automatic Switch Signal
9	Front Passenger Window Switch Down Signal
10	Ground

End View and Pin Information of Front Passenger Window One-touch Up/Down Switch Harness Connector PD003 (Anti-pinch)



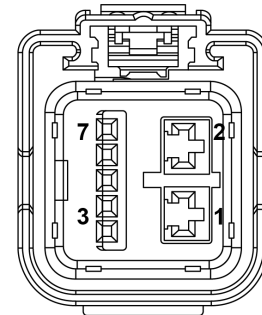
End View and Pin Information of Left Rear Window Switch Harness Connector RLD004



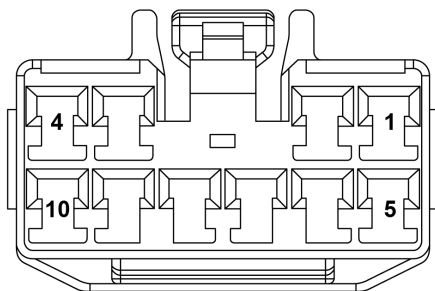
Pin No.	Description
5	Left Rear Window Down Motor
6	Left Rear Window Switch Up Signal
7	Left Rear Window Switch Down Relay
8	Left Rear Window Automatic Switch Signal
9	Left Rear Window Switch Down Signal
10	Ground

Pin No.	Description
1	Ground
2	Power Supply
3	Window Up Switch Signal
4	LIN2
5	Window Automatic Switch Signal
6	-
7	Window Down Switch Signal

End View and Pin Information of Right Rear Window Switch Harness Connector RRD003



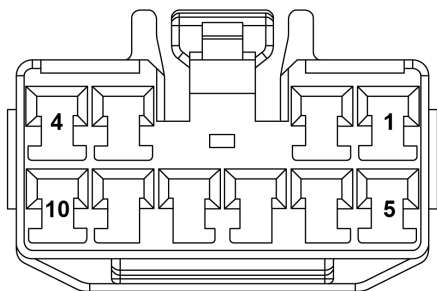
End View and Pin Information of Left Rear Window Switch Harness Connector RLD005



Pin No.	Description
1	Ground
2	Power Supply
3	Window Up Switch Signal
4	LIN2
5	Window Automatic Switch Signal
6	-
7	Window Down Switch Signal

Pin No.	Description
1	Left Rear Window Up Motor
2	Left Rear Window Switch Up Relay
3	Backlight Brightness
4	Power Supply

End View and Pin Information of Right Rear Window Switch Harness Connector RRD004



Pin No.	Description
1	Right Rear Window Up Motor
2	Right Rear Window Switch Up Relay
3	Backlight Brightness
4	Power Supply
5	Right Rear Window Down Motor
6	Right Rear Window Switch Up Signal
7	Left Rear Window Switch Down Relay
8	Right Rear Window Automatic Switch Signal
9	Right Rear Window Switch Down Signal
10	Ground

Service Guide

Front Door Window Remove

1. Remove the front door interior trim panel.

 **Front Door Interior Trim Panel Remove**

2. Remove the front door waterproof membrane.

 **Front Door Waterproof Membrane Remove**

3. Raise the glass to a certain height, to align two clip barbs of the glass with the mounting holes in the door.

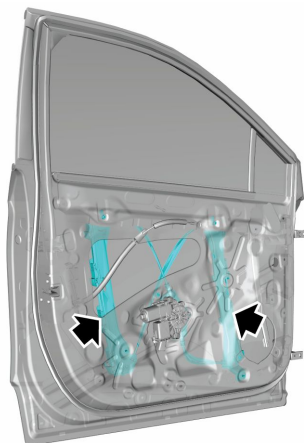
4. Remove the front door window outer weatherstrip.

 **Front Door Window Outer Weatherstrip Remove**

5. Remove the front door window inner weatherstrip.

 **Front Door Window Inner Weatherstrip Remove**

6. Push 2 clip barbs fixing the glass to the window regulator outwards from the hole in the glass regulator bracket, and lift the glass to remove it from the window frame.



SC114507

Refit

1. Carefully fit the glass between the inner and outer panels from the window frame, and fit glass run channel weatherstrips on both sides.
2. Lower the glass slowly until it reaches the slider of the glass regulator, align the glass with the clip, put the glass into the slider clip and fit it in place.
3. Fit the inner weatherstrip of front door windowsill.

 **Front Door Window Inner Weatherstrip Refit**

4. Fit the front door window outer weatherstrip.

 **Front Door Window Outer Weatherstrip Refit**

5. Fit the front door waterproof membrane.

 **Front Door Waterproof Membrane Refit**

6. Fit the front door interior trim panel.

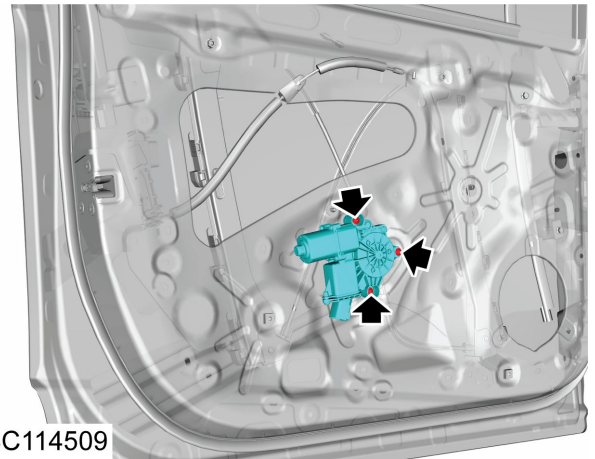
 **Front Door Interior Trim Panel Refit**

Front Door Window Regulator Remove

1. Disconnect the negative battery cable.
2. Remove the front door window glass.

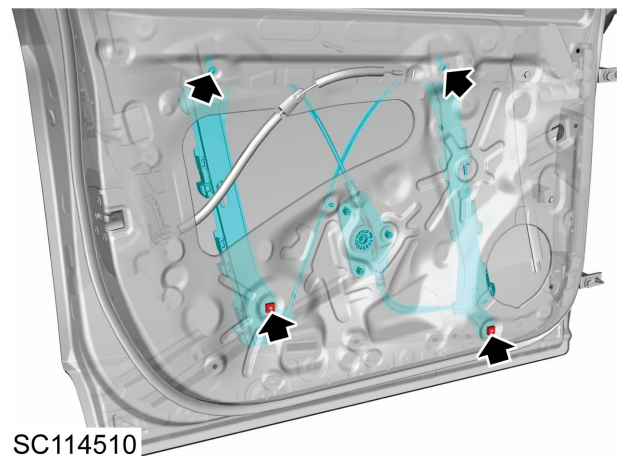
 **Front Door Window Glass Remove**

3. Remove 3 bolts fixing the window regulator motor to the door panel, and disconnect the motor harness connector.



SC114509

4. Loosen the gear engagement, and remove the window regulator motor.
5. Remove 4 nuts fixing the window regulator to the door panel, loosen the clips, and take the window regulator out of the door cavity.



SC114510

Refit

1. Fit the window regulator into the front door cavity, and press the clip in place.
2. Fit 4 nuts fixing the window regulator on the door panel, tighten them to **7-10N·m** in sequence from top to bottom and from left to right, and check the torque.
3. Locate the window regulator motor to the window regulator, engage the gear, and connect the harness connector of the motor.
4. Fit 3 bolts fixing the window regulator motor on the door panel, tighten them to **3-4N·m**, and check the torque.

5. Fit the front door window glass.

Front Door Window Glass Refit

6. Connect the negative battery cable.
7. Check if the window regulator can work properly, and check if the window with "one-touch up" function can operate normally.

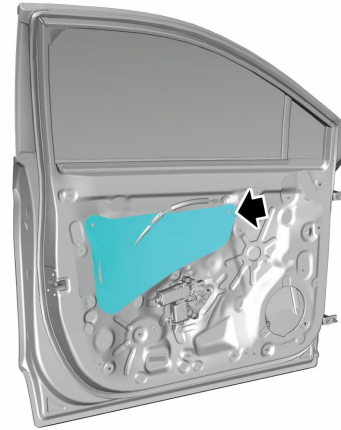
Note : *In case of power failure, the "one-touch up" function may fail; at this time, press the switch to ascend the window to the top, press and hold it for 5s to complete the self learning for window regulator, then the "one-touch up" function will be recovered.*

Front Door Waterproof Membrane Remove

1. Remove the front door interior trim panel.

Front Door Interior Trim Panel Remove

2. Tear off the waterproof membrane.



SC114514

Refit

1. Fit the waterproof membrane.
2. Fit the front door interior trim panel.

Front Door Interior Trim Panel Refit

Front Door Window Inner Weatherstrip Remove

1. Remove the front door interior trim panel.

 **Front Door Interior Trim Panel Remove**

2. Pull up to remove the front door window inner weatherstrip.



SC114517

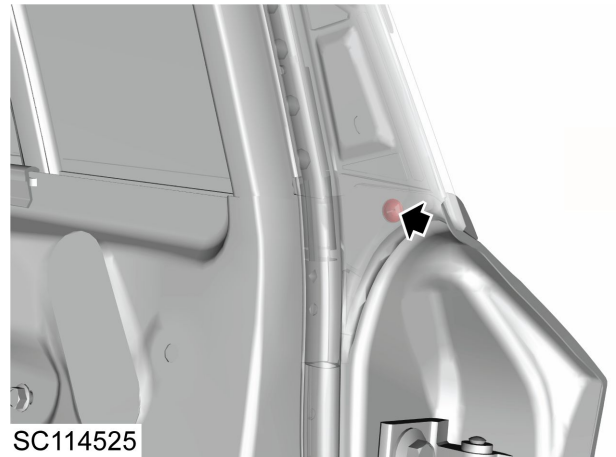
Refit

1. Align the weatherstrip opening with the door inner panel seam allowance, and fit the front door windowsill inner weatherstrip.
2. Fit the front door interior trim panel.

 **Front Door Interior Trim Panel Refit**

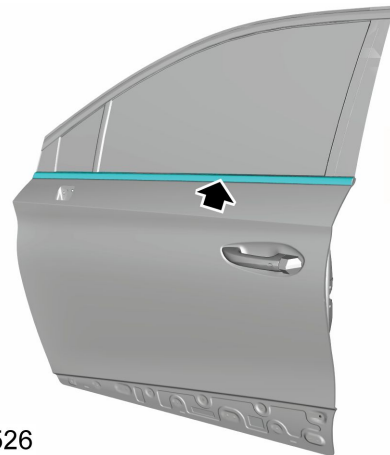
Front Door Window Outer Weatherstrip Remove

1. Open the front door.
2. Pull open part of the front door side weatherstrips at the front door window frame when removing, to expose the location of screws fixing the front door window outer weatherstrip.
3. Remove 1 screw fixing the front door window outer weatherstrip to the front door window frame.



SC114525

4. Remove the front door window outer weatherstrip.



SC114526

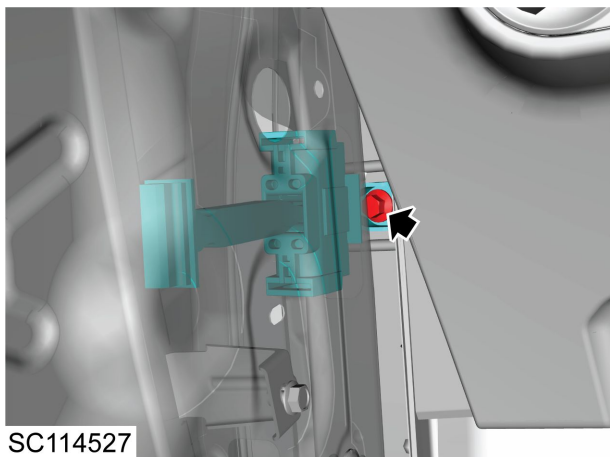
Refit

1. Fit 1 screw fixing the front door window outer weatherstrip to the front door window frame, tighten it to **1-2Nm**, and check the torque.
2. Close the front door.

Front Door Weatherstrip Assembly (Door Side)

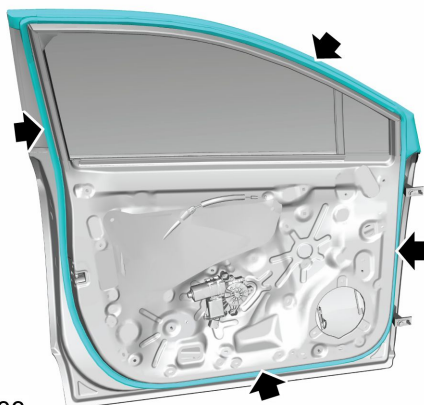
Remove

1. Remove and discard 1 bolt fixing the door check to the body side.



SC114527

2. Remove the front door weatherstrip along the front door.



SC114483

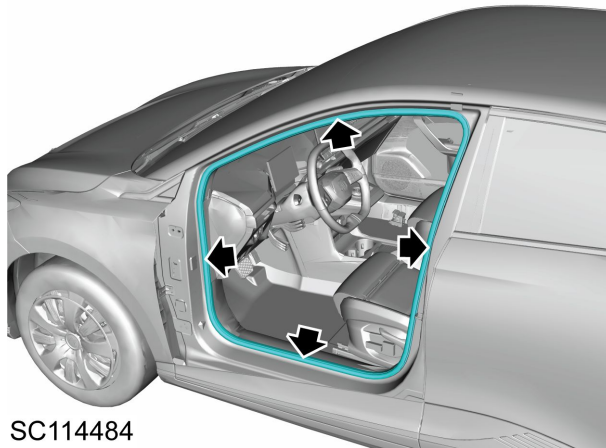
Refit

1. Fit the front door weatherstrip to the front door along the front door inner panel seam allowance.
2. Fit 1 bolt fixing the door check to the body side, tighten it to **19-25Nm**, and check the torque.

Front Door Weatherstrip Assembly (Body Side)

Remove

1. Open the front door, and remove the front door weatherstrip at bodyside.



SC114484

Refit

1. Fit the front door weatherstrip at bodyside to the body along the front door bodyside panel seam allowance, and fit the front door weatherstrip at bodyside.

Front Door Window Glass Run Channel Weatherstrip Remove

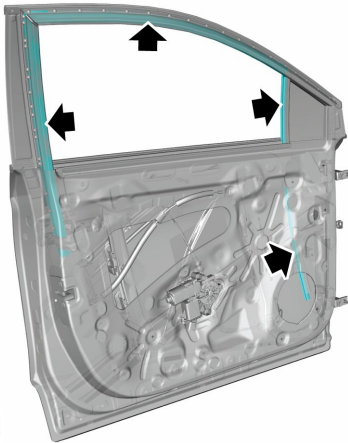
1. Remove the front door window glass.

 **Front Door Window Glass Remove**

2. Remove the front door window frame trim.

 **Front Door Window Frame Trim Remove**

3. Remove the front door window glass run channel weatherstrip.



SC114508

Refit

1. Insert the rear part of the window glass run channel weatherstrip into the front door window frame rear trim panel.
2. Align the weatherstrip opening with the door inner panel seam allowance, and fit the front door window glass run channel weatherstrip.
3. Fit the front door window frame trim.

 **Front Door Window Frame Trim Refit**

4. Fit the front door window glass.

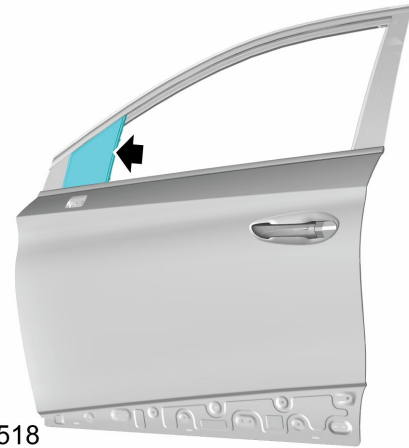
 **Front Door Window Glass Refit**

Front Door Quarter Window Glass Assembly Remove

1. Remove the front door separating pillar.

 **Front Door Separating Pillar Remove**

2. Loosen the clips, and remove the front door quarter window assembly.



SC114518

Refit

1. Fit the front door quarter window glass assembly, and fasten the clips.
2. Fit the front door separating pillar.

 **Front Door Separating Pillar Refit**

Front Door Window Frame Molding Remove

1. Open the front door, and lower the window to a proper height.
2. Loosen the clips, and remove the front door window frame trim.



Refit

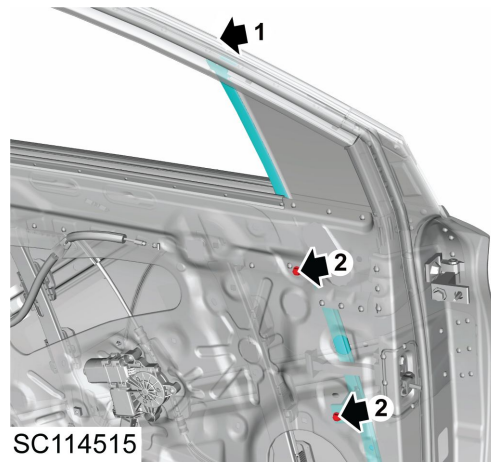
1. Fit the front door window frame trim, and fasten the clips.
2. Raise the window glass to the top position, and close the front door.

Front Door Separation Pillar Remove

1. Remove the front door window run channel weatherstrip.

Front Door Window Glass Run Channel Weatherstrip Remove

2. Pull open part of the front door side weatherstrips at the front door window frame when removing, to expose the location of screws fixing the front door separating pillar.
3. Remove 1 screw (1) fixing the front door separating pillar to the front door window frame.
4. Remove 2 bolts (2) fixing the front door separating pillar to the door panel.



5. Take out the front door separating pillar at an appropriate position.

Refit

1. Fit 2 bolts fixing the front door separating pillar to the door panel, tighten them to **7-10Nm**, and check the torque.
2. Fit 1 screw fixing the front door separating pillar to the door panel, tighten them to **1-1.5Nm**, and check the torque.
3. Fit the front door window glass run channel weatherstrip.

Front Door Window Glass Run Channel Weatherstrip Refit

Front Door Window Upper Molding Assembly Remove

1. Carefully pry off the clip of the front door window upper moulding, and gently remove the front door window upper moulding.



SC114519

Refit

1. Locate the front door window glass upper moulding to the body, and press the clip in place.

Front Door Frame A Pillar Decorative Film Remove

1. Carefully remove the front door window upper moulding assembly.



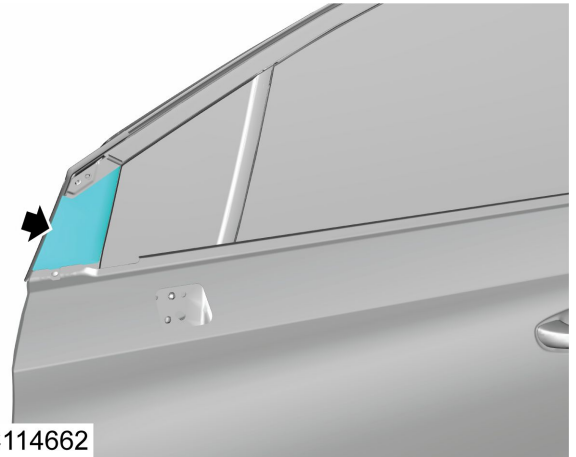
Front Door Window Upper Moulding Assembly Remove

2. Remove the front door window outer weatherstrip.



Front Door Window Outer Weatherstrip Remove

3. Tear off the front door frame A-pillar decorative film and discard it.



SC114662

Refit

1. Check the surface paint of the door frame, and ensure that the surface is spotless and flat (If there are spots and unevenness, first use non-woven fabric dipped in 50:50 alcohol to scrub the location of the film to ensure the cleanliness of the pasted parts).
2. Peel off the isolation paper on the back of the black film, remove the excess, perforated black film from the upper part along the split line, ensure that the left and right 2 points are aligned with the left and right edges of the panel and apply the film from top to bottom while using a squeegee to discharge the air, and try to avoid repeatedly lifting and pasting the black film during the process.
3. After the black film has been completely laminated to the panel, use the squeegee to scrape the film back and forth 2-3 times to ensure that the air is fully discharged. Then use the handle to quickly remove the transparent protective film from the surface at once, so as to avoid stopping in the middle.
4. The excess black film on both sides of the window frame is wrapped by hand, and the rounded corners are trimmed until they are smooth and free from warping.
5. Check that the black film and the window frame fit tightly and the surface is flat without bubbles, creases, dewy white and other defects. If there is a defect, you need to repeat the above operation.

A squeegee must be used continuously during the lamination process to expel air bubbles. If you need to rework, it is recommended to do it within 24 hours of lamination, and the risk of adhesive residue will increase beyond 24 hours. If it is removed after 24 hours, it is recommended to use alcohol to wipe it.

6. Fit the front door window outer weatherstrip.

Front Door Window Outer Weatherstrip

7. Fit the front door window upper moulding assembly.

Front Door Window Upper Moulding Assembly

Front Door Frame B Pillar Decorative Film Remove

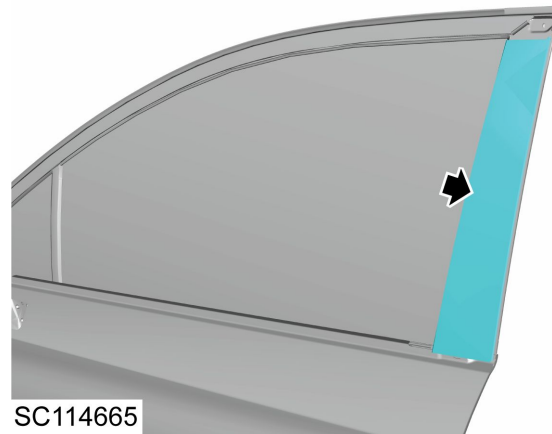
1. Remove the front door window upper moulding assembly.

Front Door Window Upper Moulding Assembly Remove

2. Remove the front door window outer weatherstrip.

Front Door Window Outer Weatherstrip Remove

3. Tear off the front door frame B-pillar decorative film and discard it.



Refit

1. Check the surface paint of the door frame, and ensure that the surface is spotless and flat (If there are spots and unevenness, first use non-woven fabric dipped in 50:50 alcohol to scrub the location of the film to ensure the cleanliness of the pasted parts).
2. Peel off the isolation paper on the back of the black film, remove the excess, perforated black film from the upper part along the split line, ensure that the left and right 2 points are aligned with the left and right edges of the panel and apply the film from top to bottom while using a squeegee to discharge the air, and try to avoid repeatedly lifting and pasting the black film during the process.
3. After the black film has been completely laminated to the panel, use the squeegee to scrape the film back and forth 2-3 times to ensure that the air is fully discharged. Then use the handle to quickly remove the transparent protective film from the surface at once, so as to avoid stopping in the middle.
4. The excess black film on both sides of the window frame is wrapped by hand, and the rounded corners are trimmed until they are smooth and free from warping.
5. Check that the black film and the window frame fit tightly and the surface is flat without bubbles, creases, dewy white and other defects. If there is a defect, you need to repeat the above operation.

A squeegee must be used continuously during the lamination process to expel air bubbles. If you need to rework, it is recommended to do it within 24 hours of lamination, and the risk of adhesive residue will increase beyond 24 hours. If it is removed after 24 hours, it is recommended to use alcohol to wipe it.

6. Fit the front door window outer weatherstrip.

Front Door Window Outer Weatherstrip

7. Remove the front door window upper moulding assembly.

Front Door Window Upper Moulding Assembly

Rear Door Window Remove

1. Remove the rear door interior trim panel.

Rear Door Interior Trim Panel Remove

2. Remove the rear door waterproof membrane.

Rear Door Waterproof Membrane Remove

3. Raise the glass to a certain height, to align two clip barbs of the glass with the mounting holes in the door.

4. Remove the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip Remove

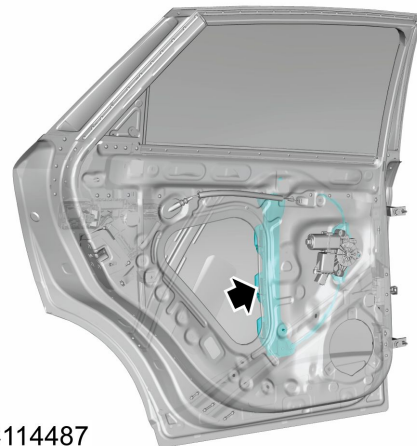
5. Remove the rear door window inner weatherstrip.

Rear Door Window Inner Weatherstrip Remove

6. Remove the rear door separating pillar.

Rear Door Separating Pillar Remove

7. Push 2 clip barbs fixing the glass to the window regulator outwards from the hole in the glass regulator bracket, and lift the glass to remove it from the window frame.



SC114487

Refit

1. Carefully fit the glass between the inner and outer panels from the window frame, and fit glass run channel weatherstrips on both sides.

2. Lower the glass slowly until it reaches the slider of the glass regulator, align the glass with the clip, put the glass into the slider clip and fit it in place.

3. Fit the rear door separating pillar.

Rear Door Separating Pillar Refit

4. Fit the rear door window inner weatherstrip.

Rear Door Window Inner Weatherstrip Refit

5. Fit the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip Refit

6. Fit the rear door waterproof membrane.

Rear Door Waterproof Membrane Refit

7. Fit the rear door interior trim panel.

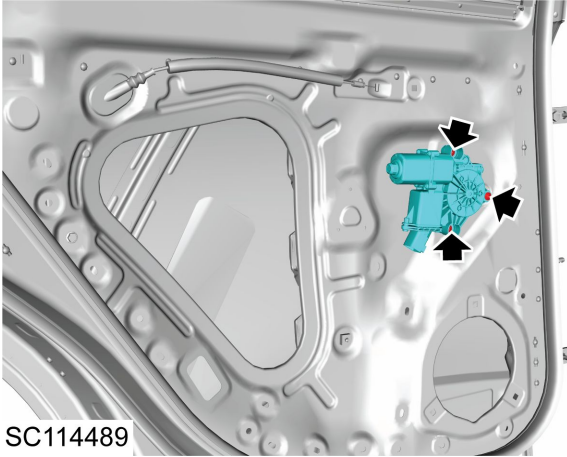
Rear Door Interior Trim Panel Refit

Rear Door Window Regulator Remove

1. Disconnect the negative battery cable.
2. Remove the rear door window.

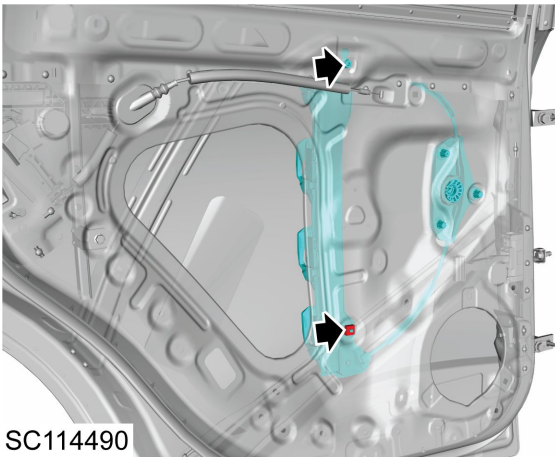
Rear Door Window Glass Remove

3. Remove 3 bolts fixing the window regulator motor to the door panel, and disconnect the motor harness connector.



SC114489

4. Loosen the gear engagement, and remove the window regulator motor.
5. Remove 2 nuts fixing the window regulator to the door panel, loosen the clips, and take the window regulator out of the door cavity.



SC114490

Refit

1. Fit the window regulator into the rear door cavity, and press the clip in place.
2. Fit 4 nuts fixing the window regulator on the door panel, tighten them to **7-10N·m** in sequence from top to bottom and from left to right, and check the torque.
3. Locate the window regulator motor to the window regulator, engage the gear, and connect the harness connector of the motor.
4. Fit 3 bolts fixing the window regulator motor on the door panel, tighten them to **3-4N·m**, and check the torque.

5. Fit the rear door window.

Rear Door Window Glass Refit

6. Connect the negative battery cable.
7. Check if the window regulator can work properly, and check if the window with "one-touch up" function can operate normally.

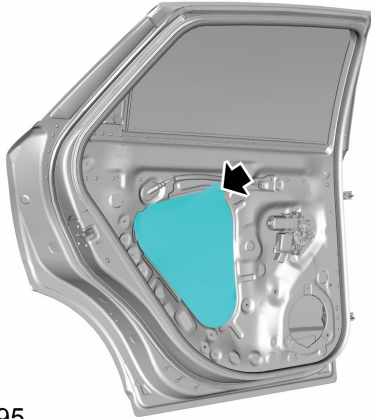
Note : In case of power failure, the "one-touch up" function may fail; at this time, press the switch to ascend the window to the top, press and hold it for 5s to complete the self learning for window regulator, then the "one-touch up" function will be recovered.

Rear Door Waterproof Membrane Remove

1. Remove the rear door interior trim panel.

 **Rear Door Interior Trim Panel Remove**

2. Tear off the waterproof membrane.



SC114495

Refit

1. Fit the waterproof membrane.
2. Fit the rear door interior trim panel.

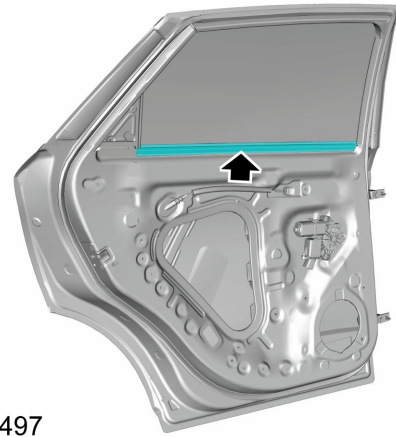
 **Rear Door Interior Trim Panel Refit**

Rear Door Window Inner Weatherstrip Remove

1. Remove the rear door interior trim panel.

 **Rear Door Interior Trim Panel Remove**

2. Pull up to remove the rear door window inner weatherstrip.



SC114497

Refit

1. Aligning the weatherstrip opening with the door inner panel seam allowance, fit the rear door window inner weatherstrip.
2. Fit the rear door interior trim panel.

 **Rear Door Interior Trim Panel Refit**

Rear Door Window Outer Weatherstrip Remove

1. Open the rear door.
2. Pull the outer weatherstrip up from the front to the rear end of the door in order and remove it.



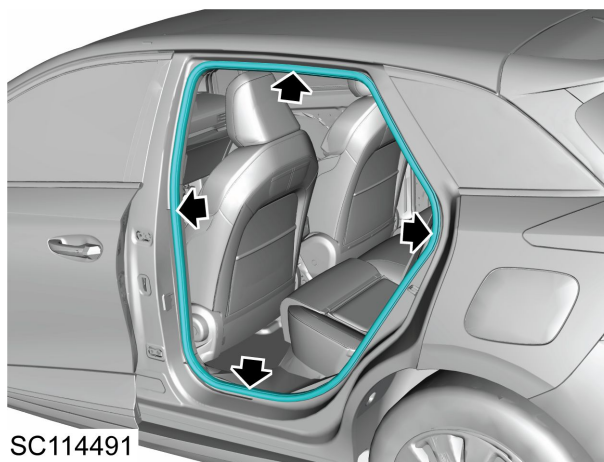
SC114503

Refit

1. Align the rear door window outer weatherstrip with the door panel, and fit it onto the flanging of the door panel.
2. Close the rear door.

Rear Door Weatherstrip Assembly (Body Side) Remove

1. Open the rear door, and remove the rear door weatherstrip at bodyside.



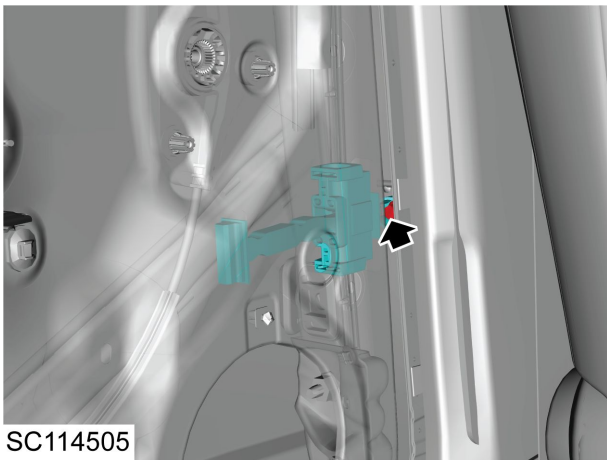
SC114491

Refit

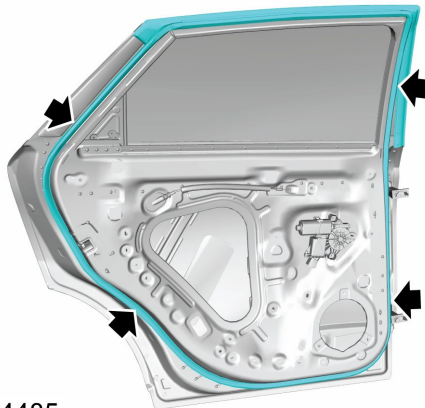
1. Fit the rear door weatherstrip at bodyside to the body along the rear door bodyside panel seam allowance, and fit the rear door weatherstrip at bodyside.

**Rear Door Weatherstrip Assembly (Door Side)
Remove**

1. Remove and discard I bolt fixing the door check to the body side.



2. Remove the rear door weatherstrip along the rear door.



Refit

1. Fit the rear door weatherstrip to the rear door along the rear door inner panel seam allowance.
2. Fix the door check to the body side, fit I bolt, tighten it to **19-25Nm**, and check the torque.

**Rear Door Lower Rear Auxiliary Weatherstrip
Assembly
Remove**

1. Pry off the clip fixing the rear door lower rear auxiliary weatherstrip to the rear door, and remove the rear door lower rear auxiliary weatherstrip assembly.



Refit

1. Fix the rear door lower rear auxiliary weatherstrip assembly to the rear door, and press the clip in place.

Rear Door Window Glass Run Channel Weatherstrip Remove

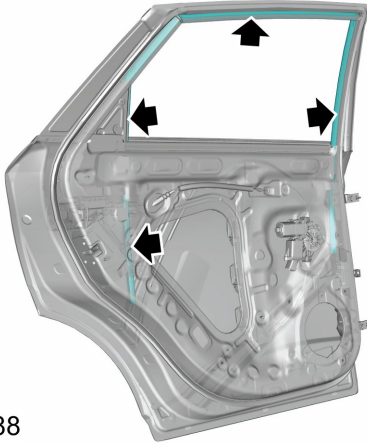
1. Remove the rear door window.

Rear Door Window Glass Remove

2. Remove the rear door window frame trim.

Rear Door Window Frame Trim Remove

3. Remove the rear door window glass run channel weatherstrip.



SC114488

Refit

1. Insert the rear part of the window glass run channel weatherstrip into the rear door window frame rear trim panel.
2. Align the weatherstrip opening with the door inner panel seam allowance, and fit the rear door window glass run channel weatherstrip.
3. Fit the rear door window frame trim.

Rear Door Window Frame Trim Refit

4. Fit the rear door window.

Rear Door Window Glass Refit

Rear Door Separator Remove

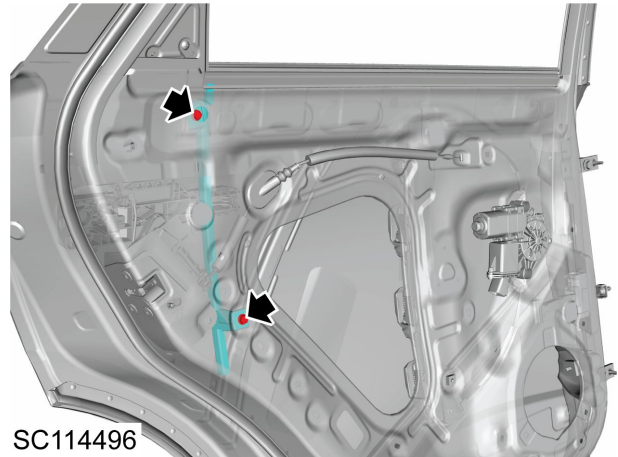
1. Remove the rear door interior trim panel.

Rear Door Interior Trim Panel Remove

2. Remove the rear door waterproof membrane.

Rear Door Waterproof Membrane Remove

3. Remove 2 bolts fixing the rear door separating pillar to the door panel.



SC114496

4. Take out the rear door separating pillar at an appropriate position.

Refit

1. Fit 2 bolts fixing the rear door separating pillar to the door panel, tighten them to **7-10Nm**, and check the torque.
2. Fit the rear door waterproof membrane.

Rear Door Waterproof Membrane Refit

3. Fit the rear door interior trim panel.

Rear Door Interior Trim Panel Refit

**Rear Door Window Upper Molding Assembly
Remove**

1. Carefully pry off the clip of the rear door window upper moulding, and gently remove the rear door window upper moulding.



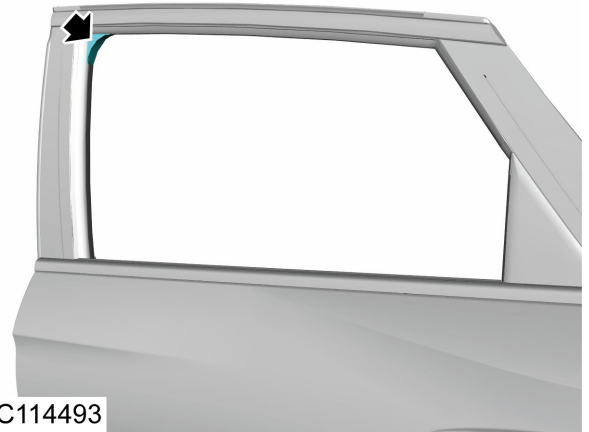
SC114498

Refit

1. Locate the rear door window glass upper moulding to the body, and press the clip in place.

**Rear Door Window Frame Molding
Remove**

1. Open the rear door, and lower the window to a proper height.
2. Loosen the clips, and remove the rear door window frame trim.



SC114493

Refit

1. Fit the rear door window frame trim, and fasten the clips.
2. Raise the window glass to the top position, and close the rear door.

Rear Door Frame D-pillar Decorative Film Remove

1. Carefully remove the rear door window upper moulding assembly.

Rear Door Window Upper Moulding Assembly Remove

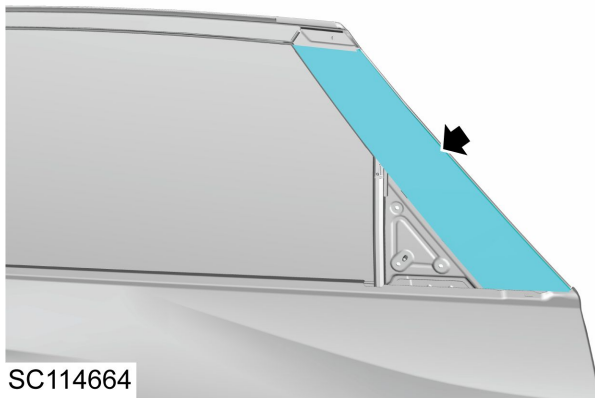
2. Remove the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip Remove

3. Remove the rear door window outer trim panel assembly.

Rear Door Window Outer Trim Panel Assembly Remove

4. Tear off and discard the rear door frame D-pillar decorative film.



Refit

1. Check the surface paint of the door frame, and ensure that the surface is spotless and flat (If there are spots and unevenness, first use non-woven fabric dipped in 50:50 alcohol to scrub the location of the film to ensure the cleanliness of the pasted parts).
2. Peel off the isolation paper on the back of the black film, remove the excess, perforated black film from the upper part along the split line, ensure that the left and right 2 points are aligned with the left and right edges of the panel and apply the film from top to bottom while using a squeegee to discharge the air, and try to avoid repeatedly lifting and pasting the black film during the process.
3. After the black film has been completely laminated to the panel, use the squeegee to scrape the film back and forth 2-3 times to ensure that the air is fully discharged. Then use the handle to quickly remove the transparent protective film from the surface at once, so as to avoid stopping in the middle.
4. The excess black film on both sides of the window frame is wrapped by hand, and the rounded corners are trimmed until they are smooth and free from warping.
5. Check that the black film and the window frame fit tightly and the surface is flat without bubbles, creases,

dewy white and other defects. If there is a defect, you need to repeat the above operation.

A squeegee must be used continuously during the lamination process to expel air bubbles. If you need to rework, it is recommended to do it within 24 hours of lamination, and the risk of adhesive residue will increase beyond 24 hours. If it is removed after 24 hours, it is recommended to use alcohol to wipe it.

6. Fit the rear door window outer trim panel assembly.

Rear Door Window Outer Trim Panel Assembly

7. Fit the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip

8. Fit the rear door window upper moulding assembly.

Rear Door Window Upper Moulding Assembly

Rear Door Frame B-pillar Decorative Film Remove

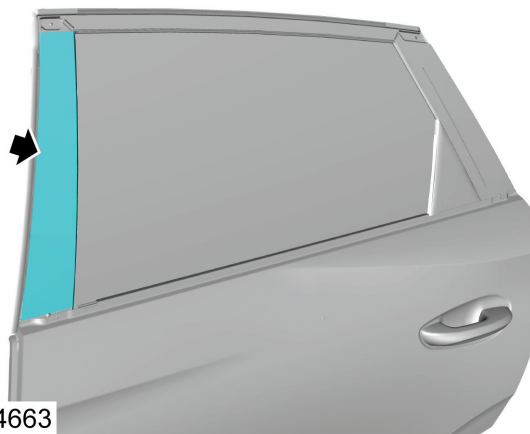
1. Carefully remove the rear door window upper moulding assembly.

Rear Door Window Upper Moulding Assembly Remove

2. Remove the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip Remove

3. Tear off and discard the rear door frame B-pillar decorative film.



SC114663

Refit

1. Check the surface paint of the door frame, and ensure that the surface is spotless and flat (If there are spots and unevenness, first use non-woven fabric dipped in 50:50 alcohol to scrub the location of the film to ensure the cleanliness of the pasted parts).
2. Peel off the isolation paper on the back of the black film, remove the excess, perforated black film from the upper part along the split line, ensure that the left and right 2 points are aligned with the left and right edges of the panel and apply the film from top to bottom while using a squeegee to discharge the air, and try to avoid repeatedly lifting and pasting the black film during the process.
3. After the black film has been completely laminated to the panel, use the squeegee to scrape the film back and forth 2-3 times to ensure that the air is fully discharged. Then use the handle to quickly remove the transparent protective film from the surface at once, so as to avoid stopping in the middle, and ensure that the black film is tightly fitted and the surface is smooth and flat.
4. The excess black film on both sides of the window frame is wrapped by hand, and the rounded corners are trimmed until they are smooth and free from warping.
5. Check that the black film and the window frame fit tightly and the surface is flat without bubbles, creases, dewy white and other defects. If there is a defect, you need to repeat the above operation.

A squeegee must be used continuously during the lamination process to expel air bubbles. If you need to rework, it is recommended to do it within 24 hours of lamination, and the risk of adhesive residue will increase beyond 24 hours. If it is removed after 24 hours, it is recommended to use alcohol to wipe it.

6. Fit the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip

7. Fit the rear door window upper moulding assembly.

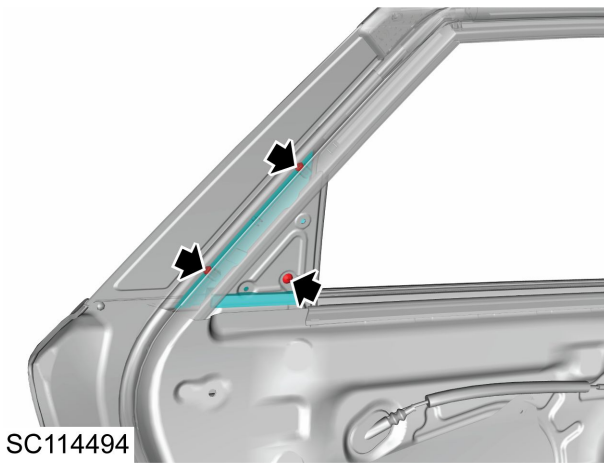
Rear Door Window Upper Moulding Assembly

Rear Door Window Exterior Trim Panel Assembly Remove

1. Open the rear door.
2. Loosen the clip, and remove the rear door window interior trim panel assembly.
3. Remove the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip Remove

4. Pull open part of the rear door side weatherstrips at the rear door window frame when removing, to expose the location of screws fixing the rear door window exterior trim panel.
5. Remove 3 screws fixing the rear door window exterior trim panel to the door panel.



6. Remove the rear door window outer trim panel assembly.

Refit

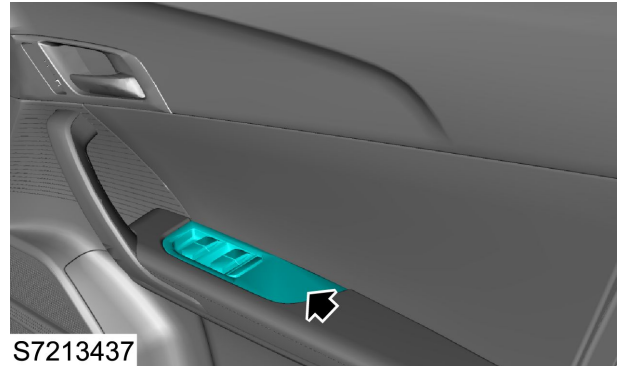
1. Fit 3 screws fixing the rear door window outer trim panel assembly to the door panel, tighten them to **0.8-1.8Nm**, and check the torque.
2. Fit the rear door window outer weatherstrip.

Rear Door Window Outer Weatherstrip Refit

3. Fit the rear door window inner trim panel assembly, and press the clip.
4. Close the rear door.

Power Window Switch - Driver Side Remove

1. Disconnect the negative battery cable.
2. Pry off the clip fixing the power window switch to the front door interior trim panel.



3. Disconnect the harness connector and remove the driver side power window switch.

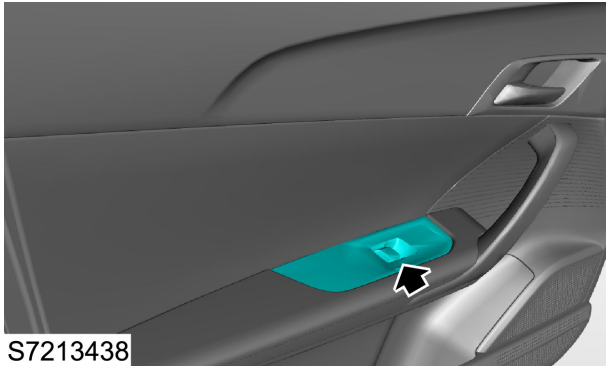
Refit

1. Connect the harness connector of the driver power window switch.
2. Fix the power window switch to the front door interior trim panel, and press the clip in place.
3. Connect the negative battery cable.
4. Check if the window glass regulator can work. During removing/refitting, the "one-button up/down" and "anti-pinch" functions may fail, in this case, perform self-learning for the driver side power window switch.

Self-learning for Driver Power Window Switch

Power Window Switch - Front Passenger Remove

1. Disconnect the negative battery cable.
2. Pry off the clip fixing the power window switch to the door interior trim panel.



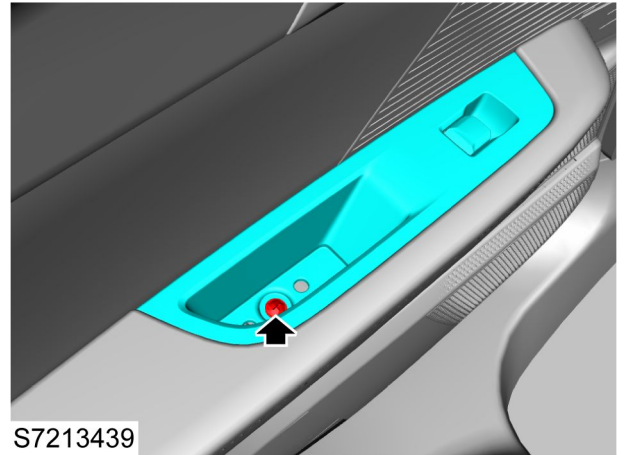
3. Disconnect the harness connector and remove the power window switch.

Refit

1. Connect the harness connector of the power window.
2. Fix the power window switch to the door interior trim panel, and press the clip in place.
3. Connect the negative battery cable.

Power Window Switch - Others Remove

1. Disconnect the negative battery cable.
2. Remove the rear door power window switch screw trim cover.
3. Remove 1 screw fixing the rear door power window switch to the door, and pry off the retaining clip.



4. Disconnect the harness connector and remove the power window switch - others.

Refit

1. Connect the harness connector of the power window.
2. Press the rear door power window switch on the door interior trim panel and ensure the clips are fully engaged.
3. Fit and tighten 1 screw fixing the rear door power window switch to the door interior trim panel.
4. Fit the rear door power window switch screw trim cover.
5. Connect the negative battery cable.

Door & Lid System

**Body Rear End Coverings and
Weatherstrips**

Specification

Torque

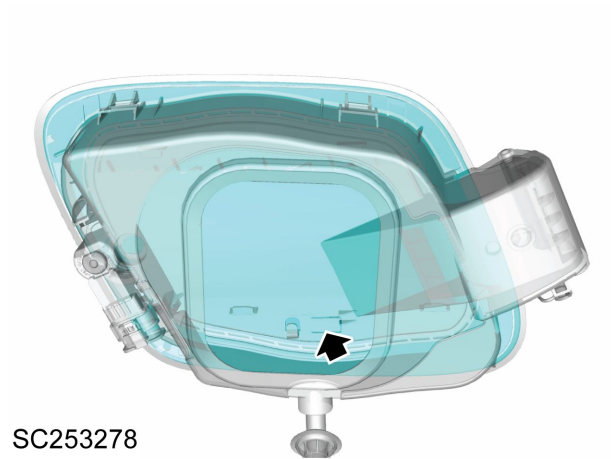
Description	Value
Bolt-tailgate hinge to tail door	26-34Nm
Nut-tailgate hinge to body	26-34Nm
Bolt-tailgate lock body assenbly to tail door	19-25Nm
Bolt-tailgate latch to body	19-25Nm
Bolt-body end gas spring mounting ball head bracket to body	19-25Nm
Bolt-tailgate end gas spring mounting ball head bracket to tail	19-25Nm
Bolt-tailgate bumper to body	7-10Nm
Bolt-tailgate bumper to tailgate	7-10Nm

Service Guide

Charging Port Door Assembly

Remove

1. Open the charging port door assembly.
2. Pry off the clip fixing the charging port door and push the charging port door assembly outwards at the same time.



SC253278

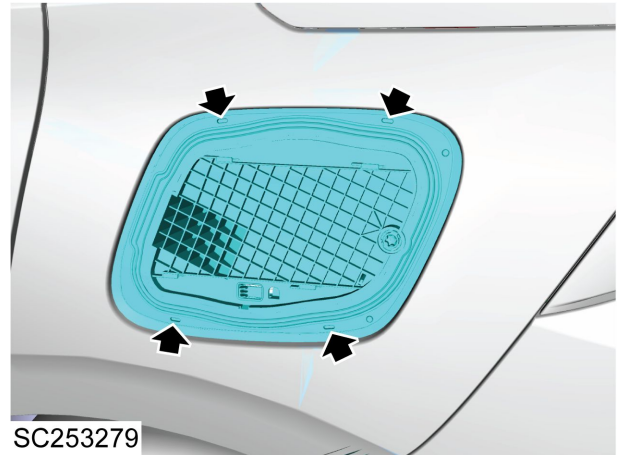
Refit

1. Push the charging port door assembly along the chute, and make sure the clip is fitted in place.
2. Close the charging port door assembly.

Charging Port Door Housing Assembly

Remove

1. Open the charging port door assembly.
2. Pry off the clip fixing the charging port door and pull the charging port door assembly outwards at the same time.



SC253279

Refit

1. Push the charging port door assembly along the chute, and make sure the clip is fitted in place.
2. Close the charging port door assembly.

Door & Lid System

Tail Gate Assembly Remove

1. Open the tail gate, and make sure that it is reliably supported to keep it open during removal.

Warning : Due to heavy tailgate, safety stands shall be set before operation, and pay special attention to avoid vehicle damage and personal injury.

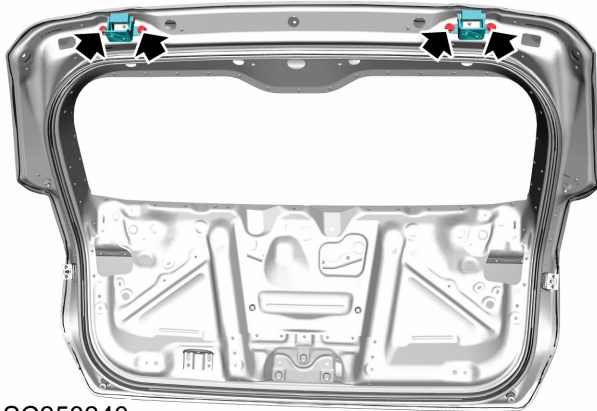
2. Disconnect the negative battery cable.
3. Remove the tail gate harness.

Tail Gate Harness

4. Remove the tail gate air spring.

Tail Gate Air Spring Remove

5. With assistance, remove 4 bolts fixing the hinges on both sides to the tail gate. If it is required to refit the tail gate, a reference position shall be marked on the hinge.



SC253240

6. Remove the tail gate assembly.

Refit

1. With assistance, fit the tail gate to the correct position.

Warning : Due to heavy tailgate, safety stands shall be set before operation, and pay special attention to avoid vehicle damage and personal injury.

2. Check the fit clearance and flushness between the tail gate and the bodyside panel and rear end panel. For clearance information, please refer to "Body Dimension" in the "Body Panel and Painting" section.

Rear End Information

3. After adjustment, tighten 4 bolts to **26-34Nm**, and check the torque.
4. Remove the tail gate air spring.

Tail Gate Air Spring Refit

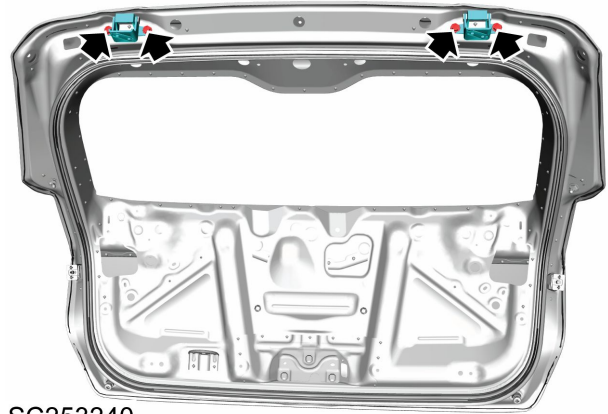
5. Remove the tail gate harness.

Tail Gate Harness Remove

Adjustment

1. Mark the profiles of the trunk lid with a non-permanent marker.

2. Loosen 4 bolts fixing the tail gate hinge flap to the tail gate.



SC253240

3. Adjust the tail gate to make the gap between the tail gate and the tail lamp and that between the tail gate and the rear bumper fascia uniform and make the tail gate flush with the tail lamp and the rear bumper fascia.
4. For clearance information, please refer to "Body Dimension" in the "Body Panel and Painting" section.

Rear End Information

5. Tighten 4 bolts fixing the hinges to the tail gate to **26-34Nm**, and check the torque.

Tail Gate Hinge Remove

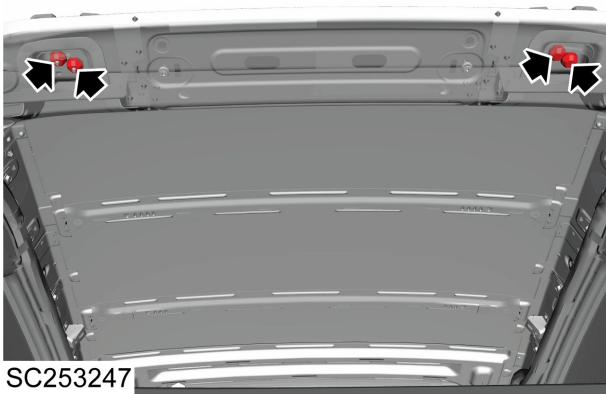
1. Open the tail gate, and make sure that it is reliably supported to keep it open during removal.

Warning : *Due to heavy tailgate, safety stands shall be set before operation, and pay special attention to avoid vehicle damage and personal injury.*

2. Remove the tail gate assembly.

Tail Gate Assembly

3. Mark the position of the tail gate hinge on the vehicle body with a non-permanent marker.
4. Loosen the clip, pry open the tail gate end of roof interior trim panel to access the retaining nuts of the tail gate hinges.
5. Remove 4 nuts fixing the left and right tail gate hinges to the body, so as to remove the tail gate hinge assembly.



Refit

1. Locate the tail gate hinge assembly to the marked mounting location on the body.
2. Fit 4 nuts fixing the left/right tail gate hinges to the body, tighten them to **26-34Nm**, and check the torque.
3. Fit the tail gate end of roof interior trim panel.
4. Fit the tail gate assembly.

Tail Gate Assembly

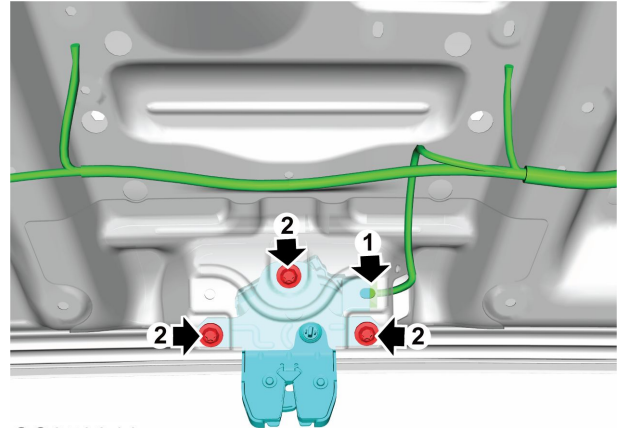
Warning : *Due to heavy tailgate, safety stands shall be set before operation, and pay special attention to avoid vehicle damage and personal injury.*

Tail Gate Lock Assembly Remove

1. Remove the tail gate interior trim panel.

Tail Gate Interior Trim Panel Remove

2. Remove 3 bolts (2) fixing the tail gate lock to the tail gate, disconnect the lock harness connector (1), and remove the tail gate lock.



Refit

1. Locate the tail gate lock to the tail gate panel, and connect the harness connector.
2. Fit 3 bolts fixing the tail gate lock to the tail gate, but do not tighten them.
3. Check and adjust the fit clearance and flushness between the tail gate lock and the surrounding panels, tighten them to **19-25Nm** after adjustment, and check the torque.
4. Fit the interior trim panel of the tail gate.

Tail Gate Interior Trim Panel Refit

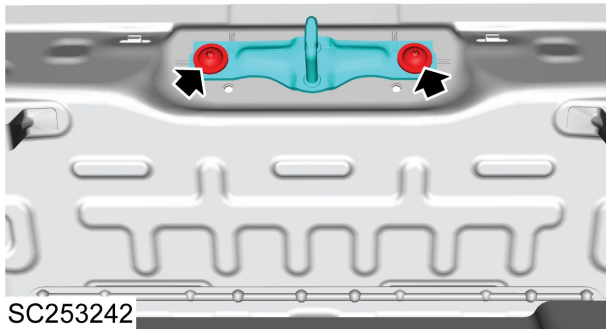
Door & Lid System

Tail Gate Striker Assembly Remove

1. Remove the trunk sill trim panel.

Trunk Sill Trim Panel Remove

2. Mark the location of tail gate striker relative to the vehicle body.
3. Remove 2 bolts fixing the tail gate striker to the body, and remove the tail gate striker.



SC253242

Refit

1. Pre-fasten the tail gate striker according to the mark of its location relative to the vehicle body.
2. Open and close the tail gate several times, check and adjust the fit clearance and flushness between the tail gate and the surrounding panels by moving the bottom panel of the striker.
3. Make sure that the tail gate lock is fully locked.
4. Fit 2 bolts fixing the striker to the body, tighten them to **19-25Nm**, and check the torque.
5. Fit the trunk sill trim panel.

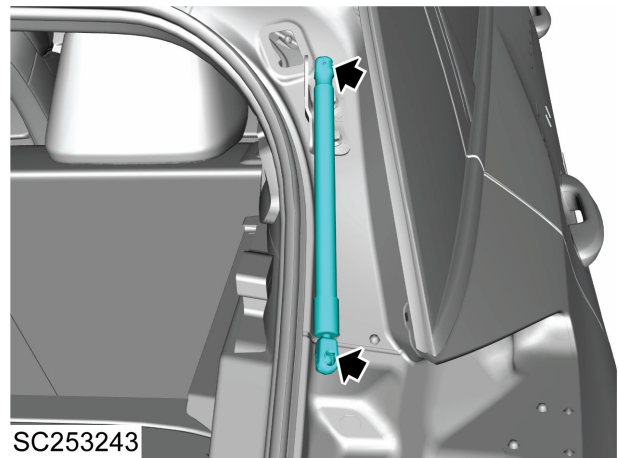
Trunk Sill Trim Panel Refit

Tail Gate Gas Spring Assembly Remove

1. Open the tail gate, and make sure that it is reliably supported to keep it open during removal.

Warning : *Due to heavy tailgate, safety stands shall be set before operation, and pay special attention to avoid vehicle damage and personal injury.*

2. Pry off the steel spring retaining clips at both ends of right (left) air springs, unplug the ball head sockets at both ends from the ball heads of the tail gate, and remove the tail gate air spring.



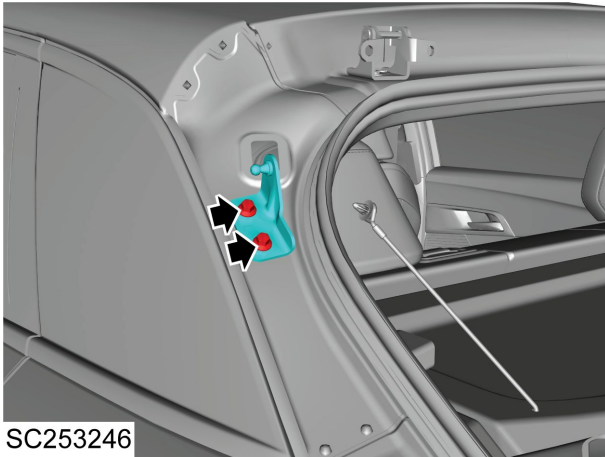
SC253243

3. Remove 1 bolt fixing the ball head mounting brackets of the air spring at right (left) tail gate end to the tail gate, and remove the ball head mounting brackets of the air spring at tail gate end.



SC253245

4. Remove 2 bolts fixing the ball head mounting brackets of the air spring at right (left) tail gate end to the body, and remove the ball head mounting brackets of the air spring at body end.



Refit

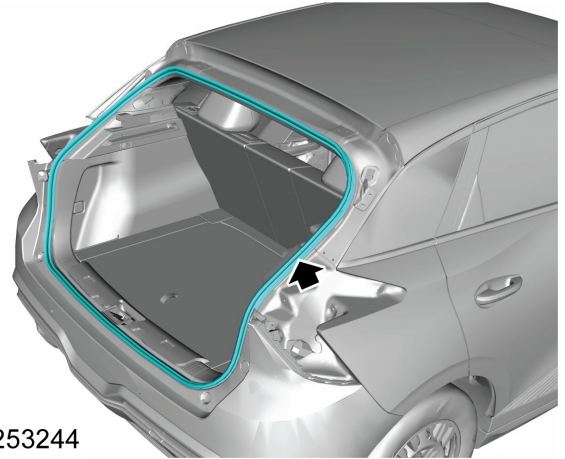
1. Fit 2 bolts fixing the ball head mounting bracket of air spring at right (left) body end to the body, tighten them to **19-25Nm**, and check the torque.
2. Fit 1 bolt fixing the ball head mounting bracket of air spring at right (left) tail gate end to the tail gate, tighten it to **19-25Nm**, and check the torque.
3. Align the ball head socket at sleeve end of air spring with the ball head on the mounting bracket at right (left) body end, and make sure the air spring piston is downward.
4. Hold the sleeve end and press the ball head socket hard to the ball head; a "crack" sound indicates the completion of the fitting.

Caution : To avoid damaging the airtightness of the air spring, never hold the centre of the air spring and laterally apply force to it by hand.

5. Align the ball head socket at piston end of right (left) air spring with the ball head on the tail gate, hold the end of the piston, push the ball head socket onto the ball head with thumb forcibly. If the two parts are fitted well, a "crack" sound will be heard.
6. Fit steel spring pieces to the ball head sockets at both ends of right (left) air spring, and ensure that they are properly located in the spring piece slots.

Tail Gate Weatherstrip Remove

1. Open the tail gate, and make sure it is securely supported during removal.
2. Carefully pull out and remove the tail gate weatherstrip.



Refit

1. Open the tail gate and ensure it is firmly supported during fitting.
2. Align the tail gate weatherstrip joint with the seam allowance close to the panel centre in the left tail lamp mounting area and insert the weatherstrip into the seam allowance.
3. Insert the weatherstrip from the joint position into the seam allowance from top to bottom in both the clockwise and counterclockwise directions respectively.
4. Tap the weatherstrip in place with the rubber hammer.

Door & Lid System

Tailgate Bumper

Remove

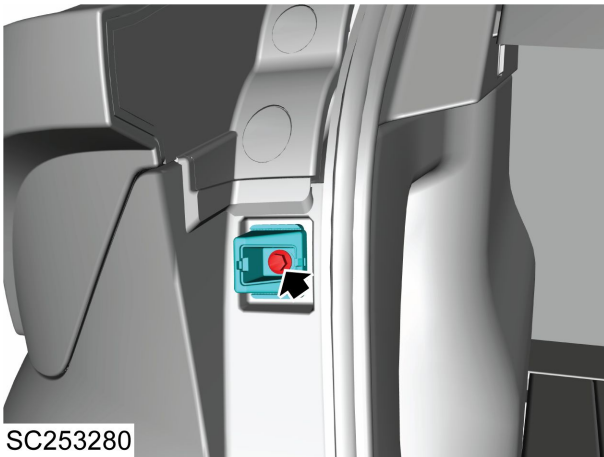
1. Open the tail gate, and make sure that it is reliably supported to keep it open during removal.

Warning : *Due to heavy tailgate, safety stands shall be set before operation, and pay special attention to avoid vehicle damage and personal injury.*

2. Remove 1 bolt fixing the tail gate buffer block to the tail gate.



3. Pry open the cover plate of the tail gate buffer block, and remove 1 bolt fixing the tail gate buffer block to the body.



Refit

1. Fit 1 bolt fixing the tail gate bumper block to the body, tighten it to **7-10Nm**, and check the torque.
2. Fit the tail gate bumper block cover plate.
3. Fit 1 bolt fixing the tail gate bumper block to the tail gate, tighten it to **7-10Nm**
4. Close the tail gate.

Fender**Specification****New sTOTopic**

Description	Value
Bolt-fender to body	7-10Nm
Nut-fender to body	7-10Nm

Service Guide

Fender
Remove

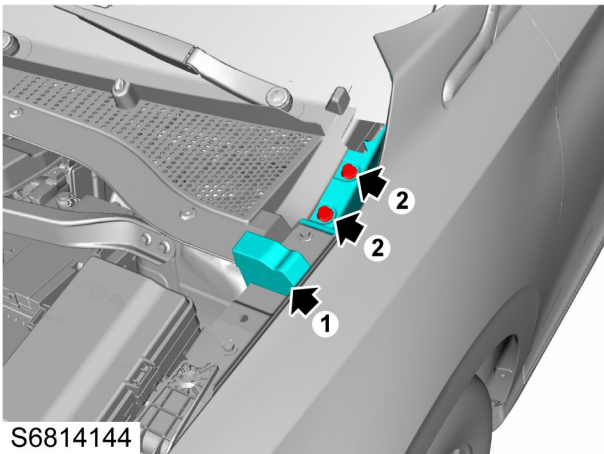
1. Remove the headlamp assembly.

 **Headlamp Assembly Remove**

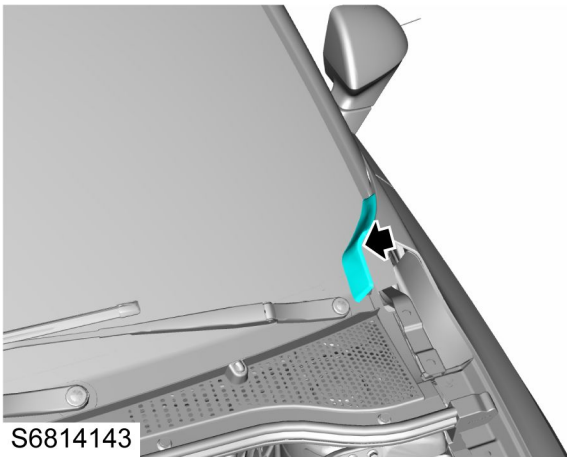
2. Remove the front wheelhouse liner.

 **Front Wheelhouse Liner Remove**

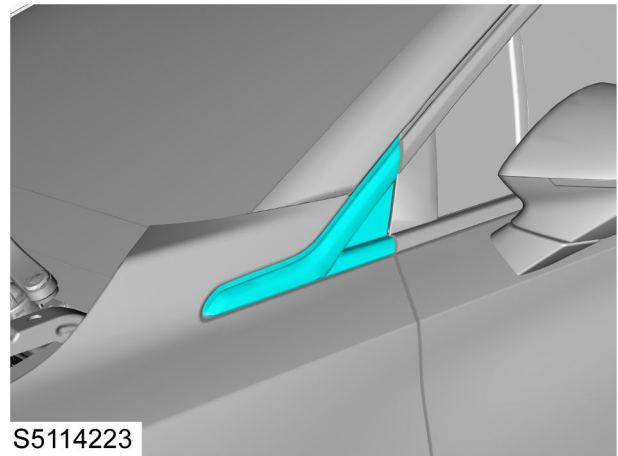
3. Remove the A/C air inlet grille assembly side water retaining block (1), and remove 2 split pins (2) fixing the A/C air inlet grille panel seals to the A/C air inlet grille assembly.



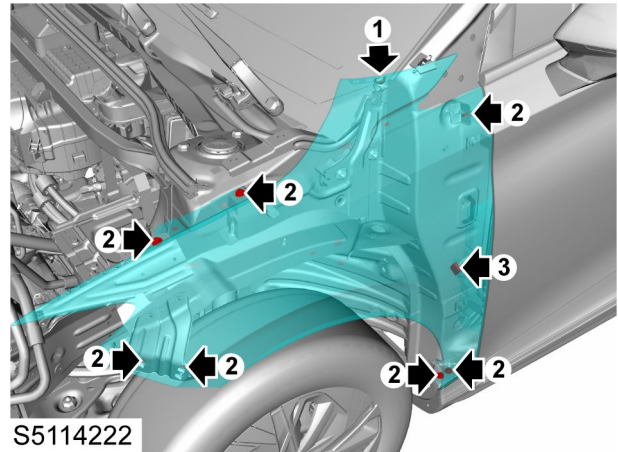
4. Release the clips at the side corners of the A/C air inlet grille, and remove the side corners.



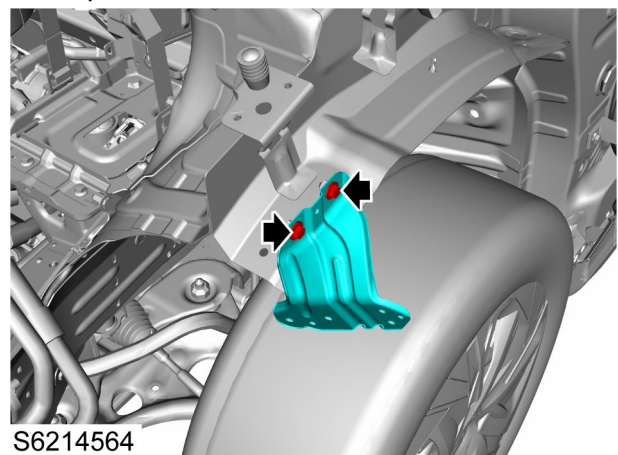
5. Loosen the clips, and remove the windscreen trim cover.



6. Open the front door, and remove 1 screw (1) fixing the fender to the body.
7. Remove the soundproof cotton, remove 7 bolts (2) and 1 nut (3) fixing the fender to the body, and remove the fender.



8. If necessary, remove 2 bolts fixing the fender to the body, and remove the fender bracket.



Refit

1. If removed, fix the fender bracket to the body, fit and tighten 2 bolts.
2. Locate the fender on the body, fit the fasteners and pre-tighten them.
3. Adjust the clearance between the fender and adjacent panels. For clearance information, please refer to "Body

Dimension" in the "Body Panel and Painting" section.

**Front End Information**

4. Fit the windscreen trim cover, and press the clip in place.
5. After adjustment, tighten 7 bolts fixing the fender to the body to **7-10Nm**; tighten 1 nut fixing the fender to the body to **7-10Nm**; tighten 1 screw fixing the fender to the body to **7-10Nm**; check the torque, and fit the soundproof cotton.
6. Fit the A/C air inlet grille side corner and press the clip in place.
7. Fit the A/C air inlet grille panel seal and press the clip in place.
8. Fit the A/C air inlet grille panel side seal.
9. Fit the front wheelhouse liner.

**Front Wheelhouse Liner Refit**

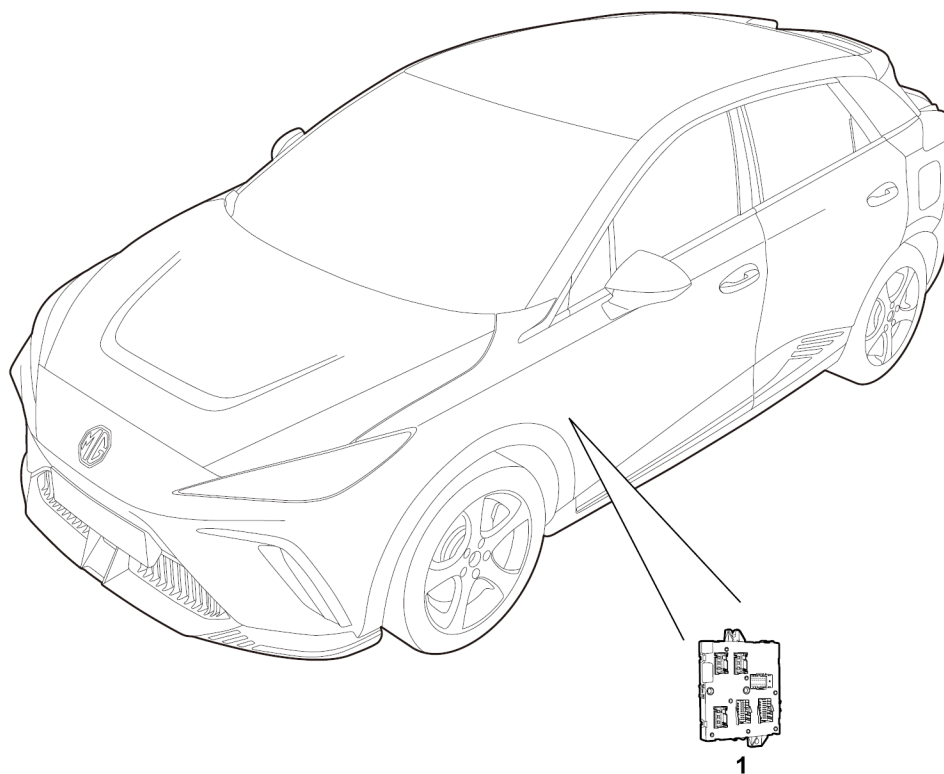
10. Fit the headlamp assembly.

**Headlamp Assembly Refit**

Body Control

Description and Operation

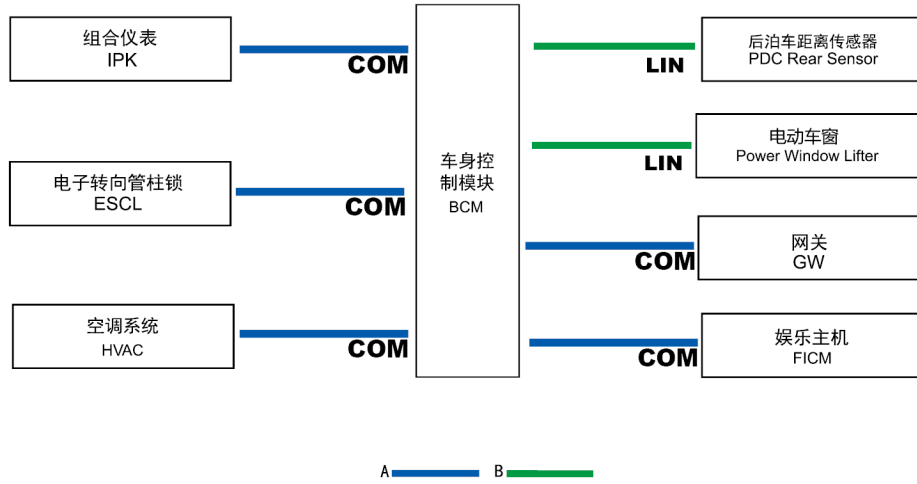
System Layout



S8361178

I. Body Control Module

System Control Diagram



S8360241

A = Comfort CAN Bus; B = LIN Bus

Description

Mounting position:

The BCM is located behind the driver side lower trim panel.

The BCM includes the microprocessor, memory, electrically erasable programmable read-only memory (EEPROM), CAN, LIN transceiver and power supply in low power mode. The BCM contains discrete input/output terminals which control most of the body functions. It interacts with other primary electrical systems through the HSCANbus and with other secondary electrical systems through the LINbus. The power mode master control module (PMM) of the BCM provides power for most of the vehicle electric components.

The BCM communicates directly with the following components through the body HSCANbus:

- IPK (Instrument Pack) (
- HVAC
- FLSM (Front Left Seat Module)
- FICM (Front Infotainment Control Module)
- PACM (Pedestrian Alert Control Module)
- ESCL (Electronic Steering Column Lock)
- GW

The BCM communicates directly with the following components through the LINbus:

- PDC (Parking Distance Control)
- PWL (Power Window Regulator Motor)

Operation

Overview

When the start switch is in "ACC" position, the BCM allows the washer/wiper, the power window system and some lighting systems to operate. When the start switch is in "ON/RUNNING" position, the BCM communicates with and transmits information to other ECU through CAN and LIN buses.

Load Management

The BCM can manage the load of some electric appliances by configuration and ensure low battery power consumption during storage and transportation or idle time.

Production Mode

It is configured for the BCM during vehicle assembly.

Transportation Mode

After vehicle assembly, programme the BCM so that the transportation mode can be used during transportation. And low battery problem can be avoided when the factory delivers the vehicle to the MG Authorised Repairer. This mode may restrict the function of some electric appliances:

- The rear fog lamp does not work when the engine is off.
- The high beam headlamp does not work when the engine is off.
- The low beam headlamp does not work when the engine is off.
- The reverse lamp does not work when the engine is off.
- The direction indicator lamp does not work when the engine is off.
- The daytime running lamp does not work when the engine is off.
- "Follow Me Home" and "Vehicle Locating" cannot be used.
- If the engine is disabled, the hazard warning lamp backlight does not work, but the function of this lamp is not affected.
- The auto lamp control does not work when the engine is off.
- When the engine is disabled, the window can be ascended, but cannot be descended.

With the aftermarket diagnostic tool, the MG Authorised Repairer can shift the vehicle load management configuration from transportation mode to normal mode.

Normal Mode

This mode applies the default setting, after completion of the PDI, the vehicle can enter into normal operation.

Sleep Mode

With the start switch off, and the BCM and LIN buses disabled, if the battery is still connected, the BCM will stay in sleep mode and be always ready for receiving the wake-up signal.

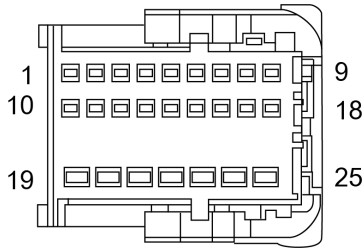
Wake-up Mode

In sleep mode, when one of the following operations is done, the BCM will be waken up.

- Activation signal of hazard warning lamp switch is received.
- Activation signal of direction indicator lamp switch is received.
- LOCK signal of internal lock is received.
- UNLOCK signal of internal lock is received.
- Activation signal of driver door switch is received.
- Activation signal of passenger door switch is received.
- Activation signal of bonnet switch is received.
- Activation signal of tail gate switch is received.
- Activation signal of tail gate release switch is received.
- Activation signal of driver door lock switch is received.
- Activation signal of driver door unlock switch is received.
- The start switch is in "ACC" position.
- The start switch is in "ON/RUNNING" position.
- Signal of depressing brake pedal
- SSB (PEPS)
- Activation signal of internal lamp switch
- Wake-up signal from LIN bus
- Wake-up signal from CAN bus
- Wake-up signal from local hard wire
- Valid radio frequency signal

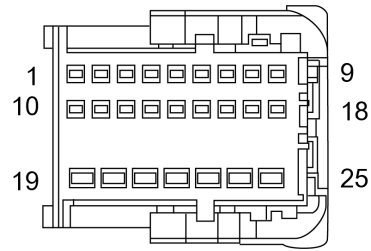
Detailed Information List of Pins

End View and Pin Information of BCM Harness Connector BY001



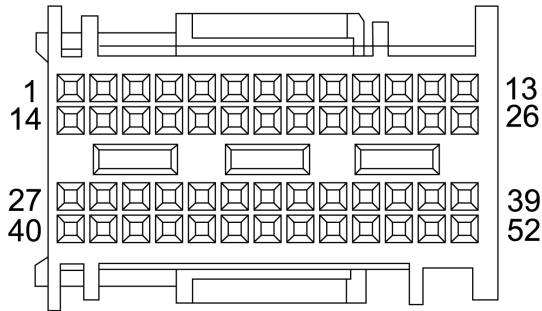
Pin No.	Description
1	-
2	-
3	DRVFuelFlapLckMot_DRV+
4	Tail Gate Lock_DRV
5	-
6	-
7	-
8	BCM_LIN4
9	BCM_LIN6
10	-
11	Ground 2
12	Left Tail Lamp Assembly_HSD
13	PosLamp_F_HSD
14	-
15	Left Tail Lamp Assembly_DIAG_SIG
16	BCM_LIN1
17	BCM_LIN8
18	-
19	Ground 6

End View and Pin Information of BCM Harness Connector BY002



Pin No.	Description
1	-
2	CotsyRoofLamp_HSD
3	-
4	TmdDlyLamp_HSD
5	-
6	-
7	High-mounted Stop Lamp_HSD
8	PosLamp_R_HSD
9	-
10	-
11	-
12	-
13	Trunk Lamp_HSD
14	WakeupEnable
15	License Plate Lamp_HSD
16	Reverse Lamp_HSD
17	Brake Lamp_RH_HSD
18	Rear Fog Lamp_HSD
19	DoorLckMot_DRV+
20	DoorLckMot_DRV
21	-
22	-
23	KL30.2
24	-
25	-

End View and Pin Information of BCM Harness Connector BY003



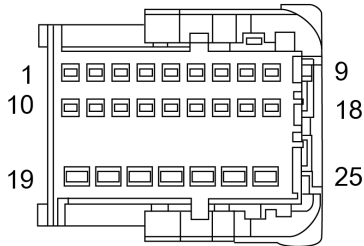
Pin No.	Description
1	MstrLckStsIndr_HSD
2	MstrLck/UnlckSw_SIG
3	-
4	-
5	Ground I
6	Front Passenger Passive Entry Switch_SIG
7	-
8	-
9	Driver Passenger Passive Entry Switch_SIG
10	Left Rear Window Motor Down Relay_DRV
11	-
12	Right Rear Window Motor Up Relay_DRV
13	-
14	-
15	BLISIndr_RH_HSD
16	BLISIndr_LH_HSD
17	DoorAjarSw_FP_SIG
18	-
19	Tail Gate Opening Switch ON_SIG
20	Tail Gate Opening Switch OFF_SIG
21	ChrgFlapDoorAjarSw_SIG
22	DoorAjarSw_DP_SIG

23	Right Rear Window Down Relay_DRV
24	Front Passenger Window Motor Down Relay_DRV
25	Front Passenger Window Motor Up Relay_DRV
26	Left Rear Window Motor Up Relay_DRV
27	PEPS Rear Bumper Antenna Ground
28	PEPS Rear Bumper Antenna Power Supply
29	PEPS Interior Rear Antenna Power Supply
30	PEPS Interior Rear Antenna Ground
31	DWSP_RRAutoSw_SIG
32	DWSP_RLDwnSw_SIG
33	DWSP_RLAutoSw_SIG
34	DoorAjarSw_RL_SIG
35	Driver Door Lock UNLOCK/LOCK_SIG
36	PDWSPUpSw_SIG
37	-
38	-
39	CAN_H
40	Front Passenger Door Antenna Power Supply
41	Front Passenger Door Antenna Ground
42	Driver Door Antenna Ground
43	Driver Door Antenna Power Supply
44	DWSP_RRDwnSw_SIG
45	DWSP_RRUpSw_SIG
46	DWSP_RLUpSw_SIG
47	PDWSPAUTOsw_SIG
48	DoorAjarSw_RR_SIG
49	PDWSPDwnSw_SIG
50	-

Body System

51	-
52	CAN_L

End View and Pin Information of BCM Harness Connector FC002

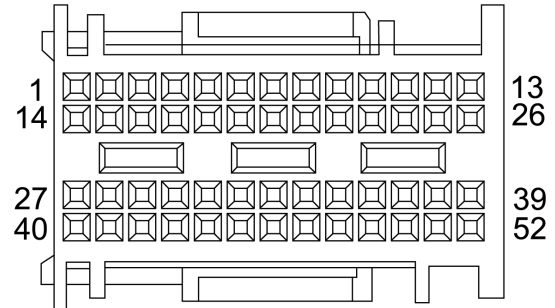


Pin No.	Description
1	Front Right Direction Indicator Lamp_HSD
2	-
3	Right Front Low Beam_HSD
4	Right Headlamp_HSD
5	Left Front Low Beam_HSD
6	Left Headlamp_HSD
7	-
8	KL.I5SwdPwrRelay_DRV
9	IGN Relay_DRV
10	-
11	-
12	-
13	-
14	Front Left Daytime Running Lamp_HSD
15	Front Left Direction Indicator Lamp_HSD
16	-
17	-
18	-
19	KL30.1
20	KL30.3
21	KL30.5
22	KL30.6

Body Control

23	-
24	-
25	KL30.7

End View and Pin Information of BCM Harness Connector FA001

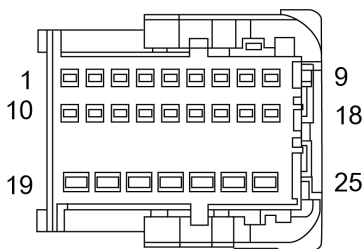


Pin No.	Description
1	-
2	Light Lever Switch_SIG
3	-
4	DrvrDetnSnsrRefc_SIG
5	-
6	-
7	KL.RPwrRelay_DRV
8	-
9	-
10	Mobile Phone Wireless Charging Enb
11	-
12	-
13	-
14	-
15	-
16	HzrdSw_SIG
17	IgnRelay
18	-
19	Light Stalk Switch Ground
20	CrashOut
21	-
22-25	-
26	Horn Switch_SIG

Body Control

27	-
28	FrtWiperIntmtSw_SIG
29	LghtSnsr_PWR
30-35	-
36	LghtSW_SIG
37	-
38	PEPS Interior Front Antenna Power Supply
39	PEPS Interior Front Antenna Ground
40	MainBeamSw_SIG
41	-
42	LghtSnsr_SIG
43	FrtWndsrnWshSw_SIG
44	FrtWiperSw_SIG1
45	-
46	-
47	-
48	FrtWiperSw_SIG2
49	-
50	-
51	PEPS Interior Middle Antenna Power Supply
52	PEPS Interior Middle Antenna Ground

End View and Pin Information of BCM Harness Connector BY001

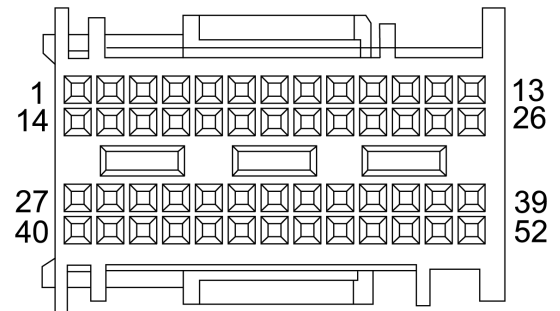


Pin No.	Description
1	-
2	-
3	DRVFuelFlapLckMot_DRV+

Body System

4	Tail Gate Lock_DRV
5	-
6	-
7	-
8	BCM_LIN4
9	BCM_LIN6
10	-
11	Ground 2
12	Left Tail Lamp Assembly_HSD
13	PosLamp_F_HSD
14	-
15	Left Tail Lamp Assembly_DIAG_SIG
16	BCM_LIN1
17	BCM_LIN8
18	-
19	Ground 6

End View and Pin Information of BCM Harness Connector FC001



Pin No.	Description
1	-
2	-
3	-
4	Front Wiper Switch_SIG
5	Left Headlamp Assembly Input
6	-
7	-
8	-

Body System**Body Control**

9	Brake Lamp Switch_SIG
10	-
11	-
12	-
13	Bonnet Open Switch_SIG
14	-
15	-
16	-
17	-
18	-
19	Right Headlamp Assembly Input
20	-
21-22	-
23	BCM_LIN7
24	
25	DrvrDetnSnsr_SIG
26	-
27	-
28	Windscreen Washer Relay_DRV
29	-
30	-
31	-
32	-
33-39	-
39	Front Wiper Speed Relay_DRV
40	-
41	Horn Relay_DRV
42	-
43	-
44	-
45	-
46	-
47	-
48	-
49	-
50	-

51	-
52	Front Wiper Enable Relay_DRV

Service Guide**Body Control Module (BCM)****Remove**

1. Disconnect the negative battery cable.
2. Remove the driver side lower closure panel.

 **Instrument Panel Lower Closure Panel**

3. Disconnect the harness connector (1) of the BCM.
4. Remove 2 bolts (2) fixing the BCM to the body, and remove the BCM.

**Refit**

1. Connect the harness connector of the BCM.
2. Connect the negative battery cable.
3. Programme and encode the BCM.



4. Fix the BCM to the body, fit 2 bolts, tighten them to **5-7Nm**, and check the torque.
5. Fit the driver side lower closure panel.

 **Instrument Panel Lower Closure Panel**

Front-end Module**Specification****New sTOTopic**

Description	Value
Bolt-water tank upper cross member to front buffer beam support	7-10Nm
Bolt-water tank upper cross member bracket to body	7-10Nm
Bolt-evaporation tank pipeline to water tank upper cross member	7-10Nm
Bolt-water tank upper cross member bracket to water tank upper cross member	7-10Nm
Bolt-front buffer beam support to body	19-25Nm

Service Guide

Upper Radiator Beam Remove

1. Remove the front bumper.

 **Front Bumper Remove**

2. Remove the beauty cover.

 **Beauty Cover Remove**

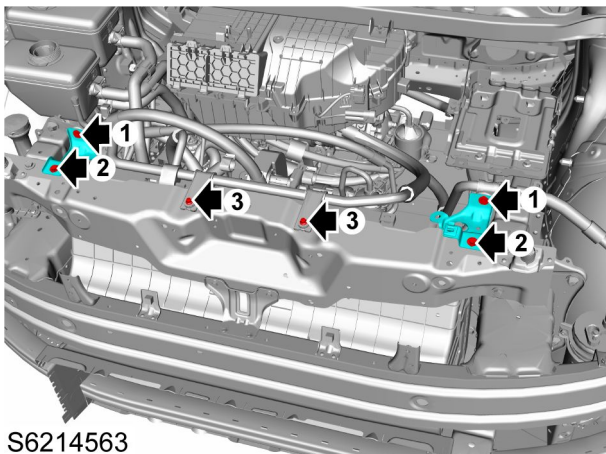
3. Remove the bonnet lock.

 **Bonnet Lock Assembly Remove**

4. Remove the bonnet support rod.

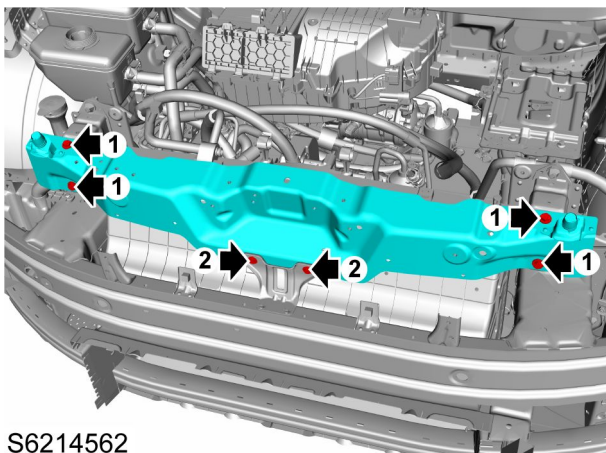
 **Bonnet Support Rod Remove**

5. Remove 2 bolts (1) fixing the upper radiator beam bracket to the body.
6. Remove 2 bolts (2) fixing the upper radiator beam bracket to the upper radiator beam, and remove the upper radiator beam bracket.
7. Remove 2 bolts (3) fixing the pipeline - A/C evaporator to compressor to the upper radiator beam, and remove the pipeline harness.



S6214563

8. Remove 4 bolts (1) fixing the upper radiator beam to the body.
9. Remove 2 bolts (2) fixing the upper radiator beam to the front bumper beam bracket, and remove the upper radiator beam.



S6214562

Refit

1. Locate the upper radiator beam to the body.
2. Fit 2 bolts fixing the upper radiator beam to the front bumper beam bracket, tighten them to **7-10Nm** and check the torque.
3. Fit 4 bolts fixing the upper radiator beam to the body, tighten them to **7-10Nm** and check the torque.
4. Fit 2 bolts fixing the pipeline - A/C evaporator to compressor to the upper radiator beam, tighten them to **7-10Nm**, and check the torque.
5. Fit 2 bolts fixing the upper radiator beam bracket to the upper radiator beam, tighten them to **7-10Nm** and check the torque.
6. Fit 2 bolts fixing the upper radiator beam bracket to the body, tighten them to **7-10Nm** and check the torque.
7. Fit the bonnet support rod.

 **Bonnet Support Rod Refit**

8. Fit the bonnet lock.

 **Bonnet Lock Body Refit**

9. Fit the beauty cover

 **Beauty Cover Refit**

10. Fit the front bumper.

 **Front Bumper Refit**

Front Bumper Beam Remove

1. Remove the front bumper.

Front Bumper Remove

2. Remove the gas-liquid separator (If equipped).

Gas-Liquid Separator (If equipped) Remove

3. Remove the windscreen washer reservoir.

Windscreen Washer Reservoir Remove

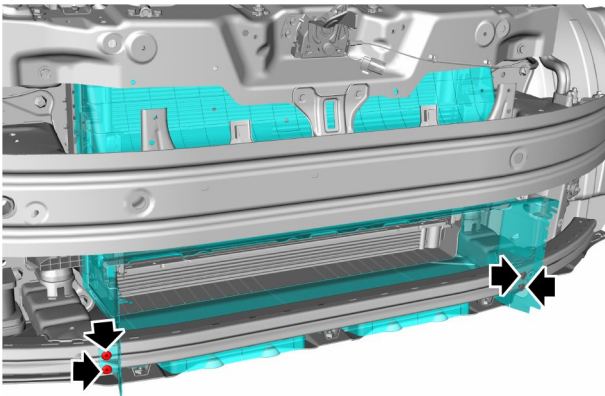
4. Remove the pedestrian alert speaker.

Pedestrian Alert Speaker Remove

5. Remove the horn.

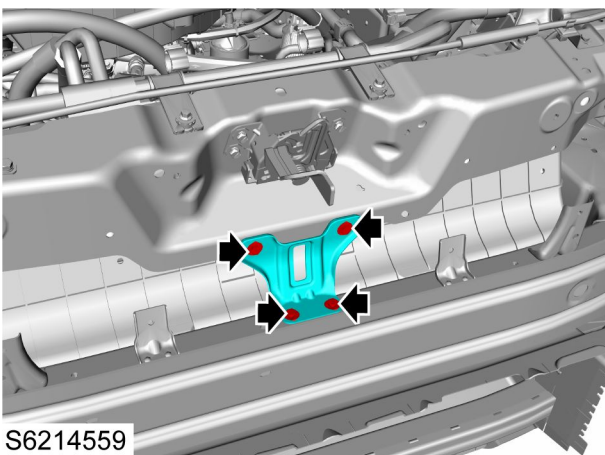
Horn Remove

6. Remove 4 split pins fixing the A/C box wind scooper to the front bumper beam.



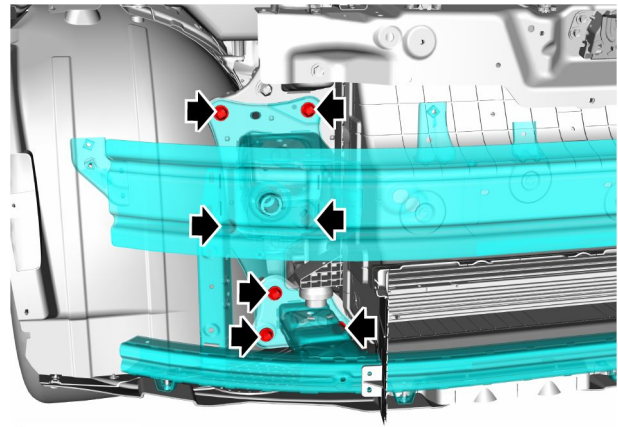
S6214561

7. Remove 4 bolts fixing the front bumper beam bracket to the front bumper beam and the upper radiator beam, and remove the front bumper beam bracket.



S6214559

8. Remove 7 bolts fixing the front bumper beam to the left (right) side of the body, move the wind scooper away and remove the front bumper beam.



S6214558

Refit

1. Locate the front bumper beam to the body, and locate the A/C box wind scooper to the front bumper beam.
2. Fit 4 bolts fixing the front bumper beam bracket to the front bumper beam and the upper radiator beam, tighten them to **19-25Nm** and check the torque.
3. Fit 4 split pins fixing the A/C box wind scooper to the front bumper beam, and press them in place.

4. Fit the horn.

Horn Refit

5. Fit the pedestrian alert speaker.

Pedestrian Alert Speaker Refit

6. Fit the windscreen washer reservoir.

Windscreen Washer Reservoir Refit

7. Fit the gas-liquid separator (If equipped).

Gas-Liquid Separator (If equipped) Refit

8. Fit the front bumper.

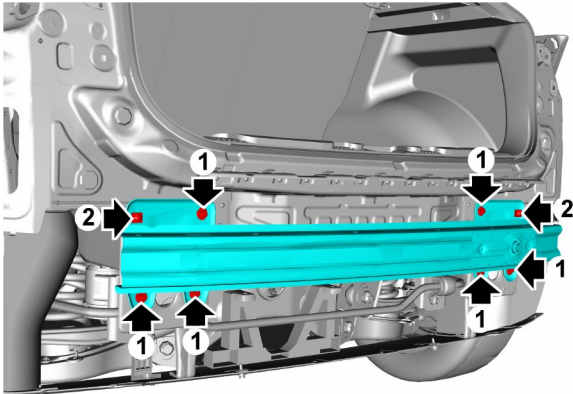
Front Bumper Refit

Rear Bumper Beam Remove

1. Remove the rear bumper assembly.

Rear Bumper Assembly Remove

2. Remove 6 bolts (1) and 2 nuts (2) fixing the rear bumper beam to the rear body.

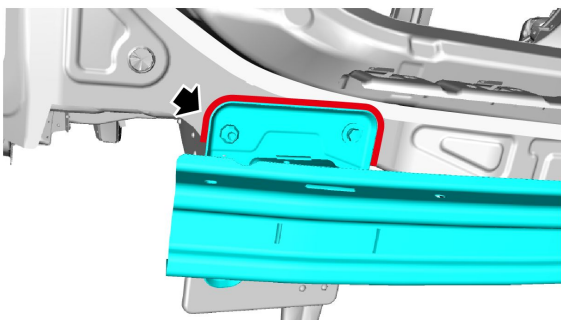


S6214557

3. With assistance, remove the rear bumper beam.

Refit

1. Locate the rear bumper beam to the body, fit 6 bolts and 2 nuts, tighten them to **19-25Nm**, and check the torque.
2. After installation, please seal the matching surface along the rear bumper beam with PVC glue on both side. The gluing width is 5-9mm and needs to be brushed (red area in the figure on rear bumper beam's left side, same with the right side), otherwise there will be a risk of water leakage.



S6214655

3. Fit the rear bumper assembly.

Rear Bumper Assembly Refit

Horn**Specification****Torque**

[A60110] 文档

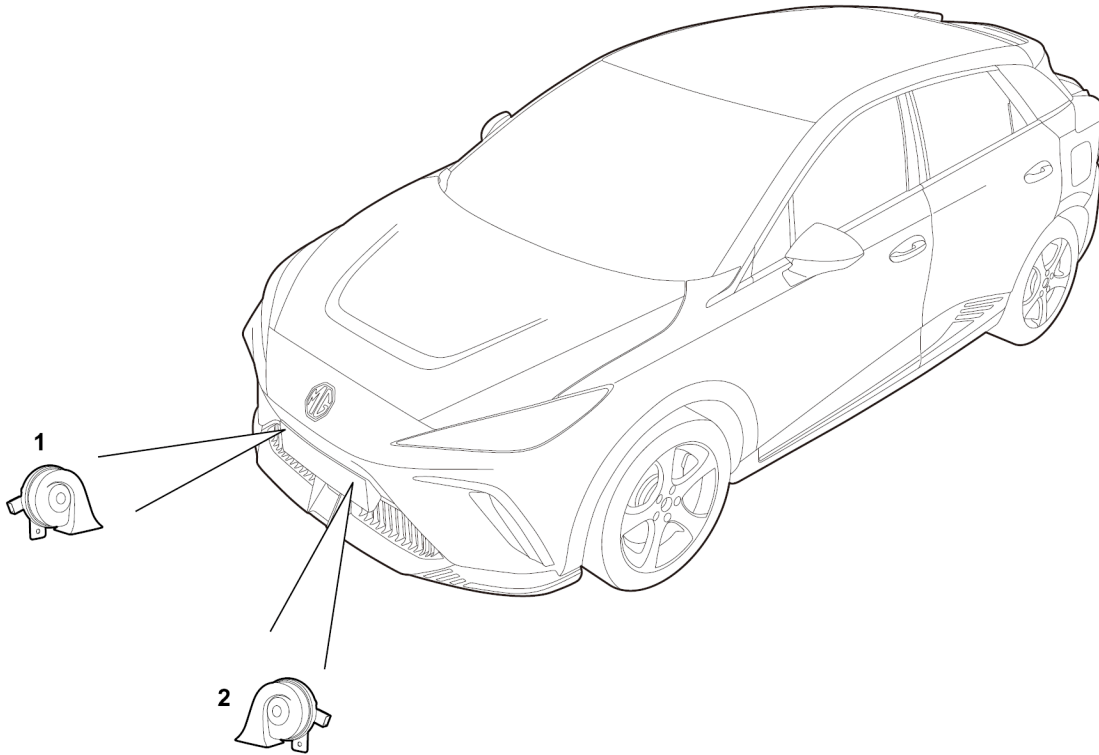
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中第 1546 行的引用 (topicref)

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Description and Operation
System Layout

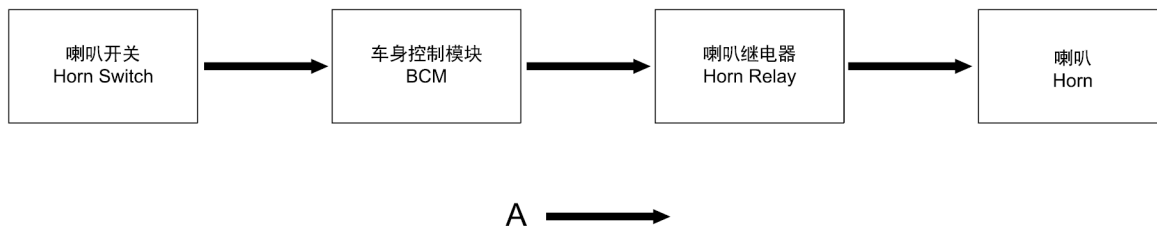


S8611250

1. Low Horn

2. High Horn

System Control Diagram

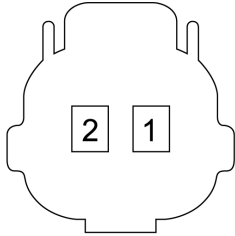


S8311001

A = Hard Wire

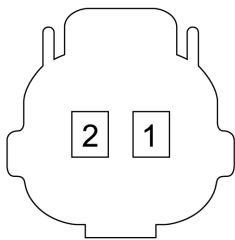
Detailed Information List of Component Pins

End View and Pin Information of Tweeter Harness Connector
FC033



Pin No.	Description
1	Power Supply
2	Ground

End View and Pin Information of Woofer Harness Connector
FC034



Pin No.	Description
1	Power Supply
2	Ground

Service Guide

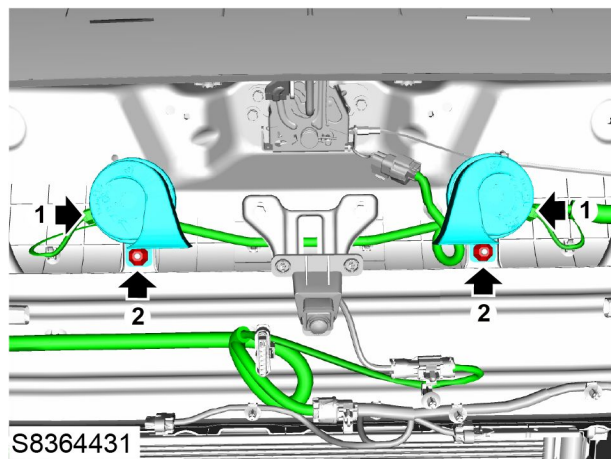
Horn

Remove

1. Disconnect the negative battery cable.
2. Remove the front bumper.

 Front Bumper

3. Disconnect the harness connector (1) of the tweeter/woofer.
4. Remove 1 nut (2) fixing the tweeter/woofer to the front bumper beam, and remove the tweeter/woofer.



Refit

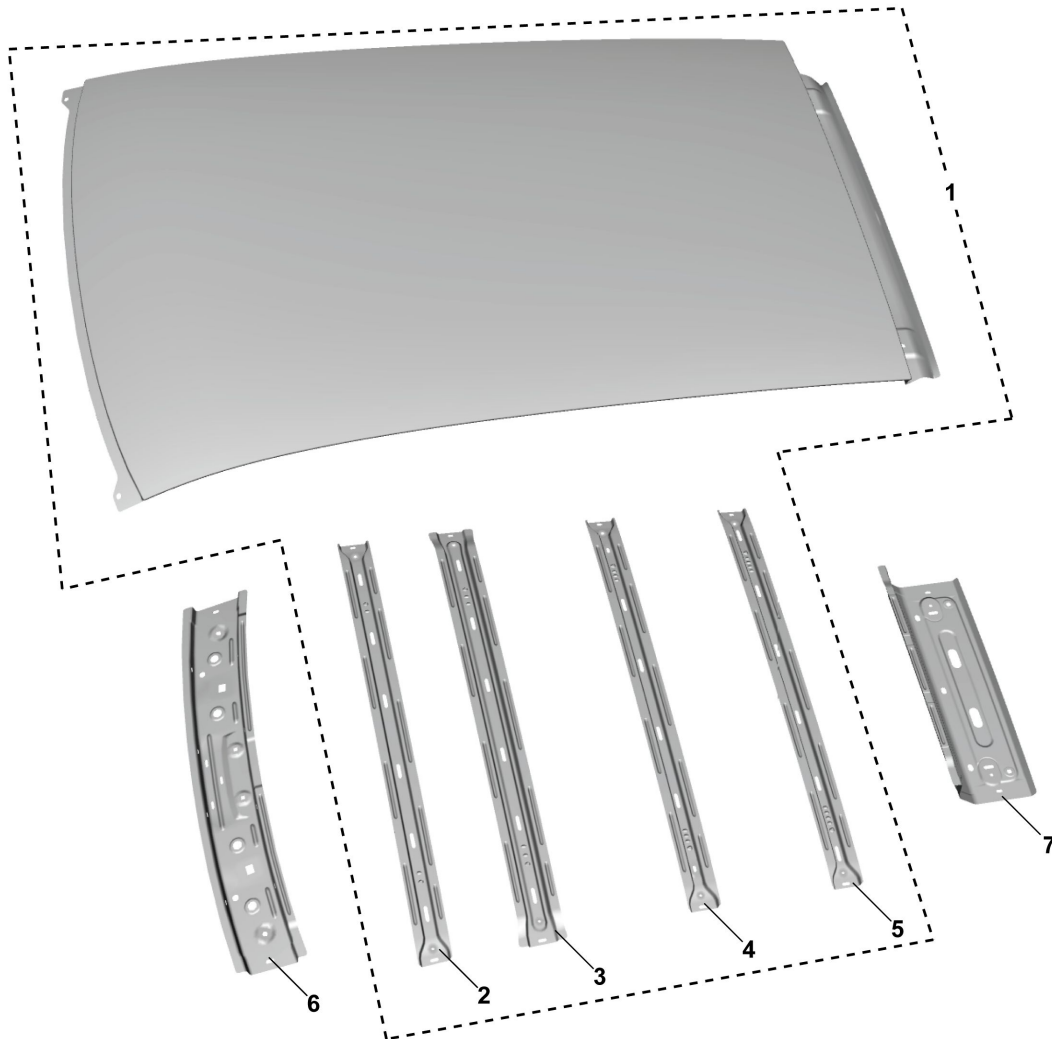
1. Fix the tweeter/woofer to the front bumper beam, fit 1 nut each, tighten them to **7-10N**, and check the torque.
2. Connect the harness connector of the tweeter/woofer.
3. Fit the front bumper.

 Front Bumper

4. Connect the negative battery cable.

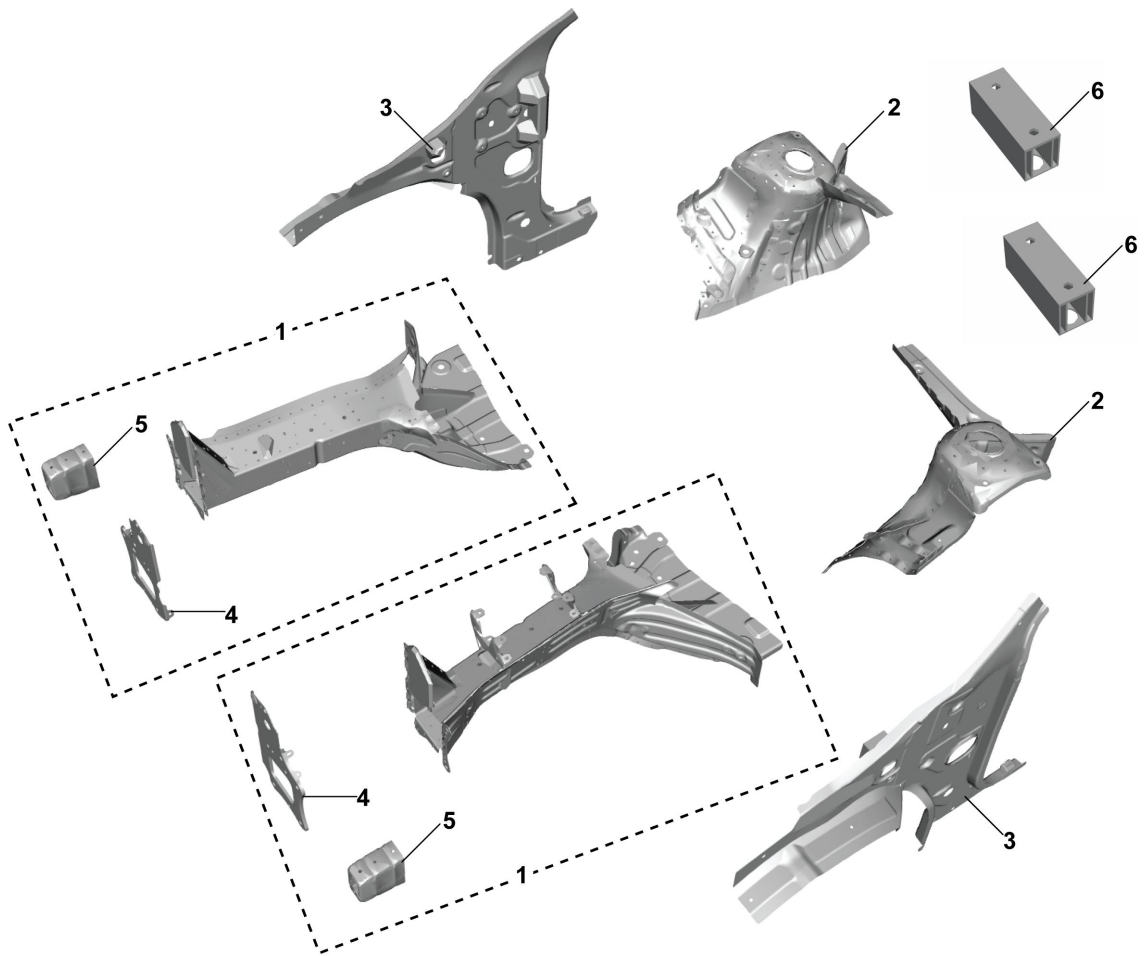
Serviceable Panels Information

Roof Panel



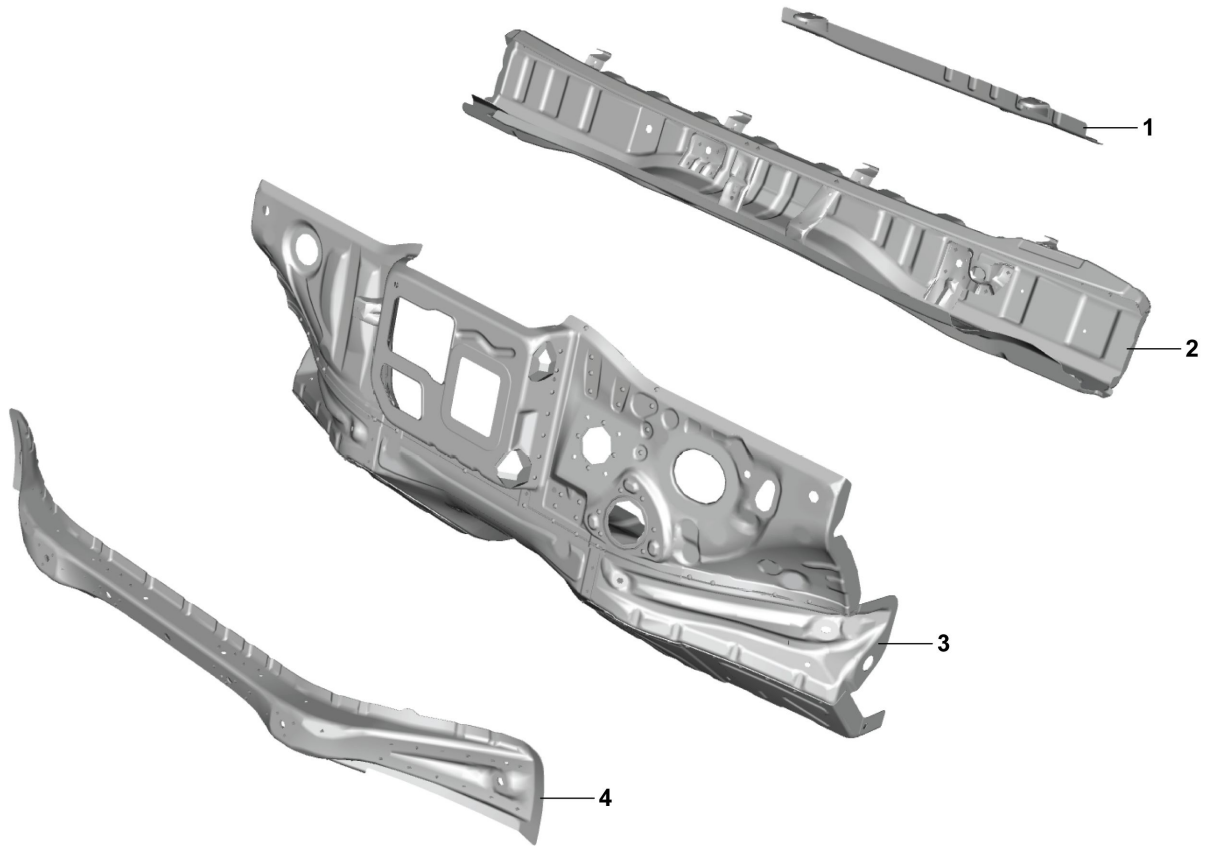
- 1. Roof Panel Assembly
- 2. Middle Roof No.1 Beam
- 3. Middle Roof No.2 Beam
- 4. Middle Roof No.3 Beam
- 5. Middle Roof No.4 Beam
- 6. Front Roof Beam Assembly
- 7. Rear Roof Beam Assembly

Engine Compartment Panel



- 1. Front Longitudinal Beam Assembly
- 2. Front Wheelhouse Assembly
- 3. A Pillar Inner Panel Assembly
- 4. Front Longitudinal Beam Front Bumper Bracket
- 5. Front Longitudinal Beam Energy Absorbing Box Subassembly
- 6. Power Battery Mounting Bracket Assembly

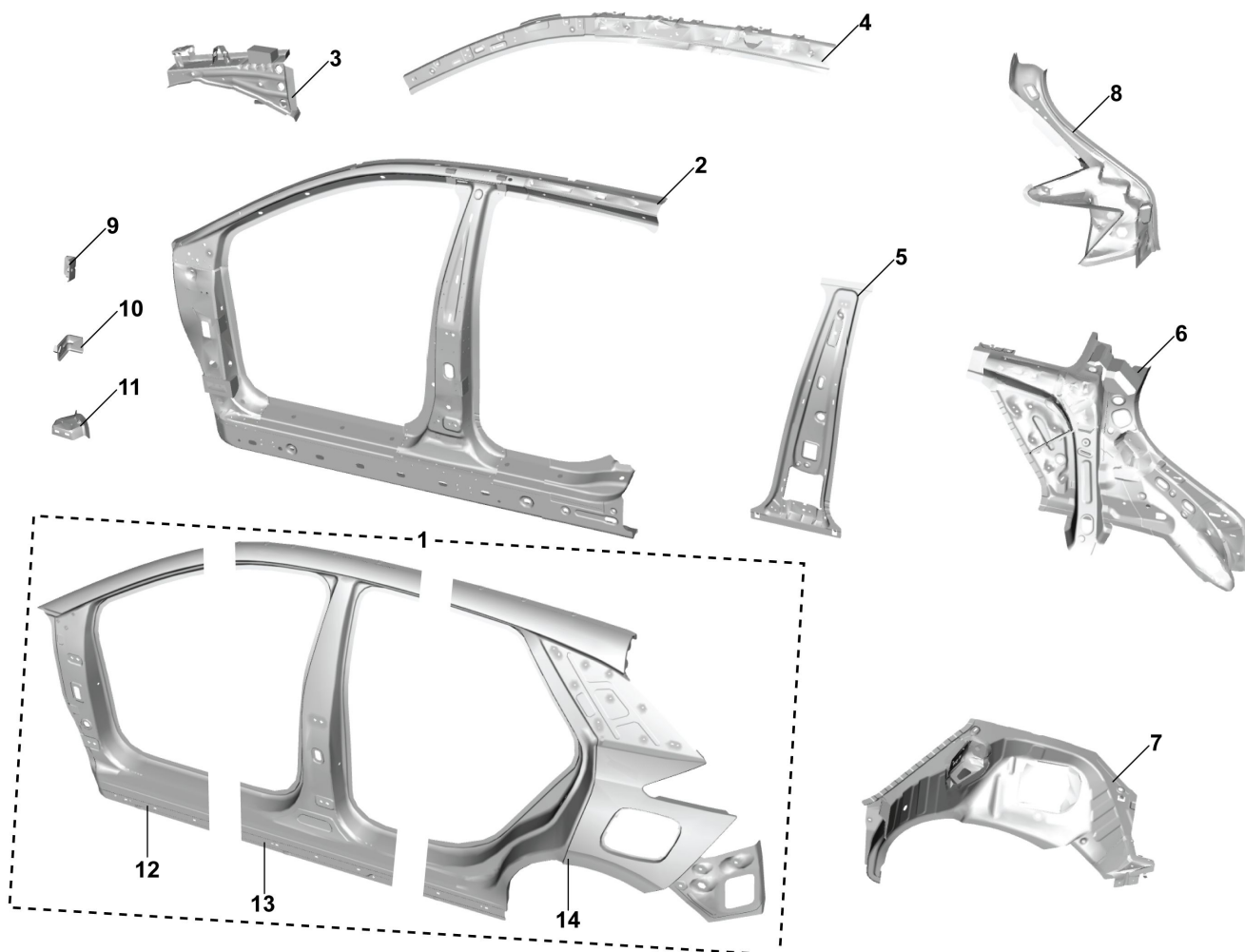
Dash Panel



- 1. Dash Panel Upper Beam Reinforcement
- 2. Vent Panel Assembly

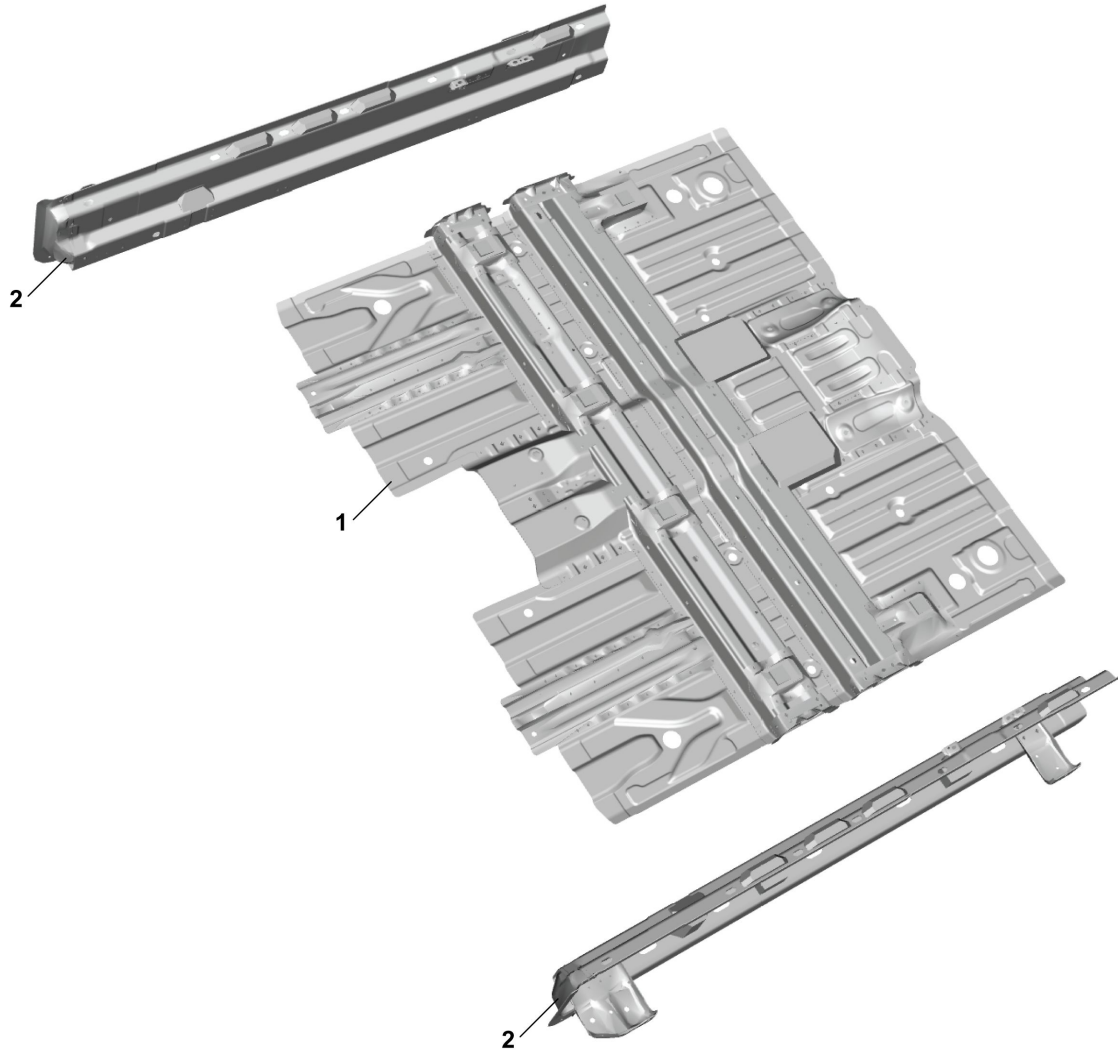
- 3. Dash Panel Assembly
- 4. Dash Panel Lower Beam Assembly

Bodyside Panel



- | | |
|--|---|
| 1. Bodyside Outer Panel | 8. Tail Lamp Mounting Panel Assembly |
| 2. Bodyside Outer Panel Reinforcement Panel Assembly | 9. Upper Front Fender Bracket Assembly |
| 3. Dash Panel Upper Beam Assembly | 10. Middle Front Fender Bracket Assembly |
| 4. Upper Side Beam Closure Panel Assembly | 11. Lower Front Fender Bracket Assembly |
| 5. B Pillar Inner Closure Panel Assembly | 12. Bodyside Outer Panel Assembly - Front |
| 6. Rear Bodyside Inner Panel Assembly | 13. Bodyside Outer Panel Assembly - Central |
| 7. Rear Wheelhouse Outer Panel Assembly | 14. Bodyside Outer Panel Assembly - Rear |

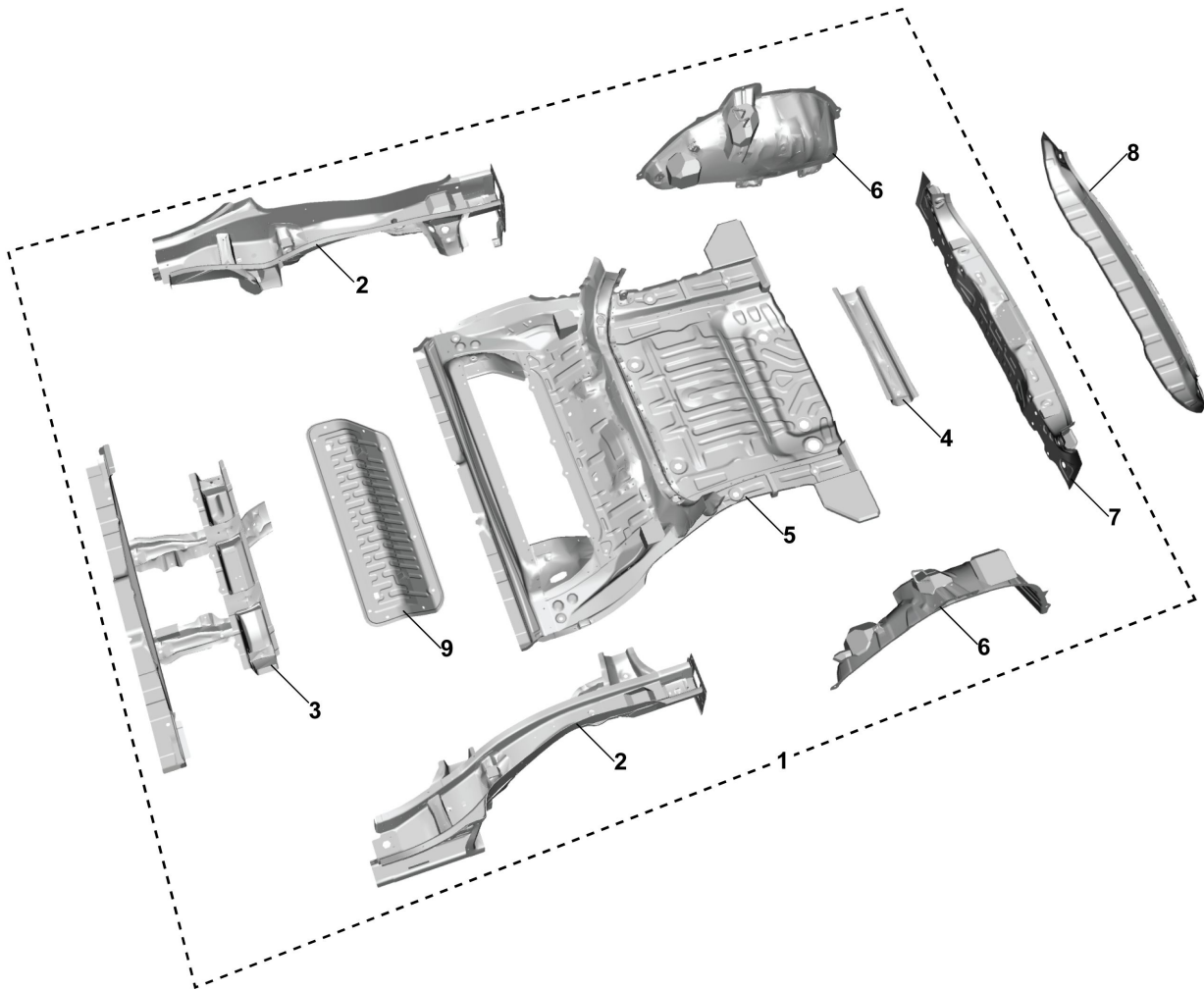
Front Floor



1. Front Floor Assembly

2. Door Sill Inner Panel Assembly

Rear Floor



- 1. Rear Floor Assembly
- 2. Rear Longitudinal Beam Assembly
- 3. Rear Longitudinal Beam Subassembly
- 4. Rear Floor Lower Beam Assembly
- 5. Rear Floor Subassembly
- 6. Rear Wheelhouse Inner Panel Assembly
- 7. Rear End Panel Reinforcement Assembly
- 8. Rear End Panel Assembly
- 9. Rear Seat Plate Assembly

Door Panel Assembly



1. Front Door Assembly

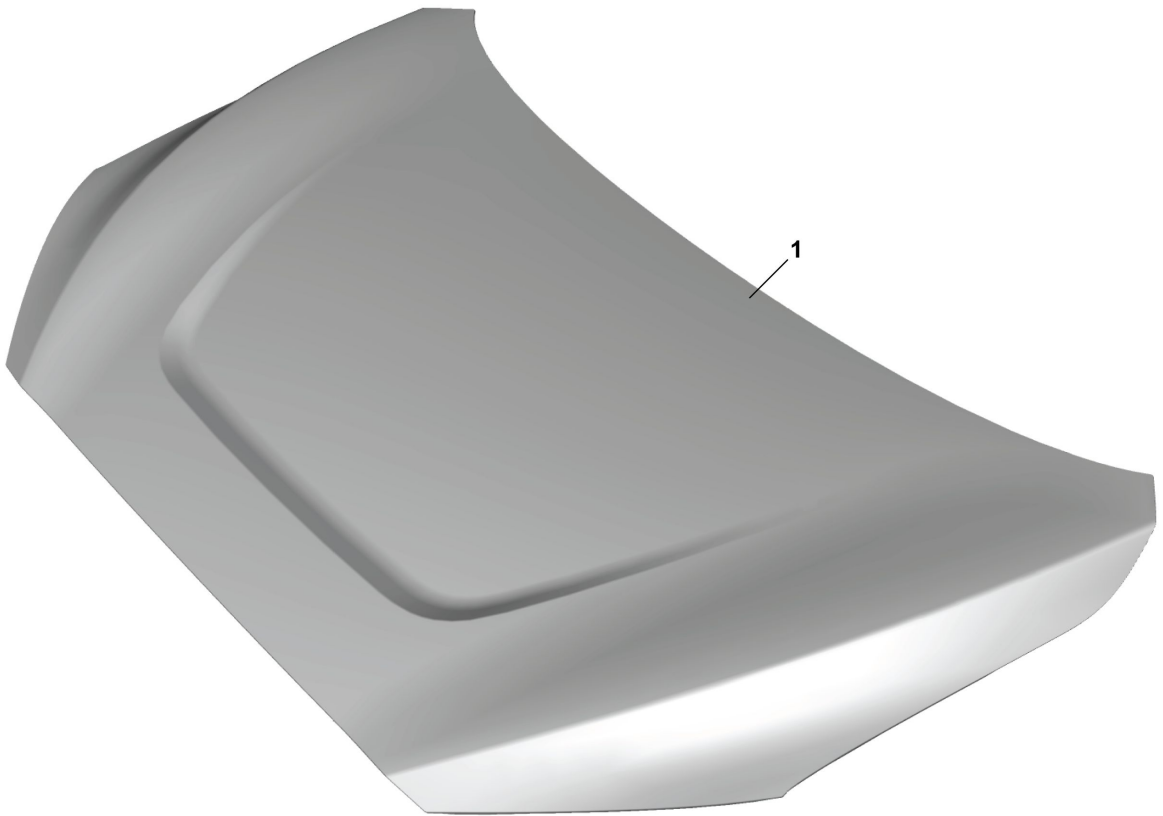
2. Rear Door Assembly

Tail Gate Panel Assembly



I. Tail Gate Assembly

Bonnet Panel Assembly



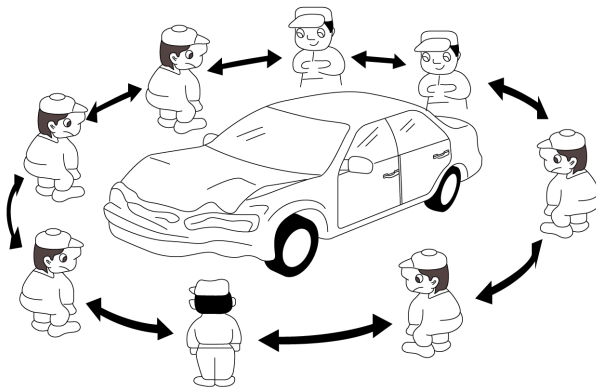
I. Bonnet Panel Assembly

Damage Diagnosis

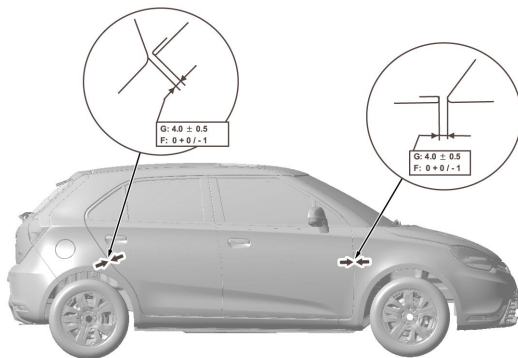
Damage Detection

During the damage detection, it is required to visually estimate the collided position, determine the collision direction and magnitude of collision force, and check the possible damage. For the vehicle damaged in an accident, it is required to ask about the speed at the moment when the accident takes place, and the position, direction and angle to the crash or rollover to grasp the impact form, position, angle, etc of the collided vehicle and intuitively determine the position damaged by the collision and the area that may be affected. A comprehensive inspection can also be conducted to the vehicle in combination with test drive and measuring equipment to confirm whether the underbody is deformed, whether the body suffers from overall damage and overall skew, whether the door can be opened smoothly, etc to determine the extent of damage and repair method.

1. Visual inspection to the vehicle



2. Visual inspection to the specific position

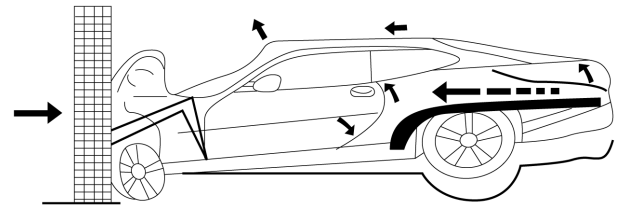


Identify all damaged positions

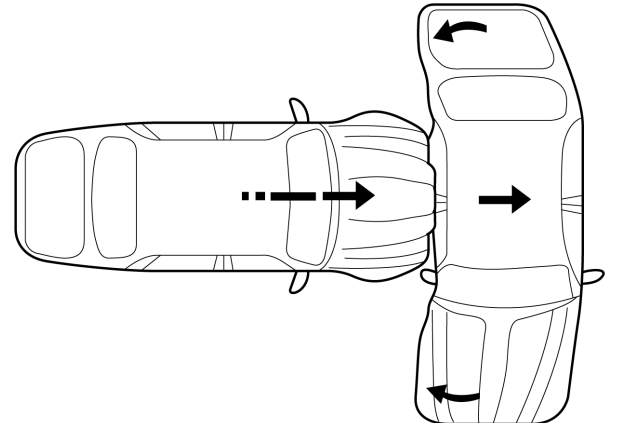
After a vehicle is collided, beyond the deformation damage from the collided position, its entire body, including frame, suspension, engine and other parts, may also be deformed. During the detection, it is required to check all damages of the related parts along the collided route system till there has been no trace of damage and those to the surrounding area.

Characteristics of body damage:

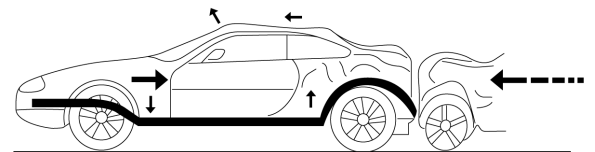
- Characteristics of front collision damage



- Characteristics of middle collision damage



- Characteristics of rear collision damage



Measurement of the damaged position

Accurate measurement is one of the procedures required to successfully perform a variety of collision repairs. For the integral body, the measurement is even more important for successful damage repair, because most of the steering and suspension systems are fitted on the vehicle body while some suspension systems are designed according to the assembly requirements. To guarantee the correct steering and driving operation performance of the vehicle, the fit tolerance of the key processing dimensions should be controlled within the allowed range.

The measurement work should be carried out in conjunction with the disassembly work, or it will be unable to accurately identify all the damages. To facilitate the body maintenance and thorough damage inspection while avoid unnecessary damage caused by the maintenance to the disassembled parts, it is required to disassemble the related parts. The disassembly should follow the principle to minimize damage and destruction of the parts.

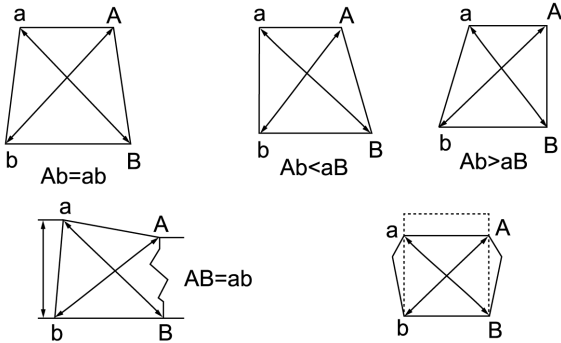
Selection of measuring point:

- Screw hole and process hole for parts installation;
- Lap point of body steel plates;

- Machining gap or raised impression on steel plate.

Measuring methods:

- Distance measuring method: it is the simplest and most practical measuring method employing a steel tape to measure the distance from each component to the datum point.



- Centring gauge method: measure with the centring gauge.
- Three-dimensional coordinate measuring method: measure the three-dimensional coordinate data of the selected measuring point, and compare them with the original vehicle data to determine the body damage.
- Electronic measuring: more accurate and more effective.

Main reasons accounting for the measuring error of body size:

The error caused by accuracy of the measuring tool or equipment itself;

The error caused by human factors:

- Failure to accurately locate position of the measuring point;
- Failure to select a correct measuring method;
- Failure to use the measuring tool and equipment in a correct manner.

Precautions for measurement:

- Adjust the body to the horizontal position before the measurement;
- Mark measuring points on the body to prevent messing up the points during the measurement;
- Conduct the measurement in an accurate manner;
- Repeat the measurement for several times;
- Verify all measuring results repeatedly.

Confirmation of Maintenance Scheme**Underbody Correction**

When the car is severely damaged, involving deformation of the underbody, there is no need to replace the body and it is required to conduct underbody correction in the first place. Completion of the underbody correction can guarantee three-dimensional position of the underbody and overall position of the body, determine placement position of the engine assembly and front suspension, and restore positioning angle of the wheel and positioning of other assemblies. The body panel repair should be carried out after completion of the underbody correction.

Correction of Body and Its Covering Part

When the body and its covering part only suffer from repairable depressed deformation and minor damage in a collision, there will be no need for part replacement while it is required to adopt a correction method to restore their original shapes.

Panel Replacement

For a certain position of the body or a part suffering from multiple breakages, when the damage/corrosion has reached a certain degree, making the repair meaningless or the required technical standards and functional requirements unable to be reached after repair, the damaged panel should be replaced.

Body Replacement

When the vehicle is seriously damaged, the entire body is almost smashed up, the underbody is severely deformed, and both sides, roof, bonnet and trunk lid are almost destroyed, therefore replacement of entire body can be made according to the needs of users if it is determined that the entire body is irreparable. Remove all serviceable assemblies and parts from the damaged vehicle, and conduct thorough check and repair for the principal assemblies of engine, etc. Replace the body assembly with a new one and all the parts requiring replacement, then conduct re-assembly in accordance with the vehicle assembly process.

Partial Body Replacement

When the vehicle is partially damaged in a collision, for example, when the front/rear fender, door, bonnet, or trunk lid is damaged, partial replacement can be made for the body to achieve the purposes of trouble saving, time saving, and cost reduction.

Body Pillar Replacement

When the body pillar, windscreen pillar, or front/rear wall pillar is beyond repair after being seriously damaged, it can only be replaced. Only after the deformation of a large area is restored can a regular pillar of the same shape can be fitted as a substitute.

Body Correction

Body correction is to eliminate the deformation (plastic deformation) and residual stress caused by vehicle collision so as to restore the correct location and size of the panel.

Introduction to Correction Equipment

The correction equipment should have the following characteristics:

- High-strength body positioning and fixing devices.
- Maintenance pullers of multiple shapes and different functions can meet the demands for repairing different parts.
- The capacity to carry out multi-point, all-round correction and drawing.
- The capacity to conduct accurate measurement, precisely detect deviation of each datum point, and fix error.

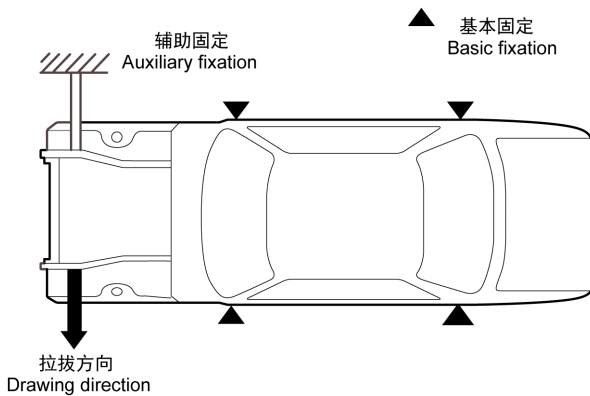
Operating Procedures of Correction Equipment

No matter which kind of equipment is employed, its operation will be roughly divided into the following four steps:

1. Get on the vehicle.
2. Positioning and clamping.
3. Drawing.
4. Measuring.

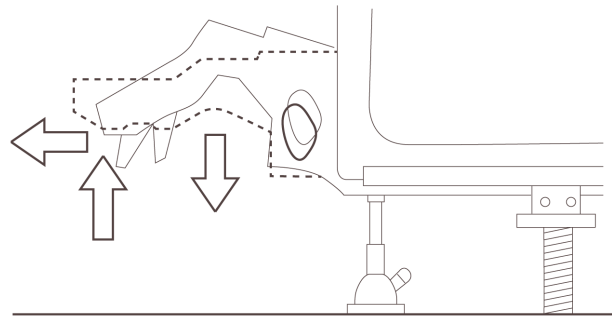
Auxiliary fixation:

- Prevent movement of the body;
- Evenly spread the force generated by drawing;



Auxiliary support:

- Prevent drawing-caused secondary damage to the body;
- Concentrate the drawing force on the damaged position to improve efficiency of the drawing;
- Prevent torque from being produced during the drawing;



Stretching-based Correction Method

Drawing Sequence

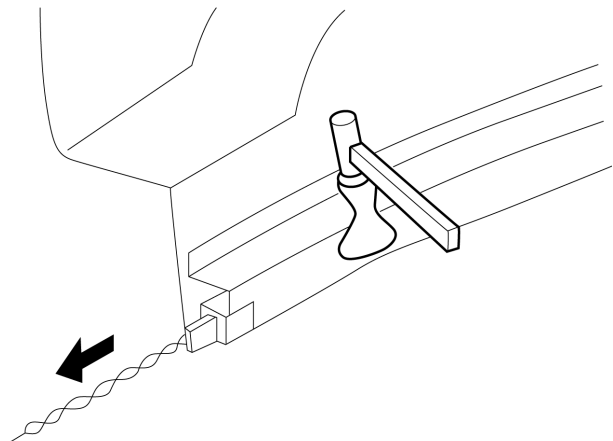
During the stretching, attention should be paid to methods and procedures: for stretching, the stretching amplitude of each time should be modest, then release the chain for force unloading and measuring. The operation should be completed according to the sequence "from the inside out".

1. Firstly, it is the length. Stretch the longitudinal direction of the vehicle along the centre line of the vehicle.
2. Then, it is the width correction. Correct the lateral direction of the vehicle.
3. Finally, it is the height correction.

Stress Relief

During the drawing, attention should be paid to stress relief:

- Beat the raised position and its back at the side of the deformed area;
- Beat the welded position of the deformed area;
- Beat the ridge line of the deformed area;
- Beat the reinforcement plate of the deformed area;



When being heated, the high-strength integral body will become very sensitive; therefore, generally, do not try to complete the stretching for correction in one step. Generally, the process of stretching – balance keeping – a second stretching – a second balance keeping should be followed and repeated. When a vehicle body gets folded tightly after being collided, if the metal undergoes the risk of being damaged, it need be heated. For heating, it should be noted that only the ridge line or the two-layered plate that gets connected too tight can be heated. Heating can only be used as a method to

relieve metal stress, rather than a method to soften a certain position.

Note: do not use the oxyacetylene heating method to repair the body.

Impose tensile force on the pre-determined position to slowly and carefully restore the damaged steel plate to its original size and shape; when stress of the bending steel plate is completely eliminated, accurate body repair can be achieved.

Note: avoid over-stretching during body correction. The only solution to over-stretching is to replace the damaged panel.

Panel Shaping**Panel Shaping Methods****Ring-pulling Method for Panel Repair (meson machine)**

As a panel repair method introduced in recent years, the so-called ring-pulling traction repair method involves a certain number of flat-washer-based rings welded based on size of the damaged panel; the ring acts as the traction medium; penetrate the wire rope into the medium, then use manpower or machine to pull the wire rope to make the damaged panel drawn outwards via the medium to its original position and shape; the ring-pulling traction repair method is more flexible, especially for the deformation of a large area, double-layered panel, position not easy to be approached, corner transition, door pillar, etc.

Heating Shrinkage Method

The local heating shrinkage method is a common method for panel repair. The deformation of panel is mainly the tensile deformation of the related position; with the heating shrinkage method employed, the tensile stress can be eliminated to make the panel restore its original shape.

Repair Method by Hammer and Jacking Block

The repair method by hammer and jacking block is a traditional method for panel repair. Holding hammer in one hand and jacking block or other tools in the other hand, the sheet-metal worker will beat the panel for shaping repair. Manual operation for panel requires skill and experience of the sheet-metal worker while superb panel repair skill cannot be acquired overnight; the panel repair mainly involves shaping for deformed surface and contour correction.

Technical Requirements for Panel Shaping

No matter which kind of repair method is employed to repair the body surface, the specified technical requirements should be met to restore the original performance and surface appearance quality of the vehicle.

Restoration of Appearance

In the repair, both the smooth structure of a large area and the wedge-shaped structure at the local transitional position should be restored to their original shapes. The original shape can be appropriately tuned when it cannot be 100% restored; however, the appearance should be symmetrically beautiful and durable.

Integrity and Refinement of Continuous Surface

Most of the car body is mass-produced by die stamping, the surface of which thus is featured by integrity and refinement. In the repair, for streamlined surface, continuous transition should be made; for surface turning point, smooth transition should be made; after being repaired, the outer surface should be as bright as new with no ripple, wrinkle, dent,

beat-caused mark, scratch or obvious flaw visible to the naked eye or perceivable by hand touch. Integrity, stream linearity, continuity and refinement of the continuous surface should be guaranteed especially for large-area repair.

Sufficient Strength and Stiffness

The original design gives sufficient strength and stiffness to the body; therefore, after being repaired, the body should not lose its strength and stiffness. Vibration noise of the body after being repaired should be controlled within the allowable range; no abnormal sound caused by vibration is accepted. It is required to ensure that the body will not suffer from fatigue damage in a certain driving range; the entire body should have a certain degree of stiffness to ensure that the body panel in use will have the capacity to maintain its original shape.

Panel Replacement

Panel replacement mainly involves the following process:

1. Preparations before cutting the damaged and new panels.
2. Removal of the damaged panels.
3. Alignment and cutting of the new panel.
4. Pre-weld treatment and corrosion protection.
5. Final alignment and welding of the panels.
6. Post-weld Treatment
7. Accessories refit and inspection after completion.

Principles for Panel Replacement

Thin Panel Replacement

Replacement of thin panels should follow the principle of being beautiful and observe the following requirements:

1. Select the shortest position to cut the position more than 15mm away from any foam part, to avoid welding-caused foam damage;
2. For replacement of the A pillar and rear fender, it is suggested to remove the windshield;
3. It is not allowed to cut any position with built-in reinforcement.

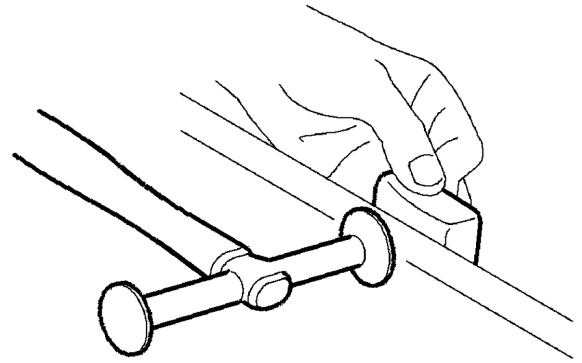
Thick Panel Replacement

Replacement of thick panels should follow the principle of being strong and observe the following requirements:

1. It is not allowed to cut the position where the energy absorption area is located.
2. It is not allowed to cut the position within 50mm before/after the laser welding position;
3. Select the shortest position to cut the position more than 15mm away from any foam part, to avoid welding-caused foam damage;
4. It is not allowed to cut any position with built-in reinforcement.
5. The size of the cutting seam should be equal to thickness of the panel, and the purpose is to guarantee weld penetration.

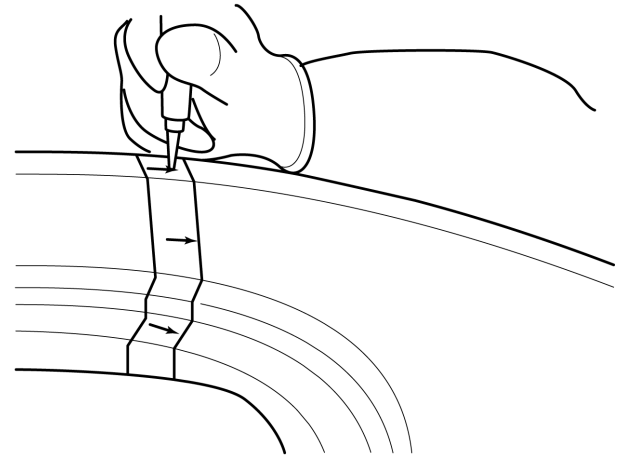
Preparations before Cutting Damaged and New Panels

1. Use a hot-air gun to remove all the residual sealants to reduce the heat-generated toxic fumes during welding.
2. Straighten the existing panel's seam edge with form block and hammer.



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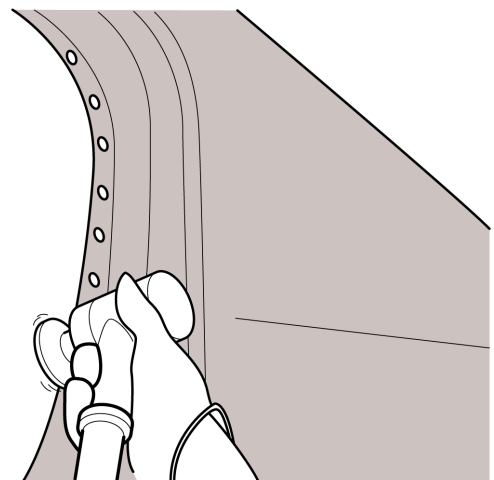
3. Mark the actual cutting position (with 15mm reserved for pasting paper self-adhesive tape) on the body's damaged part and all the positions with welding spot to be removed. (Link to OEM welding information)



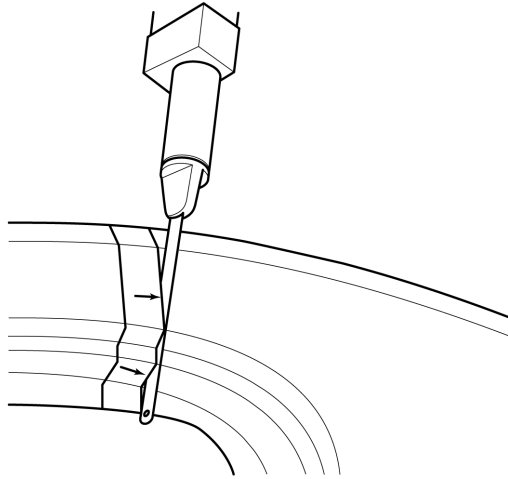
4. Mark the actual cutting position on the body's new part and paste the paper self-adhesive tape.

Damaged Panel Remove

1. Apply positioning punch to the welding spot.
2. Abrade the welding spot.



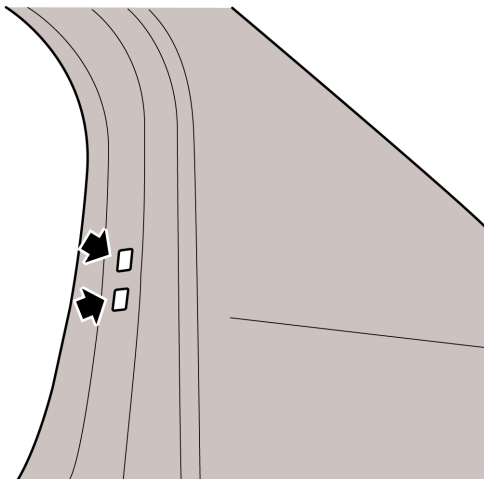
3. Conduct rough cutting and shave the welding spot.



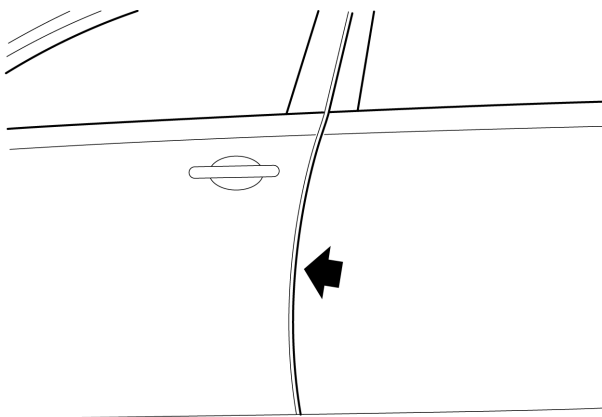
4. Remove the damaged panel.

Alignment and Cutting of New Panels

1. Locate the new panel to the body and adjust the position size.
 - Compare the space;



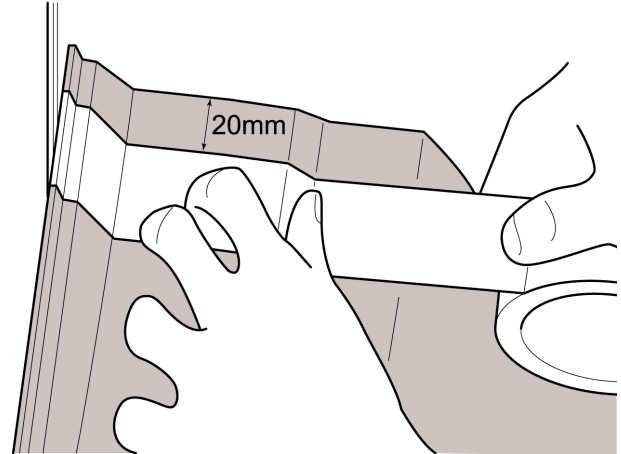
- Adjust the clearance;



- Adjust the difference between high and low surfaces;
2. Cut the overlap of the damaged and new panels; during the cutting, do not cut any reinforcement built in the body; cut off the extra damaged panel by segmentation after the new panel is taken off.
 3. Mark the hole punching position for plug welding.

Pre-weld Treatment and Corrosion Protection

1. New body panels: abrade all positions welded and glued to remove the paint layer.
2. Abrade all positions welded and glued to remove the old coating, burr, and rusty spot (paint removal at the position 20mm away from the welding port) while do not polish the abutting port's cross section.

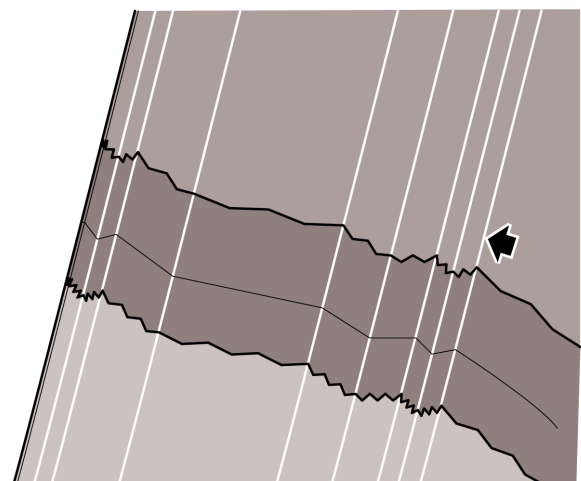


3. Clean the new panel and all positions to be welded and glued on the body; and leave them alone for 5-10 minutes for volatilization of the cleaning agent.
4. Apply zinc spray to the new panel and all welding junction surfaces with no need to be glued, and control thickness of the zinc spray.
5. Applying of structural adhesive: before the structural adhesive is applied, it is required to tap out and discard 10cm of glue to ensure that the panel will be glued evenly. The welding should be completed within the operating time as prescribed by the structural adhesive, or the gluing effect of the panel will be affected.

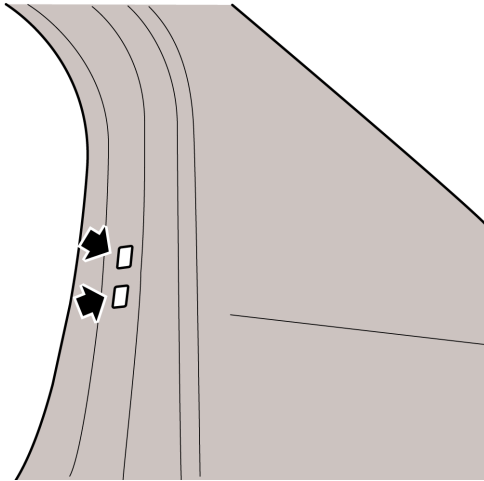
Final Alignment and Welding of Panels

Panel Refit and Adjustment

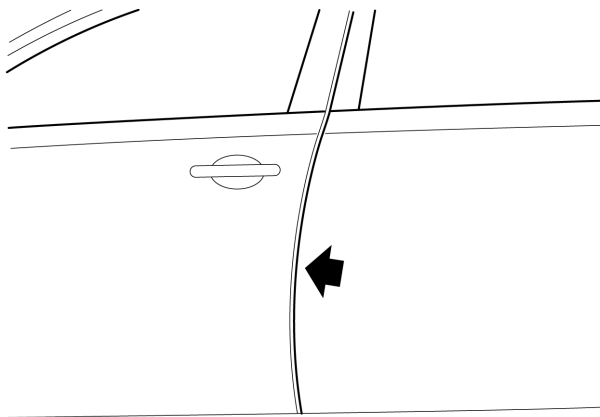
1. Determine the ridge line position;



2. Compare the space;



3. Adjust the peripheral clearance;



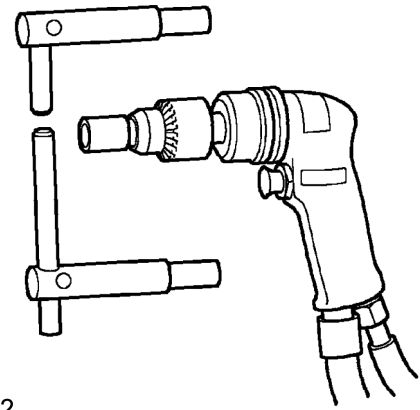
4. Adjust the difference between high and low surfaces.

Positioning for Gas Shielded Welding

1. The selected gas ratio is 80% argon and 20% CO2.
2. To guarantee the accuracy of positioning, it is not advisable to conduct positioning welding on the ridge line position; position of the positioning welding should fall on both sides of the corner angle; meanwhile, it is required to control spacing of the positioning welding above 30mm.

Trial Welding before Spot Welding

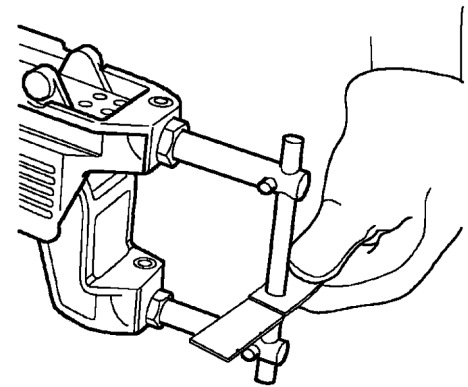
1. Select the welding arm for resistance spot welding and use the welding nozzle finisher to shape the electrode tip. Trim the welding nozzle to make its diameter equivalent to 2 times the thickness of the metal to be welded and an additional 3.0mm.



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Caution : Use welding arms not exceeding 300 mm in length.

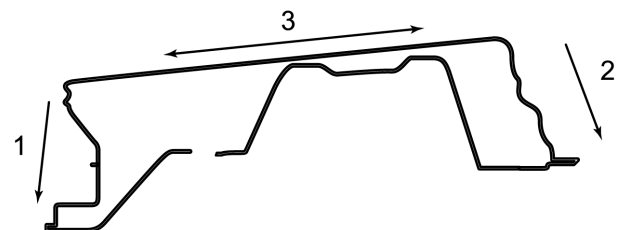
2. Use test silicon wafer and fit resistance spot welding arms and test equipment to satisfy the operational requirements. If there is no monitoring device, the welding strength can be tested by checking welding pool pull wires around the metal under tensile force during the stretching.



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Welding Sequence

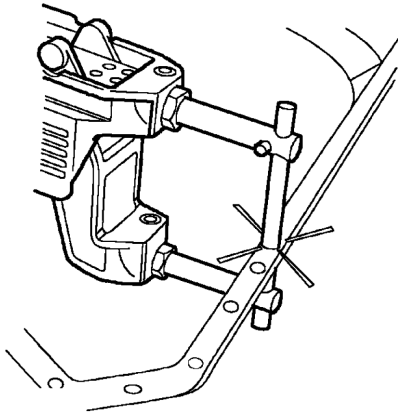
- Welding sequence: to reduce the decline of weld strength caused by welding shunt, it is suggested to start welding from double-sided spot welding according to the sequence as shown in the figure below; spacing of the welding spots is 25mm.



Welding Requirements

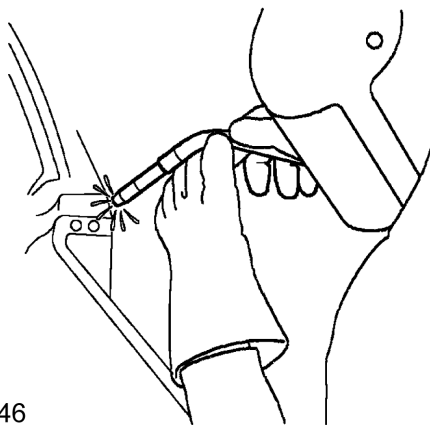
- Provided that the resistance spot welding has been used during the production, it is required to conduct another resistance spot welding in other possible position. To conduct spot welding, it is suggested to fabricate the test silicon wafer of the same metal gauge and material to perform the peeling test, thus ensuring the welding quality

will be qualified. If conditions permit, the welding quality monitoring machine can be employed to guarantee the welding quality. When the desired spot welding cannot be achieved, it is required to resort to plug welding.



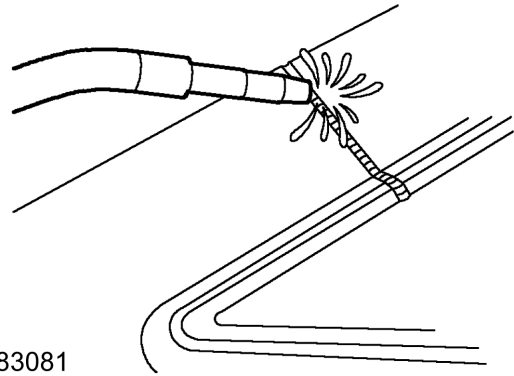
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- Length of the welding electrode hold for hand-held spot welding gun should not exceed 300mm.
- It is prohibited to conduct single-sided spot welding;
- Unless otherwise specified in the production, It is prohibited to conduct braze welding and gas welding.
- Gas shielded welding - plug welding: to weld the area of the third and above layer, or when the nozzle approaches the restricted area, if the resistance spot welding cannot be applied, metal active-gas plug welding can be employed instead through the hole left by the cutting machine for spot welding or the hole punched/drilled dedicatedly. Diameter of the welding hole for plug welding of the structural part is 8mm and that of the covering part is 5mm; the number of the welding spots for plug welding is equal to that of the original manufacturer.



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- Gas shielded welding - butt welding.

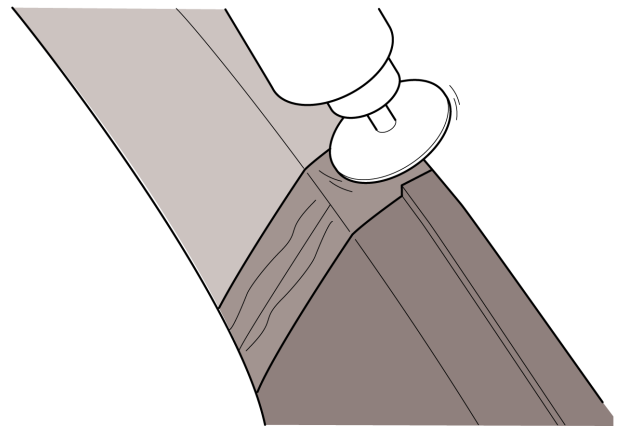


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Post-weld Treatment

Anti-corrosion Treatment Process

1. Use P36 sand disc grinder or belt grinder to grind and trim all welds and clean all welding positions.



2. Apply anti-rust primer, which can not only prevent rust, but also make the sealant better attached.
3. Apply sealant to fill the gap between the panels, thus reaching the purposes of gap filling and prevention against water leakage. (Link to information of sealant positions)
4. Hand over the vehicle to the painter for paint spraying.
5. Before the accessories are fitted, apply anti-corrosion wax to the cavity. (Link to application information of cavity protective wax)

Paint

Overview

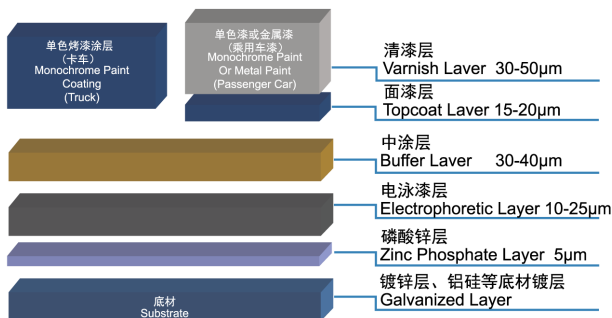
The purpose of automotive painting is to provide an excellent appearance, decoration, gloss protection, color protection, corrosion resistance and a longer service life for vehicle, so it has distinctive features:

- Automotive painting is a high-level protective painting, and the coating must have a superb corrosion resistance, weather resistance, acid/alkali resistance, inclusion resistance and an extensive adaptability, etc.
- Automotive painting (mainly refers to vehicle body painting) is also a high-level decorative painting, and careful design, good working environment and conditions are required for providing the coating with good decoration. Vehicle decoration mainly relies on painting, and the quality of the painting has a direct influence on the commercial value of the vehicle.
- Automotive painting is the most typical industrial painting, it requires reasonable and effective pretreatment method, drying method and process preparation.
- Automotive painting is a multi-coating painting system, and the painting quality and process control of each coating is of great importance.

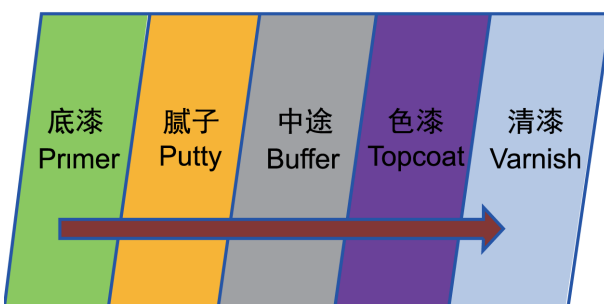
Coating Introduction

Coating Composition

During manufacture, paint coating consists of the corrosion resistant coating (zinc coating) of the raw material, zinc phosphate layer, electrophoretic layer, buffer layer and topcoat layer.



After-sale paint repair coating is mainly composed of the primer layer, putty layer, buffer layer, topcoat layer and varnish layer.



Function of Each Coating

1. Galvanized layer: with a good function of anti-corrosion/anti-rust, good paint adhesion, decorative performance and forming property.
2. Zinc phosphate layer: the first paint that is directly applied to the treated workpiece surface and is the base for the whole coating. Its characteristics are as follows:
 - It shall have a good adhesion to the treated surface of the workpiece, and the primer film formed shall have an excellent mechanical strength;
 - It shall serve as a corrosion inhibitor, and the primer coating shall have an excellent corrosion resistance, water resistance and chemical resistance;
 - It shall well fit the buffer layer or topcoat layer;
 - It shall have a good workability.
3. Electrophoretic layer: enhance cavity corrosion resistance; improve the uniformity and leveling of the paint film thickness; improve the quality of the paint film, painting efficiency and paint utilization rate.
4. Putty layer: used for the object surface with primer precoat so as to fill the pit, weld seam, scratch, rust hole, etc on the object surface, until the surface becomes flat and smooth.
5. Buffer layer: it is the last buffer layer before applying the topcoat, its binder content is between the primer and the topcoat, and the paint film is bright and semi-bright. It provides the following functions:
 - Enhance the adhesion between the primer and the topcoat;
 - Increase the total thickness of the coating and improve the richness;
 - Improve the corrosion resistance and weather resistance of the primer/top coat;
 - Repair minor defects on the substrate surface;
 - Improve the decoration performance of the topcoat.
6. Topcoat: topcoat is used for the final coating of the multi-coatings, and it directly affects the decoration performance, weather resistance, gloss protection, color protection, chemical resistance, contaminant resistance and appearance of the vehicle.

Classification of Topcoat

The classification of the topcoat by color effect is as follows:

- Pure pigmented paint: consists of resin, pigment and additive only.
- Metal paint: pigmented paint with metal powder provides better gloss and richness.

- Pearl paint: compared with metallic paint, pearl paint replaces metal powder with mica powder containing TiO_2 and FeO_2 , improving the film texture and gloss.

By application procedure, it can be classified into the following processes:

- Single-process: a system that uses one type of paint to form a complete surface coating. Single-process pure pigmented paint and metal paint are included.
- Double-process: a system that uses two different types of paints to form a complete surface coating, generally, the pigmented paint is applied before the finishing varnish is painted. Double-process pure pigmented paint, metal paint and pearl paint are included.
- Three-process: usually, a layer of primer is required for this system, then a layer of pearl paint, and finally a layer of finishing varnish, the combination of these three coatings forms a complete surface coating. Three-process pearl paint and colored varnish are included.

Principles of Paint Repairs

The following principles must be observed in the paint surface finishing process:

1. Seal inner and outer seams with an approved seam sealant.
2. Repair any damaged area of underbody sealant.
3. Use a double-paint repair system and keep it consistent with original production part.
4. Apply cavity wax to all inner surfaces that have not received paint finishing.
5. Before carrying out paint repairs, clean the vehicle thoroughly with a steam cleaner or high-pressure cleaner.
6. Wash locally repaired areas using a mild water-soluble detergent and wipe them clean with solvent, which is immediately before paint application.
7. To ensure that the exposed metal area due to a damaged paintwork is thoroughly cleaned, the cleaning area shall be larger than the original damaged area.
8. Treat the exposed metal with phosphate to remove all traces of dust and to provide a good repair environment for new paint coating.

Flat Lacquer

The flat lacquer is a special kind of paint and special care should be taken in car wash and car care.

It is recommended to wash the car manually, please do not use rough sponge or car wash cloth. When washing and wiping, please do not use excessive force. Do not wash the car in direct sunlight.

- Do not use high pressure or steam to wash the car. If the car is dirty, it needs to be pre-cleaned before washing

to first clean the body dust and other particles that may damage the paintwork.

- Spray the body with plenty of water and dry the body after washing from the top down using a soft sponge and a neutral wax-free car wash liquid.

In daily car care, the followings shall also be noted:

- If the paint film comes in contact with resin or grease, as well as insect residue or bird excrement, etc., please remove them immediately to avoid irreversible damage to the flat lacquer.
- If there is oil or fingerprint on the flat lacquer, remove them immediately with a clean rag; do not use excessive force to avoid irreversible damage to the flat lacquer.
- To maintain the matte effect of the paintwork, abrasives, polishing agents and polishing waxes cannot be used and the body cannot be polished.
- Do not use any stickers, patches, magnets and other similar things to prevent damage to the paintwork.
- Always have the paint film repaired in a qualified professional repair shop.
- Flat lacquer surface repair requires whole piece spray treatment.

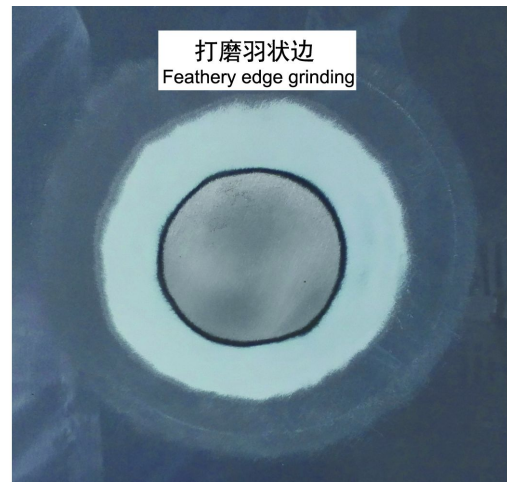
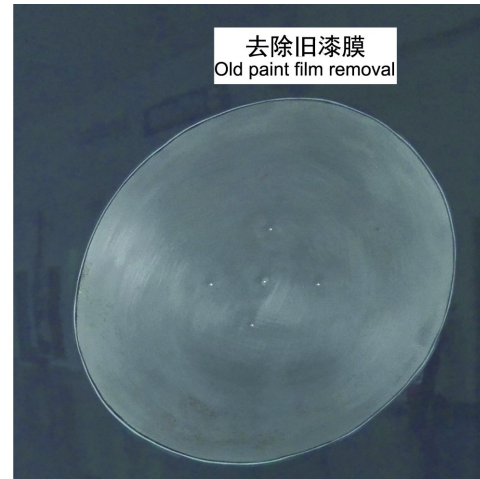
Coating Process

The automobile coating process is generally divided into two sections: One is the metal surface treatment before coating, also known as pretreatment technology; the other is the coating application process.

Surface Pretreatment

The surface pretreatment mainly consists of:

1. Surface cleaning: The mud, dirt and other foreign objects on the complete vehicle should be cleaned thoroughly during coating operation, particularly pay attention to the dirt at the door frame, trunk, bonnet apertures and wheelhouse; if not cleaned up, the new painted film may be splotchy.
 - Chemical soluble substance treatment: Apply the degreasing agent to the surface with a piece of special cleaning cloth, and wipe off the degreasing agent and removed residues, such as grease, with another clean and dry cloth.
 - Treatment of water and floating dust: Use a piece of clean and dry dust-sticking cloth to absorb the water and floating dust, then blow it dry with a high pressure air gun.
2. Coating Identification and Damage Assessment:
 - Coating identification: It is important to identify the category of the coating on the body panels in repainting process. If it is not correctly identified, the serious problems may occur during top coat application. If one vehicle has not been resprayed up to now, the category of the coating can be identified based on its model manual, but the category of body coating must be identified when repaired if the body has been resprayed.
 - Damage assessment: Evaluating the damage properly is one of the critical factors to determine the repair cost and ensure the coating quality. The repair scope can only be determined after the proper damage assessment, then the scope of each treatment process, transition area, the area to be covered and the parts to be removed, etc. can be defined, which will lay the foundation for the correct implementation of subsequent processes and satisfactory repair quality. The assessment methods for film damage include visual, touch and ruler assessment:
3. Old film removal: Examine the body coating carefully after washing the body to find the damage signs on the film, such as bubbles, cracks, peeling, rust and some damages resulted from paint baking, make-up, gas welding and other repairs. For the above damages, the old film must be wholly or partially removed based on the degree of old film damage and the quality requirement after repainting. The #P80 - P180 abrasive papers are recommended to make out the feather edges (not less than 3 cm).



Precautions for mechanical polishing:

- a. Do not use the electric sander to make cross sanding on surfaces with large curve radian and high projection or very low dent;
- b. Do not use the electric sander to sand the corners, wrinkle gaps, welding seams, sticking joints or the area that has been applied with plastic sealant;
- c. The sander can only be activated to sand when contacting with the panel surface, do not apply pressure, or deep scratches will be made, and also the sander should be aligned with edge line to be sanded before it is activated;
- d. To avoid the panel deformation caused by overheating, do not place the sander in the same position for a long time;
- e. Do not make the well painted surface around the sanded area contact with the coarse sand abrasive, and it is better to protect the perfect coating with tapes.

Sanding operation: The refined processing to the surface that has experienced rough sanding is aimed to obtain a more flat surface. Align the front of the rotating grinding wheel with the sanding surface, and get the rear part

away from the surface a little. Keep this angle and move the sander up and down to sand, and the covered area between each grinding crack is better to be 50% - 60%.

Panel replacement: Use #P280 - P320 abrasive paper to carry out dry sanding over the electrophoretic primer layer of the new part.

4. Grease and rust removal from metal surface:

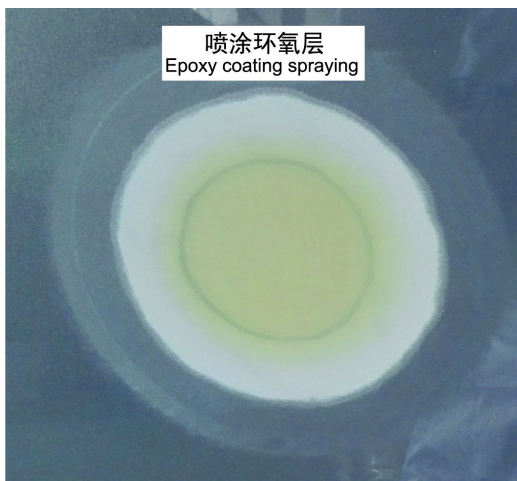
- Remove the rust spots from the surface. The methods used to remove the rust from metal include: manual rust removal (polishing, sanding, high pressure water, etc.), mechanical, chemical and ultrasonic rust removals. Different rust removal methods are selected depending on the rust conditions.
- Clean the metal surface again.

Each Coating Application

When you perform coating repairs over the panels which have experienced surface pretreatment, please refer to the detailed process as below:

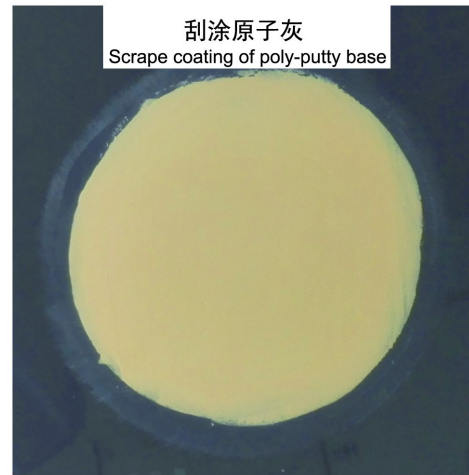
1. Primer Spraying

- Cover the surrounding of the repaired area;
- Wipe the surface to be sprayed with a piece of soft cloth soaked with detergent, while wipe the detergent left on the surface with another clean and soft cloth;
- Blow the surface clean with compressed air;
- Spray the anti-corrosive primer and let it dry;

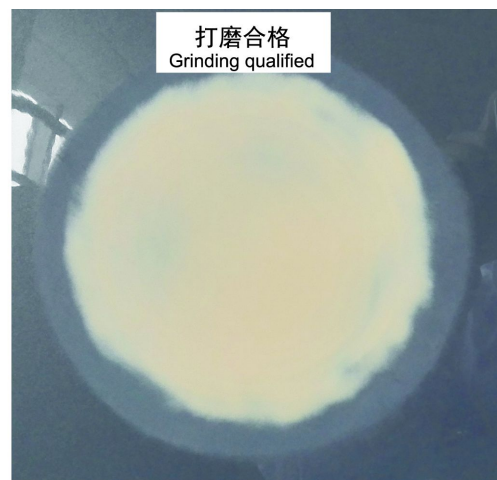


2. Putty application (not required when replacing new parts)

- Mix the putty and curing agent in the proportion defined in the instructions;
- Use a clean putty mixing plate; only mix the amount of putty to be used by this time;
- Fill up the sanding scratches and air pores, then apply the putty thoroughly;



- Let it dry for 5 minutes after application, and bake it with an infrared baked lamp according to the requirement in putty instructions;
- Wear the respirator, select the proper type of abrasive paper, then sand the surface together with hard sanding pad. The rail sander can also be used, but be careful not to sand the surrounding areas. When the sanding pad is used, it should sand in the horizontal direction and move from up to down gradually.
- Use the air blow gun to clean the repairing surface;

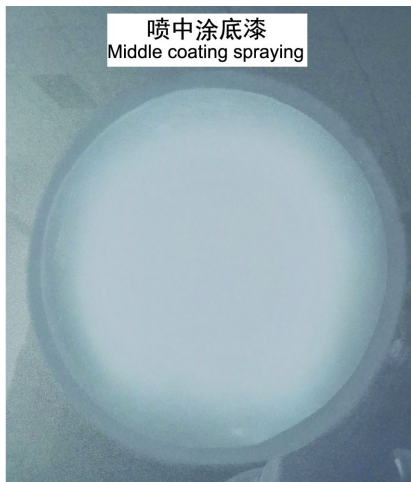


- Wipe the surface with a piece of soft cloth soaked with detergent, while dry the surface with another clean cloth;

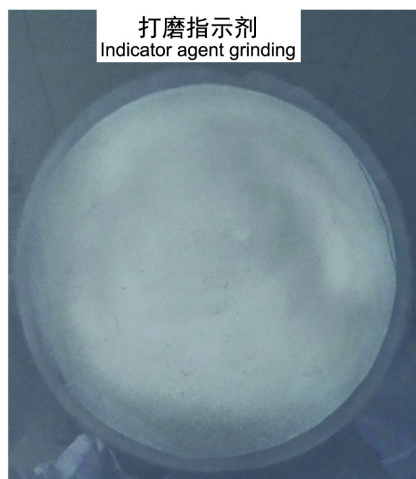
3. Middle Coating Primer Application

- Cover the surrounding of the repairing area and prepare to spray the middle coating primer, and the periphery of the covered area should be longer than the area to be sprayed by more than 10cm;
- Wipe the surface to be sprayed with a piece of soft cloth soaked with detergent, while wipe the detergent left on the surface with another clean and soft cloth;
- Blow the surface clean with compressed air;
- Mix the middle coating primer, curing agent and diluent in the proportion defined in the instructions;

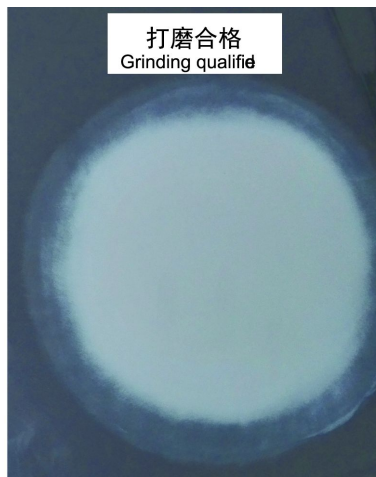
- Firstly, spray a layer of middle coating primer lightly and let it dry for 5 minutes, then wet spray it twice;



- When the paint film flows level for 10 – 15 minutes, the film can be cured with an infrared baked lamp;
- Spray the sanding indication layer on the surface, so that it is easy to find the uneven locations when sanding.



- Sand the surface roughly with #P240 - P400 abrasive paper, then sand it finely with #P600 - P800 paper;



- Remove the masking paper along the periphery of repairing area, then blow the inner and outer surfaces

of this area clean with compressed air to remove the abrasive dust and water thoroughly;

4. Top Coat Application

- Check the color code, and find out the color formulation according to the codes;
- Polish the body surface around the repairing area to obtain the exact color matching;
- Check the difference between the mix color and the original body color with the assistance of daylight stage lamp or in the sunlight;
- Spray the color test board under the same conditions with the vehicle to be sprayed (dilution rate, spray distance, air pressure, amount of sprayed paint, temperature, dry time, etc.);
- Let the test board dry for 15 minutes, then bake the board at the specified temperature within the set time. Note that do not overheat the test board when heating and curing;
- Wipe the area to be repaired with a piece of soft cloth soaked with detergent, while dry it with another clean cloth;
- Cover the surrounding of the repairing area, start to paste the papers from the inside of the repairing area, and be careful not to tear the masking papers;
- Blow the panel to be sprayed and the complete vehicle clean with compressed air, be careful not to tear the masking papers, and finally wipe the surface with dust-sticking cloth;
- To prevent the dust, particles and other impurities from entering into the paint, pour the mixed paint into the gun tank with the help of screen;
- Try to spray to check the air pressure, the amount of sprayed paint, sector pattern and atomization;
- Wet spray two layers of colorant, and the leveling between each layer takes 5 - 10 minutes;
- For the aluminum paint, make a virtual sprayed layer finally to ensure the aluminum powder is distributed evenly;

5. Varnish Application

- After spraying the pigmented paint layer, let it dry for about 15 minutes (the colorant layer totally loses the gloss), and spray the varnish: firstly, wet spray a layer of varnish and let it dry for 5 – 10 minutes; next, wet spray the second varnish layer, let it dry for 15 minutes and carry out heating and baking; (Note: Do not turn off the ventilation system fitted in the spraying booth during the phase of drying after spraying)
- Heat and cure the film at the specified product temperature within the set time. Or, dry it forcibly for 15 minutes using a far infrared baked lamp;

- After heating and curing, the further treatment (e.g. sanding, polishing) can only be done when the film is cooled down completely.

6. Polishing and Waxing

- #P1500 or P2000 abrasive papers can be used to polish the defects on the coating, such as dust spots and sags, when the film is completely cooled down.
- Grind the sanded area using slack waxes together with wool wheels. At the start of grinding, the rotating speed of polishing machine should not be too high but increase slowly;

- Perform the polishing with fine wax and sponge wheel;
- Replace with a clean sponge wheel and remove the swirl marks left by polishing with polishing wax to allow the coating to restore its original gloss.
- Examine the accuracy of color mixture at the spraying area in the lamp light, move it to outdoor and check it under sunlight.

7. Cosmetic and Cleaning

8. Information for Various Brands of Paint

	Recommended Paint Manufacturer and Product Model		
	PPG	Sherwin-Williams	Akzo Nobel
Primer	P565-895 P565-9850 P565-9085	E2G973 GBP988-AR UPO7299 UPO7226-3	Sikkens #680 Primer Grey Protective Green Primer Sikkens Universal Plastic Primer Alloy Primer IK ICF/EF
Putty	P551-1050 P551-1052 P551-1057	18380221	Sikkens Kombi Filler Alloy Putty
Middle Coating Primer	P565-510/511 P565-5601/5605/5607	P30 P50	Sikkens Autosurfacer® Classic Sikkens Autosurfacer® Classic - Rapid
Clearcoat	P190-376 P190-6850 P190-6060 P190-6208+P210-6863 P190-588AP210-790/938/939 P190-588+P210-760/790	CC645HS HPC15 CC939 CC931 CC930 CC655	Sikkens Autoclear® Plus HS Sikkens Autoclear® Xcel Autoclear® II Clearcoat Autoclear® Rapid Autoclear® Mat Clearcoat
Top Coat	NEXA Autocolor 2K (oil paint) Aquabase plus (water paint)	Ultra 7000 (oil paint) AWX (water paint)	Sikkens (oil paint) Sikkens Autowave (water paint)

Film Inspection Method and Defect Identification

Paint Film Defects Caused by Application and Treatments

Particles

The phenomenon that bumps in the film coatings are spread over the whole or local surface in granular form.

Analysis of Possible Causes:

- Poor air cleanliness and impurities in the painting environment, such as dust;
- Workers wear dirty clothes or the fibers contained in the materials are easy to fall out, substrates that are not properly handled have bumps, the vehicle body is not cleaned thoroughly, etc.
- The painting pressure is insufficient, atomization is poor, the spray gun is not cleaned up and an improper screen is selected;
- The pigments or flashing materials in the paints are badly dispersed, the paints are unfiltered or filtered improperly, the paints become deteriorated and show abnormal signs, such as precipitation, flocculation.
- The film is moved out of the baking booth before drying the surface to dust-free.

Preventive measures:

- Ensure that the spraying environment is clean;
- Ensure that the objects to be painted and workers are cleaned thoroughly before entering the baking booth;
- Ensure the paints' performance, and the deteriorated and poorly dispersed paints are not applicable;
- Set the optimal parameters for paints' application and use the spray gun to spray after the paints are filtered.

Defect treatments: The tiny dirty spots can be polished after being removed by abrasive paper; if the impurity particles are large or the dirty spots on the surfaces of primer and even surfaces of middle coating primer can only be ground to the extent that the spots disappear completely, perform the spraying again.

Sags

Upon the liquid paint is sprayed onto the workpiece surfaces, some wet film surface runs down, creating unevenly stripes and sags, which are thin on the top and thick on the bottom, resulting in the local thicker film on vertical surface. It can be divided into sinking, sagging and running depending on the shapes of sags.

Analysis of Possible Causes:

- The painted workpiece surface is too low in temperature;
- Low application environment temperature, slow wind speed and high solvent vapor content in the ambient air;

- Low product temperature, low spraying pressure, slow gunning speed, short distance to spray gun, and thicker film;
- Large caliber of spray gun, and poor atomization of spray gun;
- Slow solvent evaporation rate and low paints' viscosity;
- Short distance between spray gun and workpiece, slower gunning speed, and thicker spraying coatings;
- Insufficient flash-off intervals between layers;

Precautions

- Improve the painting environment, and control the appropriate ambient temperature, humidity and wind speed.
- Choose the correct solvent and pay attention to select the dissolving capacity and evaporation rate of the solvent;
- Strictly control the viscosity and the temperature for coating application;
- Reduce the amount of paints from spray gun, and increase the gun distance and gunning speed;
- Full flash-off between layers;

Defect treatments: For the slightly local varnish sagging, it can be sanded to eliminate the sagging defects before being polished if this defect exists; or if the sagging defect is more severe or it appears on the middle coating primer and the pigmented paint (finally revealed on the layer of varnish), the sagging must be sanded thoroughly and make the spraying again.

Needle Holes/Eyes

The blisters or solvent bubbles appear on the film and there are small needle holes on the top of them, which are referred to as needle holes (the solvent contained in the film coatings evaporates rapidly during the surface drying, its left trace forms hole); these needle holes are known as defects that the holes are still visible on the surface after spraying the top coat due to some holes on the substrate are not filled up. They are easily generated at the corners of workpieces.

Analysis of Possible Causes:

- Needle holes: The paints are mixed with impurities, for example water enters into the solvent based coating; the painted objects have dirt on their surfaces; the flash-off intervals between layers is insufficient during application; the continuous spraying is too thick; the temperature rises up suddenly and the surface is dried rapidly when stoving.
- Needle eyes: The uneven locations on the original workpiece surface are not filled up;

Precautions and Improvements:

- Set appropriate temperature and humidity for application. Wind speed and other conditions;
- Mix the paint and solvent in proportion to ensure the proper fluidness;
- It should be heated up slowly to avoid the rapid solvent evaporation.
- Full flash-off intervals between layers;

Defect treatments: The defects should be completely ground to remove the needle holes and needle eyes, then respray them.

Blistering

Part of the film coating floats from the painted surface or prime coat and is filled with liquid or gas, which is about 1-5mm in diameter or floats in large pieces. If there is some water under the film, the vapor generated by evaporation of water will plump up the film to form blister when the temperature rises up.

Analysis of Possible Causes:

- The ambient humidity is high and the film is dried naturally after spraying, resulting in moisture infiltrating into the film;
- The substrate is not dried properly, the drying time is short between coatings, and heating and drying are too fast;
- Grind the putty while adding water and the putty absorbs water;
- There is oil or water in the compressed air lines;

Preventive measures:

- Grind the dry putty;
- Ensure that the previous coating has met the requirements for cleanness and dryness before spraying;
- Reduce the humidity in the painting and spraying room;
- Use the curing agent and diluent suitable for environment temperature, and make it dry as soon as possible once the spraying is completed to prevent the moisture from infiltrating into the film.

Defect treatments: Once blisters appear on the film surface, this surface should be ground to remove the blistering defects completely, then respray it depending on the surface conditions.

Orange Skin

The orange skin is used to describe the leveling property of the film: When you observe the film surface against the light, you can see different ripples of 1 - 5mm presenting on the film surface, and the brightness and plumpness vary in different ripple areas; such texture on the film surface, which is similar to orange peel, is known as orange skin.

Analysis of Possible Causes:

- The substrate is not flat or the top coat is sprayed to the surfaces of middle coating primer without having the orange skin ground smooth;
- The ambient temperature is high, the wind speed is fast and the substrate temperature is high;
- The diluent volatilizes rapidly, the paint has high viscosity and the film is too thin;
- The distance from spray gun is too far, the gunning speed is too fast, the spraying pressure is low and the amount of paint out of spray gun is little;

Preventive measures:

- Grind the intermediate coat layer to be completely smooth according to the process requirements;
- Control the ambient temperature and wind speed (0.2 - 0.6m/s);
- Use the diluent suitable for that temperature, and adjust the paint viscosity as per the paint manufacturers' product instructions.
- Adjust the gun pressure, then regulate the gun distance to proper distance and reduce the gunning speed as per the manufacturers' instructions;
- Spray the appropriate layers to ensure that the film reaches the desired thickness;

Defect treatments: Only perform the grinding and polishing if the defect of orange skin is slight; the orange skin should be ground to completely removed and be resprayed if the defect is serious.

Sanding Scratches

The sanding scratches left by sanding substrate are visible on the film after spraying the paint. Sometimes, the sanding scratches on the substrate will extend due to the erosion caused by solvent contained in the film, the upper film would be subsided gradually after a period, resulting in the sanding scratches more and more obvious.

Analysis of Possible Causes:

- If the improper abrasive papers are used to sand the substrate, the sanding scratches will be wide and unable to be covered and filled up by upper film;
- If the lower film is sanded and sprayed with upper film over it before it is totally dry, it is easy to make the sanding scratches to extend due to the erosion caused by solvent in the upper film and form the sanding scratches defect;
- The diluent that has high solubility for upper coating or too slow to dry has been misused.

Preventive measures:

- When you select the abrasive paper number to make sanding, you should observe the principle that the

abrasive paper number should not be jumped by 2 levels for each replacement;

- Ensure that the lower film is totally dry before sanding;
- Select the correct upper film solvent as per the product instructions;

Defect treatments: For slight sanding scratches, they can be removed or made less obvious by sanding and polishing as they have been filled up by paint; for the sanding scratches that are more obvious, they cannot be removed by sanding and polishing, it should be resprayed after removing the scratches.

Putty Marks

A putty mark means the defect that trace is left along the edges of putty application areas after spraying the middle coating primer or top coat.

Analysis of Possible Causes:

- The feather edges are improperly treated before putty application;
- The putty is mixed with curing agent in improper proportion;
- The next action is taken before the putty is completely dry (sanding, spraying the middle coating primer, etc.);
- The putty is not flat enough, the feather edges do not meet the standard, and it is higher or lower than the old surrounding coatings or metal;
- The curing agent and diluent mixed in the middle coating primer or top coat are dried slowly, or the flash-off intervals between layers are too short when spraying the middle coating primer or top coat, and the solvent penetrates and erodes the putty, resulting in the edges expanded and extended.

Preventive measures:

- The width of the feather edges must be 20 - 30mm and the surface is smooth without steps before putty application;
- Add the curing agent in proper proportion according to the product instructions;
- Make sure to perform the sanding and spray the middle coating primer when the putty is totally dry.
- Use the correct curing agent and diluent, and ensure the flash-off interval between layers is enough.
- The periphery of putty must be sanded to be qualified. Not only the putty, but also the extended old surrounding coatings should be sanded when you sand the putty edges to allow the putty together with the surroundings to form flat surface.

Defect treatments: Once the putty marks appear, those areas should be sanded, and apply the putty again and respray the middle coating primer and top coat.

Lifting

The lower-layer paint is single-component, or even if it is two-component, it is not dry and cured completely (including improper amount of curing agent is used), when the paint is sprayed above it, the solvent contained in upper film will erode the lower film, causing the uplift and shrinks present on the lower film surface.

Analysis of Possible Causes:

- The lower film is not totally dry;
- The lower film becomes deteriorated;
- The continuous spraying of middle coating primer or top coat results in too thick surface, or the used curing agent and diluent are too slow to dry, or the diluent with high solubility is used, or the flash-off intervals between layers are too short when spraying the middle coating primer or top coat, or the low air temperature during the spray causes the infiltration and erosion of solvent contained in the middle coating primer or top coat, resulting in the lifting at the putty edges, one-component putty or middle coating primer edges.

Preventive measures:

- For the film not totally dry, it must be sanded and sprayed with the next layer paint after it is completely dry. If it cannot be totally dry due to the improper adding of curing agent, it needs to respray the paint mixed with proper curing agent after film removal.
- For the deteriorated film, shown as chalking, cracking, loss of gloss, it must be removed totally and resprayed with two-component middle coating primer or top coat;
- Use the correct supporting curing agent and diluent, and ensure the flash-off interval between layers is enough.
- Use the two-component putty and middle coating primer.

Defect treatments: When the lifting defect appears, it should be sanded to remove any defects at the lifting area, if the lifting is severe, the film that has lifting should also be sanded and removed completely, then spray the two-component middle coating primer and top coat.

Paint Film Defects Caused by Operating Environment and Treatments

Paint film defects caused by external corrosive materials

Defect phenomenon: The film defects occur when the film is affected by the acidic and alkaline materials as well as industrial fall-outs, such as asphalt, oil, battery electrolyte, bird droppings, sap, acid rain, pollen, dust produced by steel plant and black carbon from boiler stack. It generally appears as uplift, discolor and even cracking and peeling caused by the contaminants infiltrating into the film.

Defect treatments: If the film defect is tiny, it can be recovered only by polishing the surface damage; if the film has

been discolored, the defective areas should be sanded until eliminating the defect, then respray it.

Water Spots

Defect phenomenon: When the rainwater on the film surface or the tap-water left by car washing is heated to evaporate, a white ring drop mark will be left on the water-drop area and cannot be removed by common cleaning methods.

Causes: As the water contains mineral substances, such as calcium, when the water is heated to evaporate, some warm water will infiltrate into the softened film with heat, and the left mineral substances infiltrate into the coating.

Defect preventions and treatments: Try not to wash the car under the sunlight, and wipe the water drops off the vehicle surface after washing to avoid evaporation caused by heating. It should only be polished when water spots appear.

Stone-crash Damages

Defect phenomenon: Some small stones may hit the film and cause the film peeling during vehicle traveling, the area where the film is peeled off usually forms the surface with sharp and jagged edges, and sometimes a small indentation will appear in the middle of this area. The front edges of the vehicle bonnet or the roof is usually damaged by stones.

Defect treatments: When the stone-crash damages occur, the film on the defective area must be removed and sanded to feather edges, and filled up with putty or middle coating primer, then continue to apply the middle coating primer and top coat; if the area hit by stones is rusted, the rust must be removed thoroughly.

When new original parts are sprayed, if the top coat is directly sprayed onto the electrophoretic coating without spraying middle coating primer, and when the plastic parts are sprayed, if the middle coating primer and top coat are not added with softening agent depending on the plastic hardness, the stone crash protection capability for the film will be reduced and the film is easy to hit off by stones and sands.

Discolor/Chalking/Loss of Gloss

Defect phenomenon: As the vehicle exposes to the ultraviolet rays, the pigment deterioration of the film causes color fading, the resin deterioration causes yellowing, the film peels off as powder and loses gloss.

Defect treatments: Color fading is a representation of film aging, and it usually shows up together with chalking and full loss of gloss. Once any one of these defects occurs, the defective film must be sanded and removed thoroughly, then respray the two-component middle coating primer and top coat.

Sealing

Overview

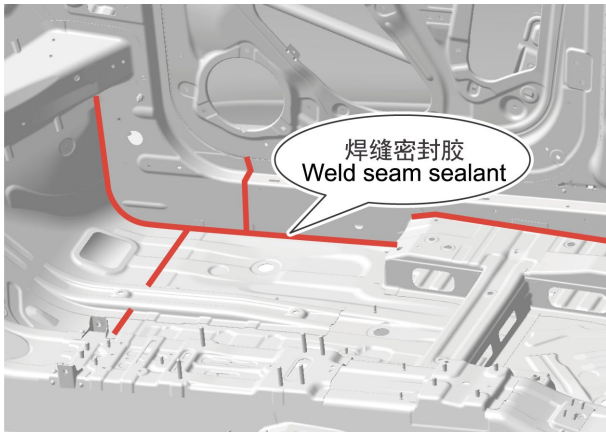
Processing Area of Underbody Seal

Platform floor areas and sill outer panels should be processed with Plastisol PVC underbody sealer. This sealer is not suitable for reuse. When repairing the sealant for the underfloor areas, the underbody sealer upon delivery should be peeled off and returned to the proper breakpoint. Do not expose the clean metal surface, and the current sealing edge should also be firmly attached to the panels.

Use new underbody sealer between primer and intermediate coat. If necessary, use the joint sealant before applying the underbody sealer. Before applying the underbody sealer, do firstly fit the plugs and insulating ring on the disk type floor (except for the part for wax spraying). Refit the heat-fusible plugs damaged in repair with heat blower or replace them with rubber insulating ring.

Caution : Ensure that suspension units, wheels, tyres, power unit, exhaust system and brake system (including all mounting points) are covered prior to application of new underbody sealer.

Joint Sealant



Joint sealant is used after applying the primer and before applying the intermediate coat and top coat. Joint sealant must be sprayed smoothly and continuously, and the spraying line depends on the joint type. If the sealant is coated by brush, pay special attention to keeping the due coverage for joint. At the places needing sealant molding, cloth dipped in the solvent oil can be used to complete the required operations.

Do seal all the joints to be processed after each repair. When the vehicle is damaged, the area away from the impact point is usually twisted. Thus, in the following repair and calibration, the sealant at these places is often touched. Check all the joints around the repaired area to see whether there is damage, and process the damages as required, then apply new sealant. Specific steps are as follows:

1. Clean the affected joints, re-process the exposed metal area with proper etch primer;




2. Apply proper sealant at the required places;
3. Process the affected area with acid-etch primer (underbody sealer is also available), and apply proper color paint film.

After reassembling or refitting the parts, if the joint is plugged, then paste joint sealant can be applied on such joint. After the panels are repaired, the joint can also be plugged. Under this circumstance, apply the sealant and spray the paint before the final assembly. If the entrance size is suitable, apply the joint sealant on both sides of joint. If the spraying operation can be only performed on one side (such as compartment), use cavity wax to process the affected compartment beam.

The joint sealed with sealant when assembling is described in detail as below:

Caution : Check all the joints near the repair areas thoroughly. If necessary, all the combined, repaired or replaced areas should be sealed. These areas should not be contaminated by moisture. Sealing could protect from moisture and wind noises and so on. Before the final inspection, it is necessary to check all the sealed areas.

PVC sealer applying method:

Process	Operation Mode	End View of Implementation Effect	Implementation Parts
PVC Glue	Frictioning Glue		On the mating faces where the components are going to be fitted and the seam parts with aesthetic requirements such as the tail lamp, joint area of the bodyside and head cover, and visible areas after assembly.
	Brushing Glue		To the seam parts without aesthetic or assembly requirements (cover the seams, the width < 50mm) such as interior floor seams, and underbody.
	Tube Glue		At the covered edges of four doors and two lids (1-2.5 mm in thickness, 5-9 mm in width)

Plug

Plug Category	Single-pack Plug	Two-pack Plug
Application Workshop	Paint or Assembly Workshop	Paint Workshop
Material	EPDM, TPE, PA6, TEEE, etc.	(PA6-GF) + heat-fusible sealer, sheet metal + heat-fusible sealer TPE + heat-fusible sealer, etc.
Sealing Performance	Leak doesn't occur in the event of 10 minutes' 30 mm height of sprout	Leak doesn't occur in the event of 10 minutes' 500mm height of sprout
Application Part	Areas around four doors, bodyside, etc.	Areas around the floor, spare tyre compartment, etc.
Remarks	To seal the holes indirectly connected to the passenger compartment or those unlikely to contact with water	To seal the holes directly connected to the passenger compartment and the exterior horizontal arrangements.

Tightness Inspection

Overview

Handling of the leaking problem needs to combine techniques, experiences and instincts to take proper and effective measures. Do not come to conclusions fast only by naked eyes.

Inspection Tools and Instruments

When checking and correcting the leaking problems, the tools and instruments below are recommended to use:

1. Garden Sprayer (hand-operated)
2. Wet/Dry Vacuum Cleaner
3. Dry, Absorbent Cloths
4. Electric Torch
5. Mirror
6. Weatherstrip Locating Tool
7. Trim Panel Remover
8. Small Wooden or Plastic Wedges
9. Dry Compressed Air Supply
10. Hot Blower
11. Sealer Applicators
12. Ultrasonic Leak Detector

When checking the leakage, at least the following parts should be checked:

- Front Inner Space;
- Rear Seat Space;
- Storage Box or Trunk

Inspection Methods and Measures

The operators at the fittings centre can judge from where to check the leakage by information offered by the customers. The next step is to find the leaking spot after the leaking place is founded.

For the first case, an easy and effective method is the common garden sprayer. Nozzle of this extruding garden sprayer ought to be adjusted, so that water can be sucked into the nozzle directly and spray out proper spray. At the dark corners, a mirror or electric torch can be used (the test light using supply voltage is not available).

The test order is very important. Begin from the lowest point and go up gradually, this can avoid blocking off the other leaking place when an area is being checked. If the test begins from the windscreen, any water flowing into the pumping chamber may drop on the pedal by baffle insulating ring. Even though, it may be judged wrongly that seal of the windscreen fails.

Another part for leaking check is to visually observe whether the door hole seal, insulating ring or weatherstrip is damaged, aged or displaced. Meanwhile, align the door with the seal.

Note : Check the colour of the leaked water. If the water is dirty, the leak is from under the vehicle. If the water is clean, it is from above the vehicle.

When the leaking spot is checked, the following methods are necessary to resolve the leaking problems:

1. Replace all of the damaged, displaced and aged door hole seals and weatherstrips.
2. Check all the vehicle seal and ensure it is fixed on the fixing flange/fixing face correctly. If necessary, simitar can be used.
3. Blow the vehicle welding lines to be processed with compressed air and/or hot blower at required place.
4. If necessary, the sealant on the outer side of the joints can be applied to prevent water.
5. When correcting leakage of the windscreen and weatherstrip (or polishing between the upper glass and the body directly), try best not to remove the glass. Use qualified materials at proper places (such as glass to the weatherstrip or glass to the body).

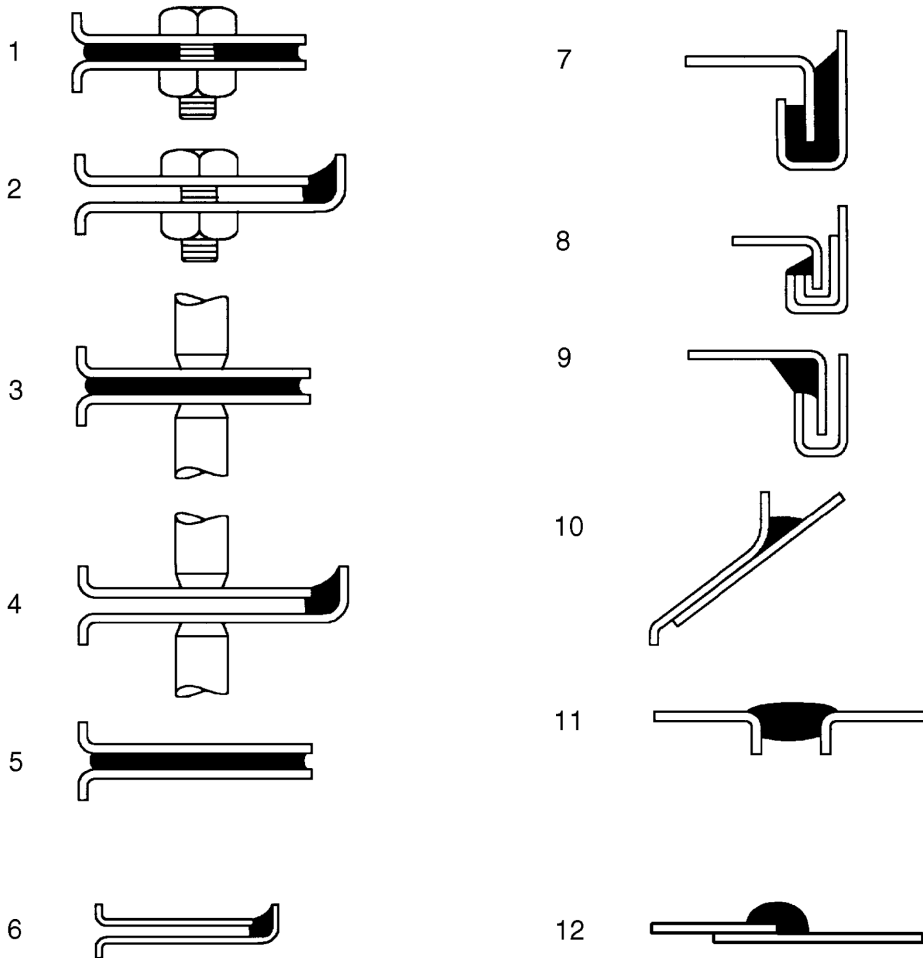
Initial Door Weatherstrip Replacement

The initial weatherstrips of the front and rear doors shall be pasted in a fixed position. Do comply with the following regulations when replacing the seals:

- Clean the places to be stuck with seals on the door thoroughly. Do not clean the doors with paint diluent agent.
- The perfect temperature for the sealing strip is 25°C(77°F). When the temperature is below 18°C (64°F), the paste effect for either the door or other sealed locations will be worse.
- The strength should not be too big when sticking the sealing strip, this is easy for either disassembly or re-installation. If the sealing strip needs re-sticking, do not touch the contact face or stain it.

Position Information of Sealant

Body Seal Identification



S882053

- 1. Between Panels - Bolted Connection
- 2. Panel Edges - Bolted Connection
- 3. Between Panels - Spot Welding
- 4. Panel Edges - Spot Welding
- 5. Between Panels - Bonding
- 6. Panel Edges - Bonding

- 7. Riveting Joints - Type (a)
- 8. Riveting Joints - Type (b)
- 9. Riveting Joints - Type (c)
- 10. Panel Gaps - Type (a)
- 11. Panel Gaps - Type (b)
- 12. Lap Joints

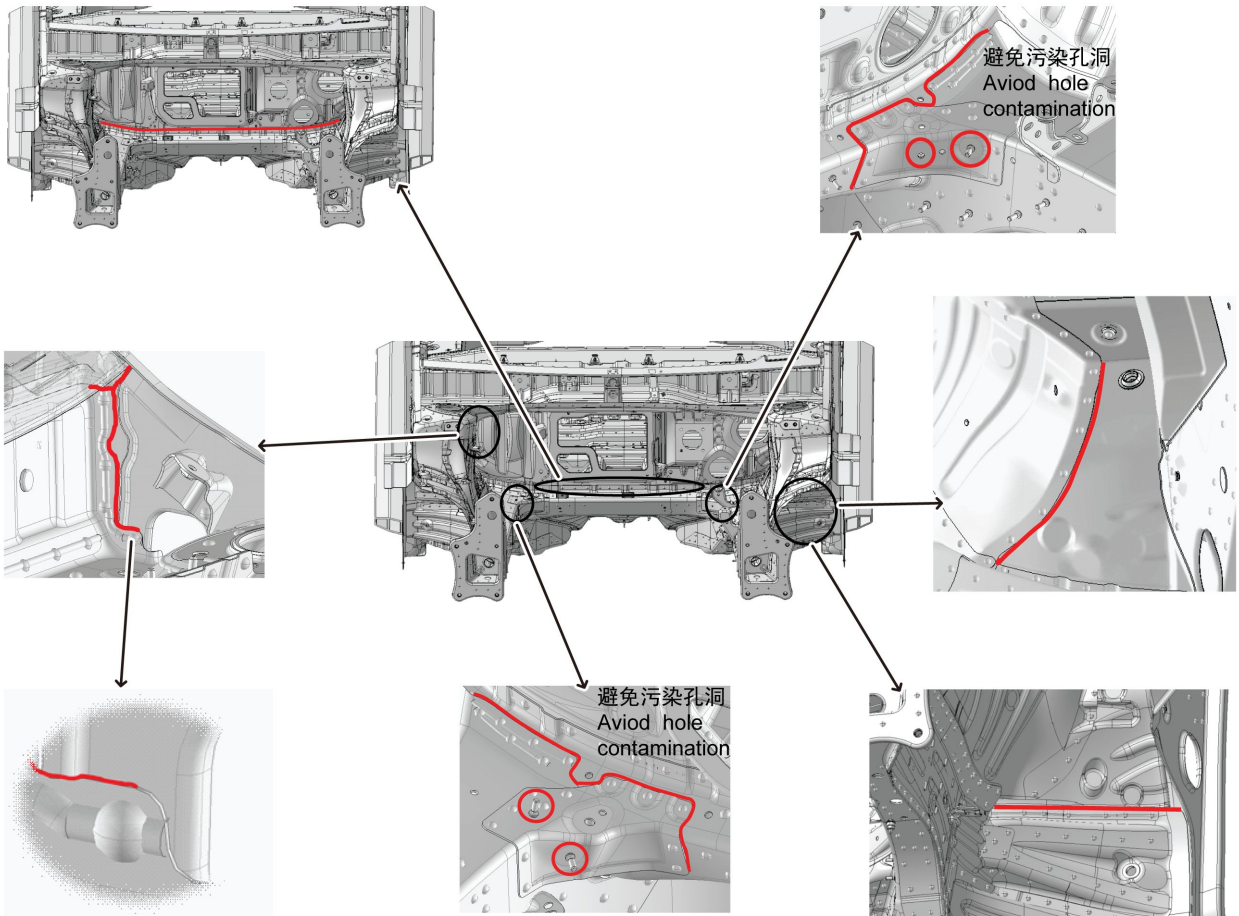
Sealant Information

After the panel is welded or replaced for repair, it is required to use PVC sealant to seal the weld seam and the new panel according to the following construction principles and the instructions on gluing position given by the original manufacturer to guarantee the repair quality:

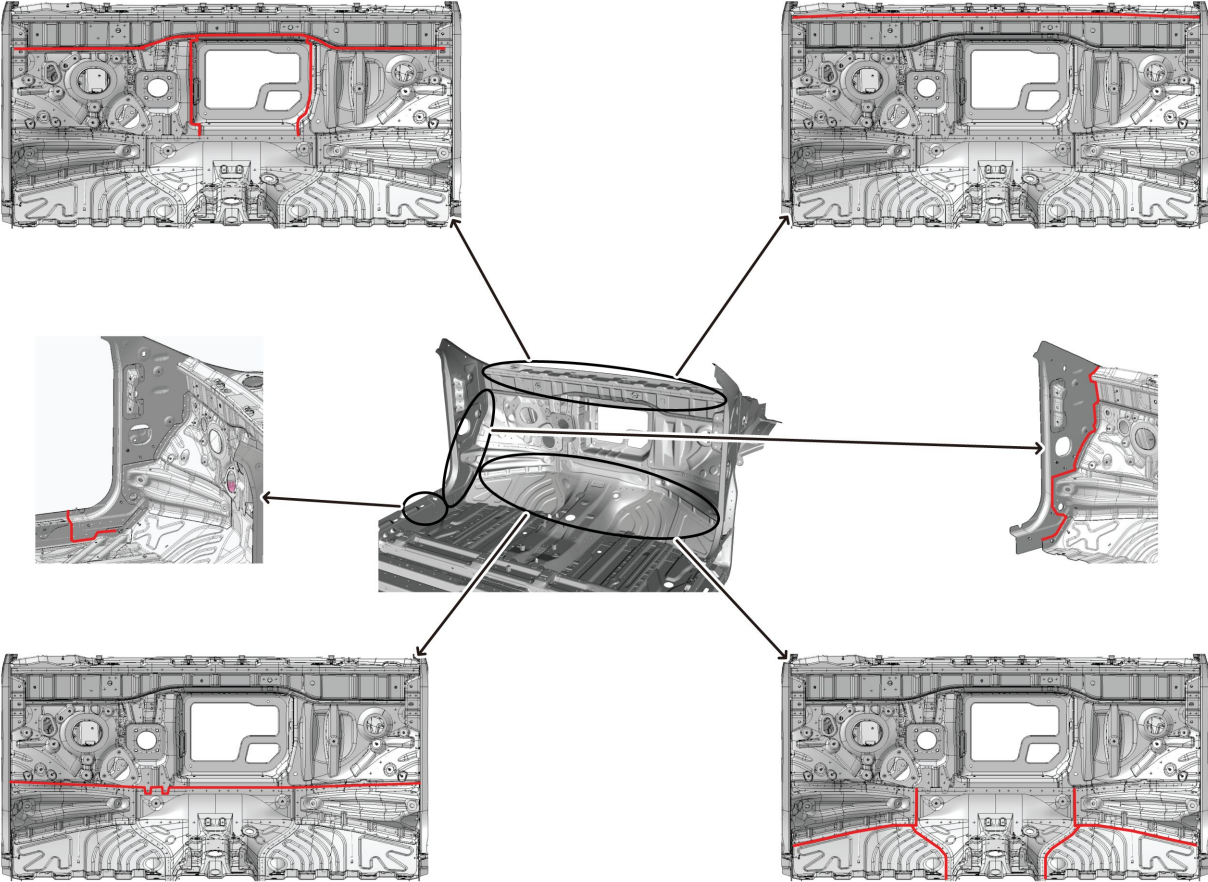
- PVC brushing glue requirements: cover the weld seam to make the surface smooth and even without fillets, and the width is less than 50mm.
- PVC tube glue requirements: cover the weld seam to make the surface smooth and even, the width is 5-9mm and the thickness is 1-2.5mm.

- PVC frictioning glue requirements: cover the weld seam to make the surface smooth and even without pinholes or bubbles.
- Apply thumb glue in the following red dots, and for any place not specifically described in the figure below, brushing glue shall be applied.

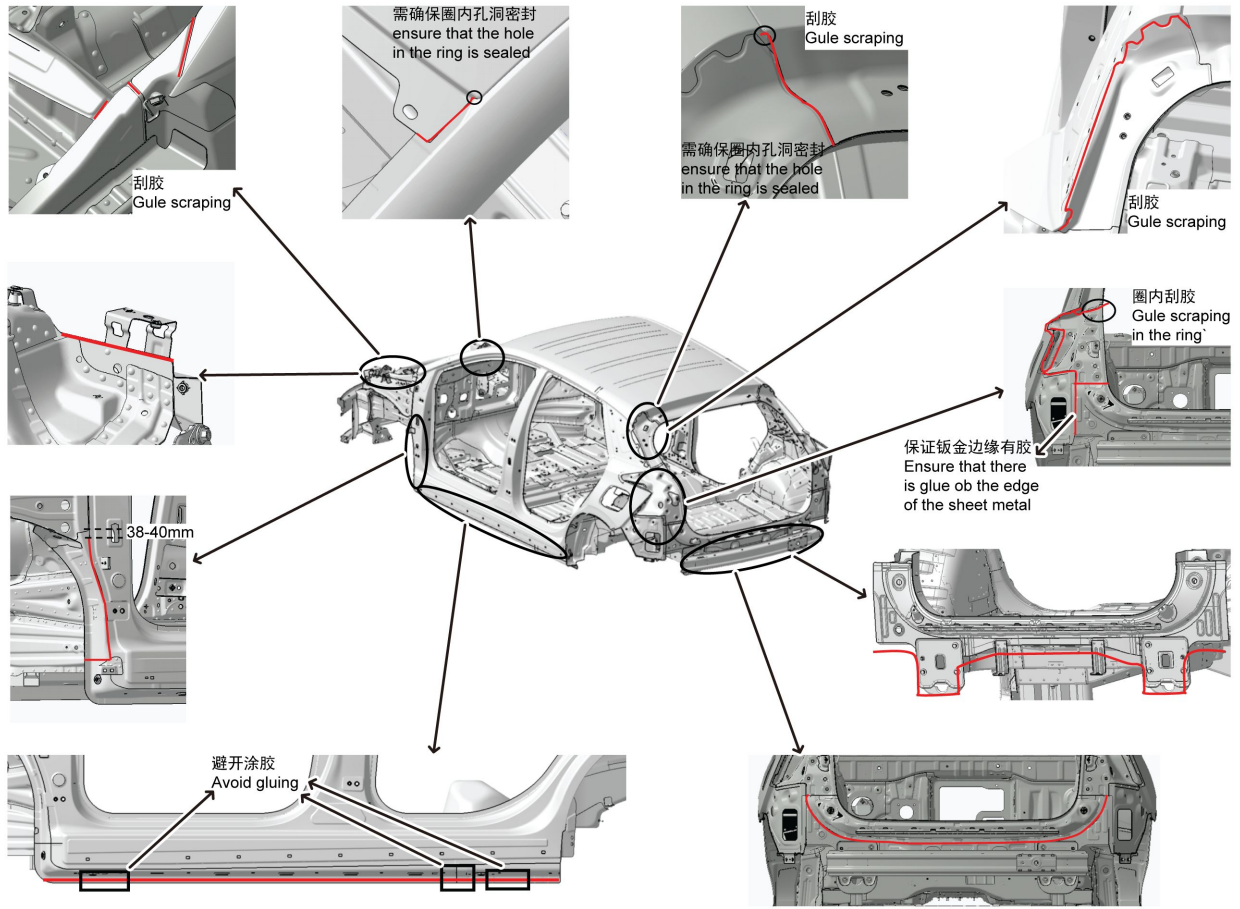
Front Compartment



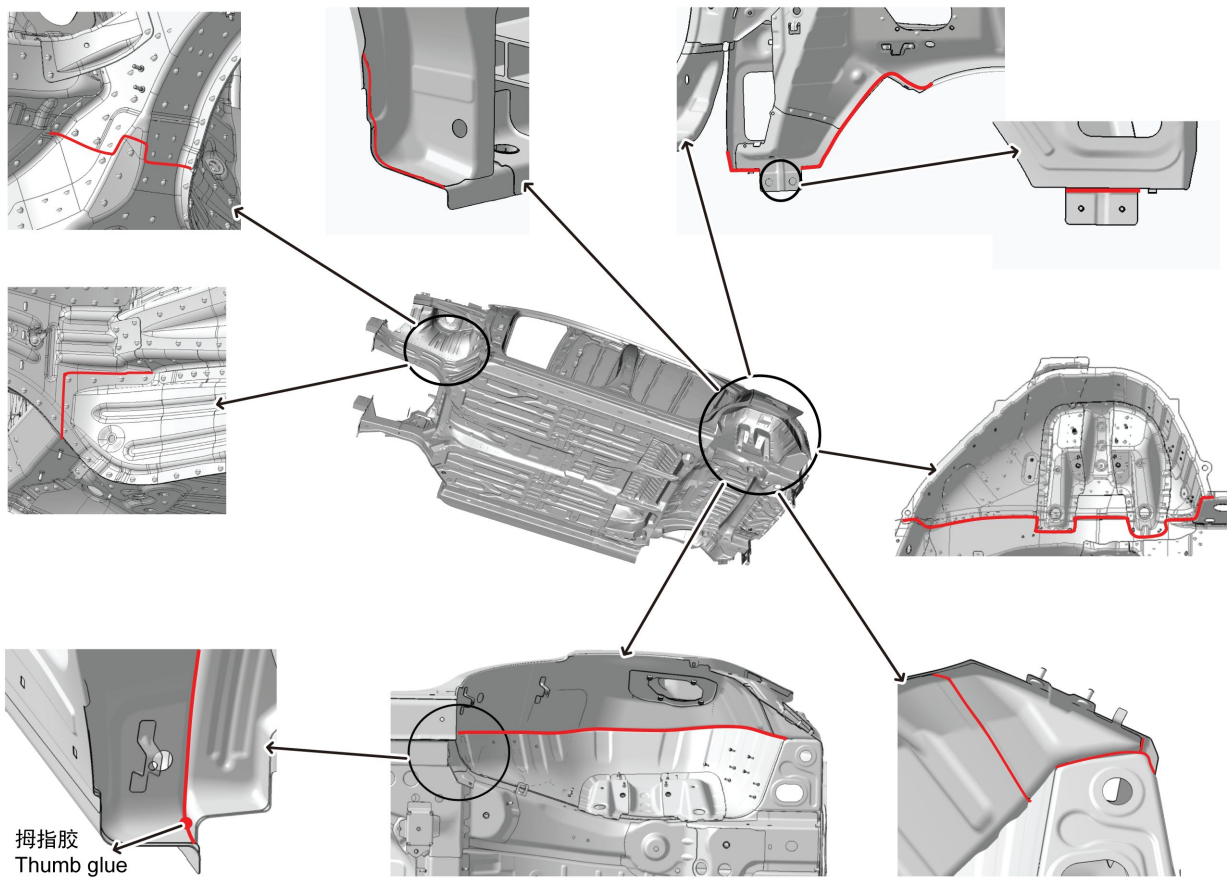
Dash Panel



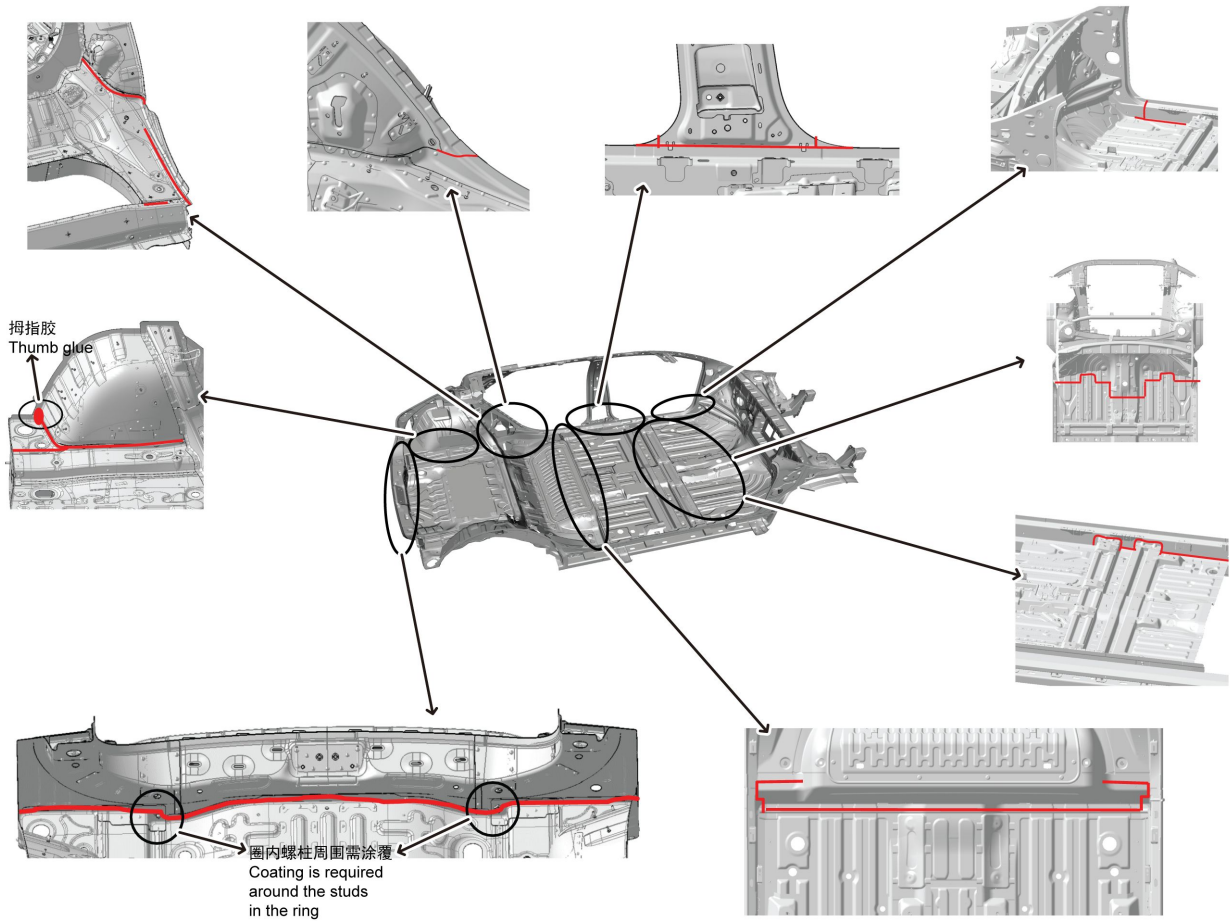
Door Sill Side Panel



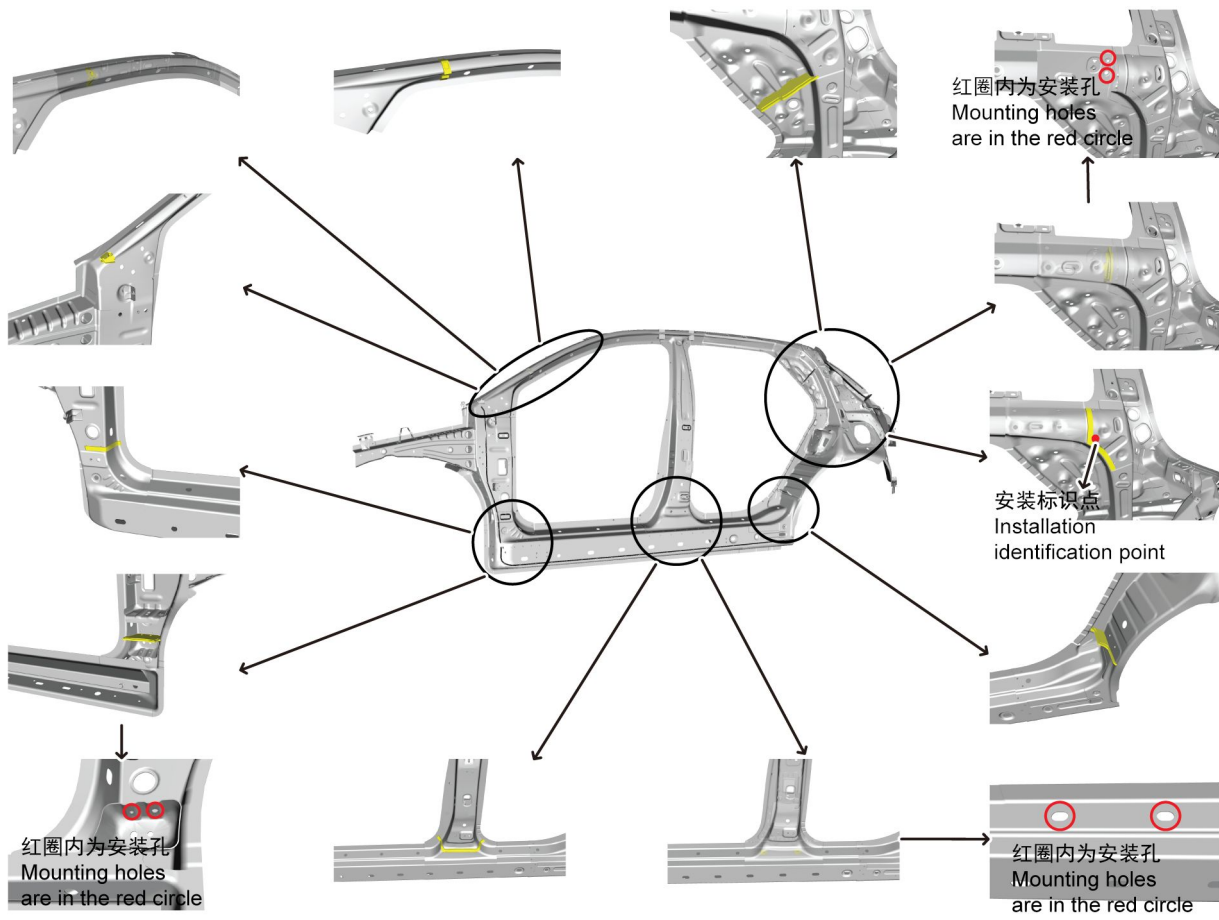
Chassis



Interior Compartment



Position Information of Foam Parts



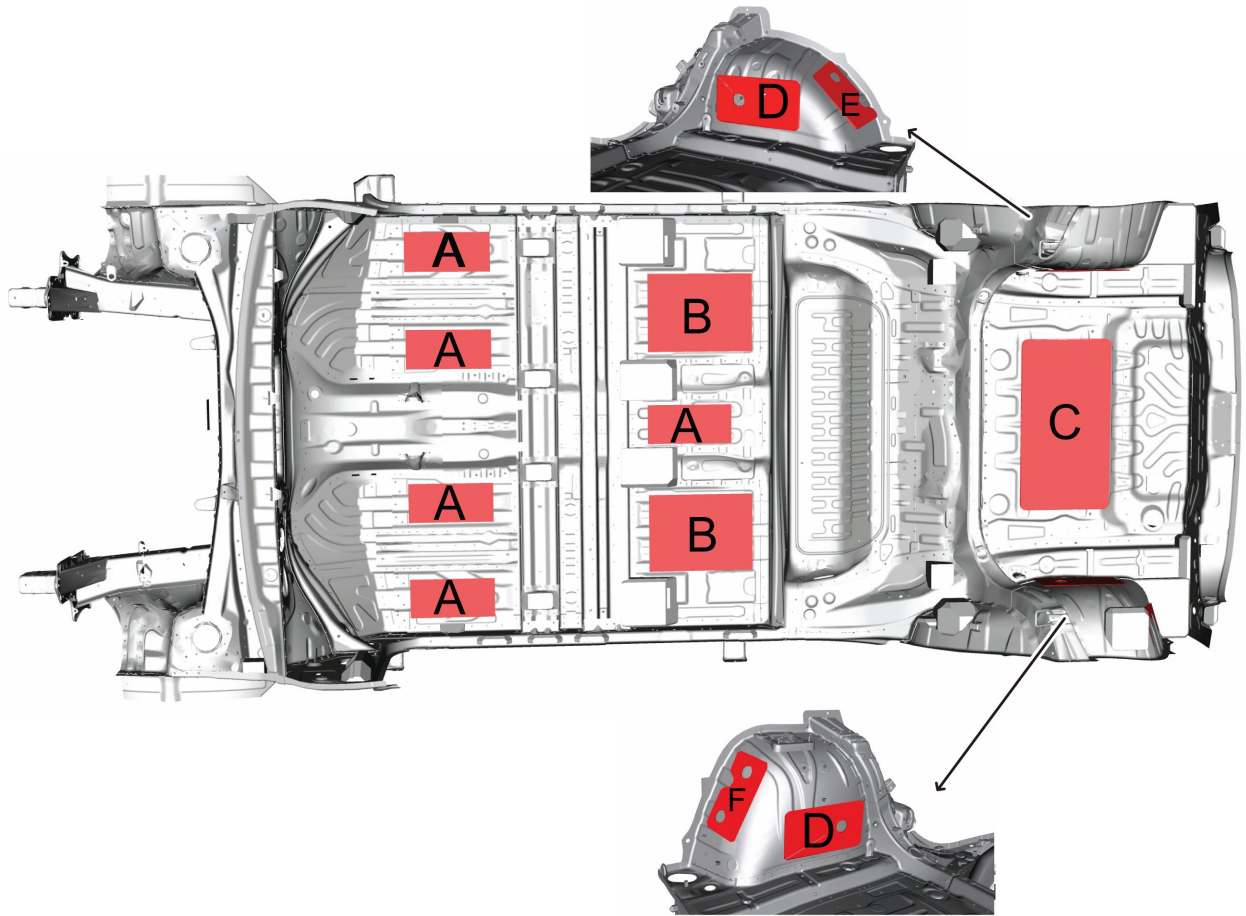
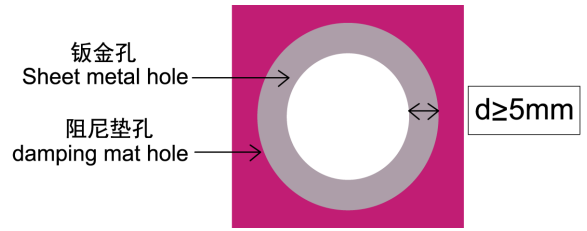
Position Information of Gaskets

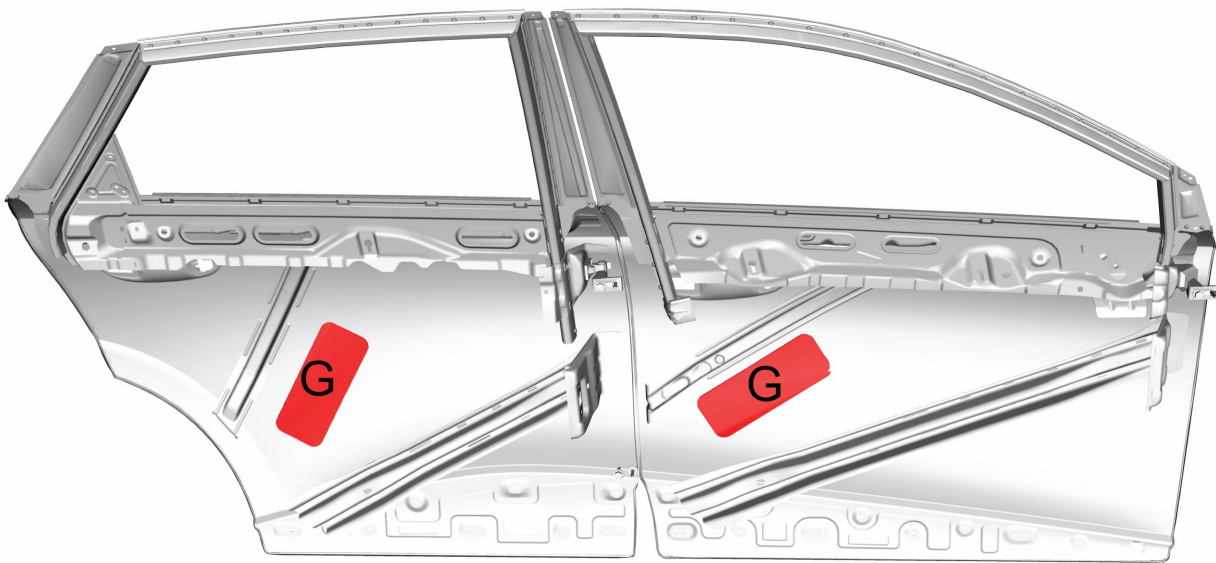
Damping mats are used in the base plate, dash panel, rear end panel, rear wheelhouse and central passage. When making panel repairs or replacements in these areas, tailor new gaskets according to the size of original ones and paste them as the following instructions:

- Clean the panel part to be pasted prior to pasting the new gasket.

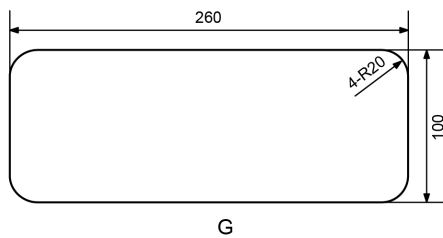
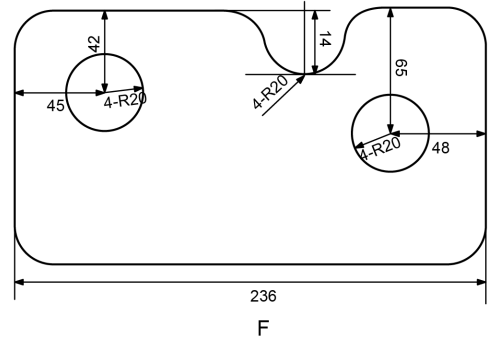
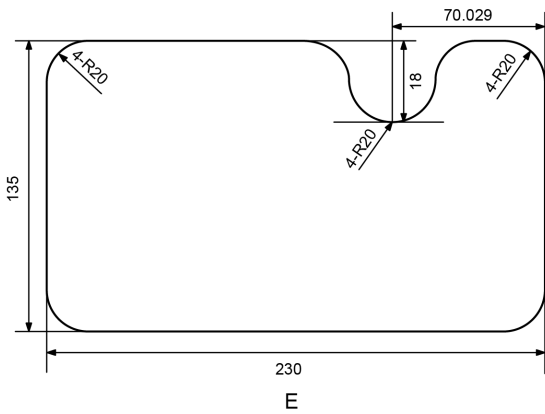
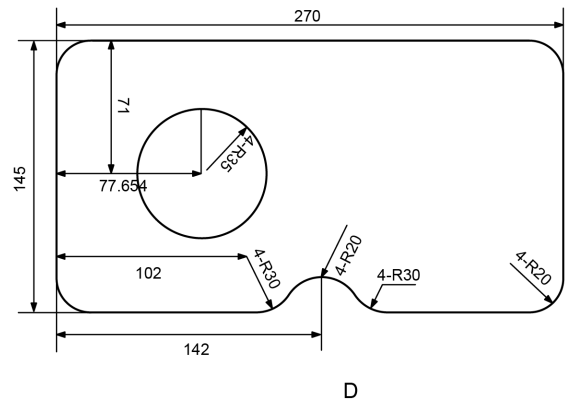
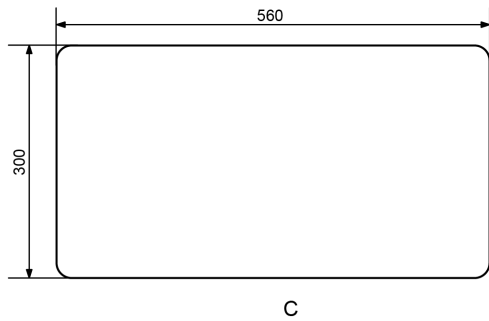
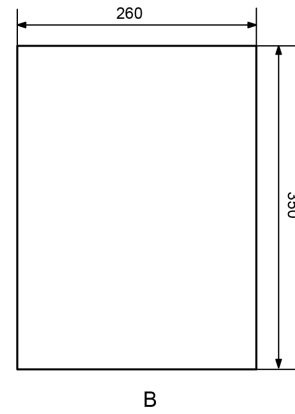
Gasket Pasting Position Information

- Follow the size requirements in the figure below.





Gasket Size Information



Anti Corrosion

Overview

Treatment during Production

During production, vehicle body is treated with the following anti-corrosion materials:

- Galvanized steel plates are used;
- Dipping and electrophoresis of phosphate antirust primer;
- Stone crash protection coating.
- Underbody coating: applied on the underbody of the main floor and the rear floor, and on the rear wheel arches;
- Cavity wax: sprayed on the sheet metals like sill panel and rear shelf panel, bodyside extensions and the lower areas of the door panels;
- Protective wax: applied to areas of the wheel arch not covered by the wheelhouse.

Whenever body repairs are carried out, ensure the anti-corrosion materials in the affected area are repaired or renewed as necessary. Ensure the materials used are also the approved anti-corrosion materials.

Precautions during Body Repair and Handling

Take care when handling the vehicle body in the workshop. Underbody sealer, seam sealing material, underbody sealing wax and body panel may be damaged if the vehicle is carelessly lifted.

When fitting accessories, ensure that the vehicle's corrosion protection is not affected, either by broken protective coating or moisture.

Do not screw self-tapping screws directly into body panels. Fit suitable plastic inserts on the body panel beforehand. Always ensure that the edges of holes drilled into panels, chassis components and other body parts are protected with a suitable zinc-rich or acid-etch primer, and applied with a protective wax coating onto the surrounding area.

Do not allow painted metal surfaces of any accessory to directly touch the vehicle body unless suitably protected. Suitable media must be available between metal surfaces to be bolted together, such as weldable zinc-rich primer or zinc strip.

Due to the high temperature generated by steam cleaning equipment, there is a risk of damaging certain decorative components, softening or liquefying some adhesives and anti-corrosion materials. Therefore, adjust the equipment so that the nozzle temperature does not exceed 90°C (194°F). Take care not to allow the steam nozzle to dwell on one area, and keep the nozzle at least 300 mm from panel surface.

DO NOT remove protective wax or paint from underbody or underhood during repairs. If steam must be used to clean these areas, apply a new coating of protective wax or underbody protective layer as soon as possible.

Inspection during Maintenance and Service

Carry out the following operations to check the vehicle body for corrosion:

- Raise the vehicle, and visually check the underbody sealer for damage;
- Lower the vehicle, check the body exterior paintwork for damage and the body panels for corrosion.

Note : *If the vehicle to be inspected is dirty, it will need to be washed prior to body inspection.*

The checks described above refer to visual check only. It is not necessary for operators to remove trim panels or acoustic materials when checking the vehicle for corrosion and paint damage.

1. After raising the vehicle, by using the detection lamps or spotlights, inspectors can visually check the followings:

- Corrosive damage and paintwork damage, and the condition of underbody sealer at the front and rear lower panels, door sills and wheel arches;
- Damage to underbody sealer. Corrosion in areas adjacent to suspension mounting points and fuel tank mounting points.

Note: In case of no exposed metal, the little bubble on underbody sealing material can be ignored.

Pay special attention to signs of damage caused to panels or anti-corrosion material by incorrect lifting method.

Warning : *It is essential to follow the correct jacking and lifting procedures.*

2. After lowering the vehicle, visually check all visible paint surfaces for signs of damage and corrosion, and pay special attention to the followings:

- Front edge of bonnet.
- Visible flanges in engine compartment.
- Lower body and door panels.

Any signs of body damage or corrosion found during inspection shall be corrected by practicable method as soon as possible. These include minimizing the extent of the damage and ensuring the long term effectiveness of the anti-corrosion treatment used in production. If the corroded area becomes clear, and spreads out from the bottom of replaceable parts (such as: various trim panels, window glass, seats, etc.), it's required to replace the parts, so as to achieve the most effective repair.

Underbody Protective Repair

Whenever body repair is carried out, ensure that the sealing and anti-corrosion measures are restored. This applies not only to the repair work on the damaged areas, but also to the repair work on some areas where protection layer has been indirectly impaired as a result of accident or repair operations.

Remove the anti-corrosion protection layer from the damaged area before straightening or panel repair. This applies in particular to panels coated with protective wax, underbody with PVC, acoustic panel, etc.

Warning : *DO NOT use oxy-acetylene gas equipment to remove anti-corrosion materials. Because these materials will release a lot of smoke and gas when burning.*

Note : *The device used for removing strong anti-corrosion sealant can provide several rates and efficiencies. The scraper (not pneumatic chisel) driven by compressed air provides a relatively quiet mechanical method by using a very rapid reciprocating motion. Move the operating edge of the tool along the workpiece surface to remove the sealing material.*

The most common method of removal is to use a heat blower integrated with scraper. One of the most efficient methods is to use 'hot knife' with rapid cutting feature. This tool uses a wide blade and is able to easily enter the outer contour areas where it is hard to reach by other methods.

Use the following procedure when repairing underbody coatings:

1. Remove existing underbody coatings;
2. After panel repair, wipe and clean the affected area with solvent, and treat exposed metal with an etch phosphate material;
3. Re-apply the primer to the affected area;

Caution : *DO NOT apply underbody sealer directly to bare metal surfaces under any circumstances.*

4. Replace all damaged heat-fusible plugs. Where such plugs do not use rubber grommets of equivalent size, ensure that they are embedded in sealer;
5. After mechanical components, hoses and pipe clips on the underbody have been removed, cover all the mounting surfaces. Underbody sealer must be applied before such components are refitted;
6. Brush sealer to all exposed joints;
7. Spray the affected area with an approved underbody sealer;
8. Remove masking from component mounting surfaces.

After refitting mechanical components, including hoses, pipes and other fixtures, cover the brake discs and apply a coat of approved underbody protective wax. The underbody

protective wax should be re-applied after panels at damaged wheel arches are repaired. This layer of protective wax also applies to various paintworks and underbody sealers. Remove old underbody protective wax completely from a zone extending at least 200 mm beyond the area where new underbody sealer is to be applied.

Note : *During repairs, for the areas requiring application of underbody protective wax and coating, be sure to carry out paint operations before applying protective wax.*

Cavity Wax Injection

After repairs, always treat areas with an approved cavity wax. In addition, treat all interior surfaces which have been damaged during repairs whether they have been treated in production or not. This includes all cavities and door interiors. It is permissible to drill extra holes for access where necessary, provided that these holes are not in load-bearing members. Ensure that such holes are treated with a suitable zinc-rich primer, brushed with protective wax and sealed with rubber grommets.

Before wax injection, ensure that the cavity to be treated is free from any contamination or foreign matter. Where necessary, remove any debris inside with compressed air.

Ensure that cavity wax is injected AFTER spraying the final paintwork and BEFORE refitting any other components.

During application, ensure that the cavity wax covers all flange and joint areas and that it is adequately applied to all repaired areas of both new and existing panels.

It should be noted that wax injection is not required when new panel and complete body shells are assembled. Ensure that such operation is carried out after repairs.

Effective cavity wax protection is vital. Always observe the following points:

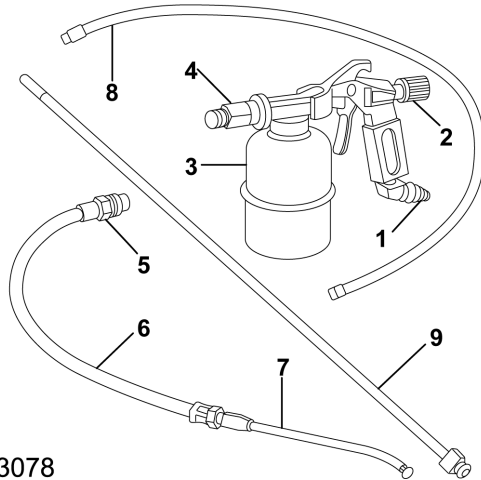
- Complete all paint finishing operations before wax injection.
- Clean body panel areas and blow-clean cavity if necessary before operation.
- Maintain a temperature of 18°C (64°F) during wax injection and drying.
- Check the injection mode of injection equipment.
- Cover all areas needing no wax protection layer and areas where could be contaminated by overspraying protective wax.
- If there is a risk of contamination, remove body devices, such as seat belt retractor;
- Move door glasses up to fully closed position before treating door interiors.
- Apply wax to body areas normally covered by trims before refitting components.

- Check that drain holes at the body and door are cleaned up after the protective wax has dried.
- Keep all equipment clean, especially wax injection nozzles.

Anti-corrosion Products and Processes

Equipment and Supplier

Cavity Wax Injection Equipment and Technology



S883078

1. Air inlet
2. Flow control (by adjusting the injection mode)
3. Pressure cup (with a capacity of 1 liter). Maximum pressure: 140 PSI (9.7 bar, 9.84 kg/cm³)
4. Spray gun connector
5. Spray gun tube-nozzle connection
6. Retractable spray gun tube
7. Rigid directional hook rod (forward tapered spray mode)
8. Movable nylon spray gun tube (1100 mm, 360° spray mode)
9. Rigid spray gun tube (1100 mm, 360° spray mode)

During repair, if the wax-sprayed area is scratched, it need be re-processed. It is required to use the compressed air spray gun with an integral pressure cup and a replaceable spray gun tube.

It should be configured based on the additional equipment; during the use, the following points should be strictly observed:

- To process the coating area, use a rigid or movable spray gun for 360° spray to achieve maximum coverage;
- Where the opening is restricted, a hook-type nozzle should be used to provide a more directional injection (such as the trunk with a narrow internal space or a short length);
- The wax will be directly sprayed from the smaller nozzle device of the spray gun onto the bottom surface to disconnect the liquid connection.

1100mm rigid spray gun: the rigid spray gun nozzle will generate a 360° circular forward tapered spray. When the wax pattern is sprayed through a single stroke, the entire trunk surface will be affected; however, when it is sprayed from inside and outside a spray gun, both the long straight structure and the trunk can be effectively and completely covered with

wax film. By visual inspection, the rigid nozzle also provides the positioning accuracy required to process the molded parts.

Caution : Do not force the spray gun into the mouth of vessel to be sprayed when using this device.

1100 mm movable nylon nozzle: although the elastic nylon spray gun is similar to the rigid spray gun in style, it provides a stronger penetrability, which is ideal for bent parts or vessels to be sprayed that are not readily accessible for the nozzle. The main weakness of the elastic nylon spray gun lies in its inability of precise positioning to the inner space. When the spraying is carried out, outward spraying will be achieved under the action of the spray gun's stroke. Therefore, to pull out the spray gun, slow withdrawal will be required to guarantee the integrity of the spray that has been completed. It is inadvisable to pull out the spray gun too quickly. Make sure that the spray gun's nylon tube is connected into the hole while being kept away from the edge to avoid wear of the nylon tube and to prolong its service life. It is required to make sure that the spray has been stopped before the nozzle is pulled out of the access port. To assist in the completion of this step, apply red paint to the last 30mm of the rear end of the nozzle.

Movable Spray Gun with Hook-type Nozzle

The spray gun with a rigid hook-type nozzle will produce a forward spray effect, whose full tapered spray mode is featured by long range and good dispersity. The combination of these two features can produce a good directivity, which thus can either be applied to the short and narrow area to be sprayed, or to the direct spraying of inner wheel arch and other scenarios.

In use, place the smooth area at the end of the spray gun to form a spraying angle of 180° with the position sprayed by the nozzle. In this way, when the area to be sprayed is hidden in a box section or enters into a hole, it will help guide the spraying to be completed more accurately.

For general spraying, the nozzle should be moved from one end to the other in an arched manner as required to ensure that the surface will be fully sprayed.

Note : Always clean the spray gun with appropriate solvent after spraying to maintain working efficiency.

Recommended Equipment

3M body Schuetz pistol spray gun 08996: Composed of casing and processed light alloy, pistol spray gun in collaboration with 3M screws will be fitted on the body's Schuetz container.

3M pneumatic shell gun-like spray gun 08012: Direct feed pneumatic gun is applied to 3M cartridge products. Its excellent performance lies in the ease for spraying; meanwhile, it is equipped with a control valve for extra control.

3M pneumatic machine-gun-like spray gun - 08006/7: direct feed pneumatic gun is used for 3M sealed bagged products (the gun numbered as 08006 is suitable for the bagged products of

200ml and 310ml to be sprayed; the gun numbered as 08007 is suitable for various models of bagged products to be sprayed, including the product of 600ml to be sprayed).

Other available spray guns: heavy pistol 08013.

3M glue gun 08190: this model of spray gun is suitable for the structural gluing 08120 of 3M.

3M cavity wax pattern glue gun 08997: This device can carry a loading tank of 1 liter and is equipped with a hose with a length of 750 mm. The approval system can be obtained from all 3M surface finishing coefficients. Cooper Pegler Falcon primary pneumatic spray gun (airtight): this pneumatic sprayer is mainly used to spray the transit wax; equipped with a container of 5 liters that is attached with a complete hand pump, it can carry out effective wax spraying with no compressed air or extra operation required. The use of nozzle, spray gun, hose, and a trigger valve with a complete filter can make the application more convenient and flexible. Other applications include general maintenance, wax injection and paint spraying. Heavy-duty materials may be used. All parts are fully replaceable and can be configured with various nozzles.

SATA Schuetz gun model UBE: SATA Schuetz gun is used to reprocess the lower part of the vehicle coated with protective paint; the gun is placed in a one-way dedicated one-liter container. The threaded fittings (the gun with internal thread) meet the criteria for most of the Schuetz type packages

Specification of the model UBE:	
Air consumption	7 ft ³ /min (200 litres/ min) @ 45 lbf.in ²
Weight:	23.3 oz (220 grams)

SATA HKDI wax injection equipment: this equipment is used for reprocessing of cavity wax. SATA HKDI device consists of the following parts: high quality forging, a gun with a pressure feed vessel of 1 liter, a retractable nylon spray gun, a steel pipe with a length of 1100 mm, and a hook-shaped rod tube. As a rapid changeover connector for standard fittings, it can facilitate re-connection of the tube instrument. Each spray gun has a complete processing nozzle featured by dedicated spraying to adapt to the type of trunk to be handled.

Note : Always clean the spray gun with appropriate solvent after spraying to maintain working efficiency.

Contact Information of 3M Supplier

3M (China) Limited

Address: 38F, Maxdo Centre, No.8 Xingyi Road, Shanghai, China

Postal code: 200336

Tel.: 86-21-62753535

Website: www.3M.com

Zinc Spray

For any area where metal inert-gas welding (MIG)/metal active-gas welding (MAG) or spot welding is required, the area near the joint surface should be sprayed with the zinc-rich primer while that to be welded should be left alone.

The zinc spray is commonly used in the following two situations:

- The damaged cutting surface or coating of the panel requires zinc spray;
- The welding contact surface requires zinc spray to prevent rust of the spot welding.

Cavity Protection Wax

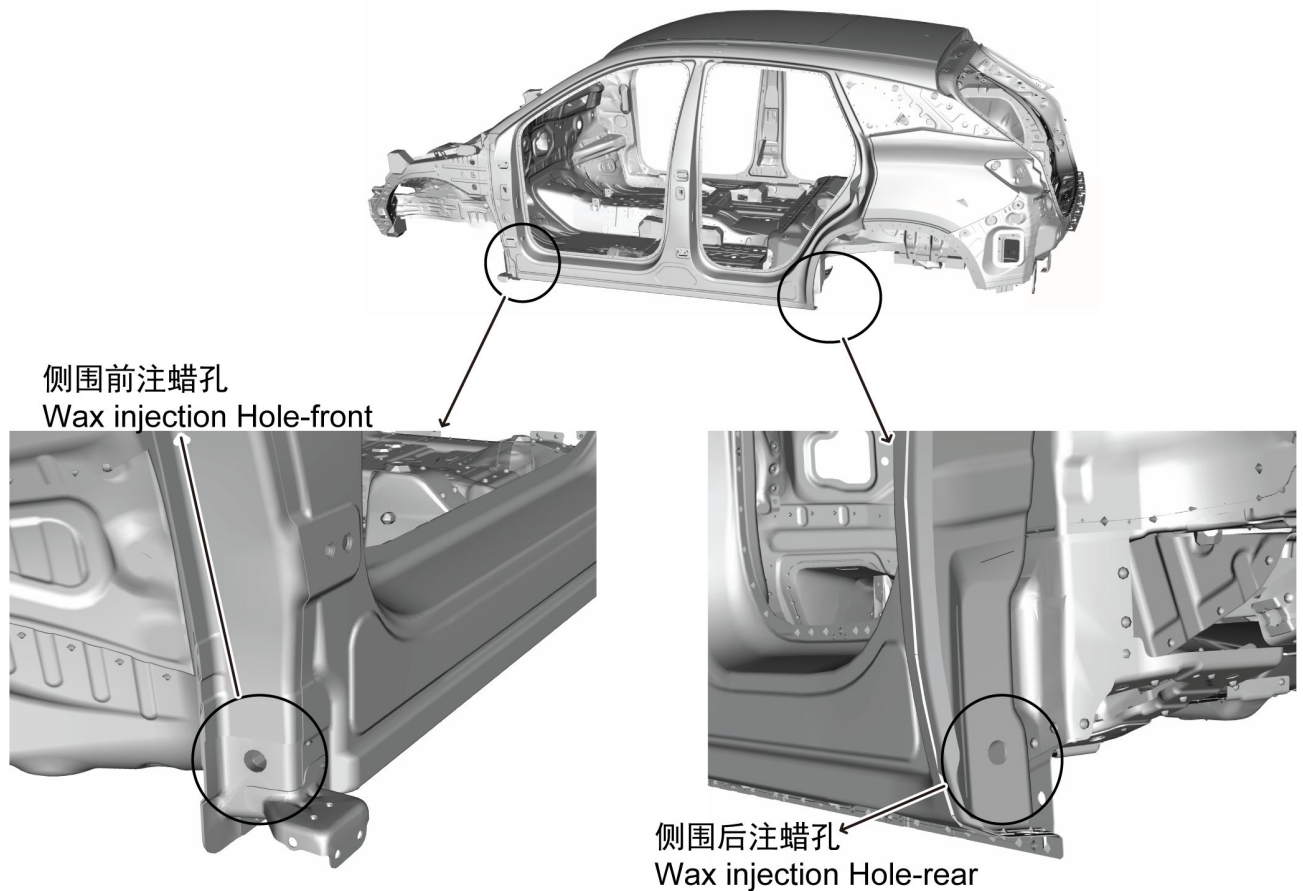
Application Process of Cavity Wax

Application tool:

- Pressurized spray gun with tank;
- Hook-like probe;
- Flexible/semi-rigid nylon probe;
- Rubber plug;

Application Information of Cavity Protection Wax

Door Sill



Underbody Sealer

Functions of underbody sealer:

- Improve the stone chip performance of the underbody;
- Improve the anti-corrosion performance of the underbody panel;
- Improve the sealing performance of the underbody panel crack;
- Improve the sound insulation performance of the underbody.

Caution : *Ensure that suspension units, wheels, tyres, power unit, exhaust system and brake system (including all mounting points) are covered prior to application of new underbody sealer.*

Construction steps of underbody sealer:

1. **Cleaning:** to ensure maximum viscosity of the product, it is required to thoroughly clean the surface of the underbody to remove dirt, oil, grease or wax residue.
2. **Check:** before starting, it is required to thoroughly check the underbody to confirm whether there is any potential damage or rusty area. The key parts include: wheel arch, door sill, seam, and lap joint.

3. **Dust removal:** use a small shovel or wire brush to remove all the rust spots from the underbody. Special attention should be paid to the hard-to-reach places, such as wheel frame, overlapped joints or seams.
4. **Check the type of the underbody coating:** check which type of the underbody coating is used to select an appropriate product.
5. **Read the instructions for use:** before starting work, please read the operating instructions on the product packaging and view the technical data sheet. Read the safety instructions in the material safety data sheet carefully to minimize potential risks and hazards and to achieve the possible optimal effect.
6. **Use the cross spraying technology:** spray the anti-rust protection product at a distance of approximately 30cm, first in the horizontal direction, then spray the bottom plate stiffener at a suitable angle (cross spraying technology). At least three times of spraying can bring about the optimal wet film thickness of 1.5mm.
7. **Drying time:** a specific drying time is required to make the coating material tightly and permanently attached to the underbody. The drying time will vary with the type of the solution and the thickness of the coating. The drying time

for the product containing high volatile solvent will at least last for 2 hours.

8. Spray gun cleaning: clean the spray gun with a dedicated detergent immediately after the completion of the operation.

Welding Process

Overview of Welding Methods

Welding Process Characteristics:

- It is not restricted in shape; it is suitable for connecting integral body structure, which, after being welded, can still maintain its intactness;
- With no adapting piece needed, it can reduce the weight;
- Good sealing performance against air and water;
- High productivity;
- Strength of the welded joint will be affected by the operator's technical level;
- In case of overheating, the surrounding panels will be deformed.

Generally, GMAW, resistance spot welding and braze welding are adopted for the body welding of modern automobiles. When the body panel should be welded for repair, based on specific conditions, it is required to adopt an optimal welding method that will not reduce original strength and durability of the body; it is advisable to use spot welding or inert-gas welding where possible.

Gas Metal Arc Welding (GMAW)

GMAW is mainly used to weld high-strength and low-alloy steel bodies and cast aluminum parts. The advantages include:

- The operation method is easy to be mastered;
- It can 100% melt a variety of base metals; when being applied to a thin metal, it can use weak current to reduce the damage to the strength of adjacent parts;
- The arc is stable and easy to be controlled;
- It is suitable for welding of parts with gaps and mismatches;
- Able to control the welding temperature and duration, it can shorten heating time of the welded zone, thus reducing fatigue and deformation of the base metal.

Typical welding positions and welding methods:

- Butt welding. Mount two adjacent metal edges together, then conduct welding along the edge of the two metal plates mated or butted;
- Overlap welding. Weld two overlapped metal plates;
- Plug welding. Drill a hole in one or several workpieces outside to make the arc access the workpiece inside through the hole which will be filled with molten metal;
- Spot welding. When the timing pulse for wire feeding is triggered, the current will be introduced into the two metal plates to be welded.

Resistance Spot Welding

As the most commonly used method for welding of the integral body, resistance spot welding is suitable for thin steel

plates of the body requiring high welding strength without deformation. Roof, door window, door sill plate, external components, etc. The welding quality of the resistance spot welding will be affected by the voltage, current, pressurized time, thickness of the welded metal plate, and other related factors, which are expounded as follows:

- Material and degree of cleanliness of the welding parts: the contact points between welding parts and between the welding parts and the electrodes should be carefully polished and cleaned;
- Electrode pressing force: if the pressure is insufficient, weld spatter will be caused at the contact point; if the pressure is excessive, although the current flowing through is large, owing to the enlarged heat distribution area, the welding spot diameter and weld penetration will become smaller instead;
- Welding current: both welding spot diameter and welding strength will be increased with the increase of welding current; however, when the current is excessive but the pressure is insufficient, the weld spatter will also be caused between the plates, whereas it may be minimized;
- Power-on duration: the effects exerted by long power-on duration on the welding spot include abundant heat generated, large welding spot diameter, and deep weld penetration. However, if the power-on duration is excessively prolonged, electrode indentation and thermal deformation will be caused instead of increased welding spot;
- Arrangement of welding spot: both spacing and margin (the distance from the welding spot to the plate edge) of the welding spot will also impose a decisive effect on the strength of the welding spot. Although shortening spacing of the welding spot can improve the connection strength of the welding parts, in fact, there is a limit, because when the spacing exceeds a certain limit, the welding current will be diverted and leaked through the last welding spot; at this point, the increased welding spot will lose its effect to enhance the connection strength of the welding parts, but will lead to counterproductive effect; therefore, spacing of the welding spot should step outside leakage area of the current.

The use of resistance spot welding method requires a correct welding sequence; generally, the spot welding should not be conducted continuously along a single direction; when the electrode tip becomes hot and changes its color, the welding should be stopped immediately to cool it down. Do not weld any edge at the corner, so as to prevent cracking caused by stress concentration.

Aluminum Welding

With the use of new materials, many vehicle panels are made of aluminum which is more difficult to be repaired as compared to steel. Aluminum is softer than steel and is more difficult to be processed and formed after being subject to work hardening, and is easily deformed after heating. The thickness of aluminum body and vehicle structure is usually as 1.5-2.0 times as that of the steel parts, so during processing of aluminum panels, pay attention to the following points:

Aluminum Plate Calibration

Aluminum material is highly extensible and can hardly be restored to its original shape or size after being collided. During repair, use wooden hammer or rubber hammer to perform roller hammer malposition strike, so as to reduce extension of aluminum material. If it is necessary to perform roller hammer normal-position strike, strike gently for many times, otherwise, it will worsen the damage degree of aluminum materials. Prior to aluminum plate repair, first distinguish the category of deformation: flexibly strike the protruding parts with wooden hammer or rubber hammer to release the stress generated by collision, so as to reduce the possibility of bending at the hard damaged part; for repair of depressed part, avoid stretching the aluminum plate instead of raising too much during each repair. For aluminum panel repair, you can also use aluminum shaper to level the damaged part. After completion of repair, use spacial tool to cut down the entire Meson welding screw and polish it evenly. For steel body, when the panel and inner structure are deformed at the same time, separately repair the inner and the outer layers, then articulate the folding edge. But for aluminum panel, this method does not apply. If using this method to repair the aluminum panel, the folding part will crack or fracture due to low aluminum toughness.

If using heat shrinkage method to calibrate the aluminum plate, keep in mind the major differences between steel plate calibration and aluminum plate calibration: during steel plate calibration, avoid heating as much as possible so as to prevent the steel strength being reduced; during aluminum plate calibration, restore the lowered plasticity during work hardening by heating. Without heating, the aluminum plate will crack when the calibration force is applied to the aluminum plate. Prior to calibration, heat the damaged aluminum plate with welding torch. As aluminum does not change color at high temperature, it is likely to be overheated. In this case, the thermal coating or thermal pen that changes color at the temperature of 120°C can be used to control the heating temperature.

When the aluminum plate extends, it can be treated with the heat shrinkage method. During operation, slowly cool the contracted part instead of cooling it down rapidly, so as to avoid plate deformation due to excessive shrinkage. In addition,

during repair of aluminum plate, do not use the contraction hammer or contraction shim plate that are used to repair steel body, so as to avoid crack of the damaged part.

Aluminum Plate Welding

In normal cases, alloy aluminum can be welded with the method of inert-gas arc welding. However, because of the annealing effect in welding process, there is a great loss of strength at the welding part. After repair, the welding part will crack due to vehicle vibration and bumpy driving. So, welding is rarely applied to aluminum body repair, and bonding and riveting are normally used instead. Nevertheless, welding is not an unnecessary process during aluminum body repair. During replacement of structural parts, welding is generally used between structural parts so as to strengthen the integrity and conductivity of the vehicle.

Compared to steel plate welding, during aluminum plate welding, pay attention to the following points:

- During aluminum plate welding, the wire feed speed is higher and more stable, and by using aluminum welding wire and 100% argon, the amount of airflow increases by about 50% as compared to steel body welding.
- During aluminum plate welding, the welding torch should be closer to the vertical position, and the welding direction can only be tilted from the vertical direction by 5-15°;
- Use the positive-direction welding method without pushing or pulling. For vertical welding, weld from the bottom up;
- During aluminum plate welding, the amount of protective air increases by about 50%, and there are more spatters, so apply anti-spattering agent to the nozzle and the conductive steel nozzle;
- The distance between the conductive steel nozzle and the workpiece is generally within the range of 7-14mm.

Repair through Tin Soldering

For curved surface shape partially unrepairable or difficult to repair, use tin soldering to fill the part to be repaired into curved surface shape. Prior to tin soldering, apply tin soldering paste to the repair welding surface, toast the panel surface with the welding torch flame, melt the tin solder, and weld it on the surface to be repaired at a thickness determined by the curved surface, so as to make the surface restore to its original shape after welding. After tin soldering repair, the surface tends to be not perfect enough. In this case, use grinding wheel and sand paper to polish the surface until it is smooth.

Welding Protection Measures

Electronic Control Unit

The Electronic Control Unit (ECU) fitted to the vehicle makes it advisable to follow suitable precautions prior to carrying out welding repair operations. During these operations, a large amount of heat and severe vibration may be generated, which could cause damage to the ECU.

In particular, it is essential to follow the appropriate precautions when disconnecting or removing the sensing diagnostic module (SDM).

Supplementary Restraint System Precautions

When performing any work related to removal or replacement of any item of the SRS, extra care shall be taken and appropriate precautions shall be observed.

Equipment

When starting any test on the vehicle, ensure that the relevant test equipment works normally and all harnesses and connectors are in good condition. This is especially important to the ECU.

Seat Belt Riveting Points

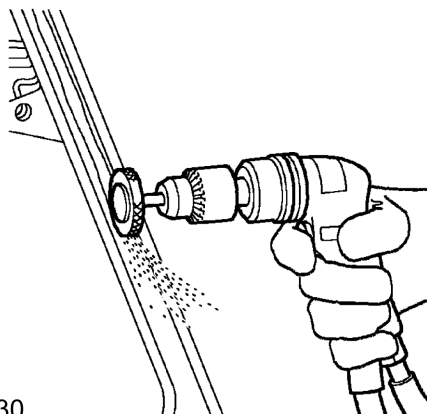
Seat belt riveting points are the key to safety. When making repairs in these areas, it is essential to follow the following design specifications. Note: High Strength Low Alloy (HSLA) steel may be used for seat belt mounting position.

Where possible, the original production assembly should be used, including seat belt riveting points, or the cutting line should be so arranged that the original seat belt riveting points are not disturbed.

All welds within 250 mm at seat belt riveting points must be carefully checked for welding quality, including spacing of spot welding.

Welding Parts Remove

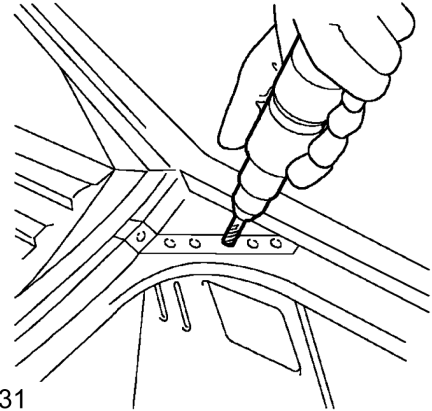
1. Expose resistance spot welds. For those spot welds which are not obviously visible, use a rotary drum sander or wire brush fitted to an air drill, or alternatively a hand held wire brush.



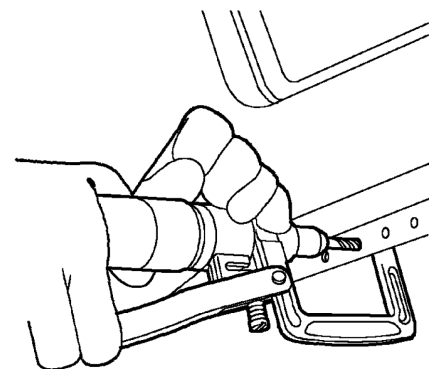
S883030

Caution : In wheel arch areas, it may be necessary to soften underbody coating, using a hot air gun, prior to exposing spot welds.

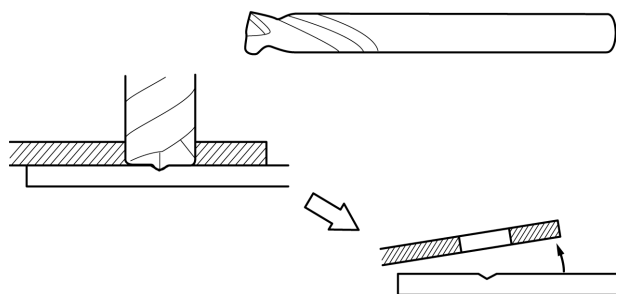
2. Cut out welds using a cobalt drill. Alternatively, use a clamp-type spot weld remover.



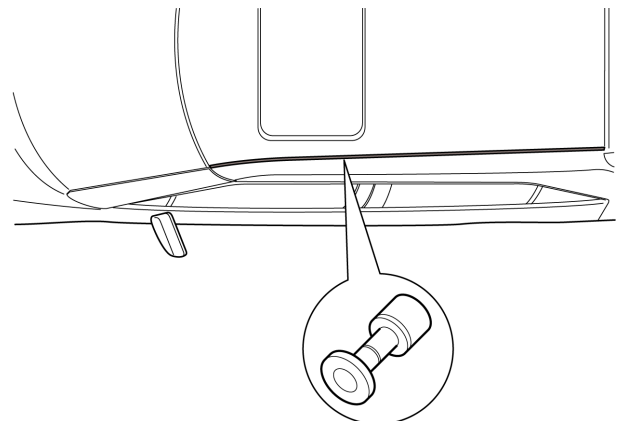
S883031



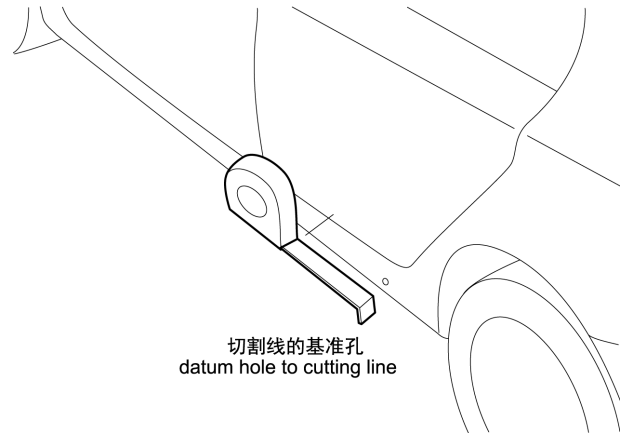
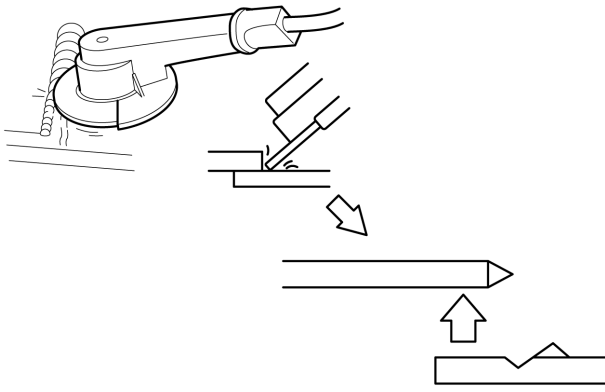
S883032



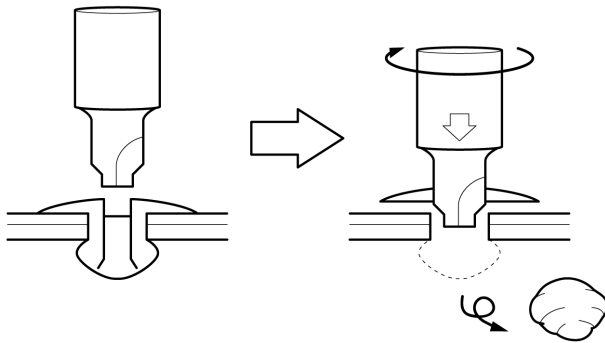
3. Laser weld parts: grind with grinder and grinding disc.



4. CO2-MAG Arc Welding Parts

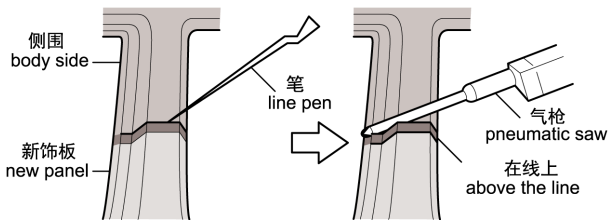


5. Rivet Joint Parts

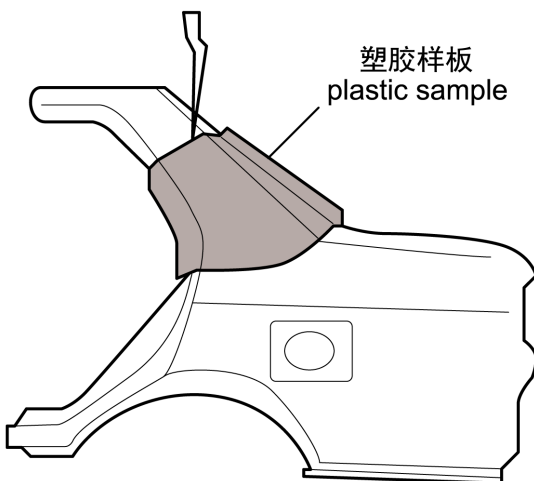


6. Large Panel Cut

a. Cut using steel plate edge

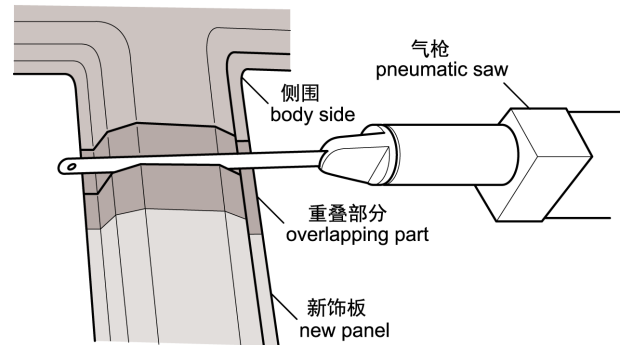


b. Plastic sample plate cutting method



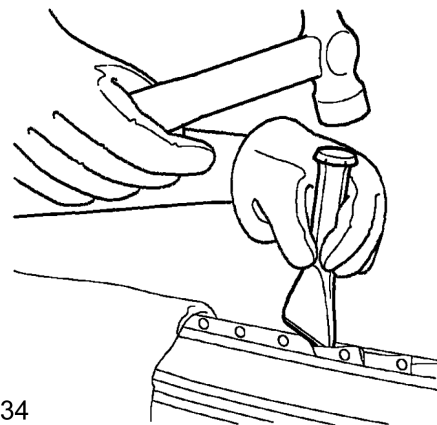
c. Dimension measurement method

d. Overlap cutting method



Caution : Before cutting out the large panel, a sander shall be used to remove MIG welds and braze at certain panel joints.

7. Separate spot welded joints and remove panel remnants using hammer, bolster chisel and pincers.



S883034

Laser Welded Roof Repair

Roof Remove

1. Remove the accessories around the roof.

Before removing the roof, remove necessary peripheral accessories, including front and rear windcreens, interior trim panels, sunroof, ceilings, curtain airbags, etc. Before removing, disconnect the negative battery cable for two minutes.

2. Knock out the welding spots between the roof and the beam.

Use an electric hand drill to drill out the original welding points of the roof on the upper part of the front and rear windcreens, so as to separate the roof from the body beam.

3. Remove bonding between the roof and the roof beam.

Remove the bonding between the roof and the roof beam with a cutting disk.

4. Cut and remove the old roof.

Before cutting, it needs to drill a hole on the roof to facilitate cutting. Use a pneumatic saw to cut the old car roof, and remove the whole old roof.

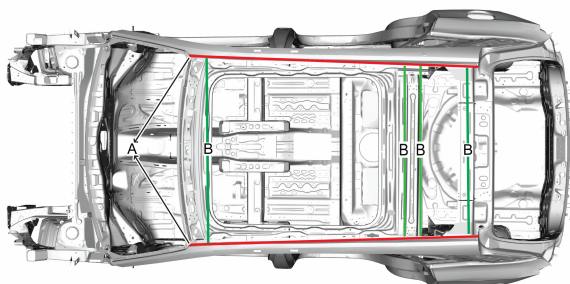
Roof Refit

1. Roof position measurement.

To fit a new roof, first measure and position it according to the actual standard of body size.

2. Grind and clean the roof bonding area.

As bare steel plates are required for structural adhesive bonding, before applying structural adhesive, it needs to use a grinder to polish the adhesive positions of the roof and both bodysides, and remove the paint in the area coated with structural adhesive (the position A of structural adhesive is marked in the figure below) to ensure the strength of structural adhesive, and clean the adhesive areas with cleaning agents. The position B in the figure shows the application position of panel sealant.



3. Glue Application on the Roof

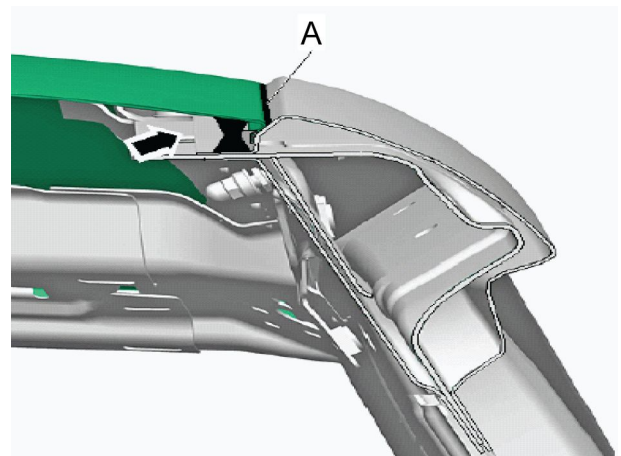
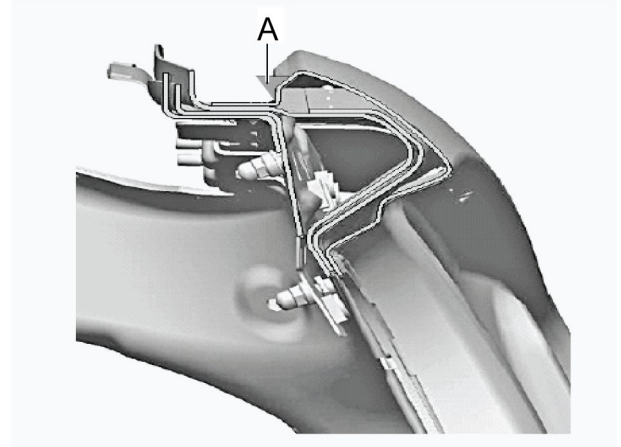
Apply the panel sealant to the roof beam.

Apply the two-component structural adhesive for panel bonding on the edge of the roof (position A in the

following figure), and squeeze out about 5g structural adhesive before use to ensure that the structural adhesive is mixed evenly.

Before applying the structural adhesive, stick adhesive tapes on the paint surface of roof and the bodyside to prevent the adhesive from overflowing and sticking to the paint surface.

After applying the structural adhesive, use a plastic scraper to evenly spread the adhesive overflowing from the roof joint, and repair the appearance.



4. Fix the bonded roof.

Fix and stick the two sides of the roof with straps, snap and fix 4 corners of the roof with lock wrenches until the structural adhesive is dry, and remove the straps and lock wrenches.

5. Heat treatment of bonded roof.

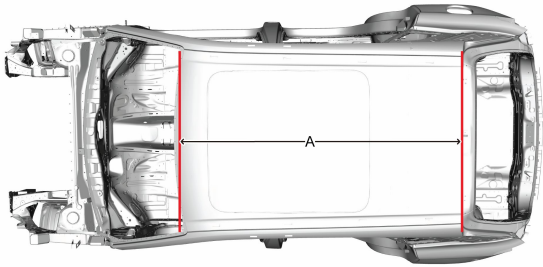
When the indoor temperature is lower than 20 °C, the structural adhesive must be heated by infrared oven lamp before it can be hardened; or move the vehicle to the paint baking room for baking.

Note that the temperature shall not be higher than 60 °C during heating

If the indoor temperature is higher than 20°C, after applying the structural adhesive, the vehicle needs to be placed statically for 36 hours without heating.

6. Weld the front/rear end of roof and beams.

Use CO₂ welding to weld the edges of front and rear windcreens of roof (figure A below) and polish them.



OEM Welding Information

Welding Identification

●—2 layers of welding

■—4 layers of welding

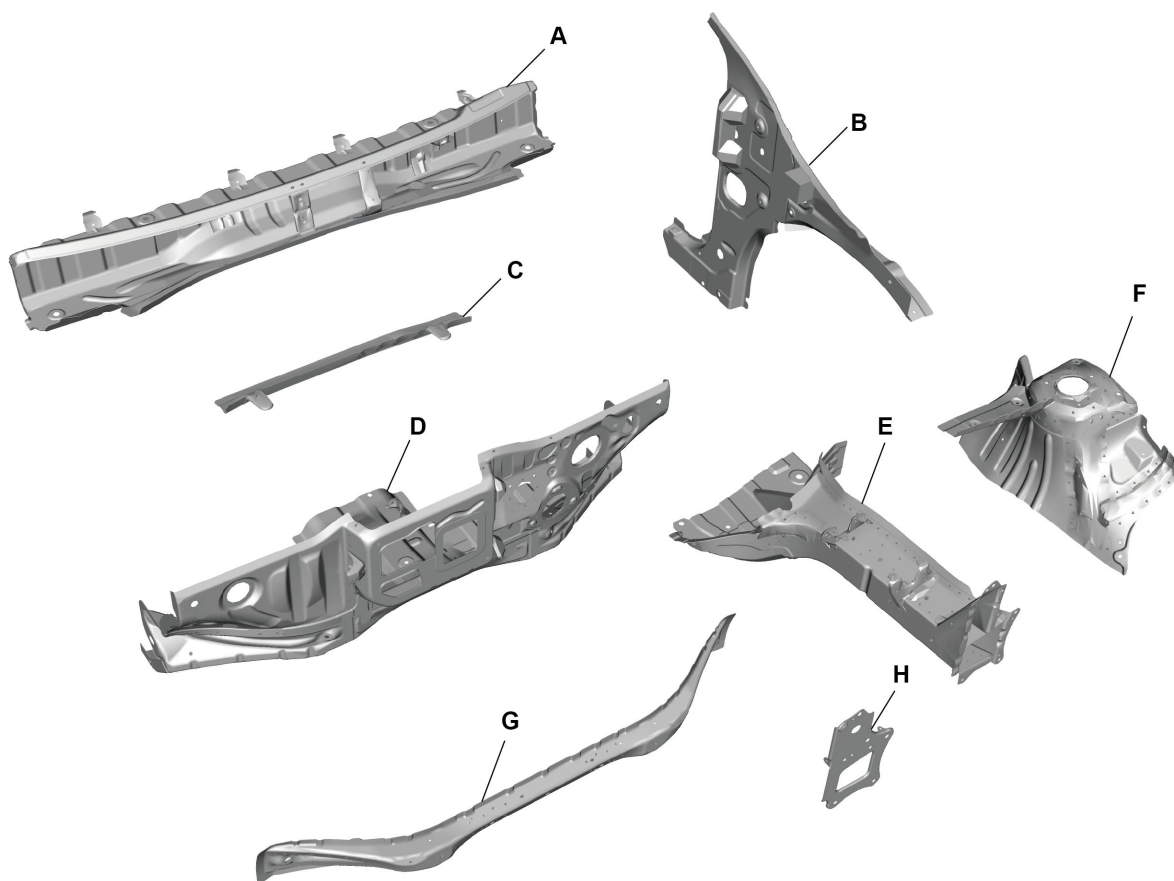
▲—3 layers of welding

■- MAG welding

Welding Information of Main Parts

Front-end Area

Structure



A - Vent Panel Assembly

C - Dash Panel Upper Beam Reinforcement Panel

E - Front Longitudinal Beam Assembly

G - Dash Panel Lower Beam Assembly

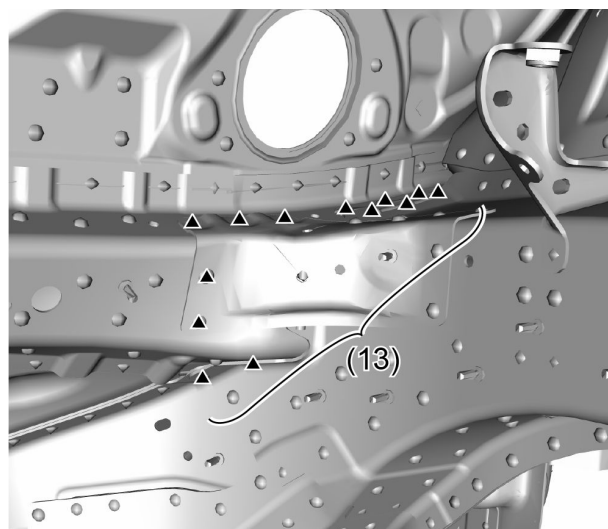
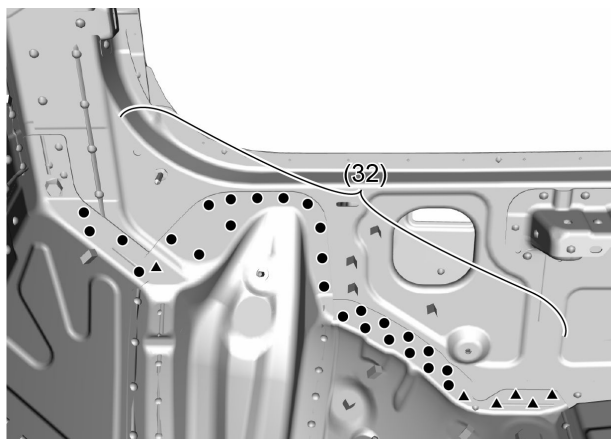
B - A Pillar Inner Panel Assembly

D - Dash Panel Assembly

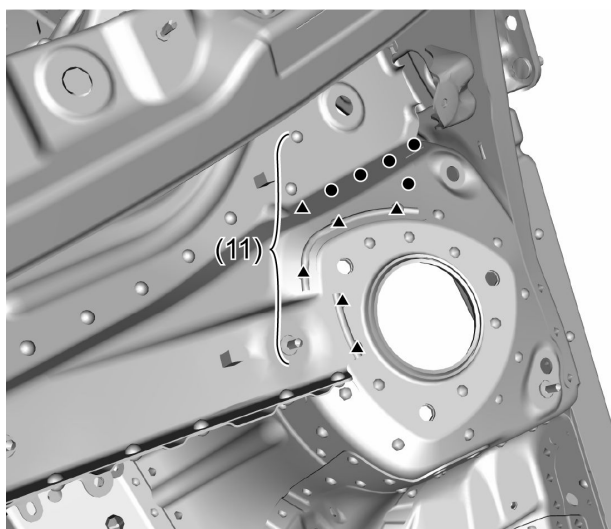
F - Front Wheelhouse Assembly

H - Front Longitudinal Beam Front Bumper Bracket

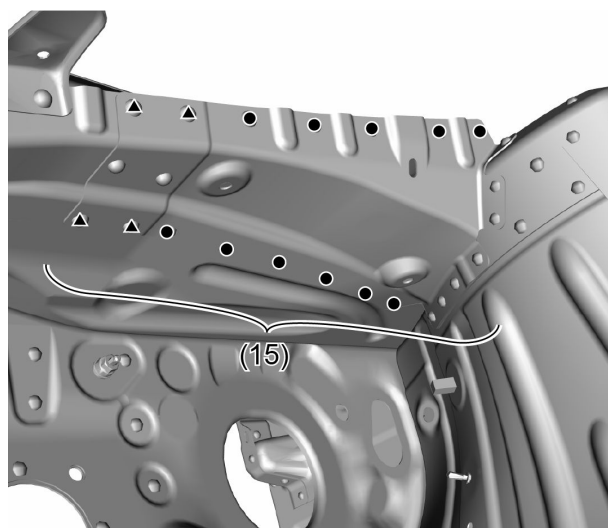
1. A Pillar Inner Panel Assembly to Dash Panel Assembly;



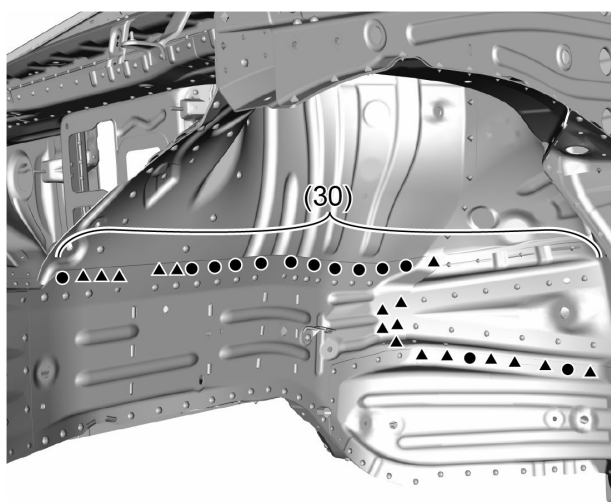
2. Front Wheelhouse Assembly to Vent Panel Assembly;



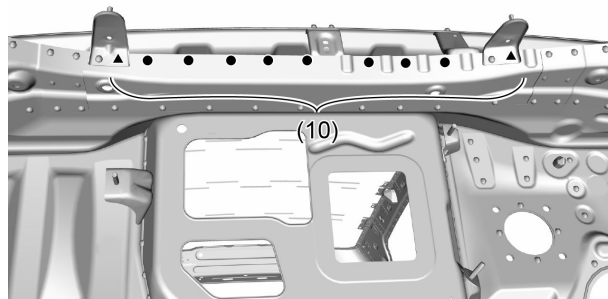
5. Front Wheelhouse Assembly to Dash Panel Upper Beam Reinforcement Panel;



3. Front Longitudinal Beam Assembly to Front Wheelhouse Assembly, Dash Panel Lower Beam Assembly;

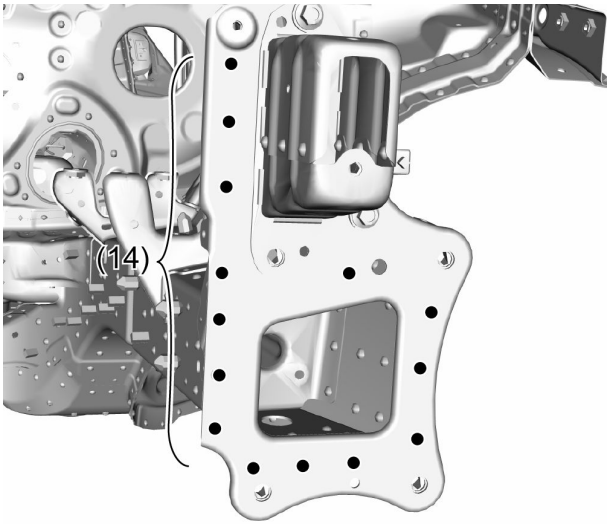


6. Dash Panel Upper Beam Reinforcement Panel to Vent Panel Assembly;

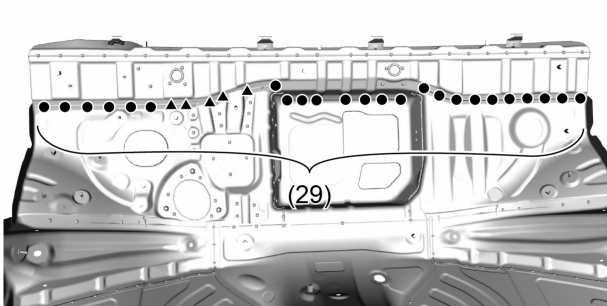


4. Front Longitudinal Beam Assembly to Dash Panel Lower Beam Assembly;

7. Front Longitudinal Beam Front Bumper Bracket to Front Longitudinal Beam Assembly;

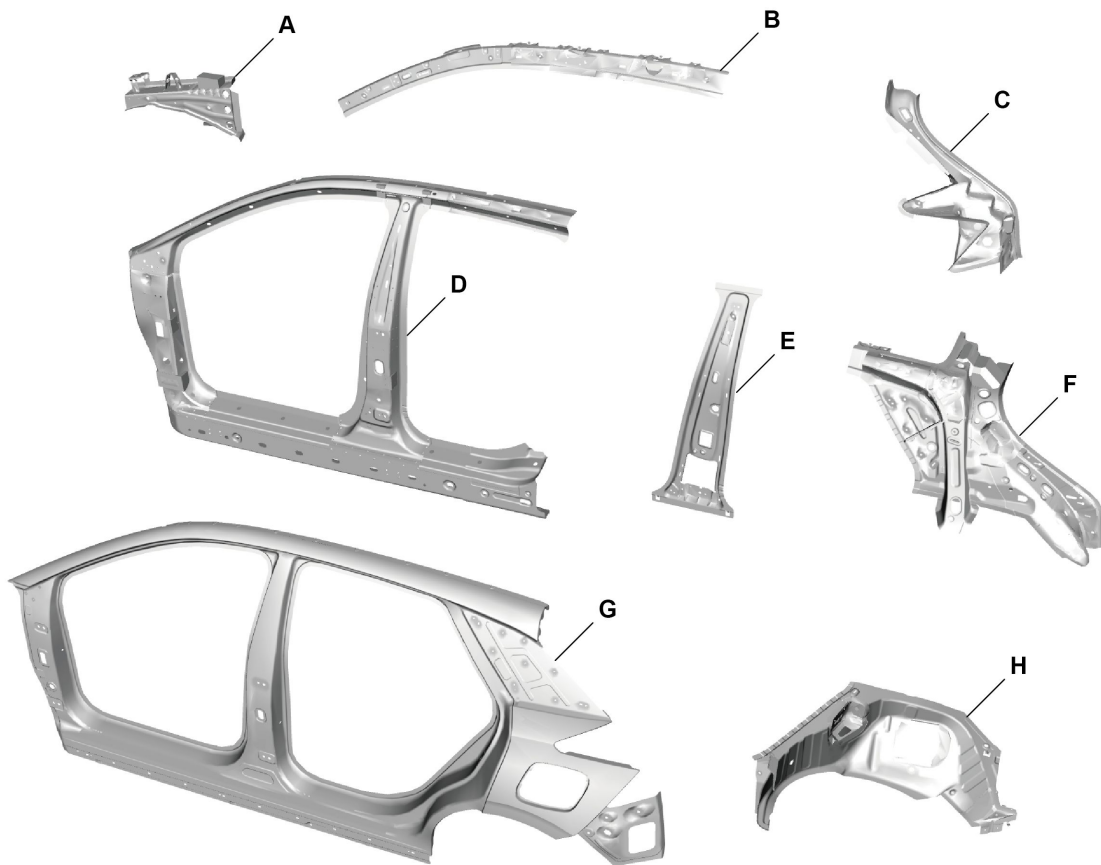


8. Vent Panel Assembly to Dash Panel Assembly;



Bodyside

Structure



A - Dash Panel Upper Beam Assembly

C - Tail Lamp Mounting Panel Assembly

E - B Pillar Inner Closure Panel Assembly

G - Bodyside Outer Panel

B - Upper Side Beam Closure Panel Assembly

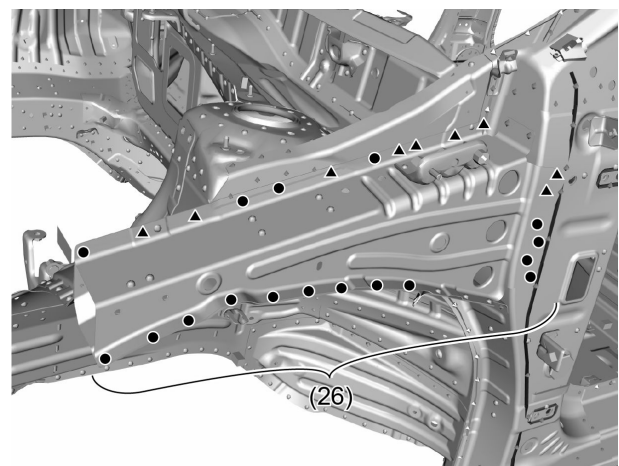
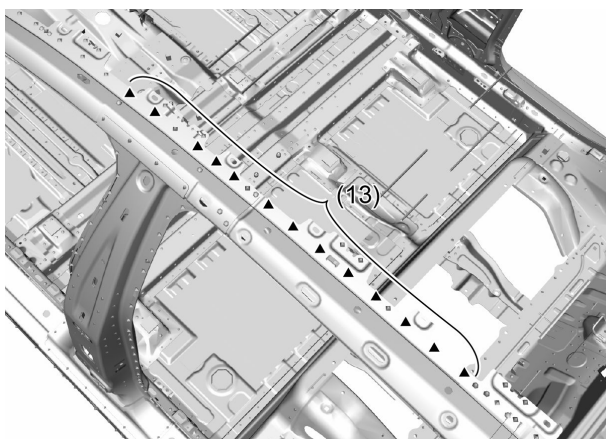
D - Bodyside Outer Panel Reinforcement Panel Assembly

F - Rear Bodyside Inner Panel Assembly

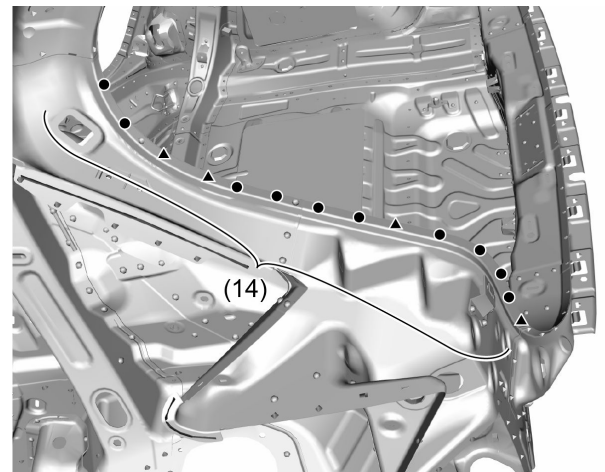
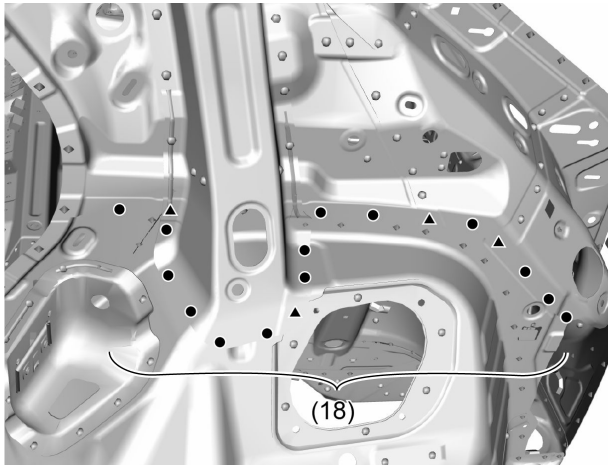
H - Rear Wheelhouse Inner Panel Assembly

1. Upper Side Beam Closure Panel Assembly to Bodyside Outer Panel Reinforcement Panel Assembly;

2. Dash Panel Upper Beam Assembly to A Pillar Inner Panel Assembly;

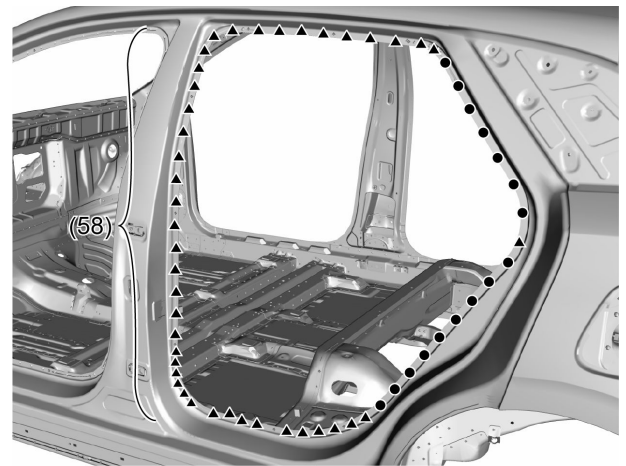
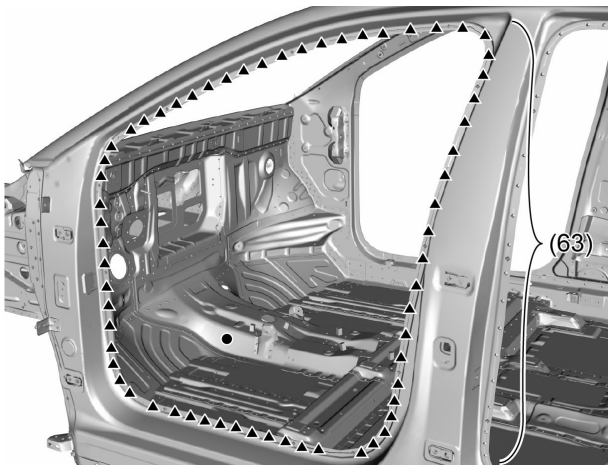


3. Rear Bodyside Inner Panel Assembly to Rear Wheelhouse Outer Panel Assembly;



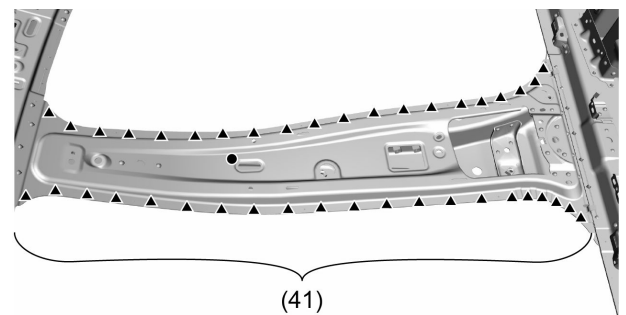
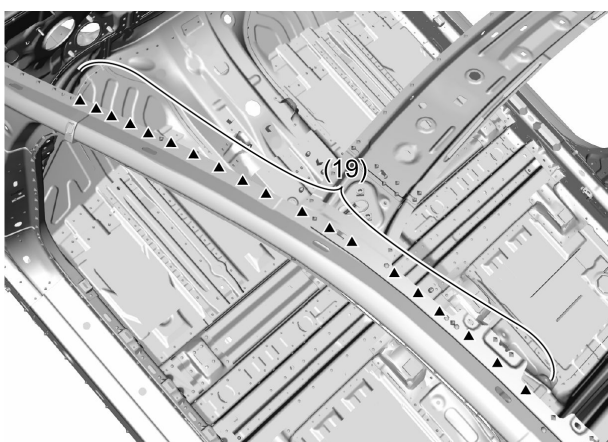
7. Bodyside Outer Panel to Bodyside Outer Panel Reinforcement Panel Assembly;

4. Bodyside Outer Panel to Bodyside Outer Panel Reinforcement Panel Assembly;



8. B Pillar Inner Closure Panel Assembly to Bodyside Outer Panel Reinforcement Panel Assembly;

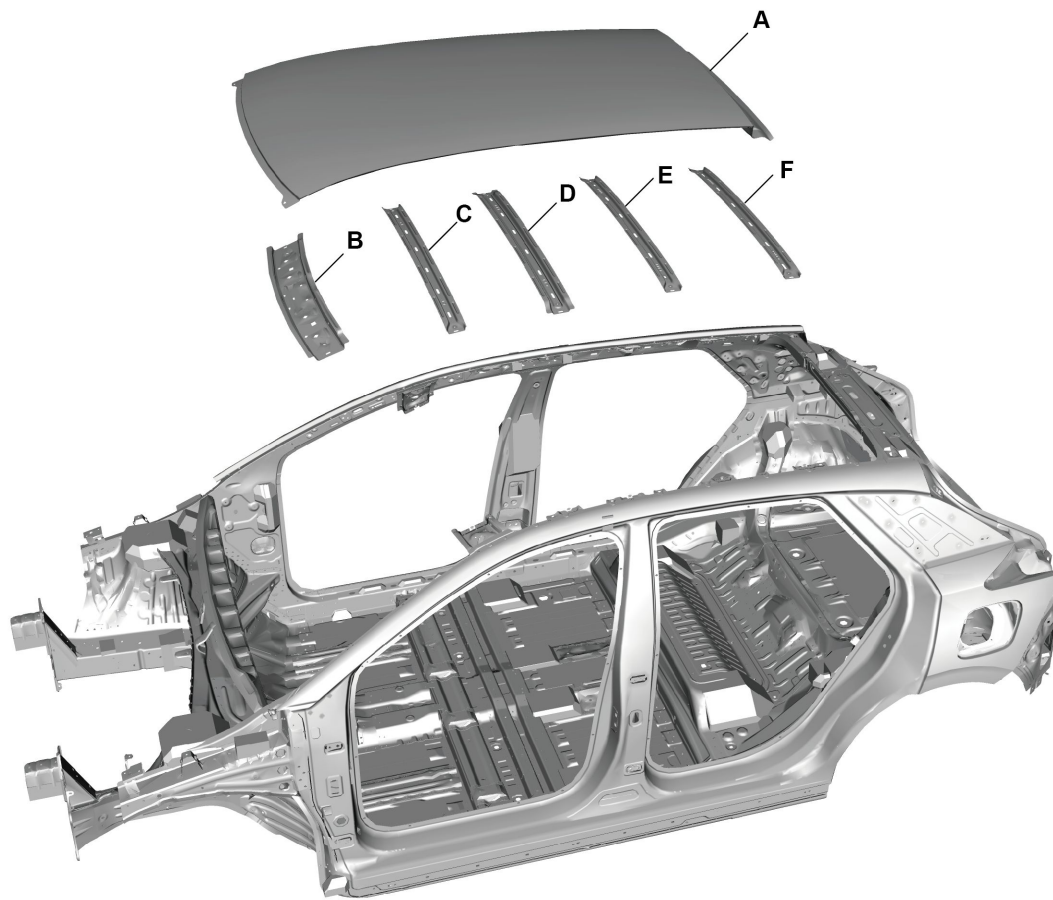
5. Upper Side Beam Closure Panel Assembly to Bodyside Outer Panel Reinforcement Panel Assembly;



6. Tail Lamp Mounting Panel to Rear Bodyside Inner Panel Assembly;

Roof Area

Structure



A - Roof Panel Assembly

C - Middle Roof No.1 Beam

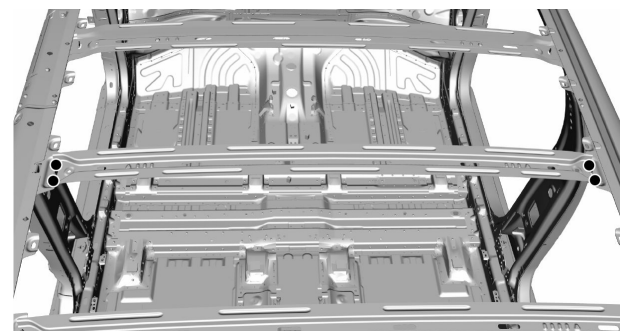
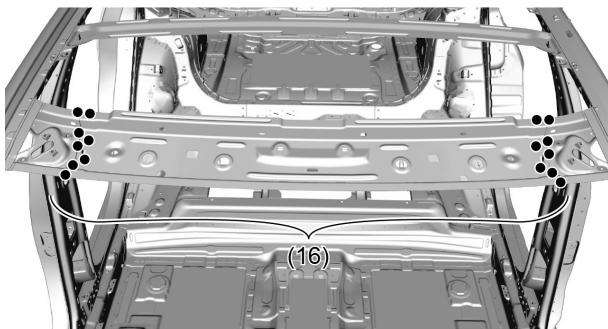
E - Middle Roof No.3 Beam

B - Front Roof Beam Assembly

D - Middle Roof No.2 Beam

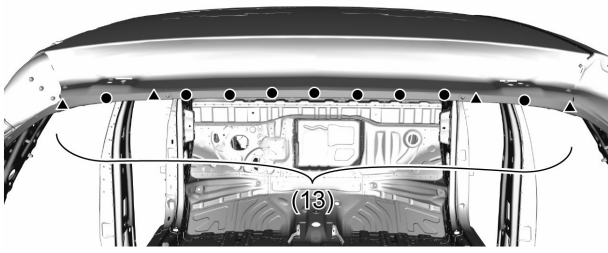
F - Middle Roof No.4 Beam

1. Front Roof Beam Assembly to B Pillar Inner Closure Panel Assembly;

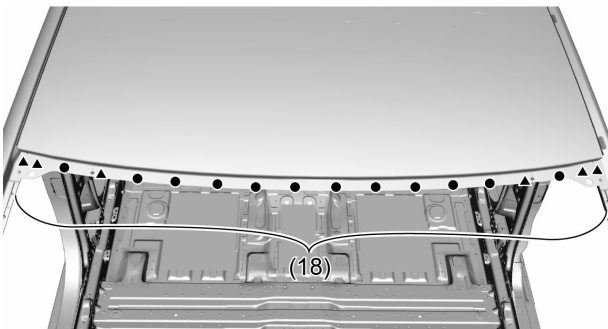


3. Roof Panel Assembly to Rear Roof Beam, Rear Bodyside Inner Panel Assembly;

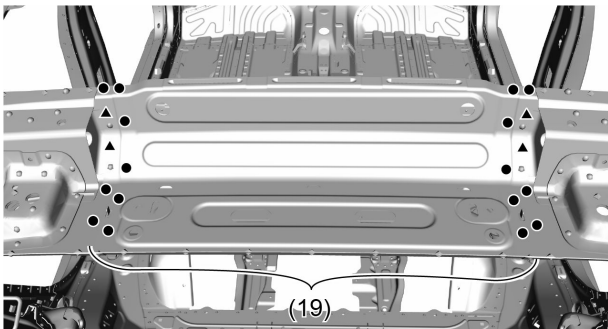
2. Middle Roof No.3 Beam to B Pillar Inner Closure Panel Assembly;



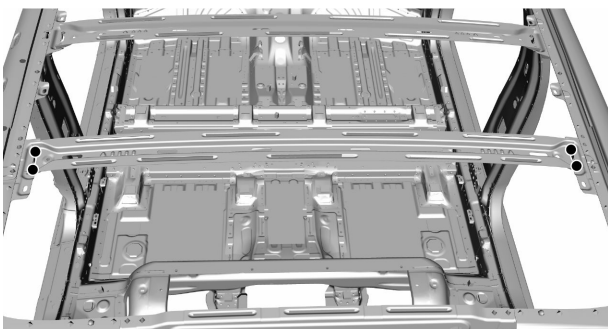
4. Roof Panel Assembly to Front Roof Beam, B Pillar Inner Closure Panel Assembly;



5. Rear Roof Beam to Rear Bodyside Inner Panel Assembly;



6. Middle Roof No.4 Beam to Rear Bodyside Inner Panel Assembly;

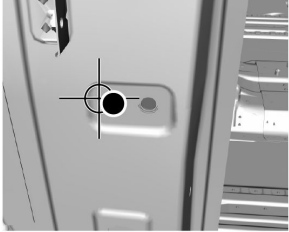


Body Size

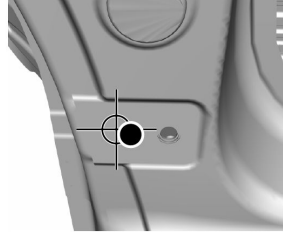
Point-to-point Dimension

Bodyside and Top Information

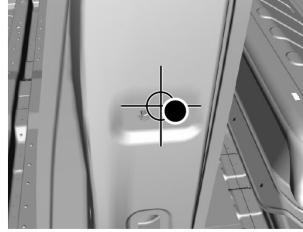
A
前门上铰链安装孔 $\Phi 11$
Front door upper hinge mounting hole



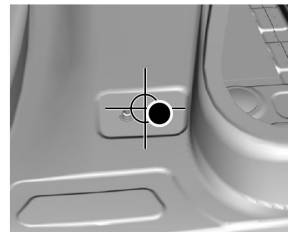
B
前门下铰链安装孔 $\Phi 11$
Front door lower hinge mounting hole



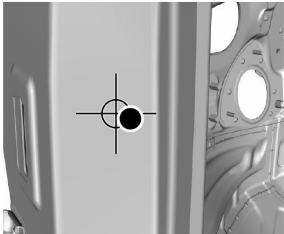
C
后门上铰链安装孔 $\Phi 14$
Rear door upper hinge mounting hole



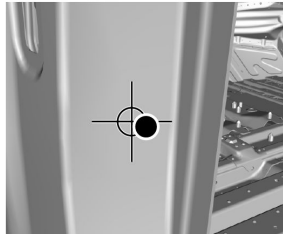
D
后门下铰链安装孔 $\Phi 14$
Rear door lower hinge mounting hole



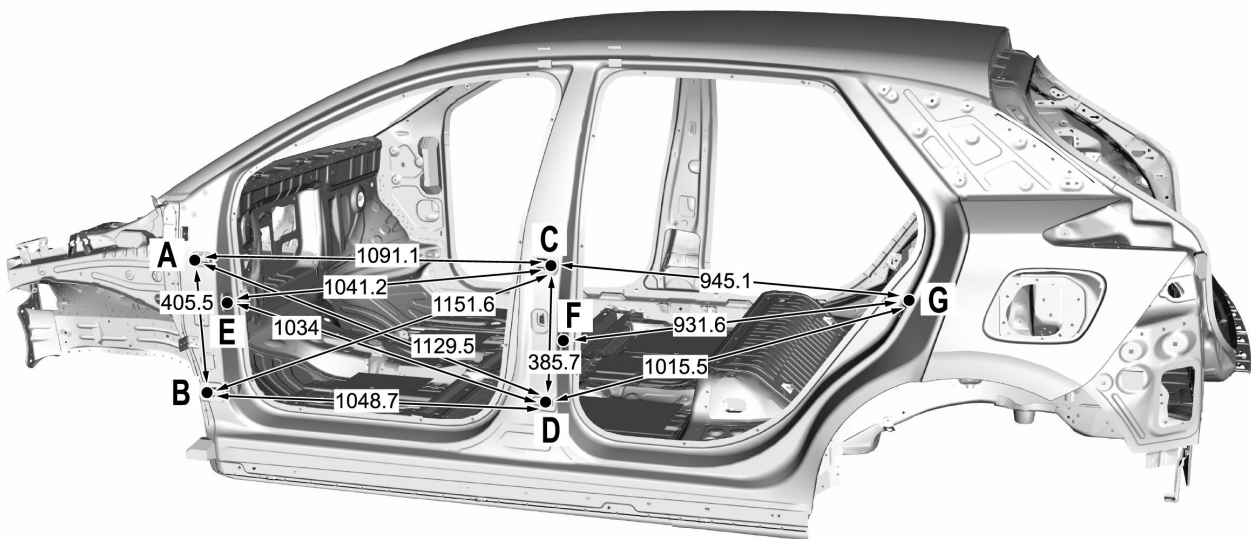
E
前门限位器安装孔 $\Phi 11$
Front door retainer mounting hole



F
后门限位器安装孔 $\Phi 11$
Rear door retainer mounting hole



G
后门锁扣安装孔 $\Phi 9$
Rear door swith mounting hole

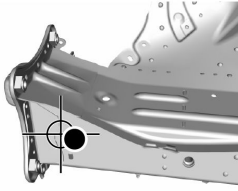


Note : All dimensions refer to central dimensions of hole (slotted hole).

Bottom Plate Information

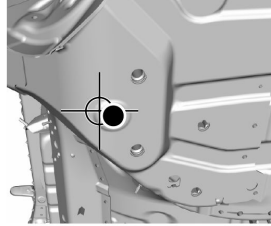
A1A2

基准孔 $\Phi 25$
Reference hole



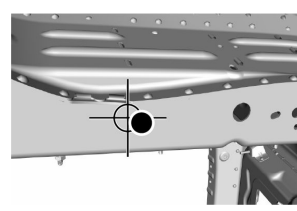
B1B2

前副车架安装孔 $\Phi 16$
Front subframe mounting hole



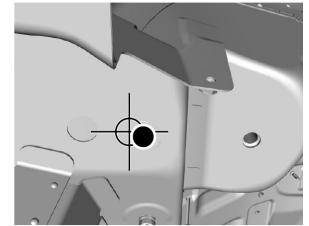
b

主基准孔 $\Phi 18$
Main reference hole



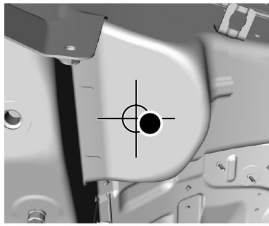
C1C2

后副车架安装孔 $\Phi 14$
Rear subframe mounting hole



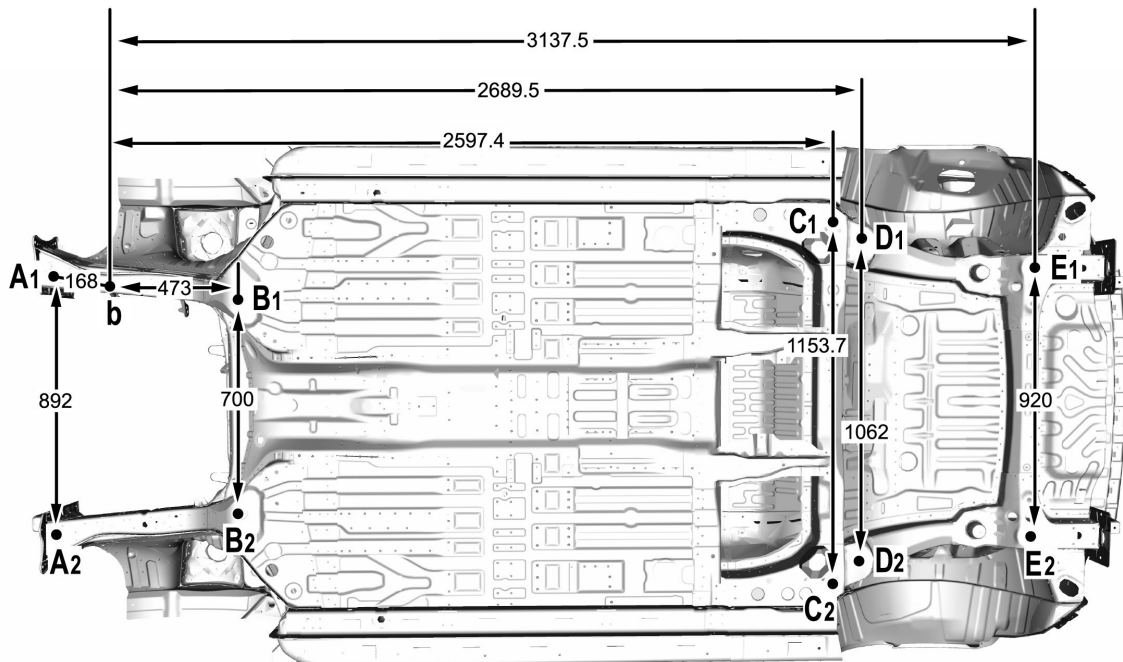
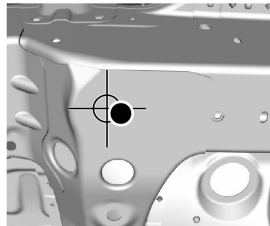
D1D2

后悬安装孔 $\Phi 16$
Rear suspension mounting hole



E1E2

后副车架安装孔 $\Phi 16$
Rear subframe mounting hole

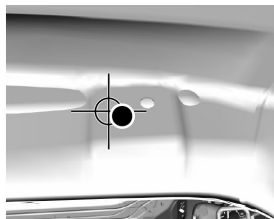


Note : All dimensions refer to central dimensions of hole (slotted hole).

Rear End Information

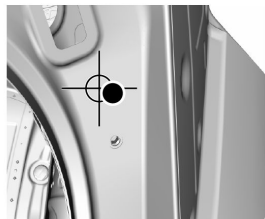
A1A2

尾门铰链安装孔 $\Phi 12$
Tail door link mounting hole



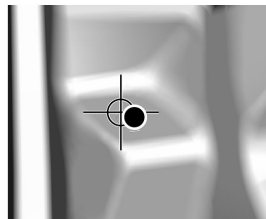
B1B2

尾门气弹簧安装孔 $\Phi 6.6$
Tailgate gas spring mounting hole



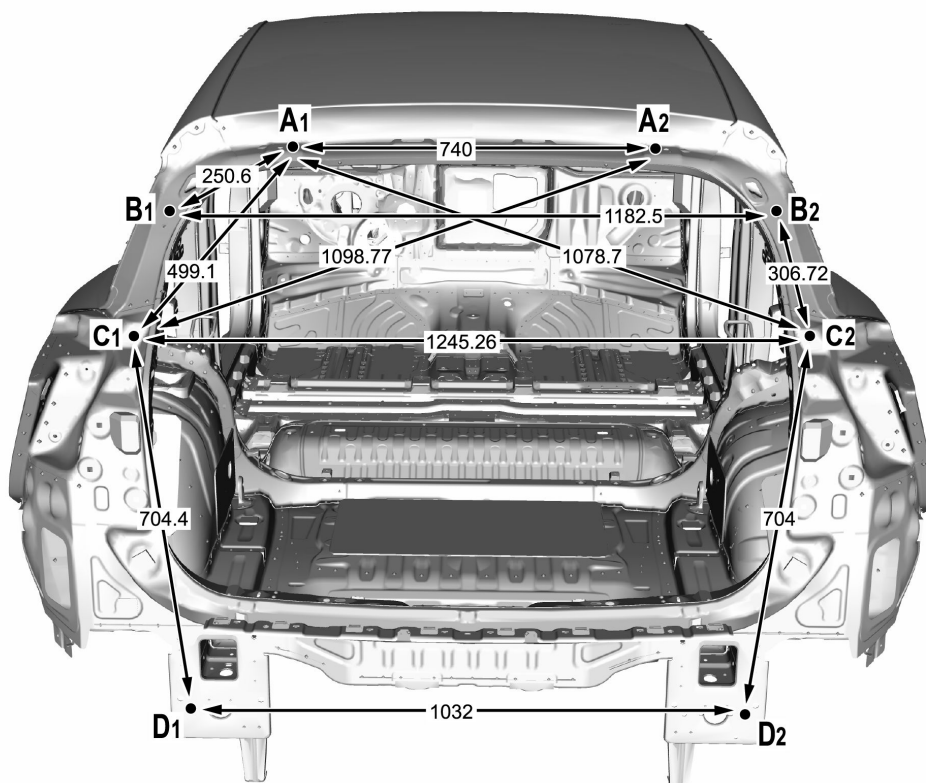
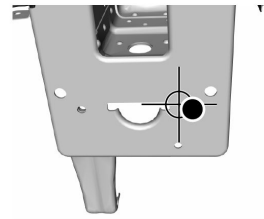
C1C2

尾灯安装孔 $\Phi 5$
Tail lamp mounting hole



D1D2

后缓冲梁安装孔 $\Phi 8$
Rear bumper beam mounting hole



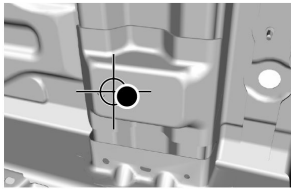
Note : All dimensions refer to central dimensions of hole (slotted hole).

Internal Information

A1A2

前排座椅安装孔 $\Phi 9$

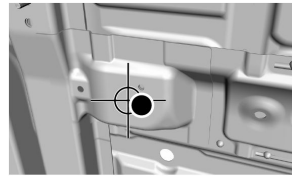
Front seat mounting hole



B1B2

前排座椅安装孔 $\Phi 9$

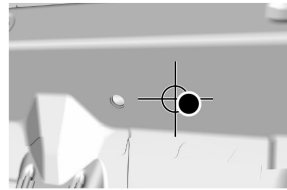
Front seat mounting hole



C

后排座椅安装孔 $\Phi 10$

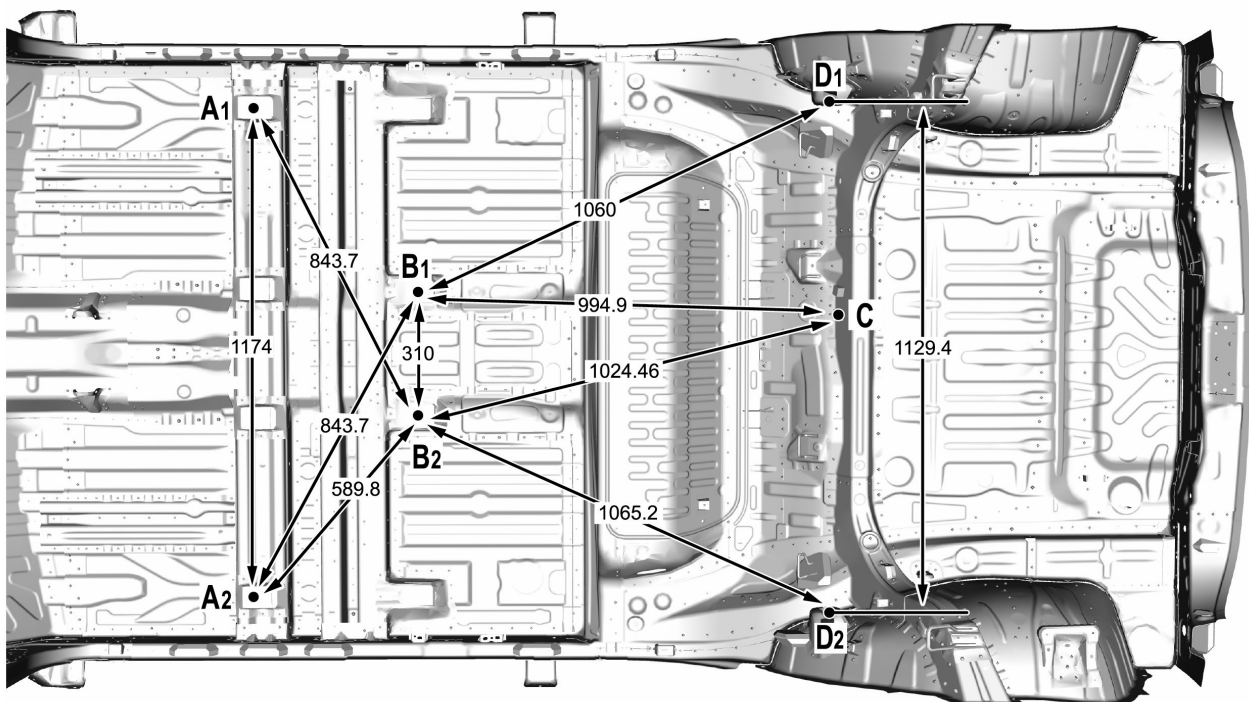
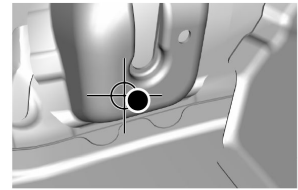
Rear seat mounting hole



D1D2

后排座椅安装孔 $\Phi 8$

Rear seat mounting hole

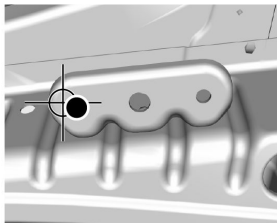


Note : All dimensions refer to central dimensions of hole (slotted hole).

Front End Information

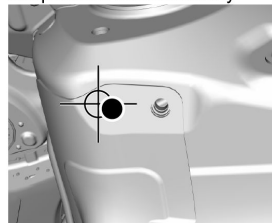
A1A2

发动机罩铰链安装孔 $\Phi 8$
Hood hinge mounting hole



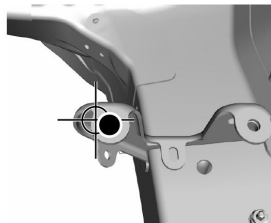
B1B2

前舱横梁总成安装孔 $\Phi 8$
Mounting hole of front compartment beam assembly



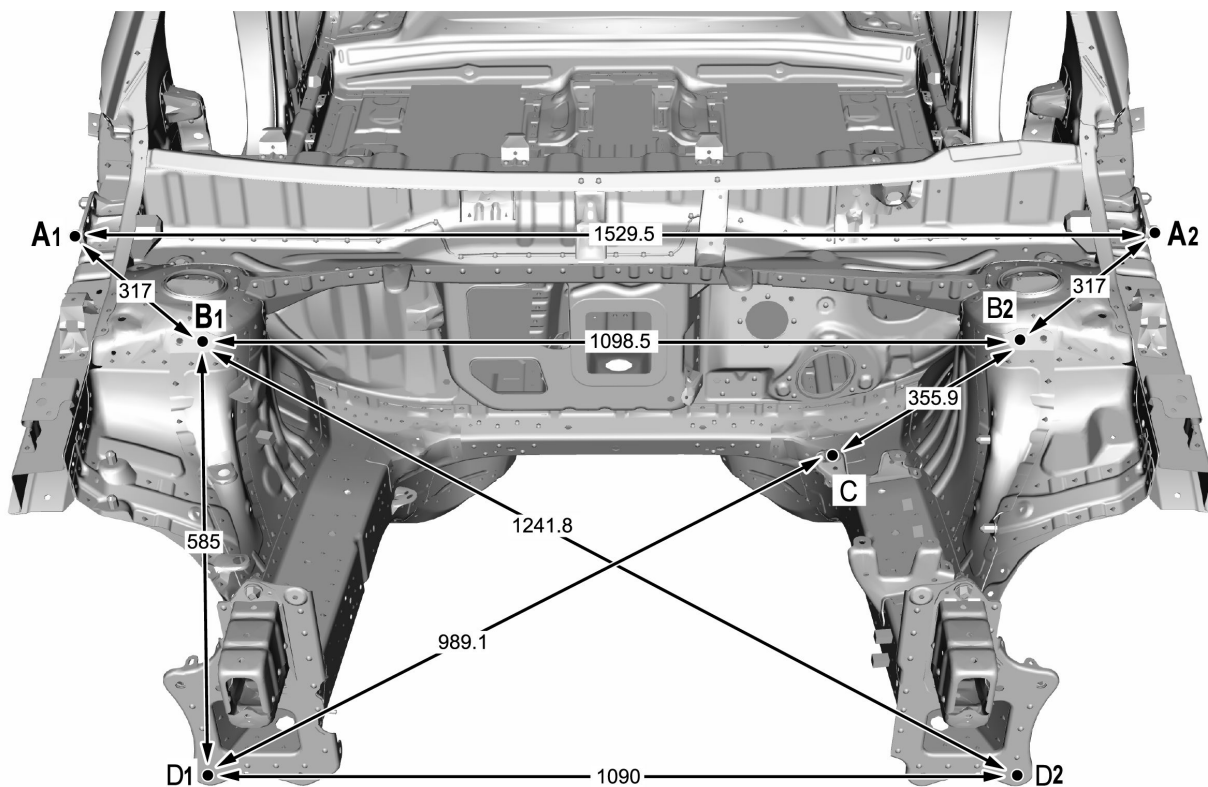
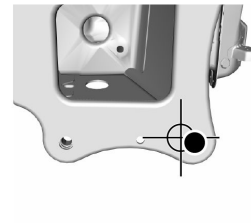
C

蓄电池安装孔 $\Phi 8$
Battery mounting hole



D1D2

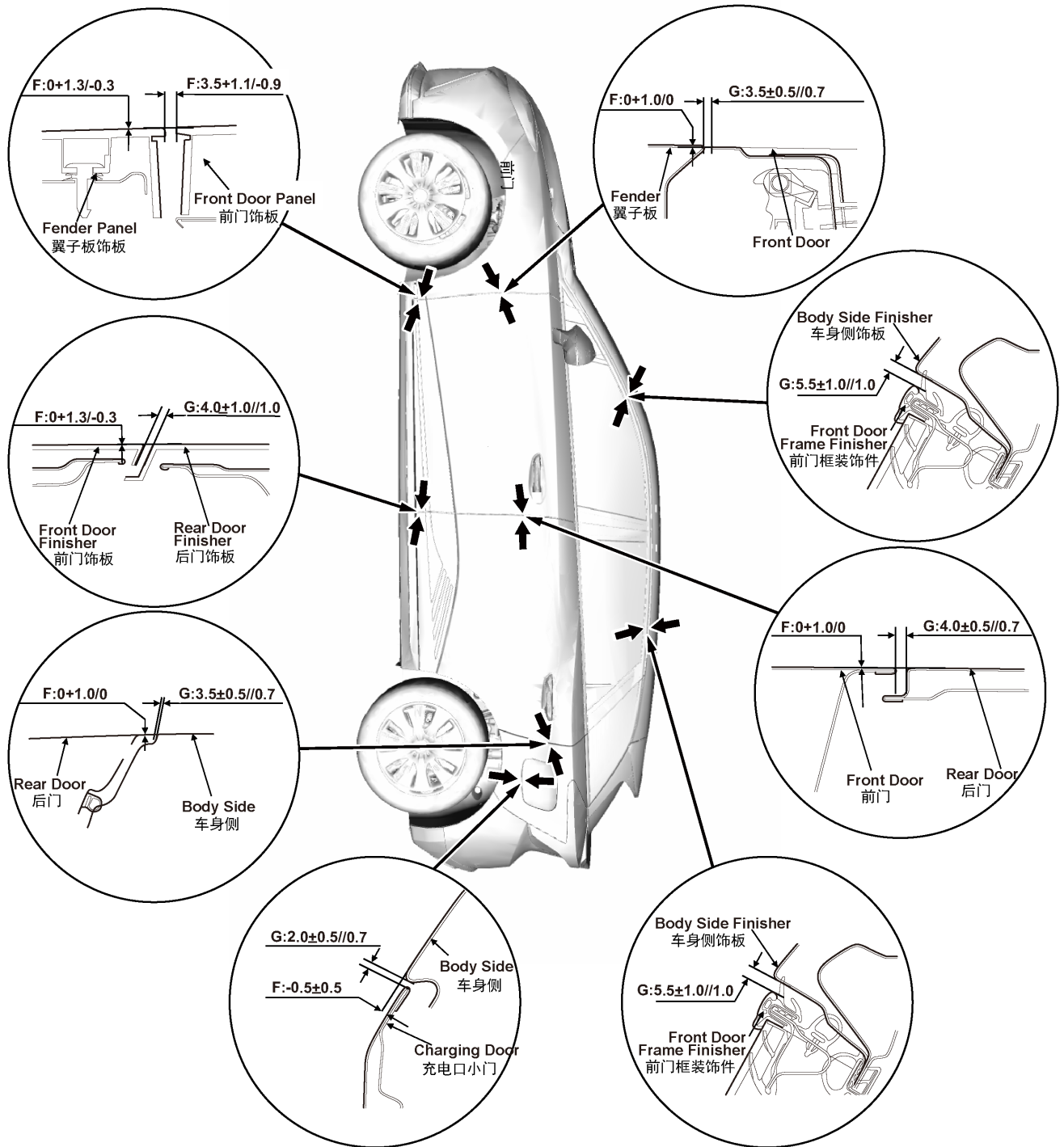
前缓冲梁安装孔 $\Phi 10$
Front buffer beam mounting hole



Note : All dimensions refer to central dimensions of hole (slotted hole).

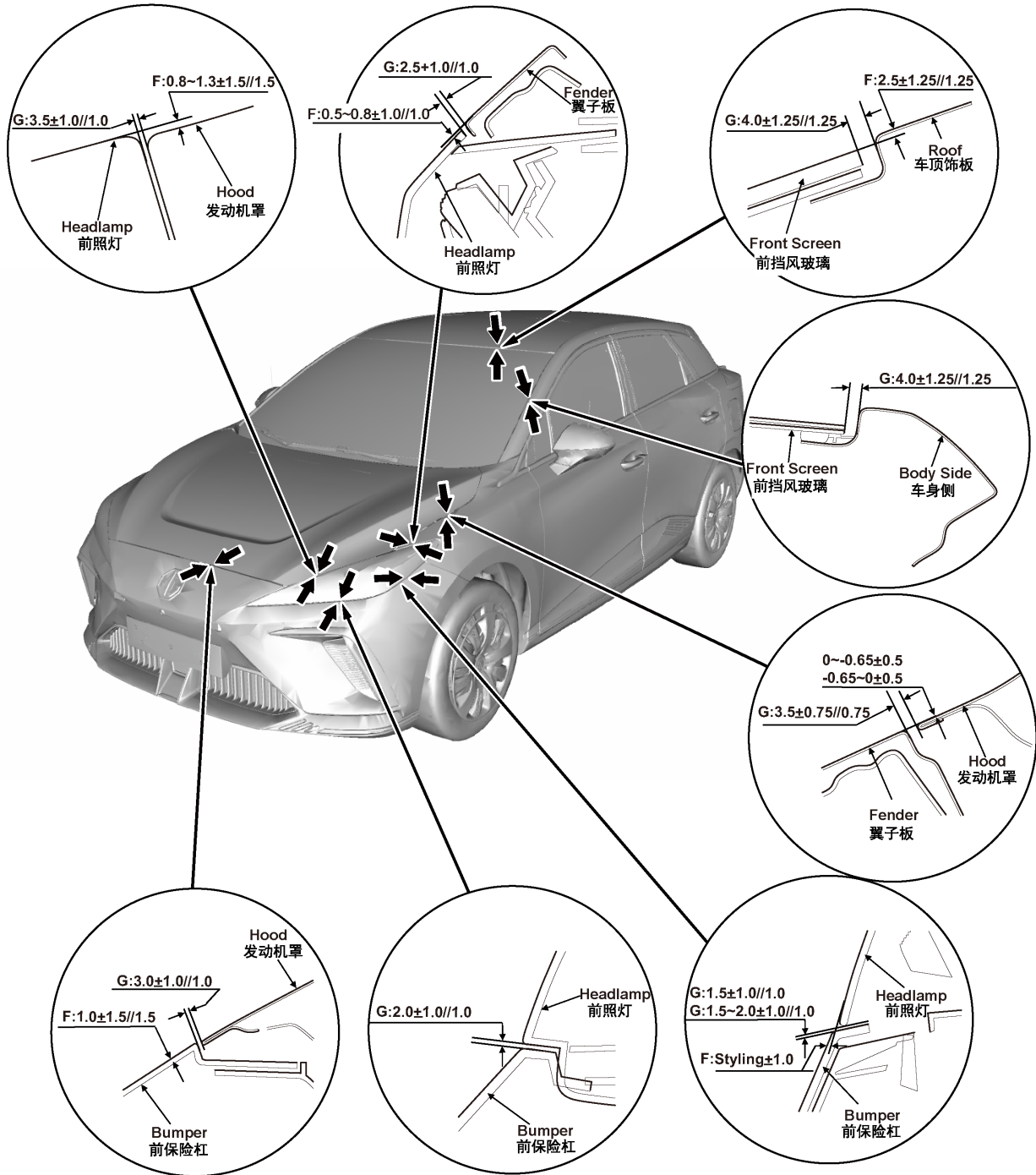
Gap Size

Body Side and Fuel Filler Cap Information



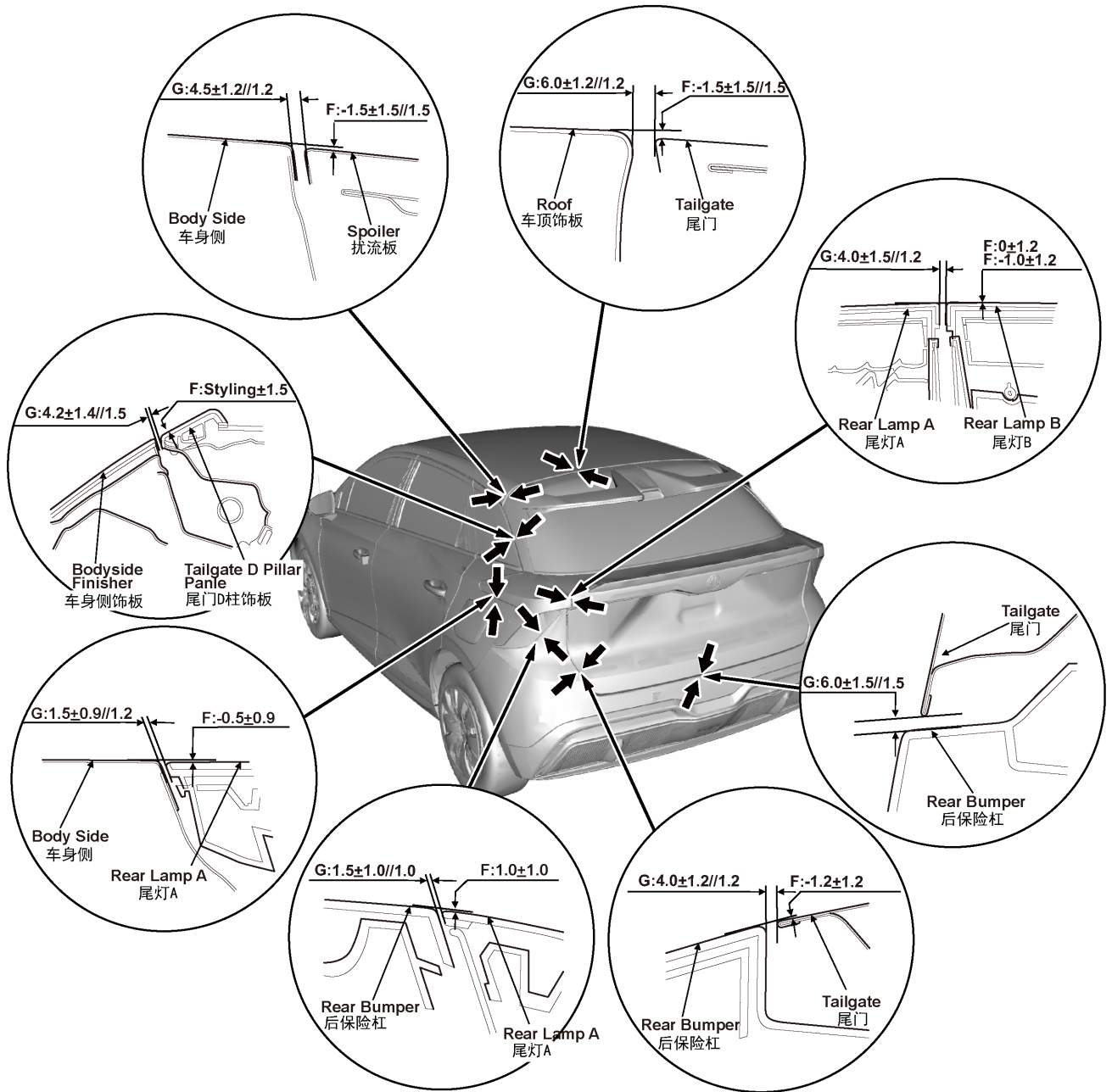
Note : "://" represents requirements for uniformity, which means the difference between maximum and minimum values of measured gap shall be within the specified range.

Front End Information



Note : "//" represents requirements for uniformity, which means the difference between maximum and minimum values of measured gap shall be within the specified range.

Rear End Information



Note : "//" represents requirements for uniformity, which means the difference between maximum and minimum values of measured gap shall be within the specified range.

