

OPIRUS

Body shop Manual

FOREWORD

This Body Shop Manual illustrates body structures and service procedures for the OPIRUS.

This manual illustrates the replacement of major body panels, plastic parts, body dimensions, sealing treatment etc., in a systematic manner which is necessary for effective and lasting body repairs.

You are encouraged to become familiar with this manual and understand each section in order to perform proper repair procedures. Keep this manual in a convenient location so that it is readily available.

All information in this manual including specifications, data and illustrations is made based on the vehicles built at the time the manual was printed.

Information regarding the removal/replacement of components not specifically covered in this manual can be found in the OPIRUS Service Manual. Information regarding electrical harness routing/ connections, etc. can be found in the OPIRUS Electrical Troubleshooting Manual.

The descriptions and specifications contained in this manual were in effect at the time this manual was approved for printing. Kia Motors Corporation reserves the right to discontinue models at any time, or change specifications or design without notice and without incurring obligation.

Kia Motors Corporation
SEOUL, KOREA

CAUTION :

Severe engine and transaxle damage may result from the use of poor quality fuels and lubricants that do not meet Kia specifications. You must always use high quality fuels and lubricants that meet the specifications described on the specification section in the relevant group of the Workshop Manual.

Copyright © 2004, Kia Motors Corporation
Printed in Korea, February 2004
Pub. No. : A3FB-EG42A (English)

All rights reserved. No part of this publication may be reproduced, stored in any retrieval system or transmitted in any form or by any means without the prior written permission of Kia Motors Corporation.

CONTENTS

Title	Group
GENERAL INFORMATION	00
BODY STURCTURE	11
REPLACING BODY PANELS	21
BODY DIMENSIONS	31
WATERPROOFING AND RUSTPROOFING	41
BODY MODIFICATION TOOLS	51
PLASTIC PARTS	61




IMPORTANT SAFETY NOTICE

Proper service methods and repair procedures are essential for safe, reliable operation of all motor vehicles as well as personal safety of the operator. The service procedures and descriptions in this body shop manual provide general directions for a service and repair.

Procedure, techniques, tools, and parts for service including the skill of the technician vary. It is impossible to provide advice or caution as to each case in this manual.

Accordingly, anyone who intends to use a replacement part, service procedure, or tool, which is not recommended by the vehicle manufacturer, must first assure thoroughly that neither their personal safety nor the safe operation of the vehicle will be first jeopardized by the replacement part, service procedure, or tool they select.

IN THIS MANUAL

-  **WARNING :** Remind you to be especially careful in those areas where carelessness can cause personal injury.
-  **CAUTION :** To prevent you from making errors that could damage the vehicle as well as personal injury.
-  **NOTE :** Gives you added information that will help you complete a particular procedure.

The following list contains some general WARNINGS that you should follow while working on a vehicle.

- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires you to be under the vehicle.
- Make sure that the ignition switch is always in the OFF position, unless otherwise required by the procedure.
- Set the parking brake when working on the vehicle. If you have an automatic transaxle, set in park unless instructed otherwise for a specific operation
- Place supporters against the front and rear surfaces of the tires to help prevent the vehicle from moving
- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide poisoning.
- Keep yourself and your clothing away from moving parts when the engine is running, especially the drive belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.
- Do not smoke while working on a vehicle.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing before beginning to work on a vehicle.
- When it is necessary to work under the hood, keep hands and other objects clear of the radiator fan blades! Your vehicle may be equipped with a cooling fan that may turn on, even though the ignition switch is in the OFF position. For this reason care should be taken to ensure that the radiator fan electric motor is completely disconnected when working under the hood and the engine is not running.

General information

Fundamental procedures

Vehicle protection	00- 1
A word about safety	00- 1
Welding procedures	00- 1
Body frame straightener	00- 2
Electrical procedures	00- 2

00

For best results

Disassembly	00- 3
Preparation of assembly	00- 5
Assembly	00- 6
Rustproof treatment after assembly	00- 7

Vehicle lift (2-Support type) & safety stand positions 00- 8

Jack and safety stand positions 00- 8

Towing 00- 9

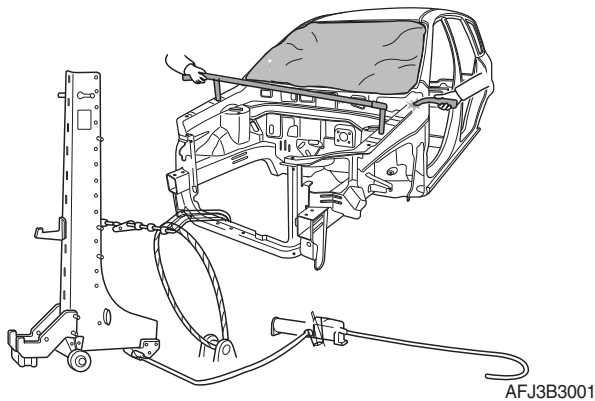
Body colors and major specifications

Kia color codes	00- 10
Paint manufacture codes	00- 10

Fundamental procedures

Vehicle protection

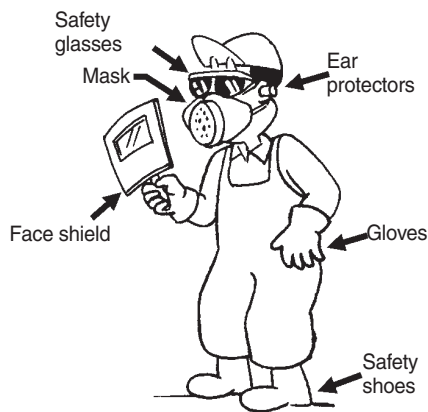
1. Cover the seats before performing any procedure to keep them from getting dirty.
2. Cover all glasses, seats and mats with a heat resistant cover when welding.



3. Protect moldings, garnishes and ornaments.

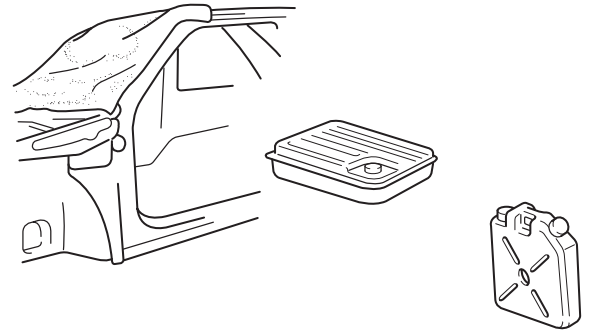
A word about safety

1. Wear the appropriate safety equipment that is necessary for the procedure being performed.



00003

2. When welding or performing other procedures that require the use of an open flame near the fuel tank, disconnect and remove the tank and fuel pipe, and cap the pipe to prevent fuel leakage.



ASD1BM003

Welding procedures

Observe the following tips when welding.

1. Wear appropriate eye protection.
2. Carefully follow the manufacturers operating instructions for the welding machine you are using.
3. Do not weld, smoke or allow open flames around volatile chemicals, cleaners or solvents or in any area where they have just been used.

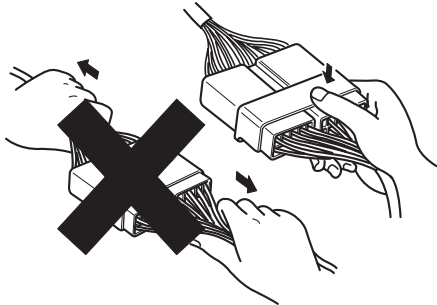
00-2 General information

Body frame straightener

When using a frame straightener, do not enter the area where the body is being straightened by the chain.

Electrical procedures

1. Disconnect the negative battery terminal.
2. Do not pull on wires when disconnecting electrical connectors. Be careful to hold the connector itself when disconnecting it.
3. Insert the connector until it “clicks” when connecting the connector.
4. Handle all electrical components with care.



ba2c015f

For best results

Disassembly

Measuring dimensions before beginning

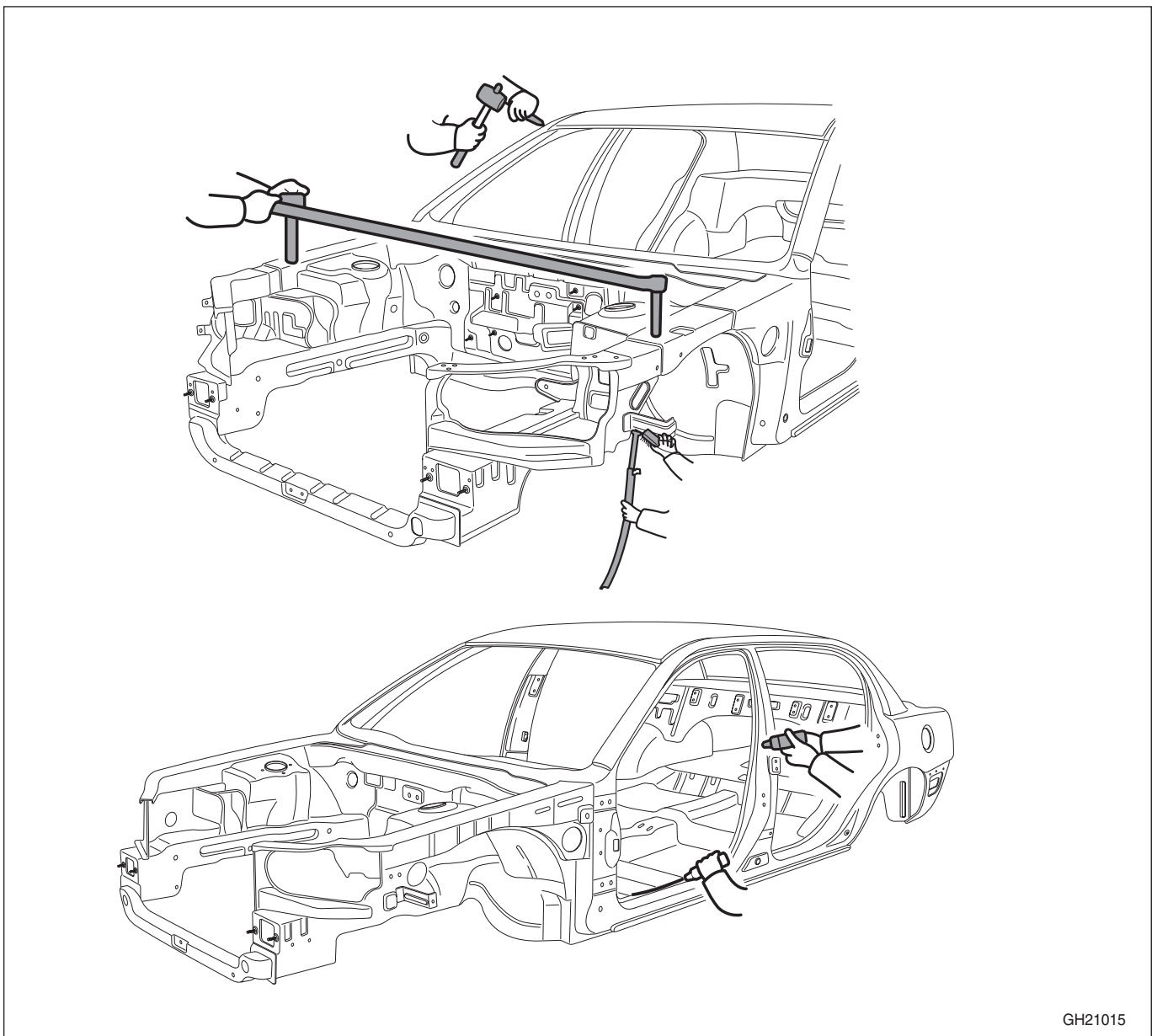
Measure the dimensions of the damaged area according to the body dimension drawings before disassembling and repairing. Adjust dimensions with body frame adjuster if deformed.

Selecting cutting area

Select a cutting area that is easily accessible and that is prone to the least amount of distortion when welding. Select an area that would allow the new part to overlap repair area by 1.2~2.0 in (30~50 mm).

Protecting body from damage

Secure the body with clamps and jacks to prevent damage to the body when working on it.

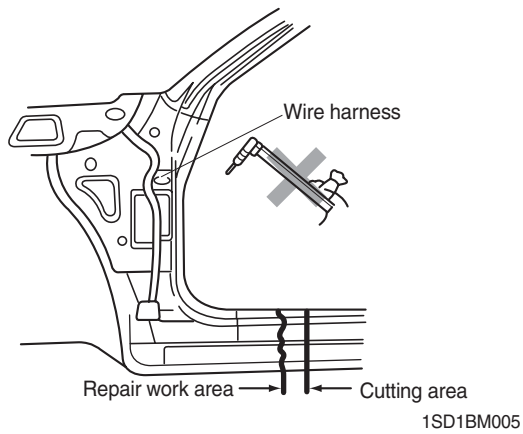


GH21015

00-4 General information

Disassembling related parts

Use caution when removing body molding and trim from the area to be worked. Apply masking tape where needed to prevent damage to the part being removed or to the vehicle body. Before starting repairs, check if pipes, hoses or electrical components are present near damaged area.



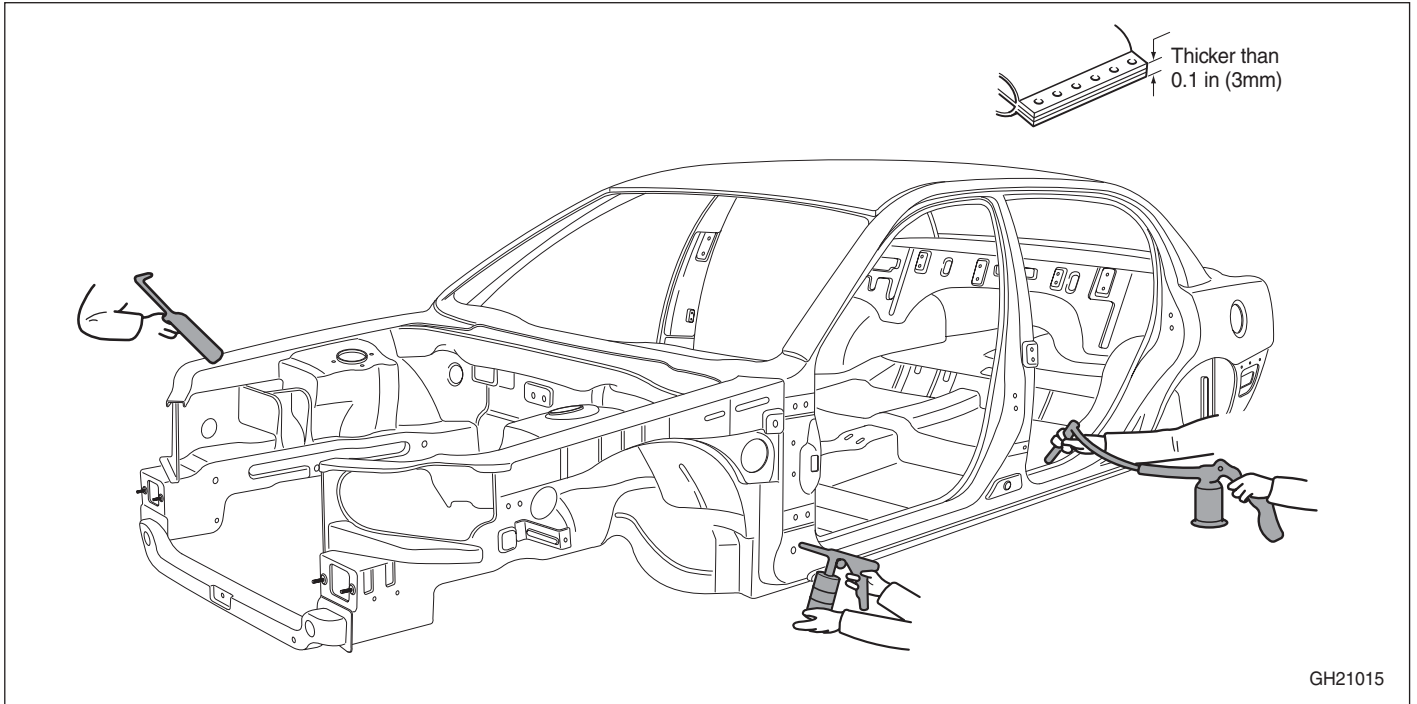
Preparation of assembly

Applying spot sealer

Remove paint from the surface of new parts and body to be spot welded, and apply spot sealer for rustproofing.

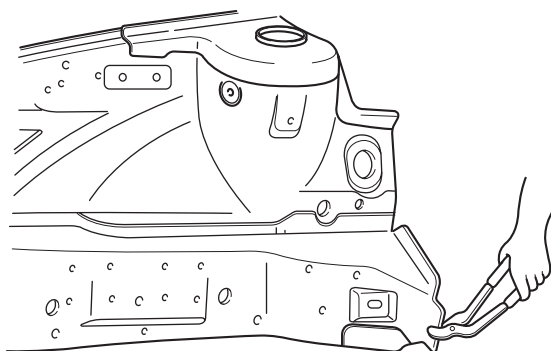
Selecting a welding method

If the thickness of the area to be welded with the panels overlapped is greater than 0.1 in (3 mm), do plug welding using a carbon arc welding machine.



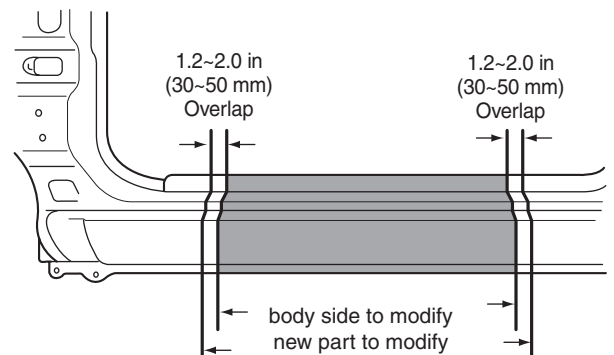
Machining holes for plug welding

Drill a hole of approximately 0.2~0.24 in (5~6 mm) in diameter in those areas which are not suitable for spot welding.



Adjusting a new part

The new part should be cut larger than the repair area, overlapping the repair area by 1.2~2.0 in (30~50 mm).



00-6 General information

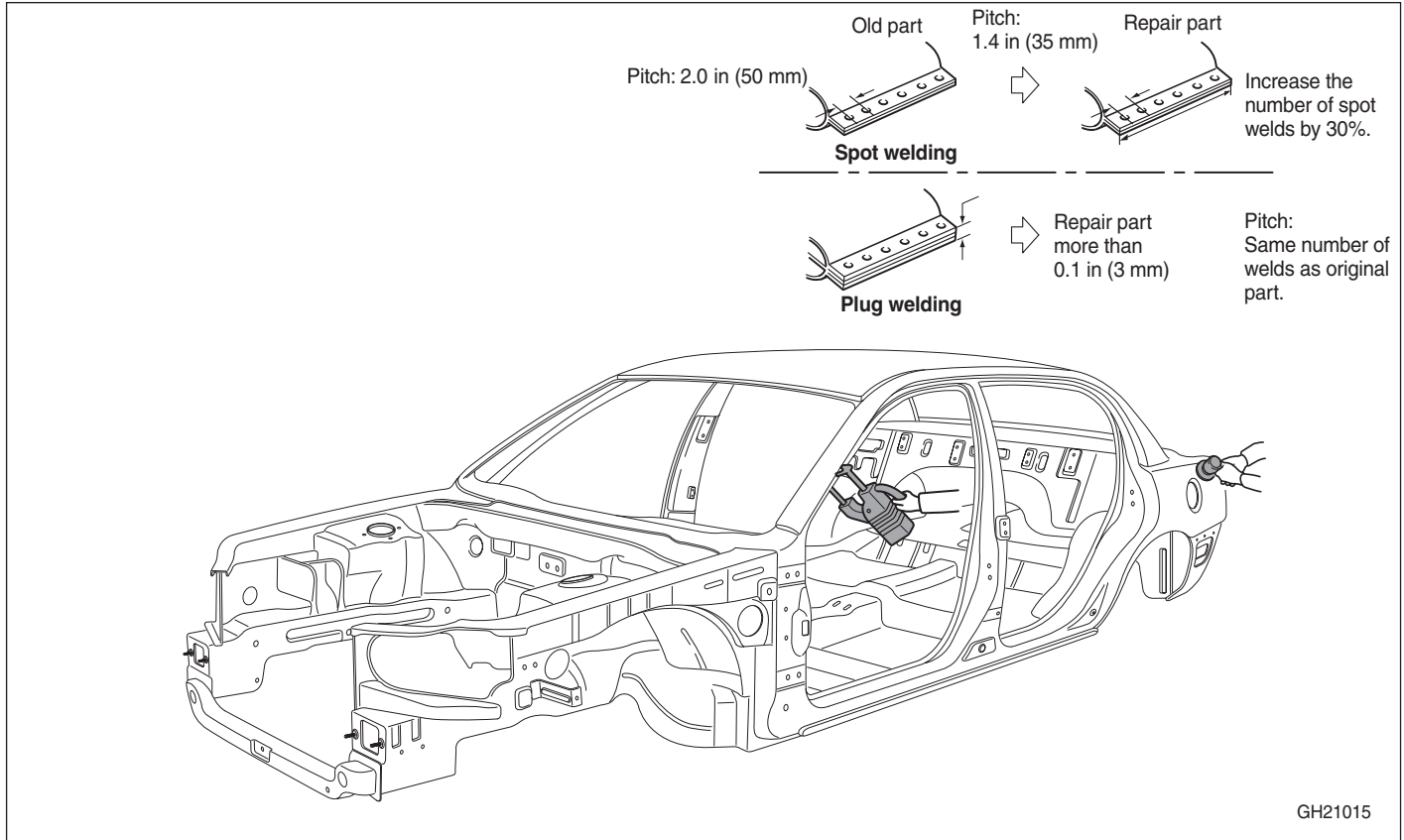
Assembly

Measuring dimensions before welding

When assembling a new part, assemble it according to the body dimensions given in Section 31, and start welding after checking the gaps with nearby parts.

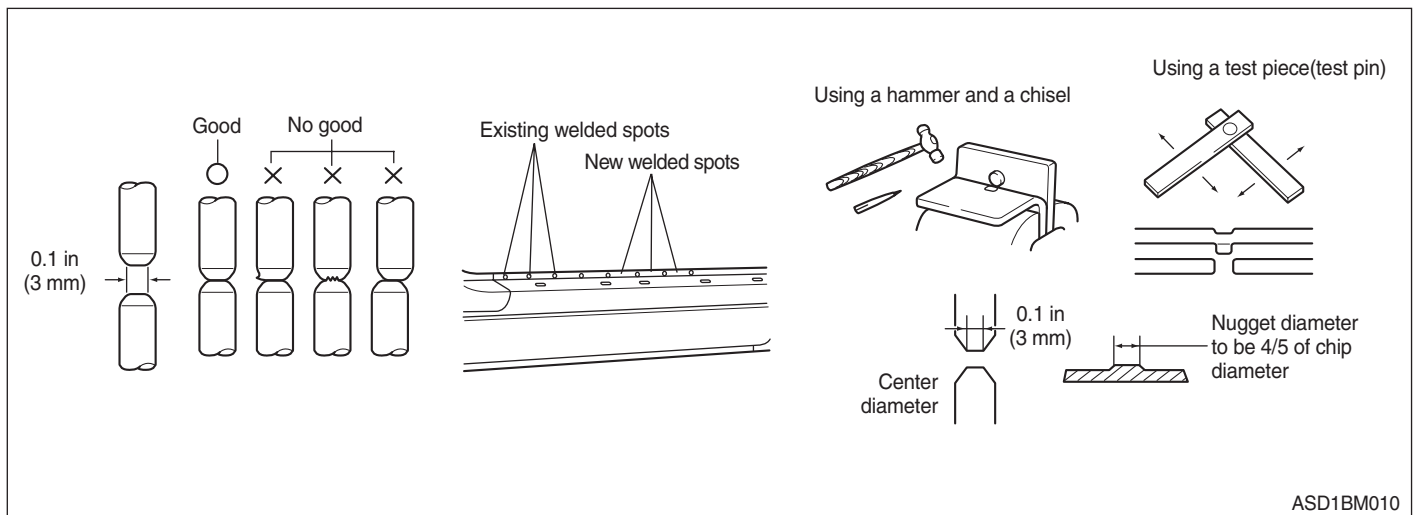
Caution when welding

The number of welding points should be determined based on the criteria below:



Caution when spot welding

- The tip of the spot welding machine should be maintained to a minimum of 0.1 in (3 mm) because it greatly affects welding strength. When possible, spot welding should be done between the existing spot welded points.
- Before and after spot welding, weld a test piece (test pin) of the same material as the body panel, and check the welding strength.



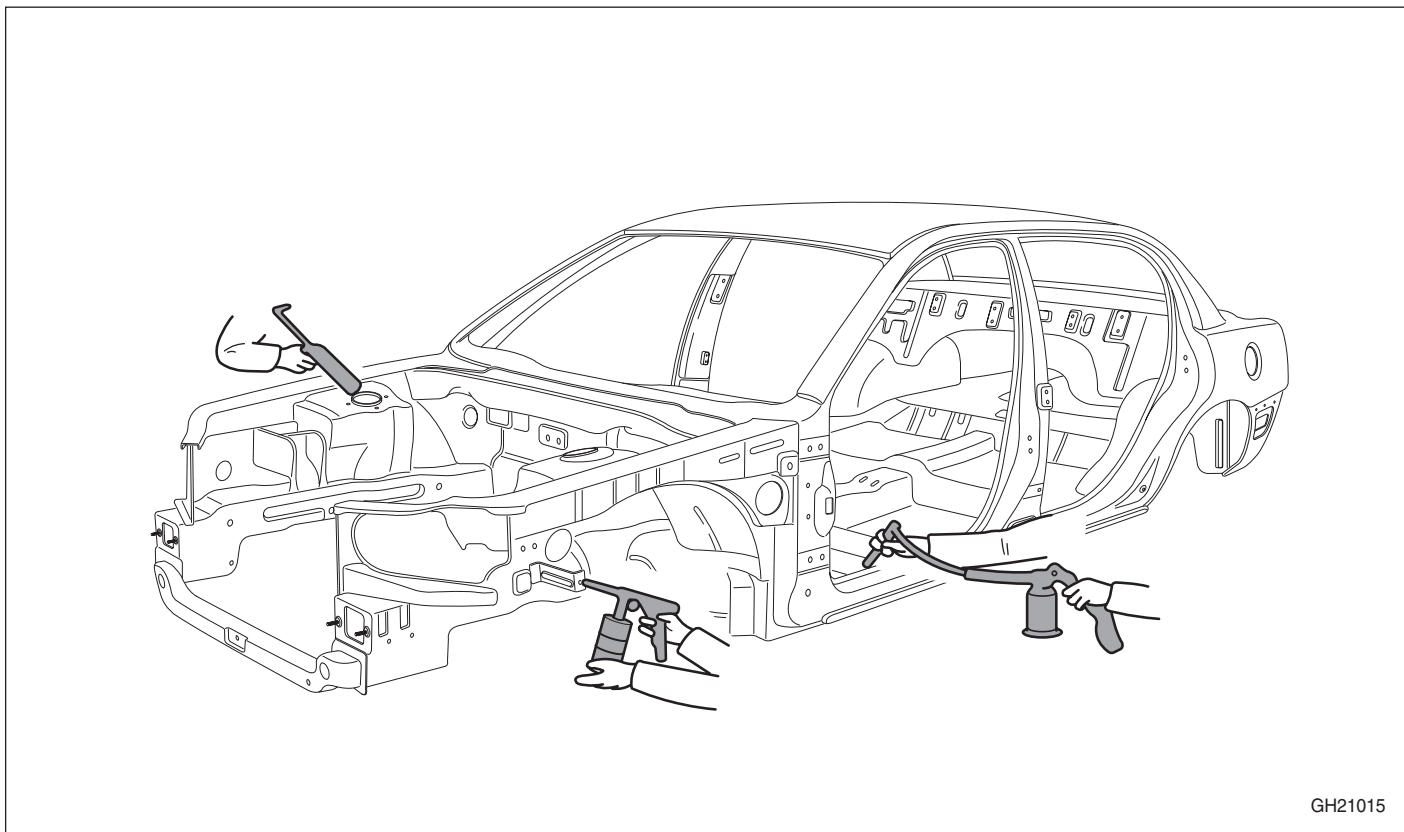
Rustproof treatment after assembly

Body sealing

Apply body sealer where necessary.

Applying rustproof material

Apply rustproofing material(wax, oil, etc.) behind welded area.

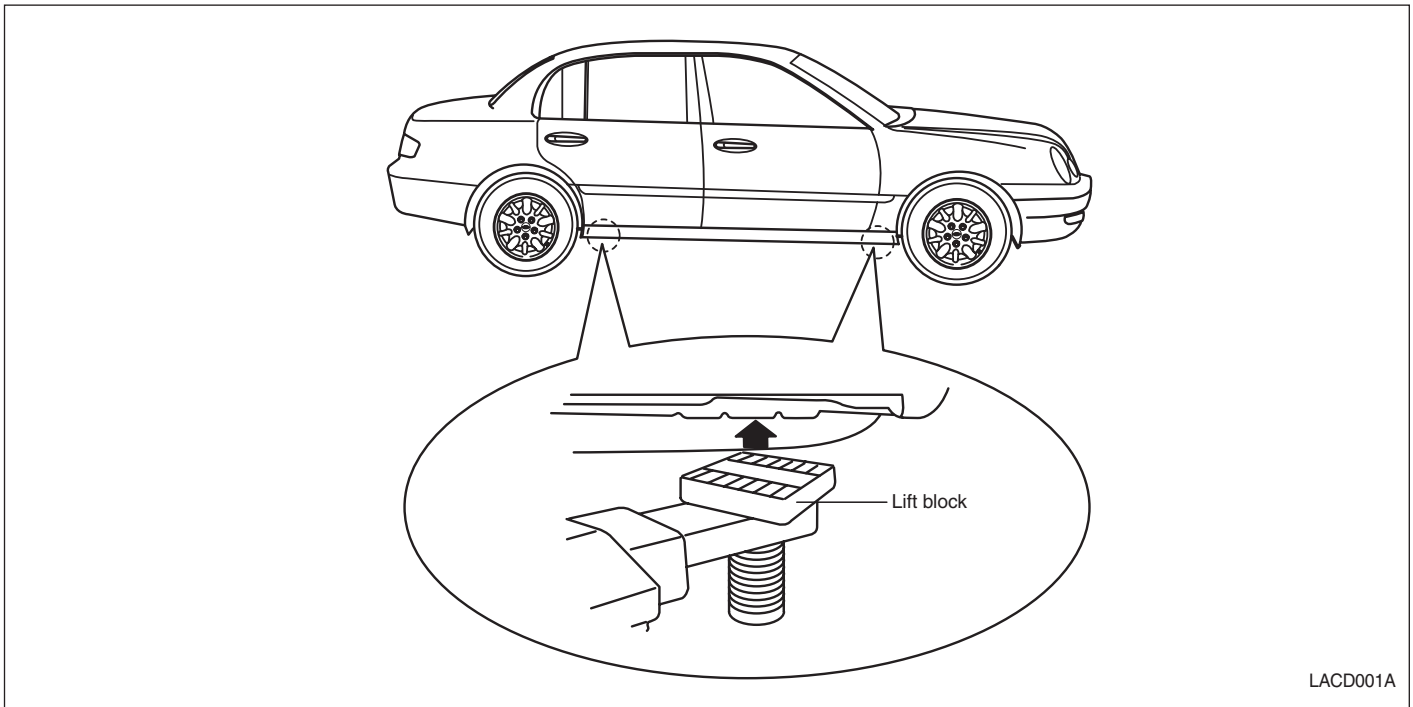


Applying undercoat

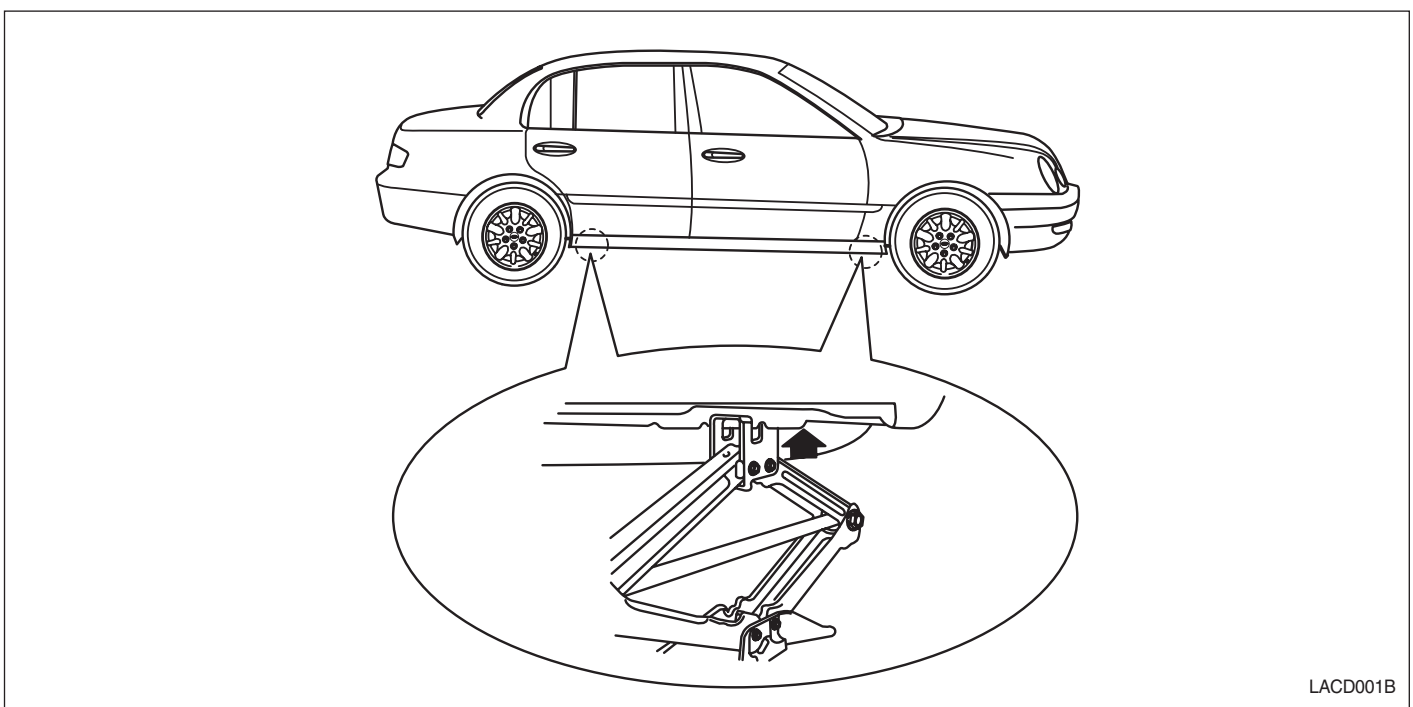
Apply undercoat on the body where necessary.

Vehicle Lift (2-Support Type) And Safety Stand Positions

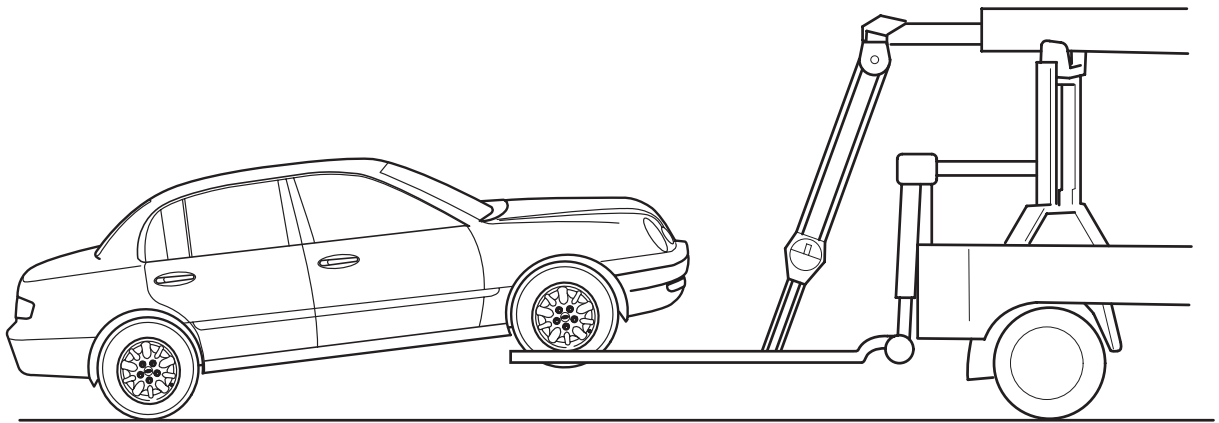
1. Place the lift blocks under the support points as shown in the illustration
2. Raise the hoist a few inches and rock the vehicle to be sure it is firmly supported.
3. Raise the hoist to full height to inspect the lift points for secure support.



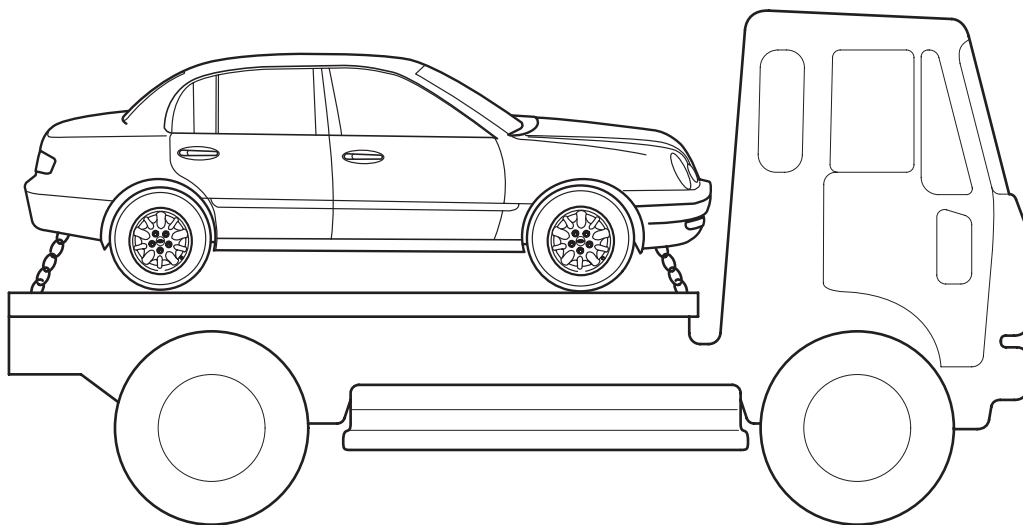
Jack Support Positions



Towing



[Wheel lift]



[Flat-bed]

LACD001F

If emergency towing is necessary, we recommend having it done by an authorized KIA dealer or a commercial tow-truck service.

Proper lifting and towing procedures are necessary to prevent damage to the vehicle.

It is recommended that your vehicle be towed with a wheel lift or flatbed equipment.

Do not tow with a slingbelt.

Our company has not approved a slingbelt towing procedure.

Body colors and major specifications

Kia color codes

Kia code	Paint color
Y7	Gold Silver
6W	Warm Grey
R8	Dark Rose Red
D8	Cream Gold
Y5	Light Beige
4C	Cobalt Blue
N7	Carbon Grey
U3	Pearl White
EB	Ebony Black
C5	Diamond Silver

Paint manufacture codes

Kia code	Color name	Dupont	Spies Hecker	Standox	BASF	Akzo Nobel	PPG
Y7	Gold Silver	X0349	741711	Y7	Y7	KIA9732	Y7
6W	Warm Grey	X0350	745278	6W	6W	KIA9734	6W
R8	Dark Rose Red	X0346	741121	R8	R8	KIA9317	R8
D8	Cream Gold	X0347	748019	D8	D8	KIA9806	D8
Y5	Light Beige	X0348	735566	Y5	Y5	KIA9733	Y5
4C	Cobalt Blue	X0343	737518	4C	4C	KIA9536	4C
N7	Carbon Grey	X0344	748020	N7	N7	KIA9731	N7
U3	Pearl White	X6781	747887	U3	U3	KIA9407	U3
EB	Ebony Black	F0193	746187	EB	EB	KIA4002	EB
C5	Diamond Silver	M7633	739245	C5	C5	KIA9716	C5

Body structure

Body composition

Body shell	11- 1
Body service holes	11- 1

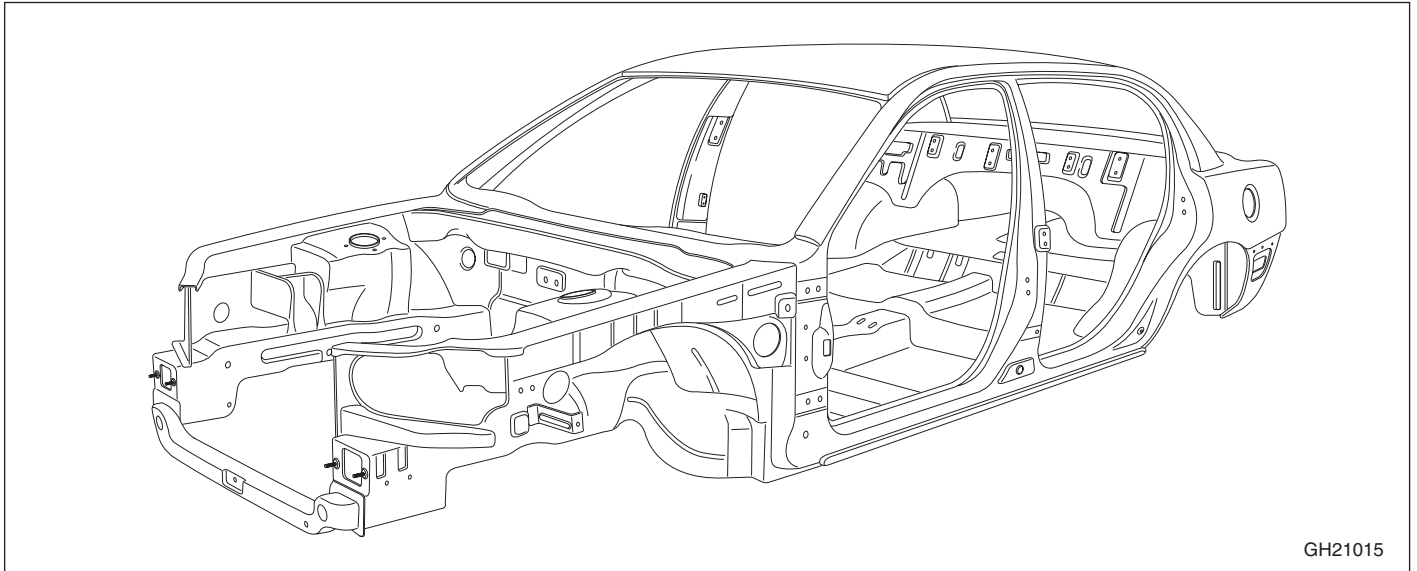
High tension steel sheet used area

Radiator support panel	11- 2
Wheel apron panel	11- 3
Cowl & Dash panel	11- 4
Side body panel	11- 5
Roof panel	11- 6
Floor panel	11- 7
Hood / Front fender / Trunk lid	11- 8
Front door & Rear door	11- 9

Body composition

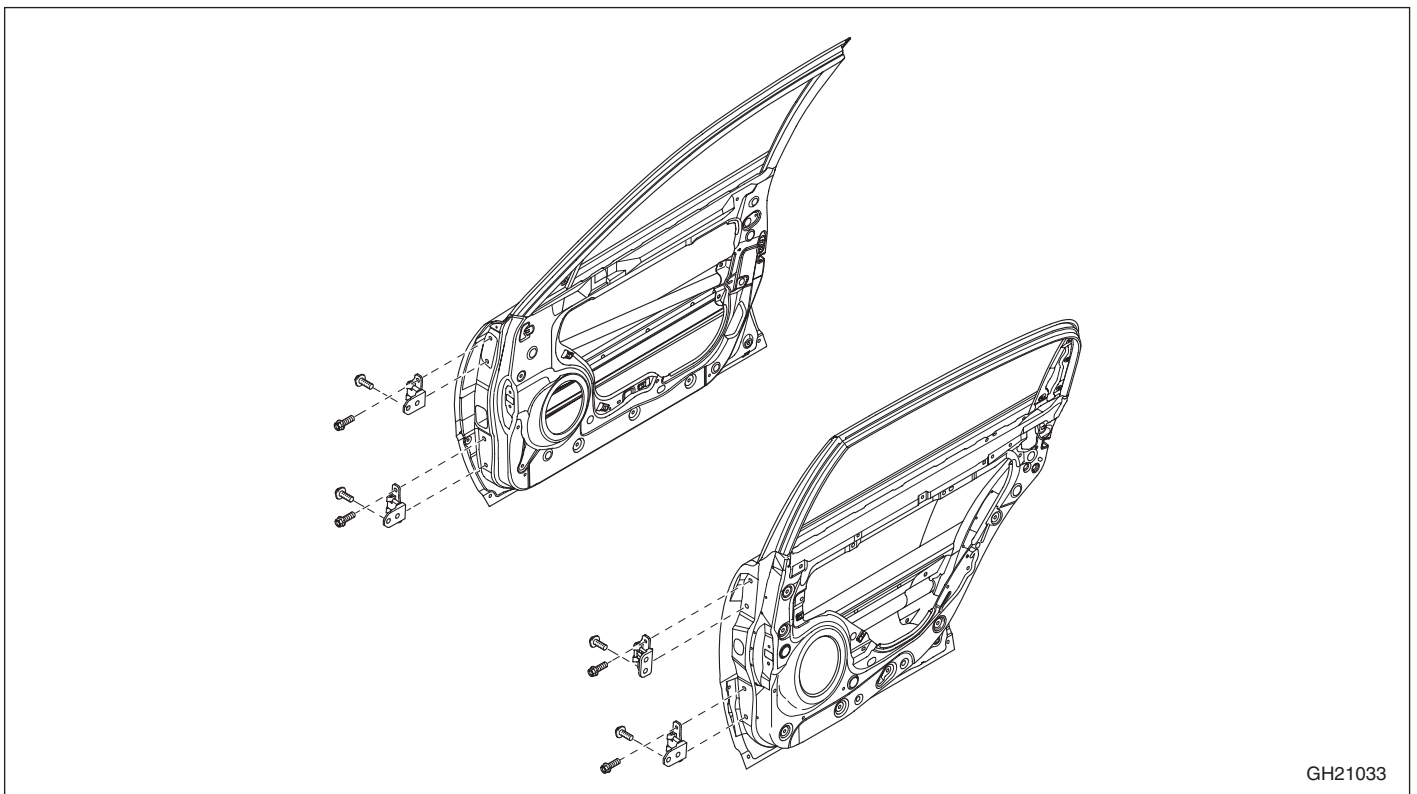
Body shell

The body consists of the body shell, frame and cross members, etc, welded together. This provides safety, durability, noise protection, rustproofing and vibration proofing of the vehicle.

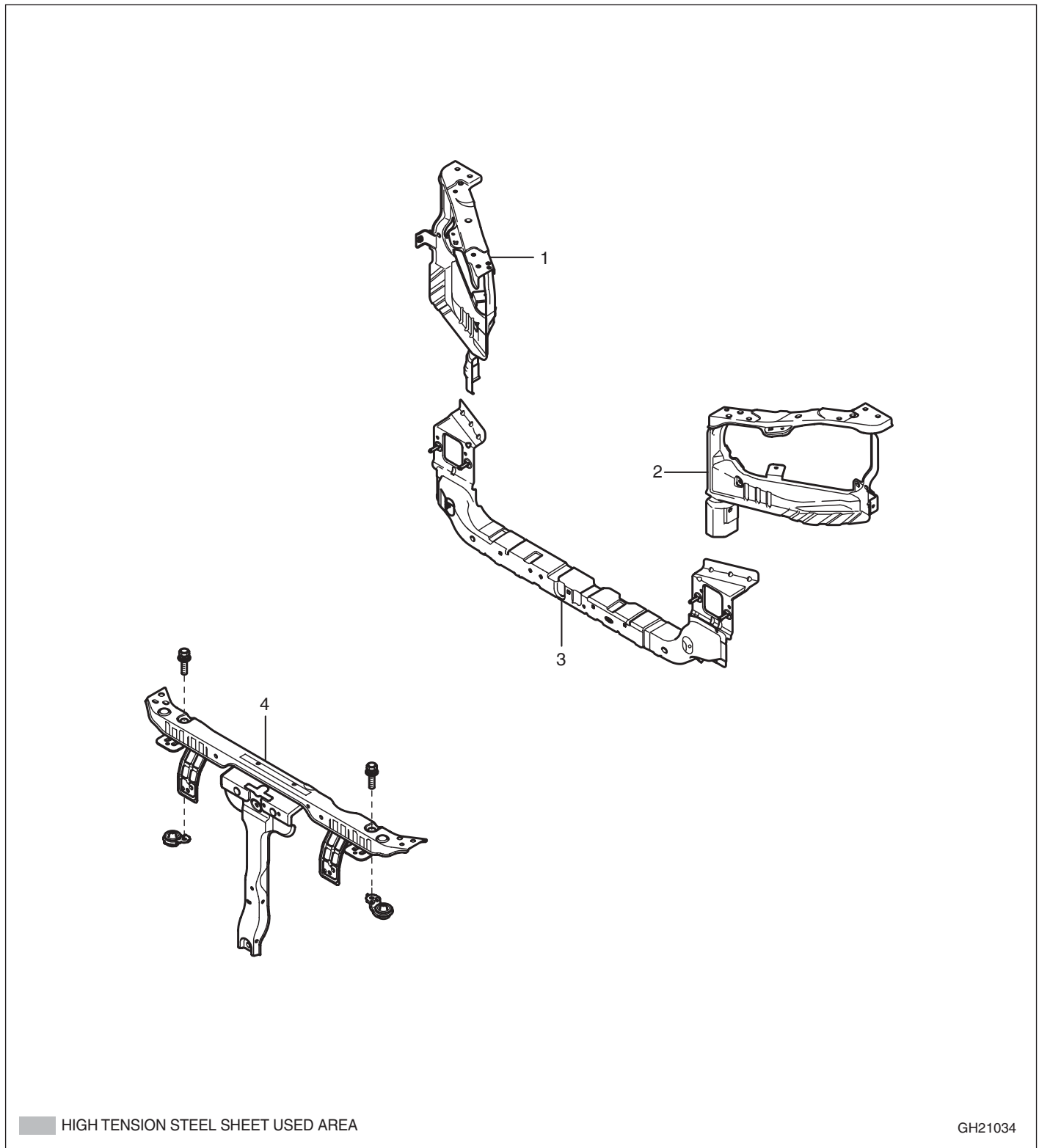


Body service holes

Body service holes are provided in the inner panel to improve serviceability of the body.



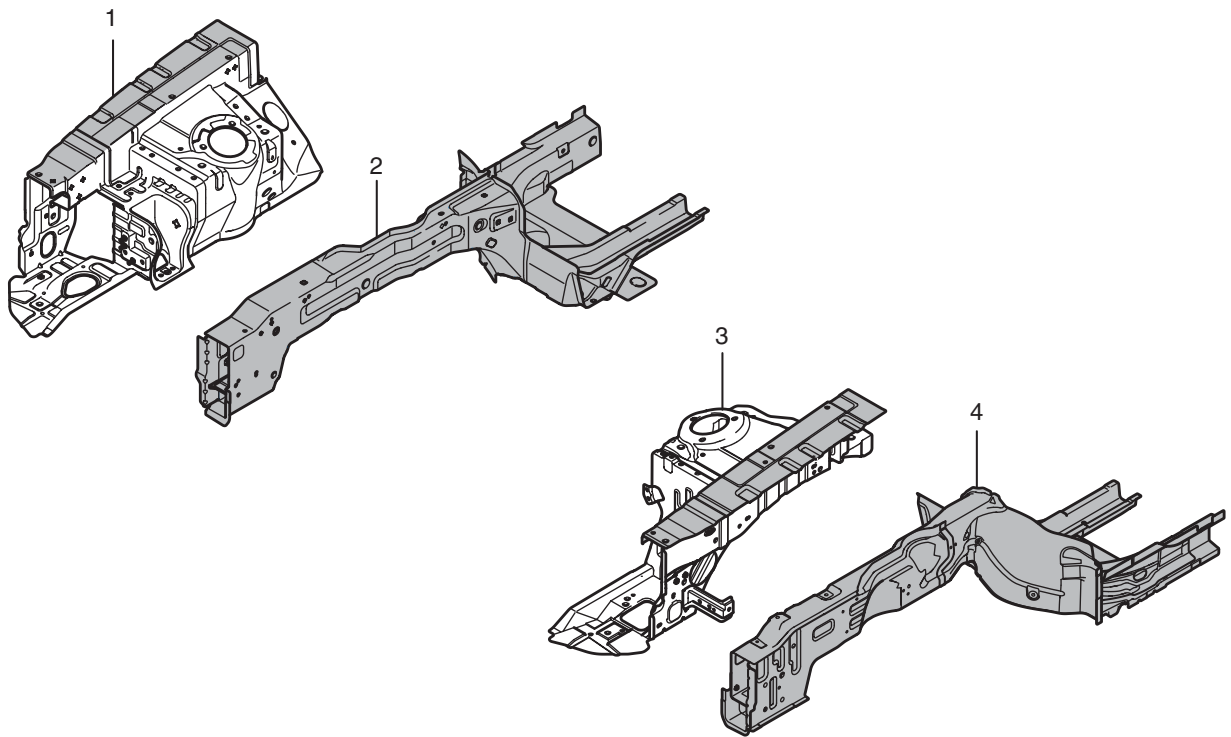
High tension steel sheet used area Radiator support panel



- (1) Radiator support upper RH member assembly
- (2) Radiator support upper LH member assembly

- (3) Radiator support lower member assembly
- (4) Radiator support center member assembly

Wheel apron panel



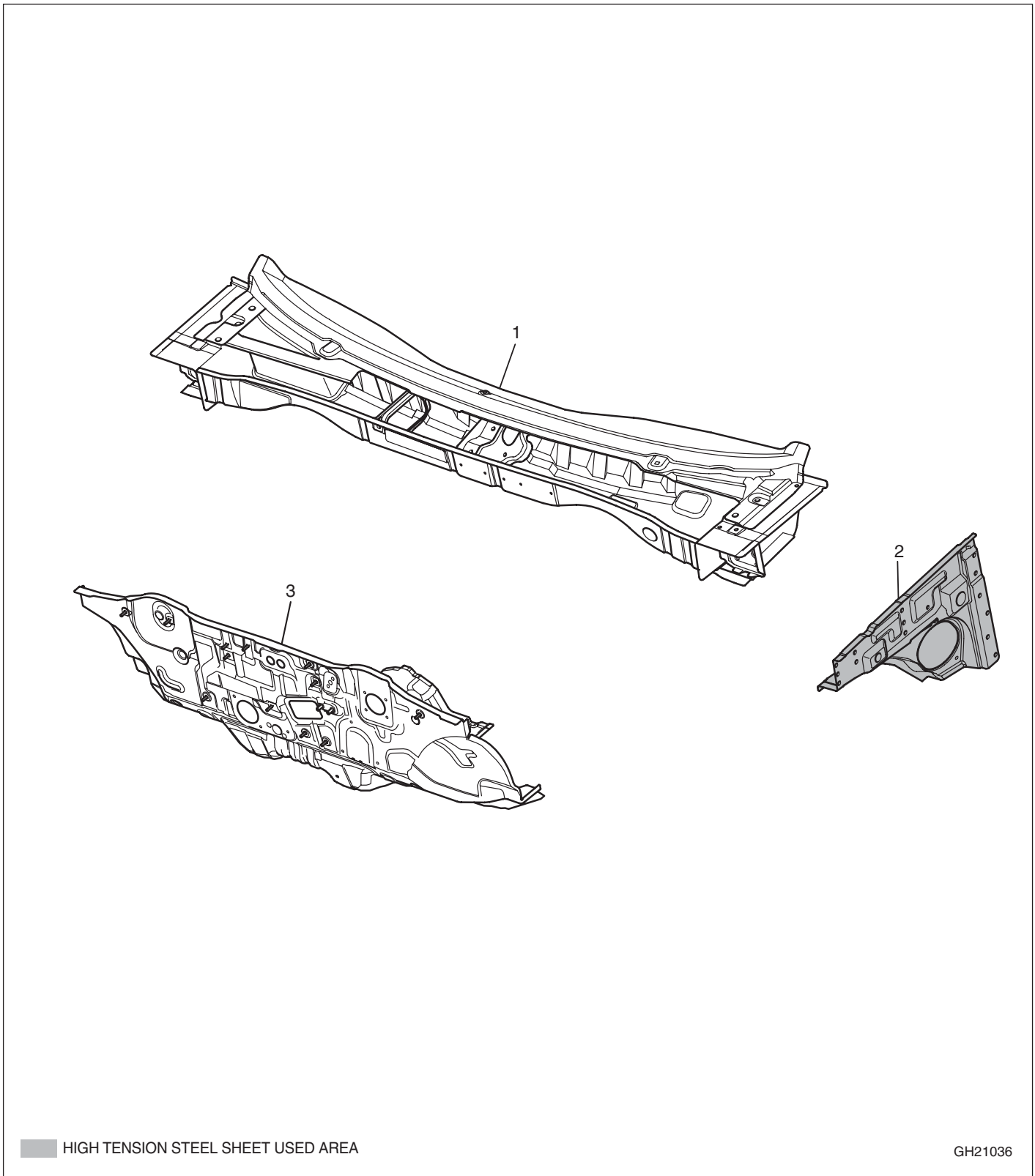
■ HIGH TENSION STEEL SHEET USED AREA

GH21035

- (1) Fender apron RH panel assembly
- (2) Front side RH member assembly

- (3) Fender apron LH panel assembly
- (4) Front side LH member assembly

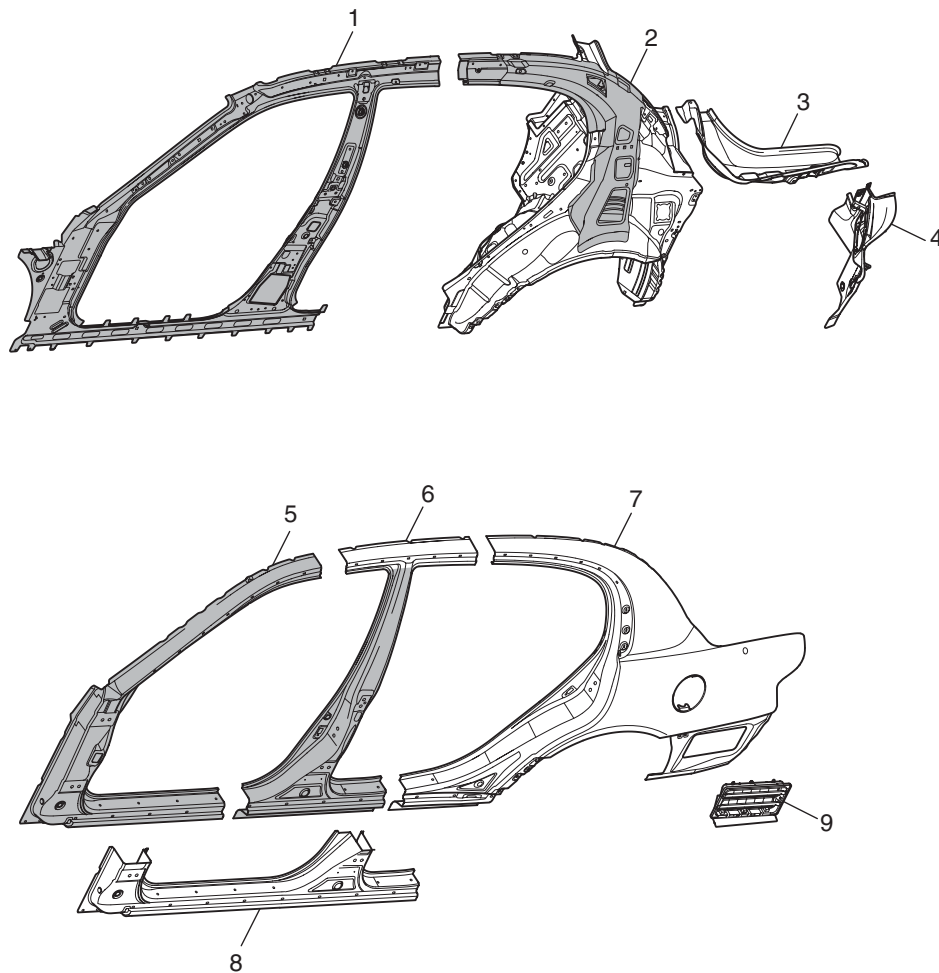
Cowl & Dash panel



(1) Cowl complete panel assembly
(2) Cowl side outer upper panel

(3) Dash complete panel & member assembly

Side body panel

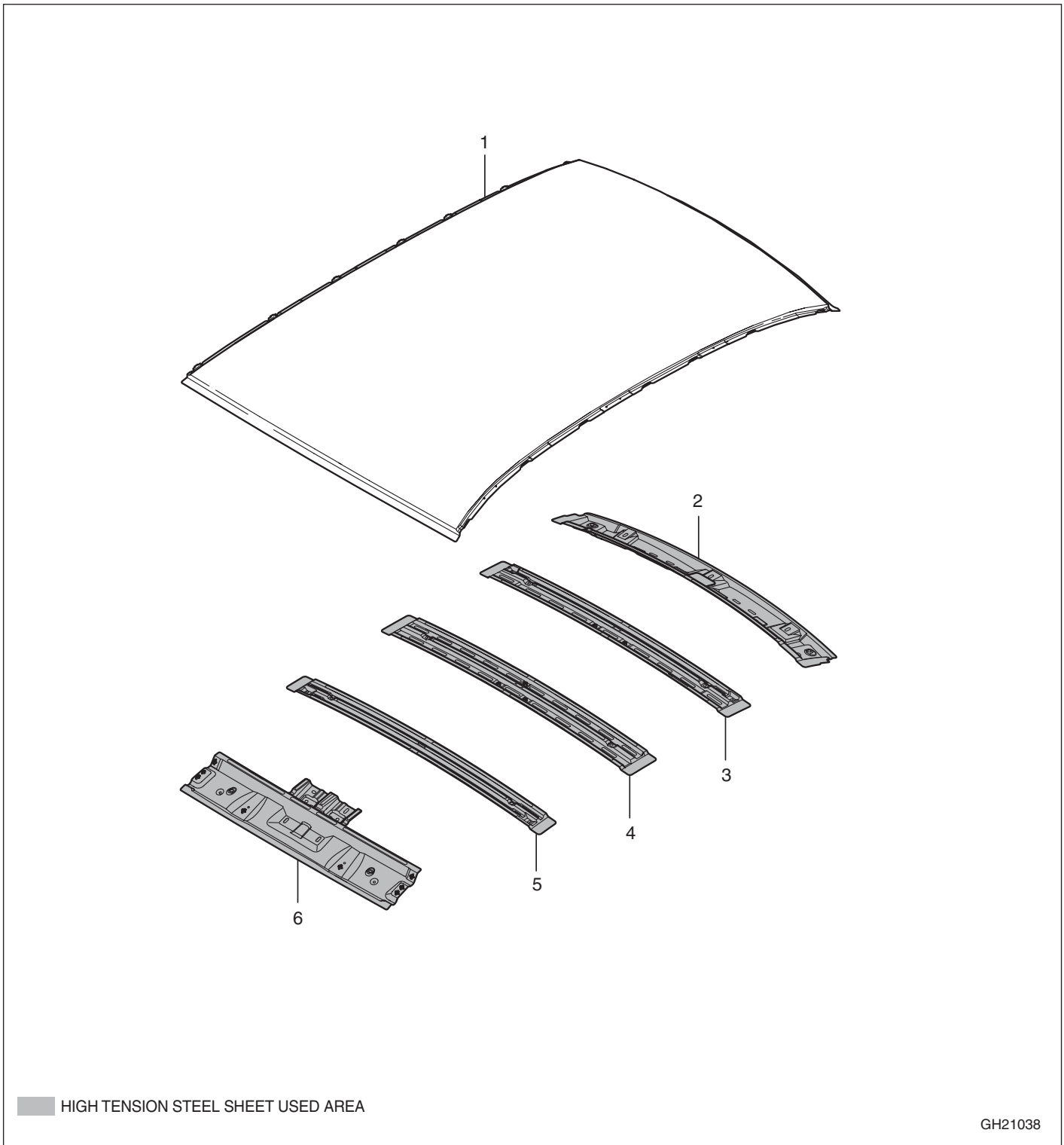


■ HIGH TENSION STEEL SHEET USED AREA

GH21037

- | | |
|---|-----------------------------------|
| (1) Front inner pillar assembly | (6) Center outer pillar assembly |
| (2) Quarter inner panel assembly | (7) Quarter outer panel assembly |
| (3) Quarter outer extension assembly | (8) Side sill outer panel |
| (4) Combination lamp housing panel complete | (9) Air extractor grille assembly |
| (5) Pillar outer panel assembly | |

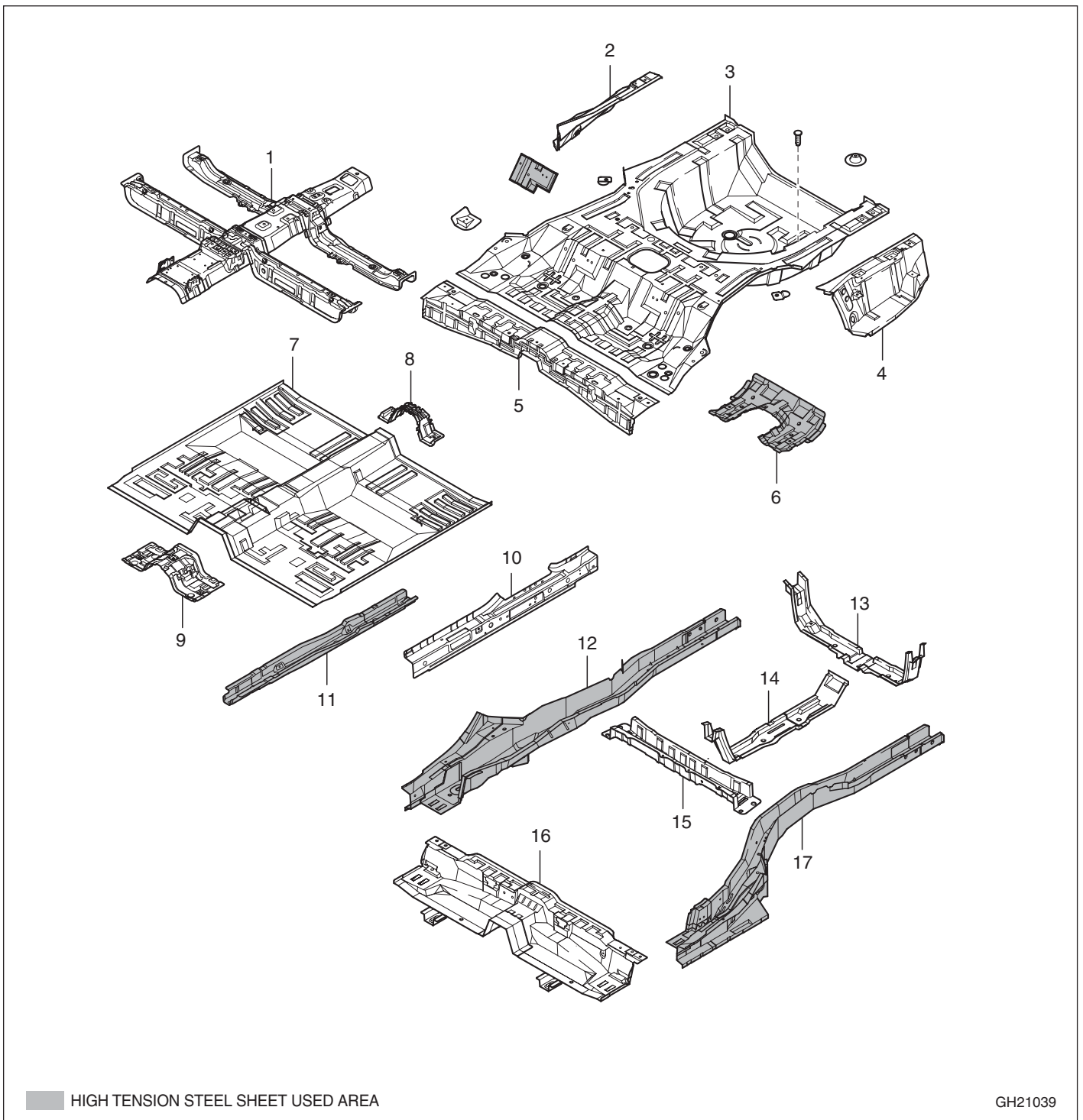
Roof panel



- (1) Roof panel
- (2) Roof rear rail
- (3) Roof center No.1 rail

- (4) Roof center No.2 rail
- (5) Roof center No.3 rail
- (6) Roof front rail assembly

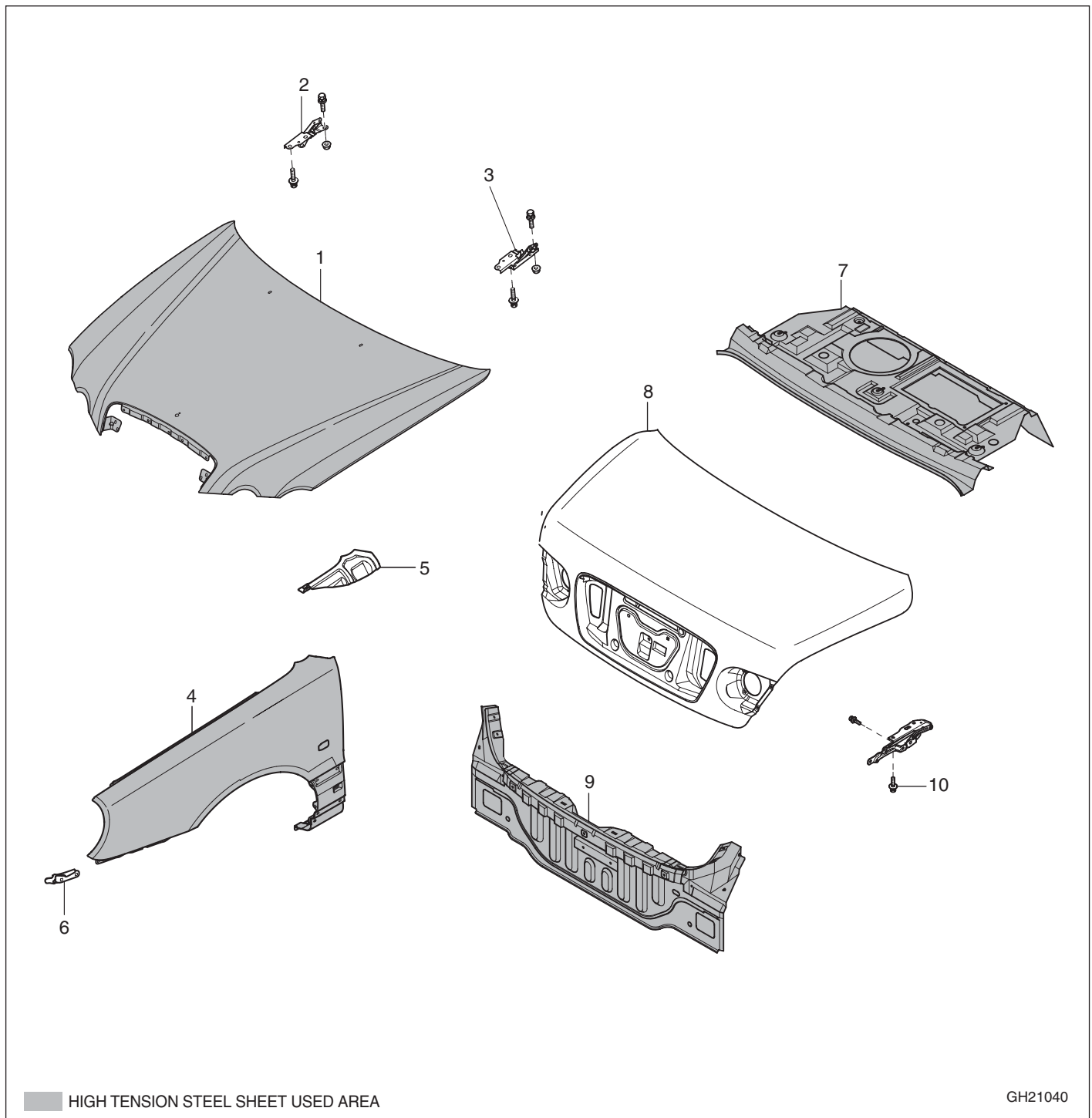
Floor panel



- | | |
|--|---|
| (1) Center floor reinforcement assembly | (10) Side sill inner panel assembly |
| (2) Rear floor RH panel assembly | (11) Center floor side member assembly |
| (3) Rear floor panel | (12) Rear floor side RH member assembly |
| (4) Rear floor side LH panel assembly | (13) Jack up cross member assembly |
| (5) Rear floor front extension assembly | (14) Rear towing hook bracket assembly |
| (6) Seatbelt anchor bracket assembly | (15) Rear floor cross member assembly |
| (7) Front floor panel | (16) Rear floor front cross member assembly |
| (8) Heat protector mounting front bracket assembly | (17) Rear floor side LH member assembly |
| (9) Muffler hanger mounting front bracket assembly | |

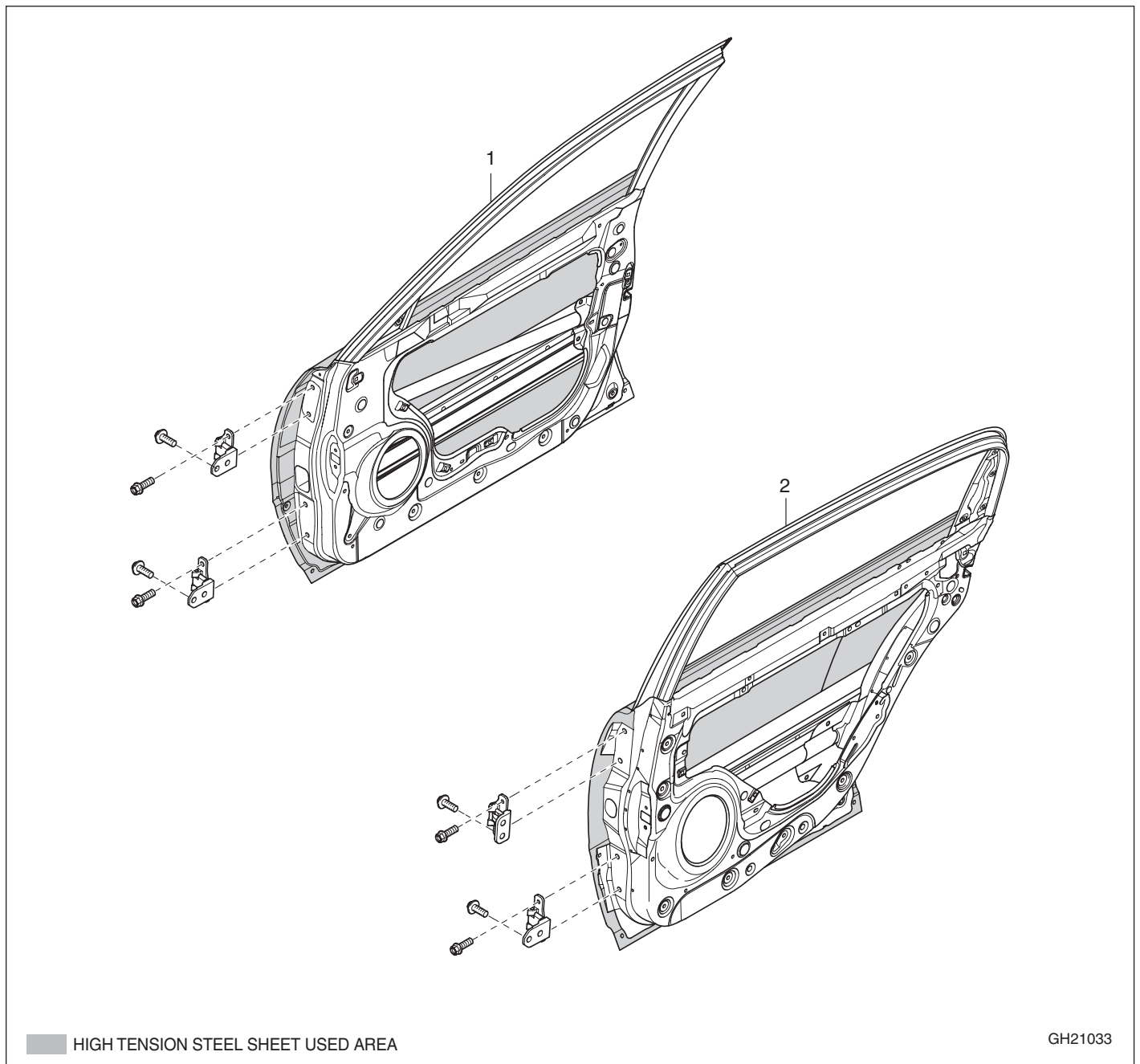
11-8 Body Structure

Hood / Front fender / Trunk lid



- (1) Hood panel assembly
- (2) Hood RH hinge assembly
- (3) Hood LH hinge assembly
- (4) Fender panel
- (5) Fender rear upper extension
- (6) Front bumper mounting bracket
- (7) Rear package tray panel assembly
- (8) Trunk lid panel assembly
- (9) Back panel assembly
- (10) Trunk lid hinge assembly

Front door & Rear door



(1) Front door panel assembly

(2) Rear door panel assembly

Replacing body panels

Replacing body panels	
Codes for disassembling and assembling body panels	21- 1
Notes when welding body	21- 3
Disassembling spot welded area	21- 3
Assembling a new body frame	21- 5
Determining a welding method	21- 5
Spot welding	21- 5
Carbon arc welding	21- 6
Replacing body panel	21- 7
Radiator support panel	21-12
Fender apron panel	21-13
Cowl & Dash panel	21-14
Floor panel (Front)	21-15
Floor panel (Rear)	21-16
Side panel - 1	21- 17
Side panel - 2	21- 18
Roof panel	21-19
Back panel	21-20

Replacing body panels

Codes for disassembling and assembling body panels



Three plate welding



Carbon arc welding (plug welding)

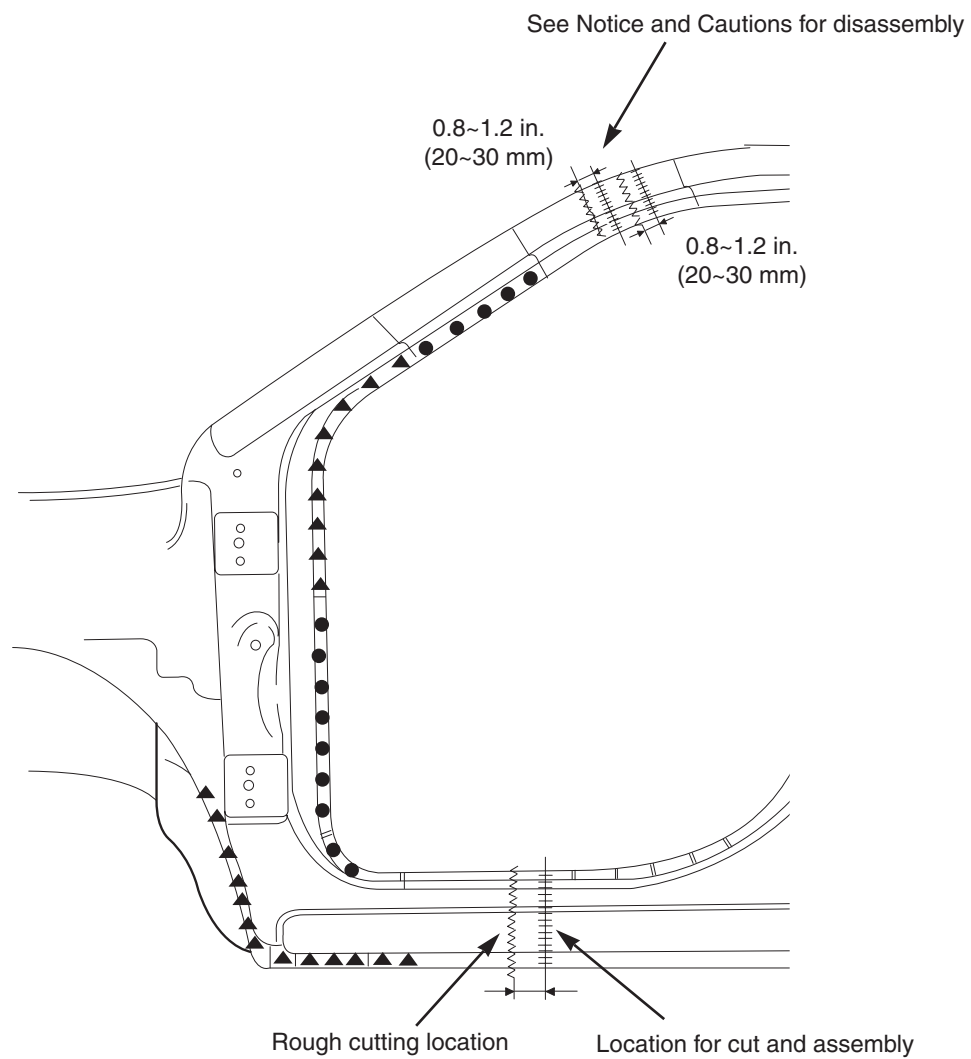


Four plate welding



Five plate welding

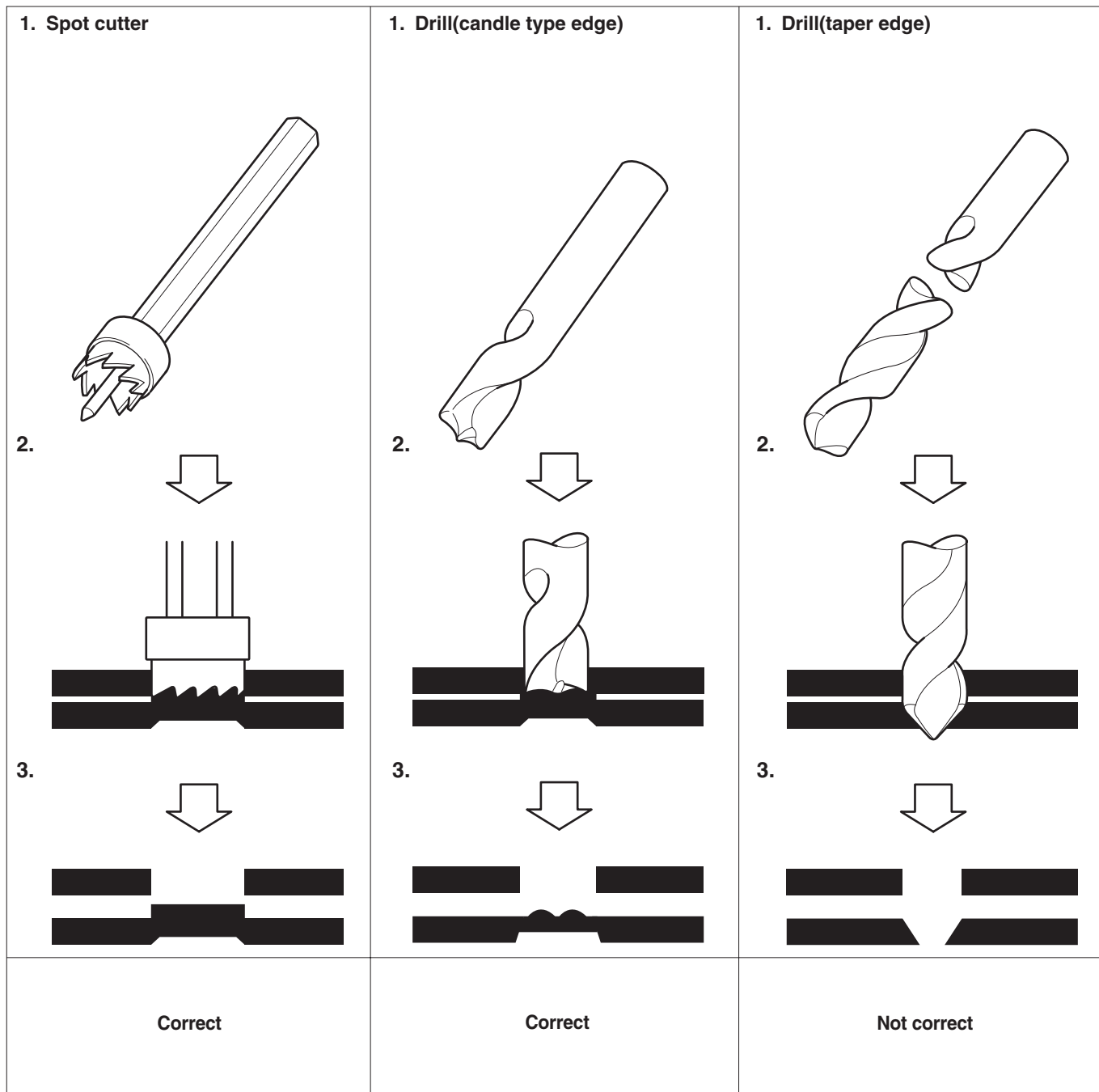
21-2 Replacing body panels



ARS1BD040A

Notes when welding body Disassembling spot welded area

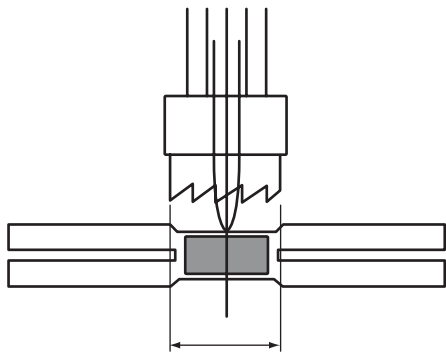
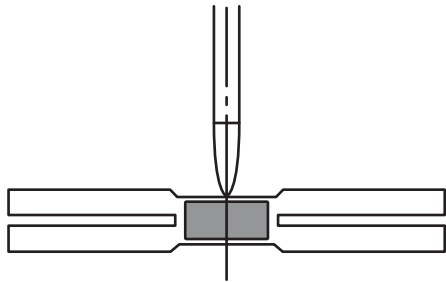
Most body parts are spot welded. In order to disassemble the damaged area, it is best to disassemble the spot welded area from the body frame using a spot cutter or candle type edge drill bit. Do not use a drill bit with a tapered edge. Center punch middle of spot weld to insure the entire spot weld will be removed.



A3EB3251

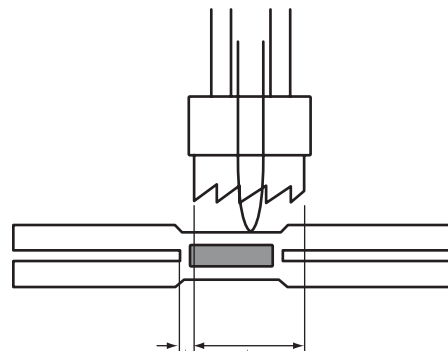
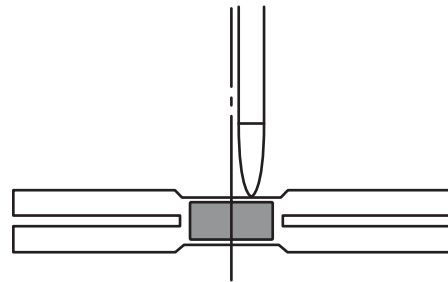
21-4 Replacing body panels

Center punch the middle(nugget) of the spot weld.



Spot welded area can be removed from the body frame.

Otherwise,



Spot welded area cannot be removed from the body frame.

A3EB3252

Assembling a new body frame

The efficiency of the transmission and load distribution are determined by many complicated factors such as thickness of plate, shape and size of a cross section, damage of parts, variance of joints, welding method, and/or welding locations. Therefore, a new part should be fitted to the body frame using the proper procedures to avoid reducing the strength of the body.

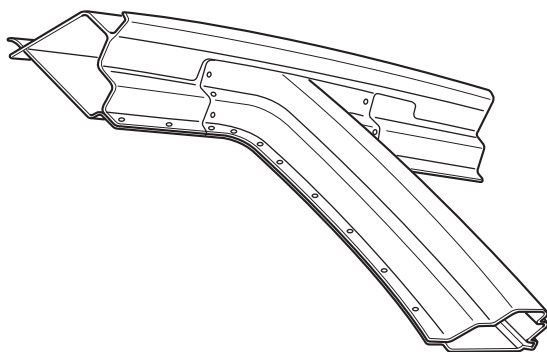
Determining a welding method

It is extremely important that appropriate welding methods, which don't reduce the original strength and durability of the body be used when making repairs, Try to use either spot welding or carbon arc(plug) welding, Do not braze any body components other than the ones brazed at the factory. Do not use an oxy-acetylene torch for welding.

Welding	Symbol	Details
Spot welding	●	The most reliable welding method (provides high efficiency and quality of assembled part.)
Carbon arc welding (Plug welding)	■	Use when spot welding cannot be done or spot welding is not necessary.
Oxygen-acetylene welding	✕	Not used

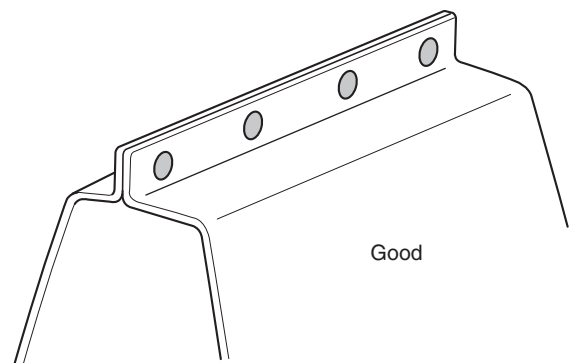
Spot welding

1. Commercial spot welding machines do not perform as well as the machines used in the manufacturing process. When spot welding, increase the number of spot welds by 30%(1.3 times the original number of welds).



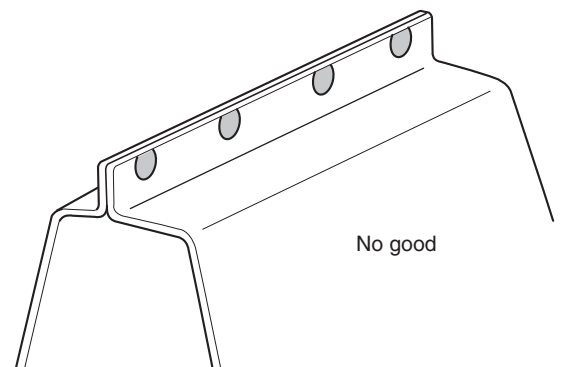
A3EB3253

2. When spot welding, weld in the middle of the joint.



A3EB3254

- Spot welding on the edge of the joint will reduce welding strength.



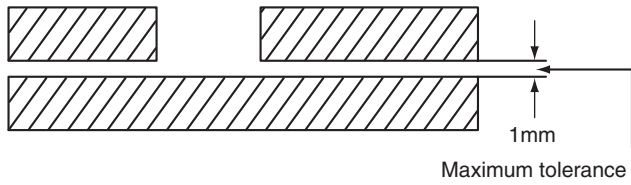
A3EB3255

21-6 Replacing body panels

Carbon arc welding

In areas where spot welding is not suitable, do plug welding using a carbon arc welding machine.

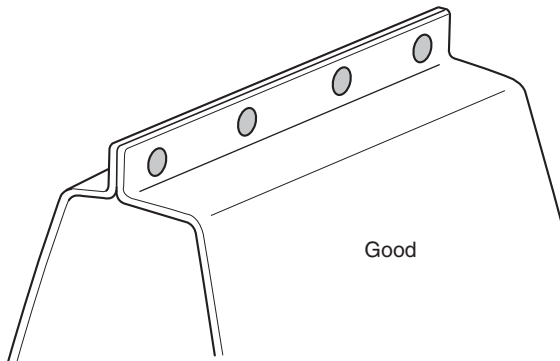
1. Clamp the parts to be welded together tightly. Do not exceed 1 mm of space between parts. A tolerance greater than 1 mm will reduce the strength of the welded area.



A3EB3256

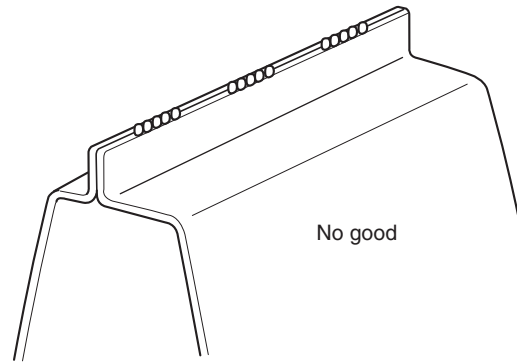
2. Weld in the middle of the flange joint.

- a) Drill a hole 5~6 mm on one side of the flange only, and weld within the hole.



A3EB3254

- b) Do not weld on the edge of the flange joint.



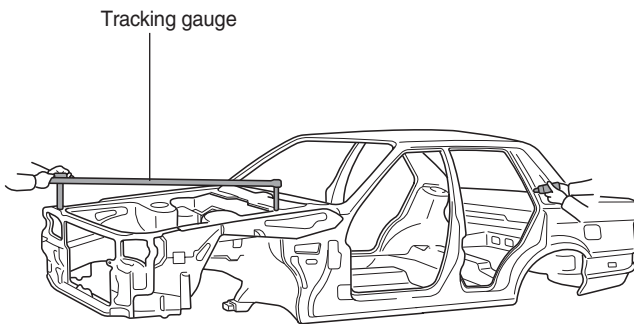
A3EB3257

Replacing body panel

Disassembly

1. Body measurement

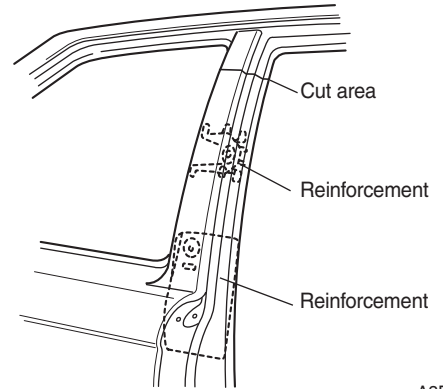
- Before disassembling, measure the damaged area according to the dimensions supplied in Body Dimension, Section 31. If deformation is present, use a frame straightener to adjust.
- When disassembling a panel, apply clamps to prevent damage of each part, and support the lower end of the frame to prevent deformation during the procedure.



A3EB3261

2. Cut and welding point selection

Cutting, if necessary, should not be done in a reinforcement area. Select an area which will result in the least amount of deformation after welding.

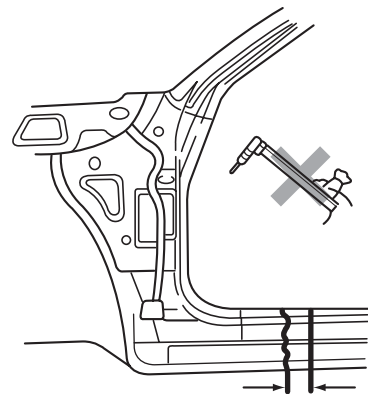


A3EB3258

3. Cutting rough area for replacement part

Cutting should be done according to the following steps to make disassembly easy:

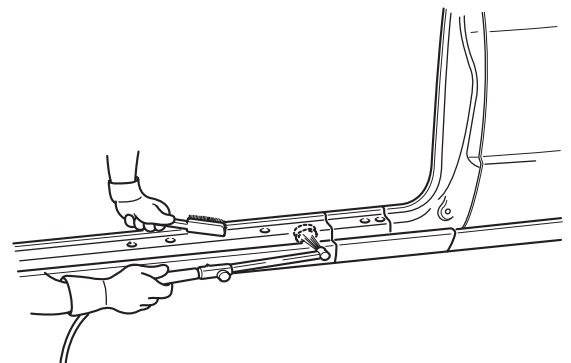
- Use care when cutting an area close to a pipe or wiring harness.
- Cut an area leaving 30~50 mm of tolerance.



ASD1BM005

4. Removing paint from an area to be spot welded

Using a torch and wire brush, remove paint completely before beginning welding.



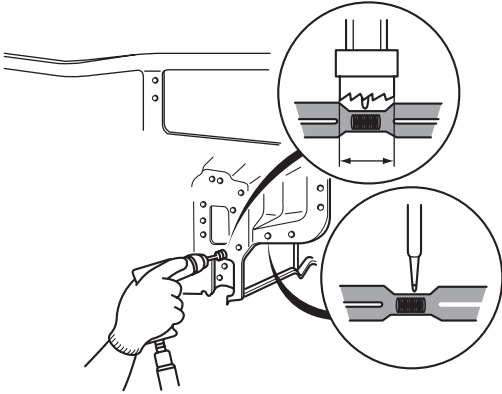
1SD1BM014

21-8 Replacing body panels

5. Determine a cutting method

a) Cutting a spot welded area

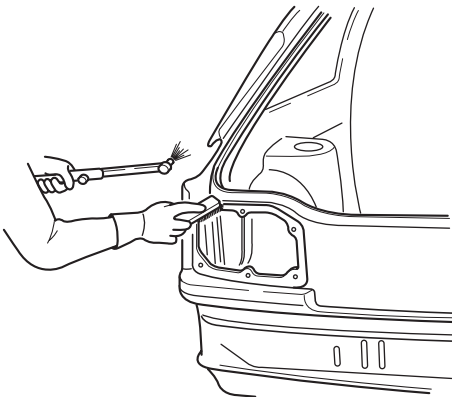
Make a hole in the middle of spot welded area with a punch, disassemble welded area using a spot cutter and remove using a chisel.



1SD1BM015

b) Removing brazed area

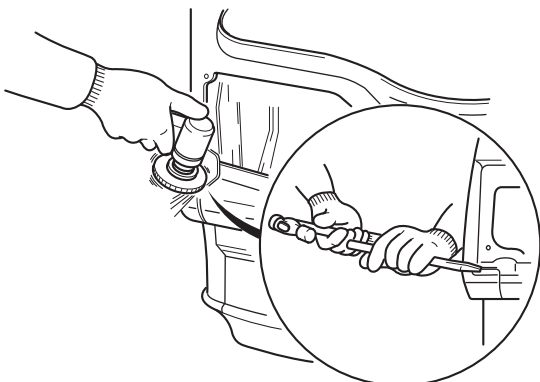
Disassemble using a torch and wire brush, and remove with a chisel.



1SD1BM016

c) Removing arc welded area

Remove plug welded area using a disk grinder and disassemble with a chisel.

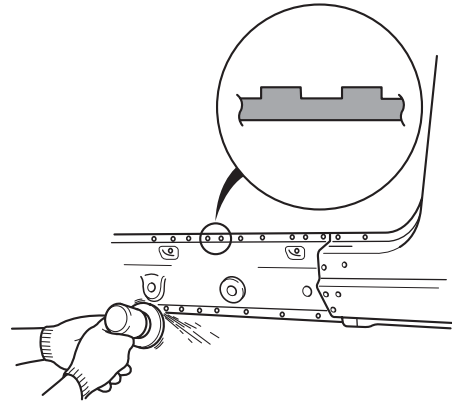


1SD1BM017

Preparation for assembly

1. Spot weld finish

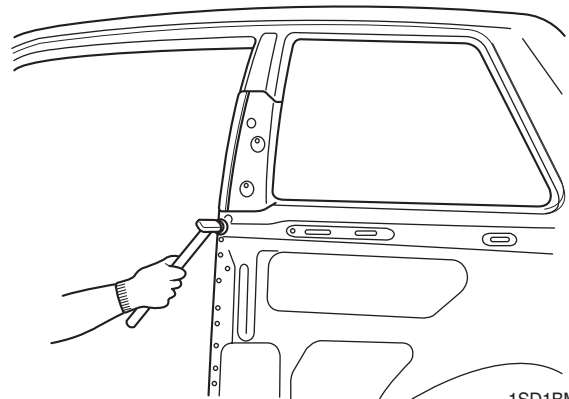
Use a disk grinder or similar tool to finish spot weld mark. Do not grind more than is necessary to smooth surface.



1SD1BM018

2. Panel preparation

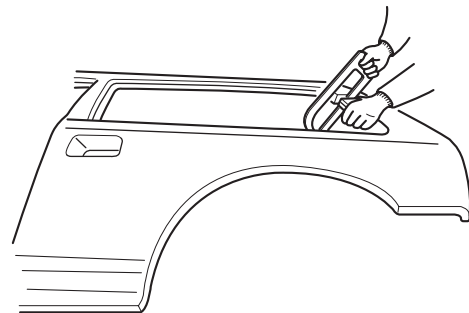
Repair any bent or uneven areas with a hammer to improve the assembly process.



1SD1BM019

3. Cutting a rough area for a new part

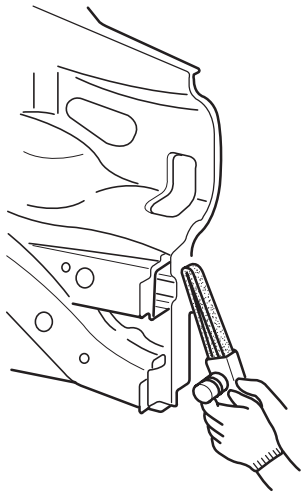
When rough cutting an area for a new part, leave a tolerance of 30~50 mm.



1SD1BM020

4. Preparation for spot welding

Remove paint on spot welded area and on the area overlapped by the new part using a belt sander or similar tool.



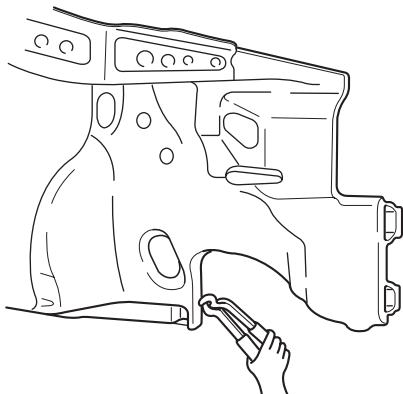
1SD1BM021

5. Drilling a hole for plug welding

If the thickness of the part to be welded is less than 3 mm, drill a 5~6 mm diameter hole. If the thickness of the part to be welded is greater than 3 mm, drill a hole using a 7 mm diameter drill.

***** Notice

- Do not spot weld where thickness is greater than 3 mm.



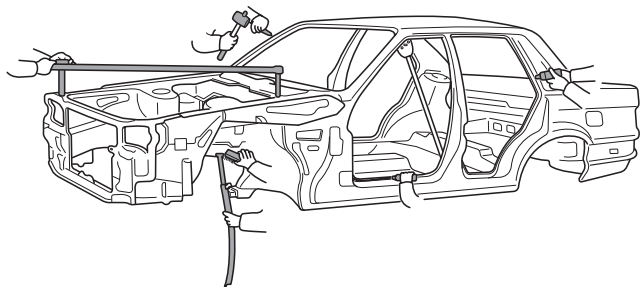
1SD1BM022

21-10 Replacing body panels

Assembly

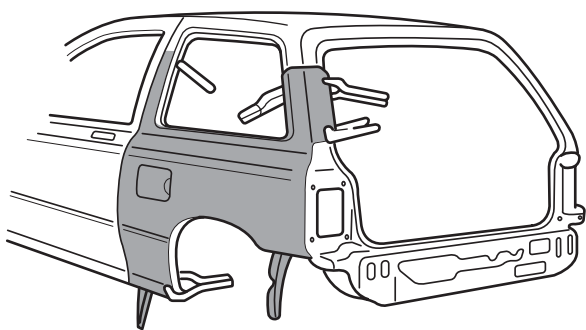
1. Checking welding and fitting in advance

- When assembling a new part, measure the dimensions of each part according to the body dimensions given in Section 31, and set part to the reference dimensions.



1SD1BM02004

- Prior to final welding, check the fit of all related parts.



1SD1BM023

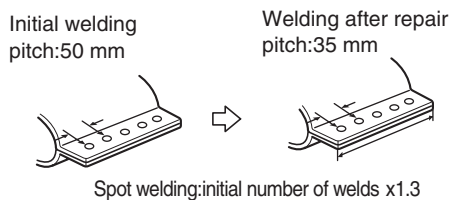
2. Selecting number of welding points

Spot welding : Multiply the original number of factory welds by 1.3

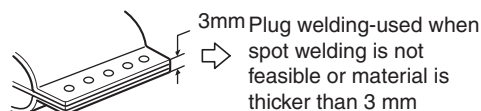
Plug welding : Same number as original number of factory welds

* Notice

- Plug welding should be done using a carbon arc welding machine.
- Brazing should be done only on areas that were originally brazed at the factory.



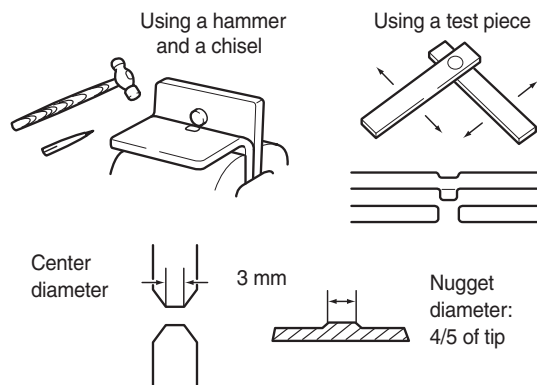
Welding points-same number as original number of factory welds.



A3EB3259

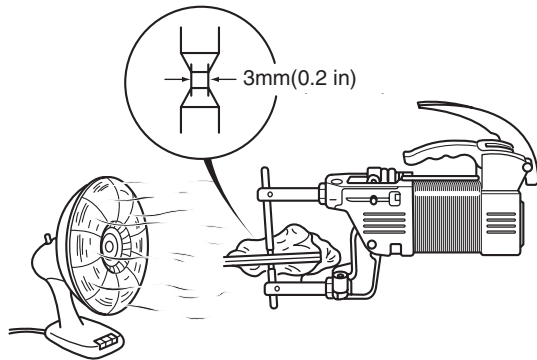
3. Caution when spot welding

- Do a test welding on a piece of material of the same type and thickness as the part to be welded and proceed if test weld is good.
- Before spot welding, check if welding debris, oil or paint is present on the area where surfaces meet. Clean or sand as necessary.



A3EB3260

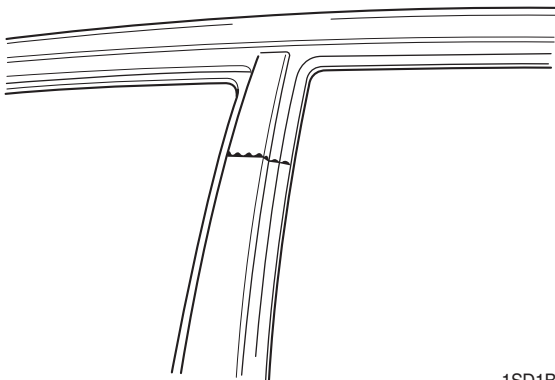
- c) The tip of the spot welding machine should be maintained to a minimum tolerance of 3 mm. Also let area cool after 5 or 6 welds to minimize problems caused by excessive heat.



1SD1BM026

4. Cutting and welding an assembled area

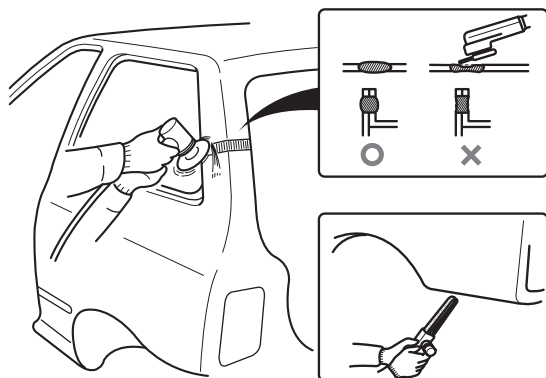
To align a roof panel and a center pillar together for butt welding, temporarily fasten a steel flange to the roof panel and then apply the new center pillar panel. Remove the flange when final welding is done.



1SD1BM027

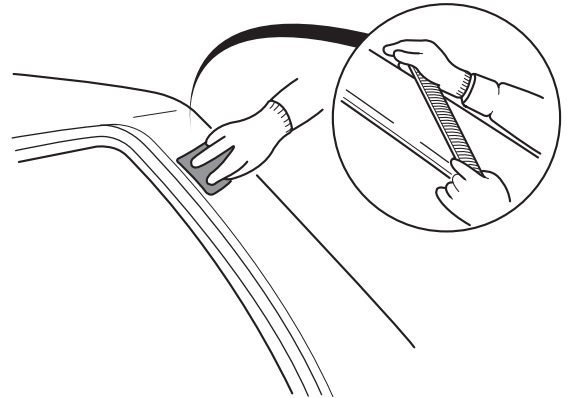
5. Finishing after welding

- a) Grind any areas that were plug welded or butt welded using a disk grinder. Grind carefully to avoid removing too much material. This degrades the strength of the weld.



1SD1BM028

- b) Finish areas that have been brazed by applying body filler then smooth the area with a flexible file and sander.



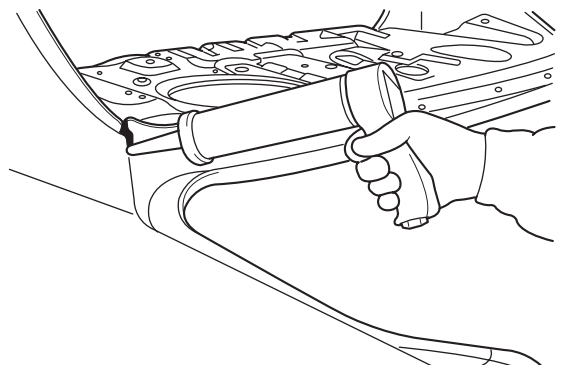
1SD1BM029

6. Applying anti-rust agent and body sealer

After coating the surface with anti-rust agent, apply body sealer where necessary.

* Notice

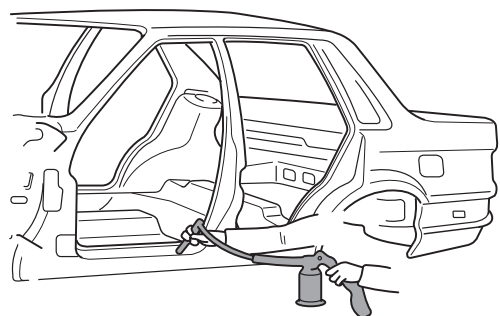
- Apply body sealer before assembly.



1SD1BM030

7. Anti-rust treatment

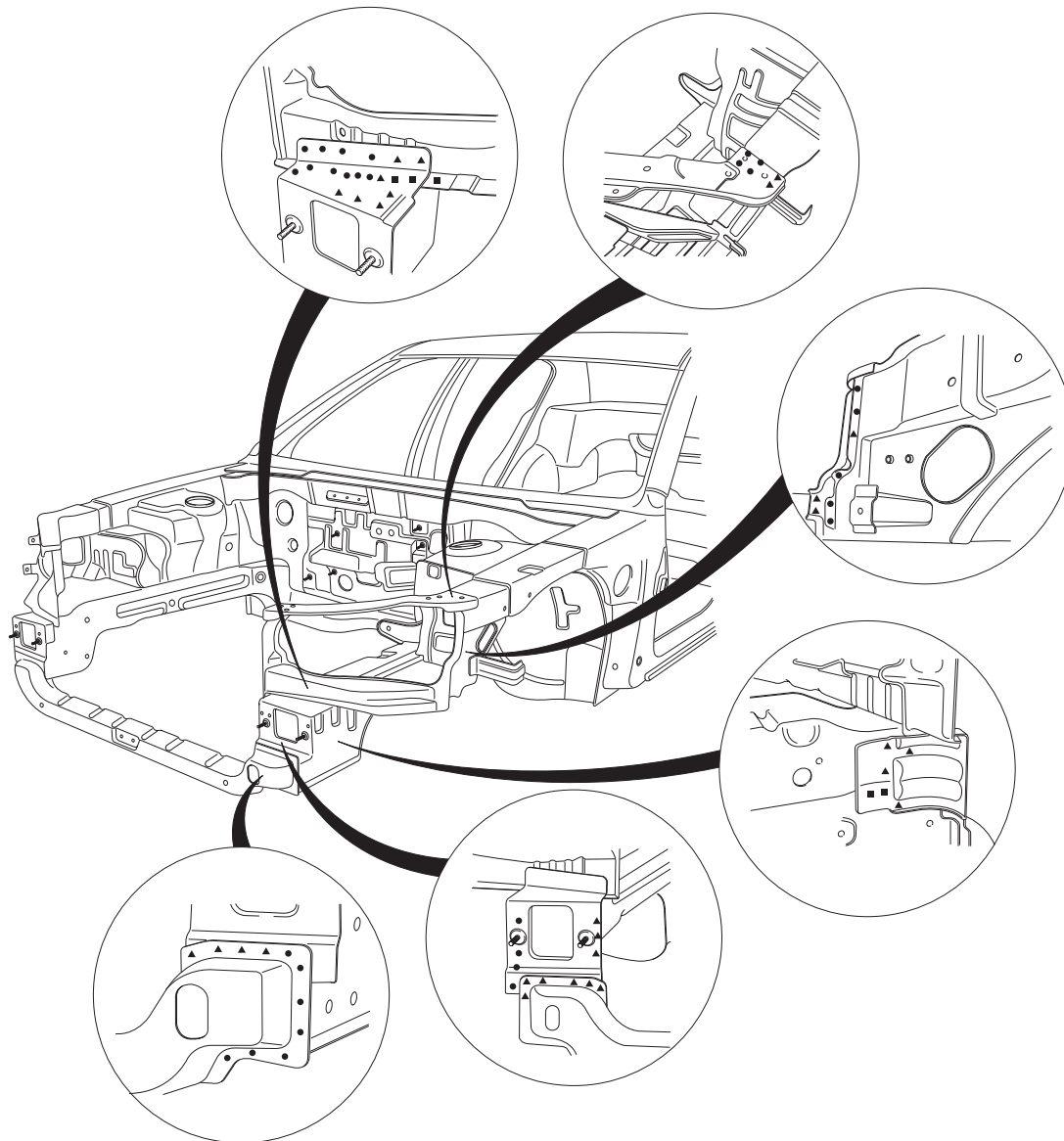
Apply anti-rust agent to inside of doors and sills by spraying through access holes provided.



A3EB3261

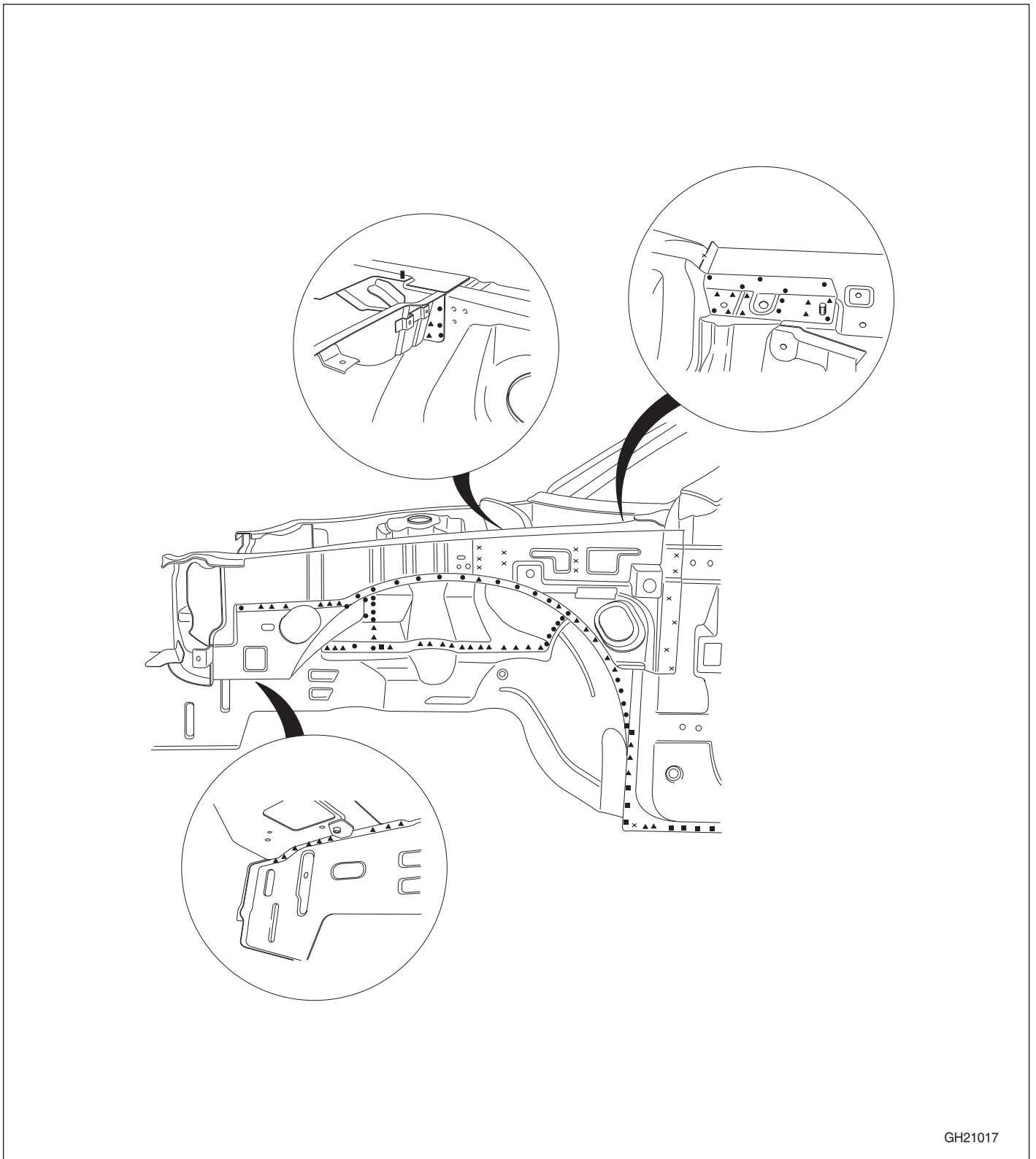
Radiator support panel

Welding part



GH21016

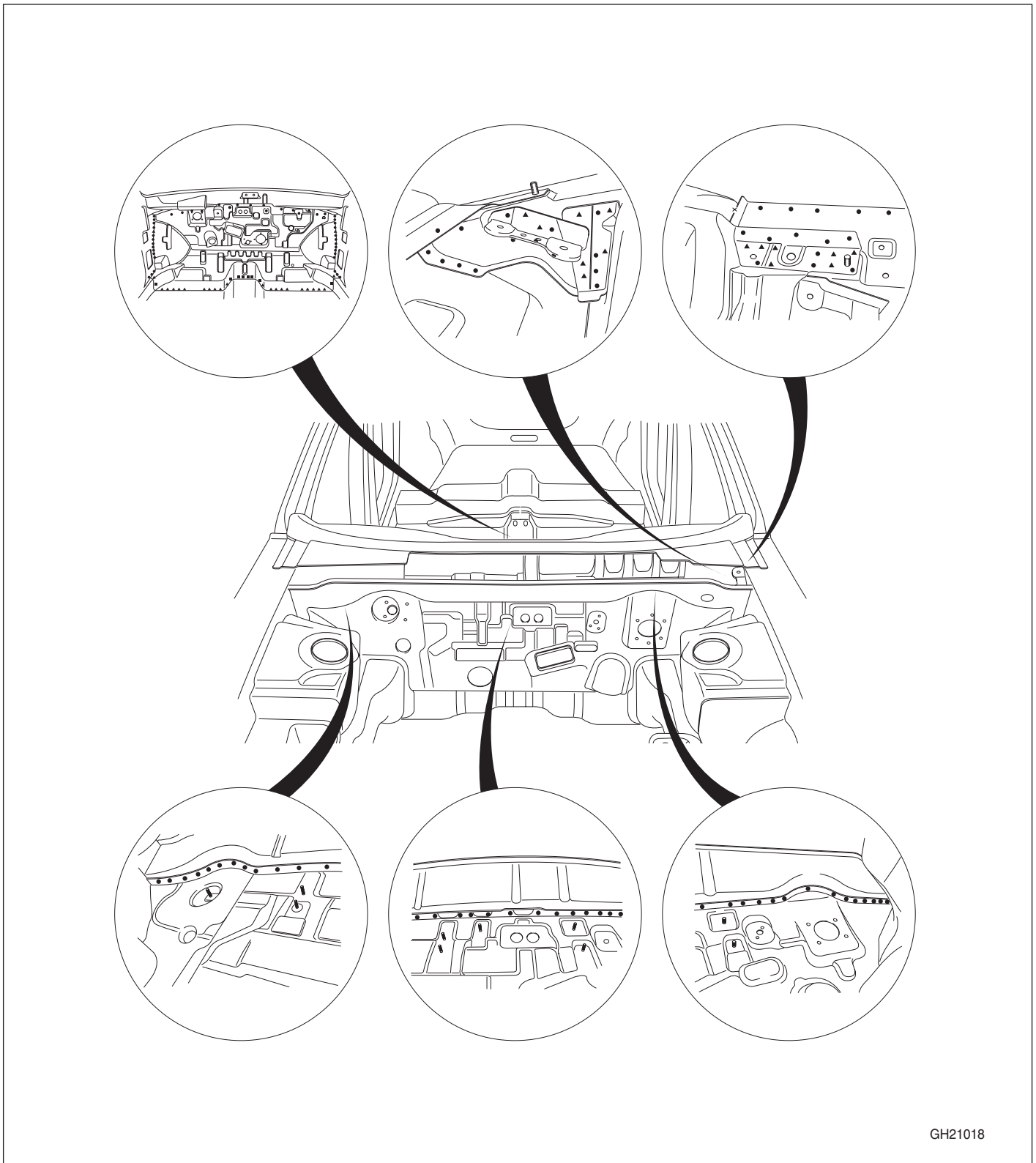
Fender apron panel Welding parts



GH21017

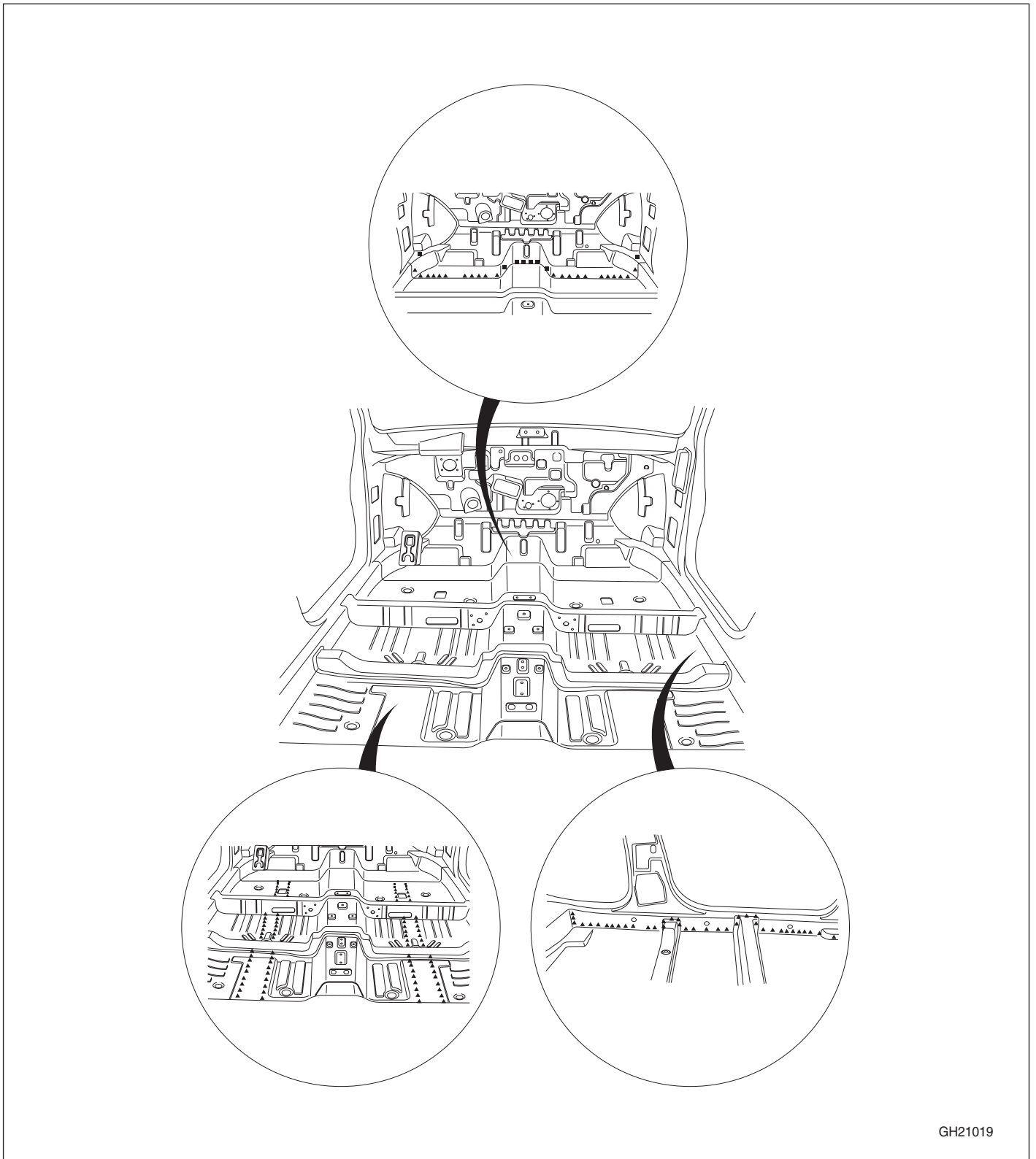
21-14 Replacing body panels

Cowl & Dash panel
Welding parts



GH21018

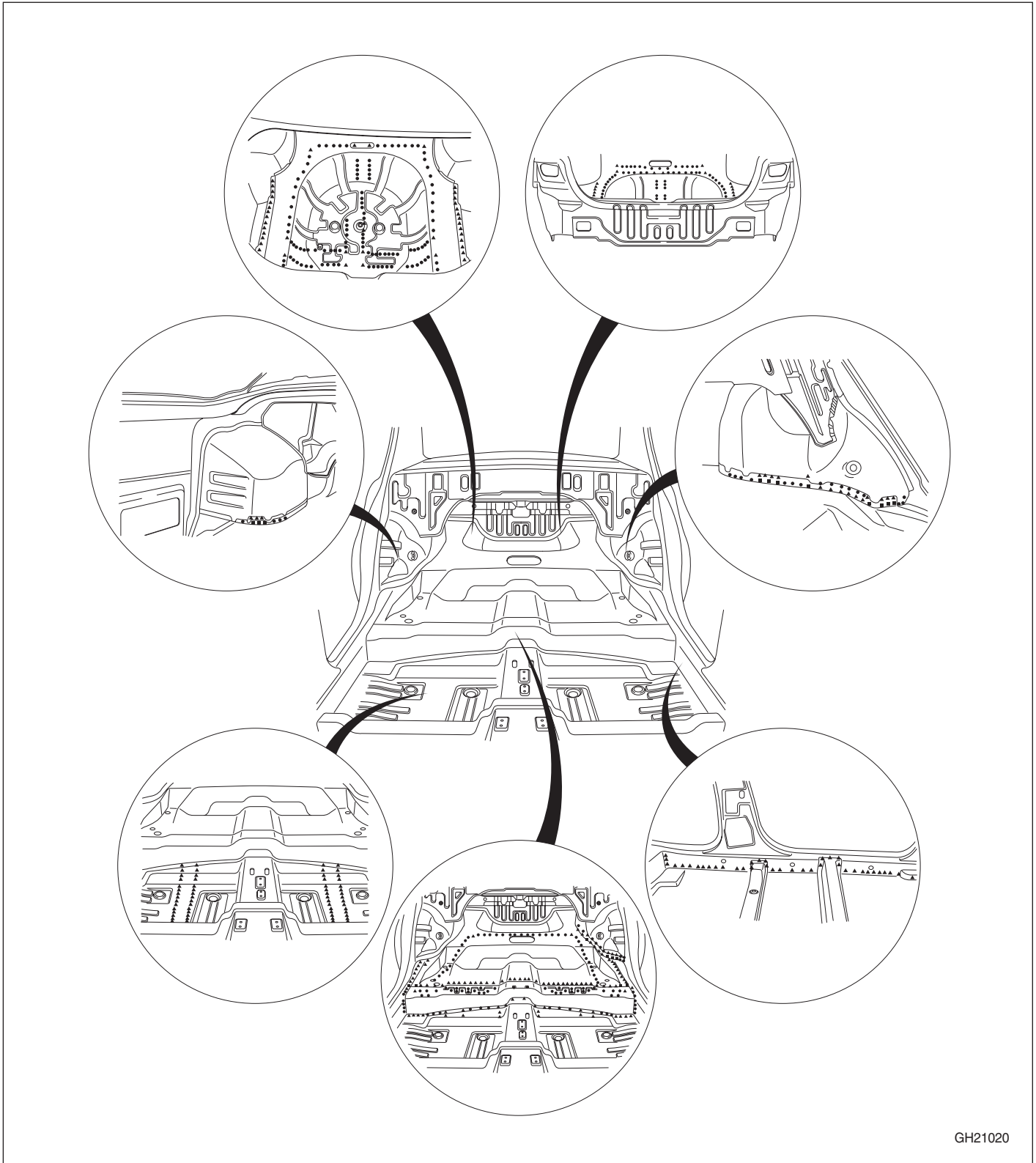
Floor panel (Front) Welding part



GH21019

Floor panel (Rear)

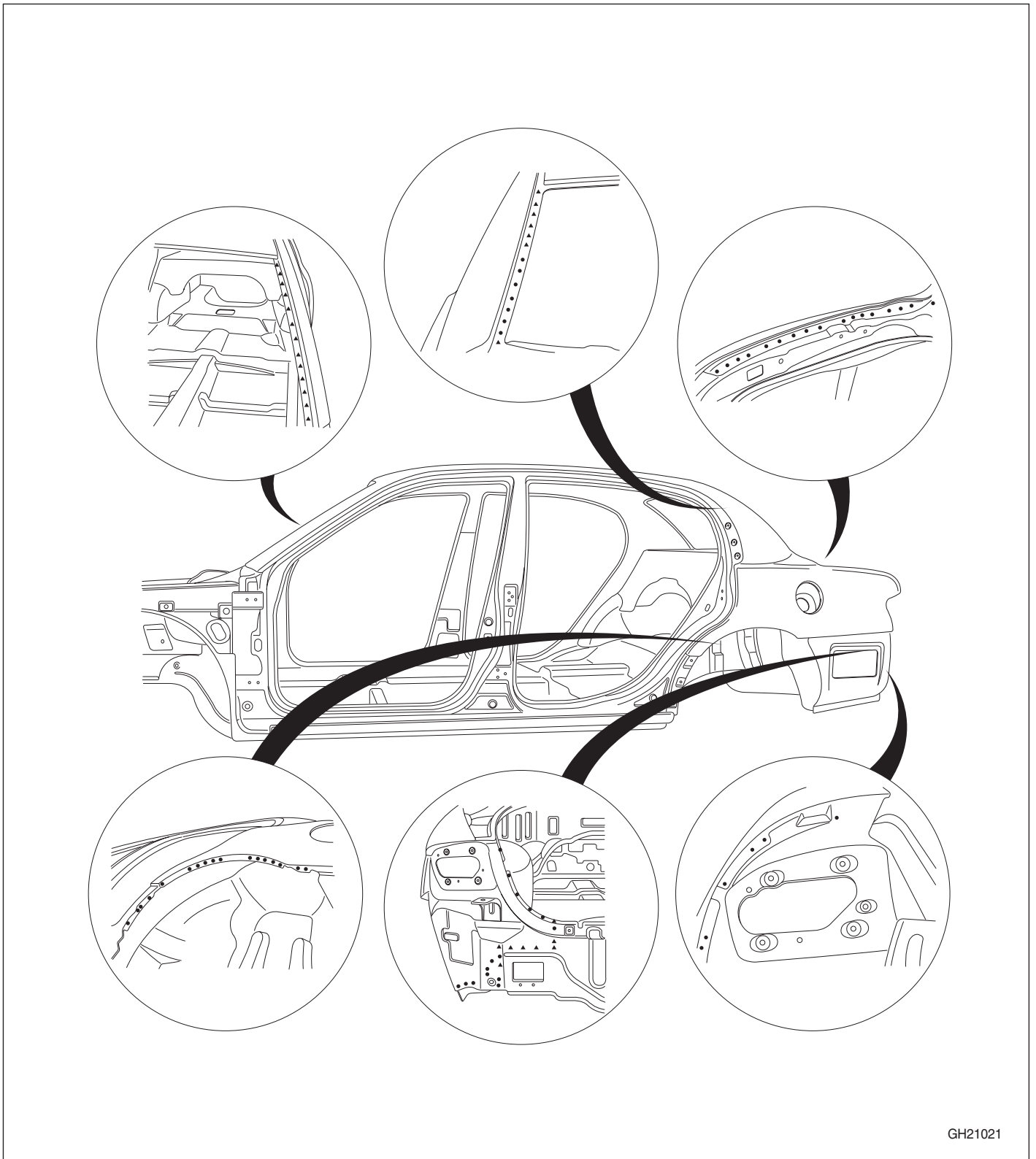
Welding part



GH21020

Side panel - 1

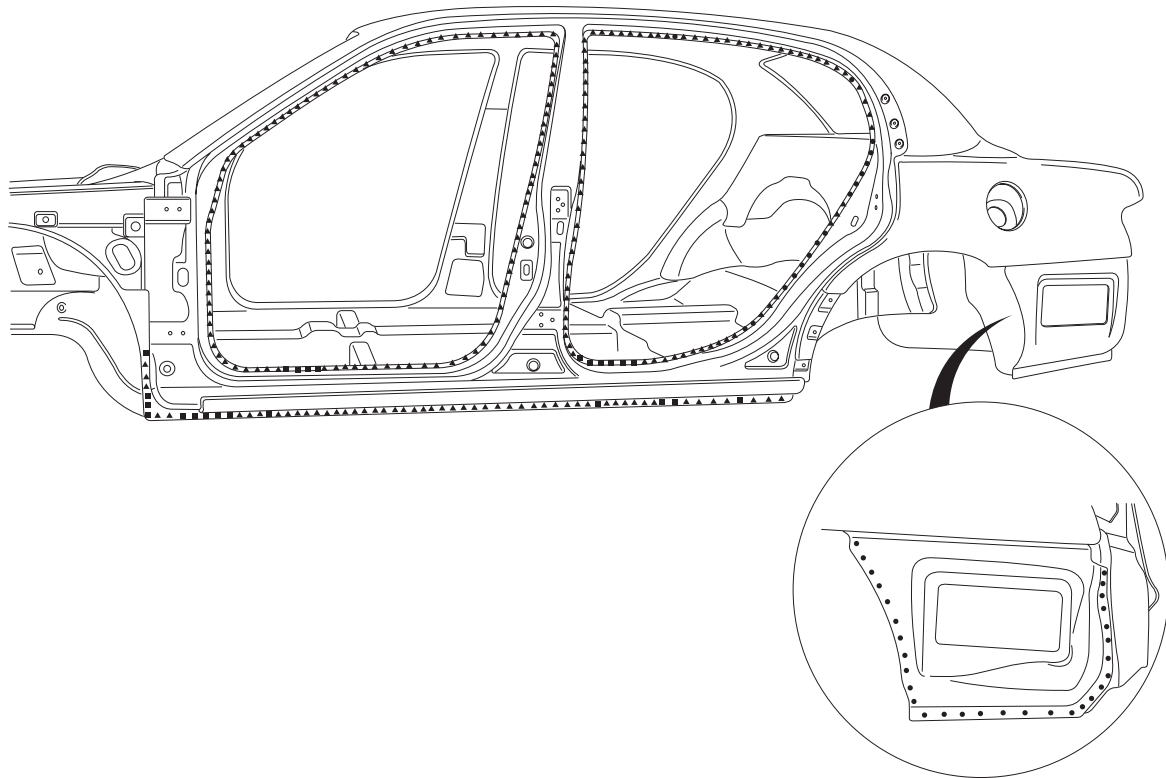
Welding part



GH21021

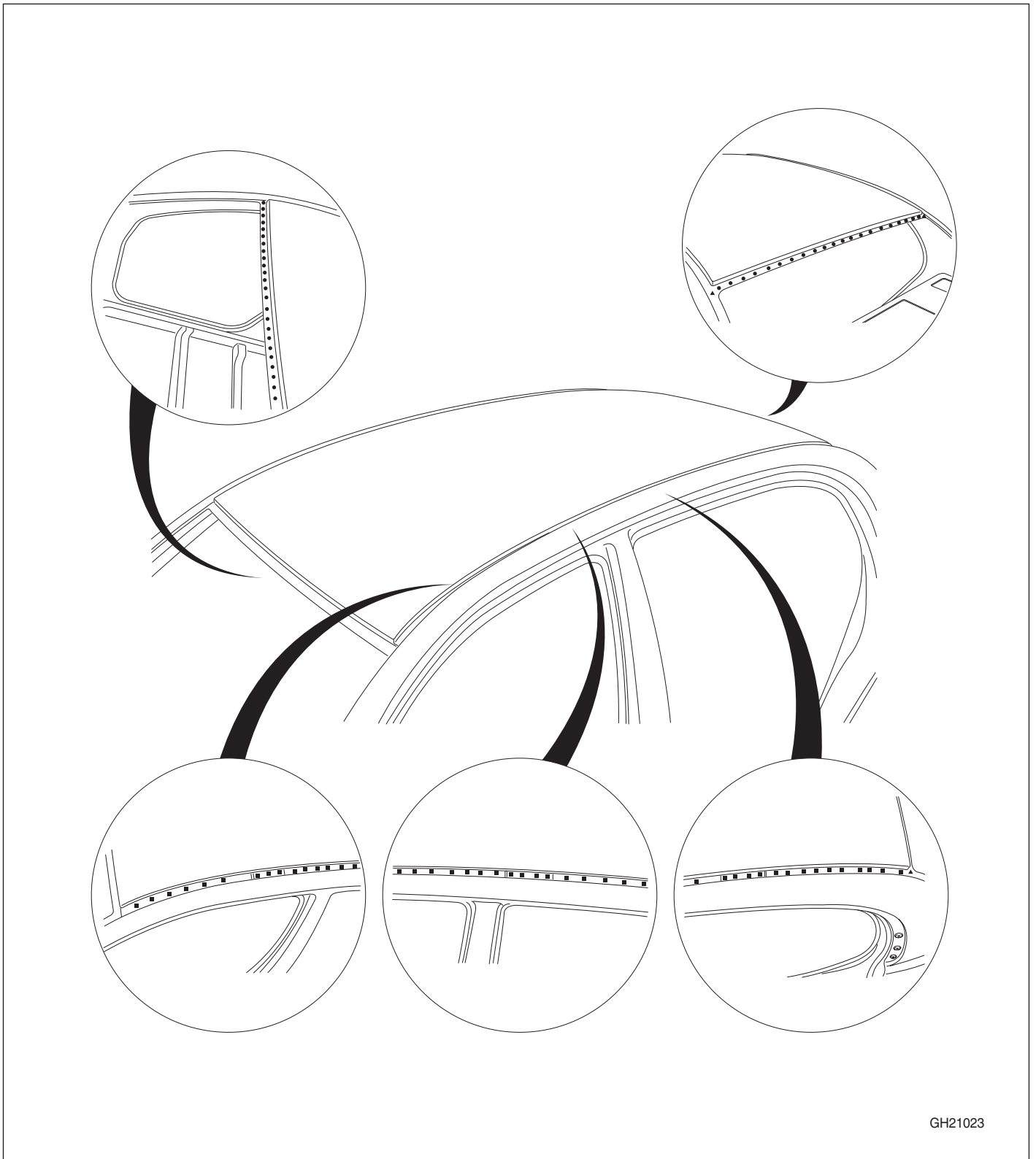
Side panel - 2

Welding part



GH21022

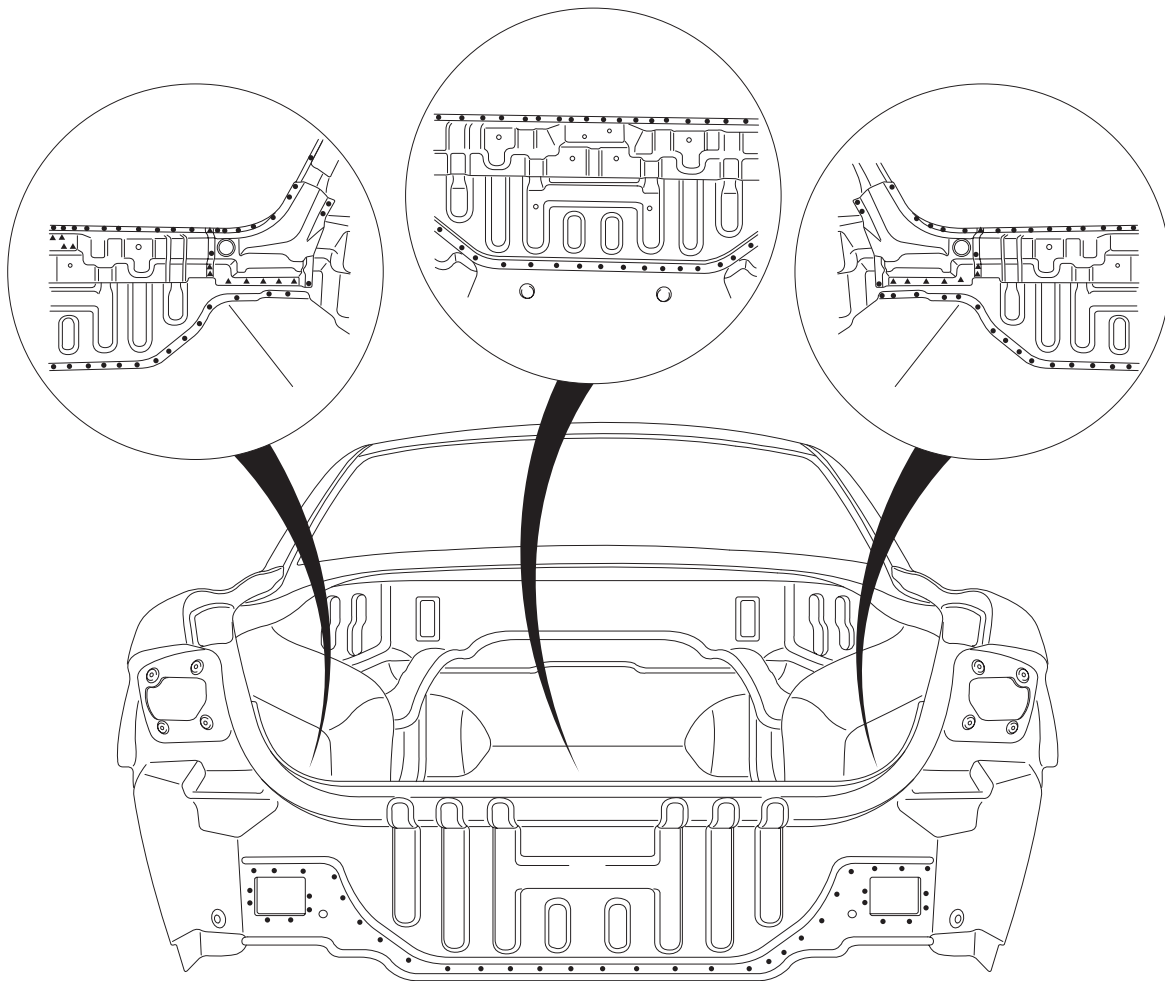
Roof panel
Welding part



GH21023

Back panel

Welding part



GH21024

Body dimensions

Body dimensions

Body dimension indications	31- 1
Projected dimensions	31 - 1
Straight-line dimensions	31- 1
Front body	31- 2
Side frame panel	31- 4
Interior A	31- 6
Interior B	31- 8
Interior C	31-10
Rear body	31-12
Under body	31-14

Body dimensions

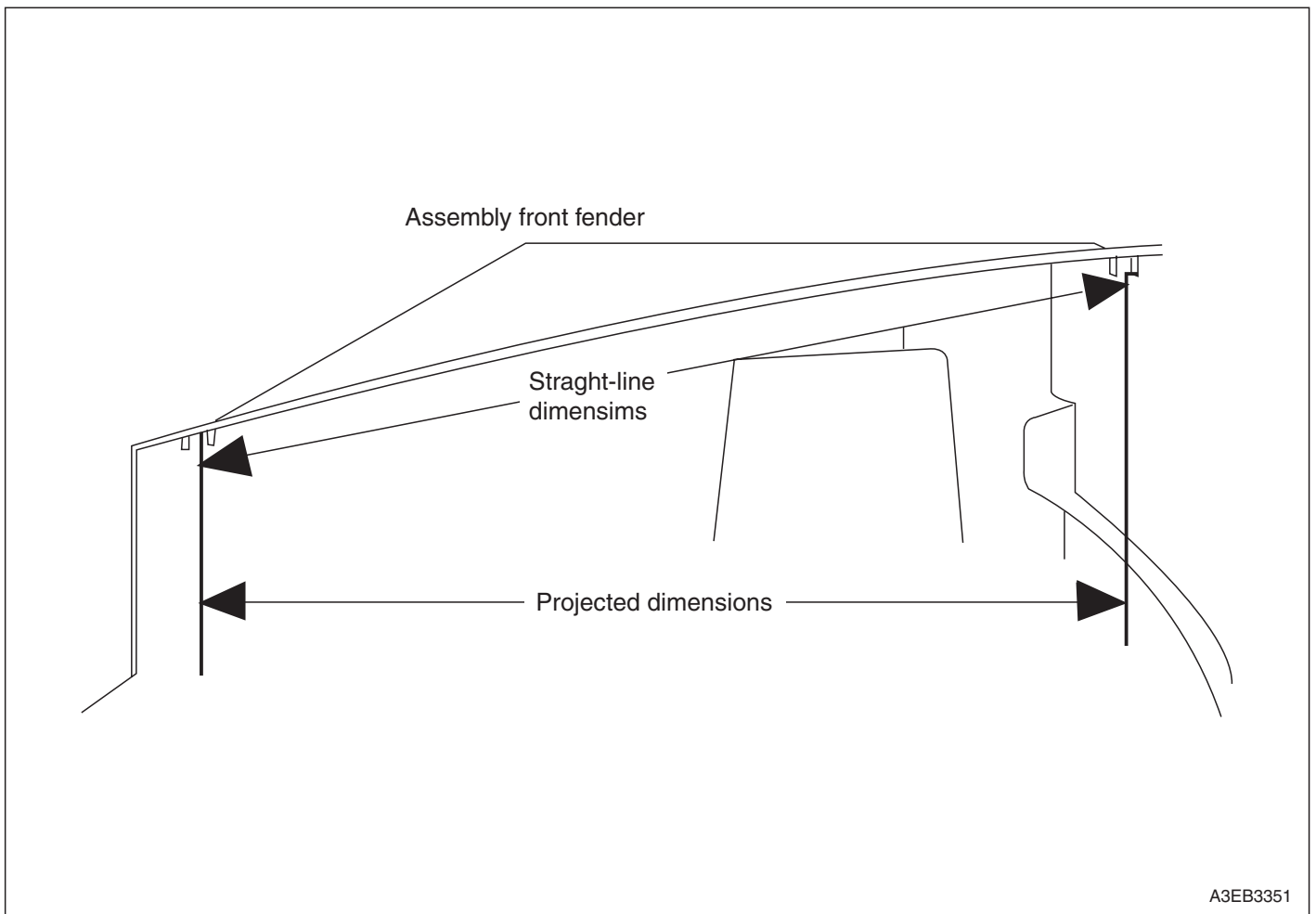
Body dimension indication

Projected dimensions

The projected dimension indicates a dimension from a reference point on the body. (Height may be different in some cases)

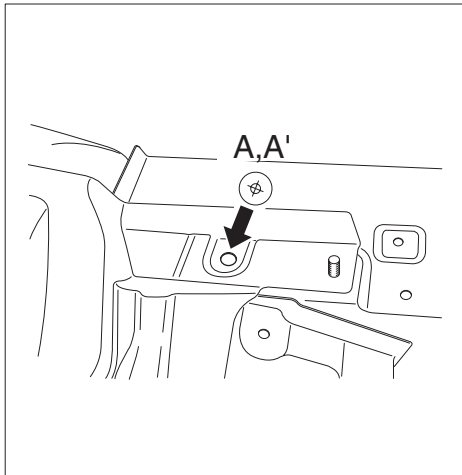
Straight-line dimensions (Actual measured dimensions)

The straight-line dimension indicates a actual measured dimension between the measurement reference points.



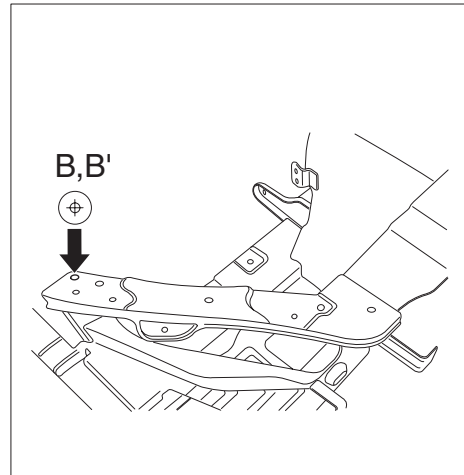
31-2 Body dimensions

Front body straight - line dimensions



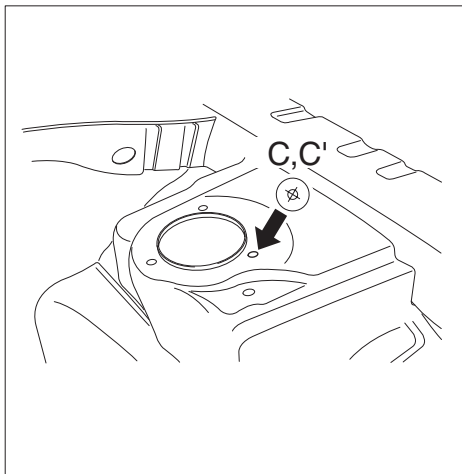
Hood hinge mounting hole

ø13



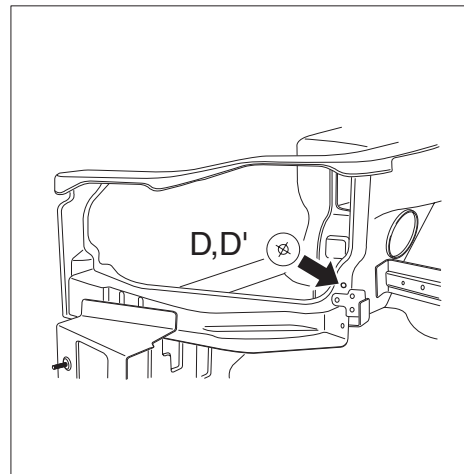
Engine room cover mounting hole

ø8.5



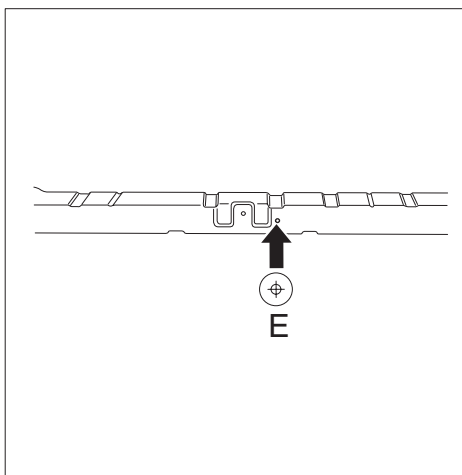
Front suspension housing hole

ø12



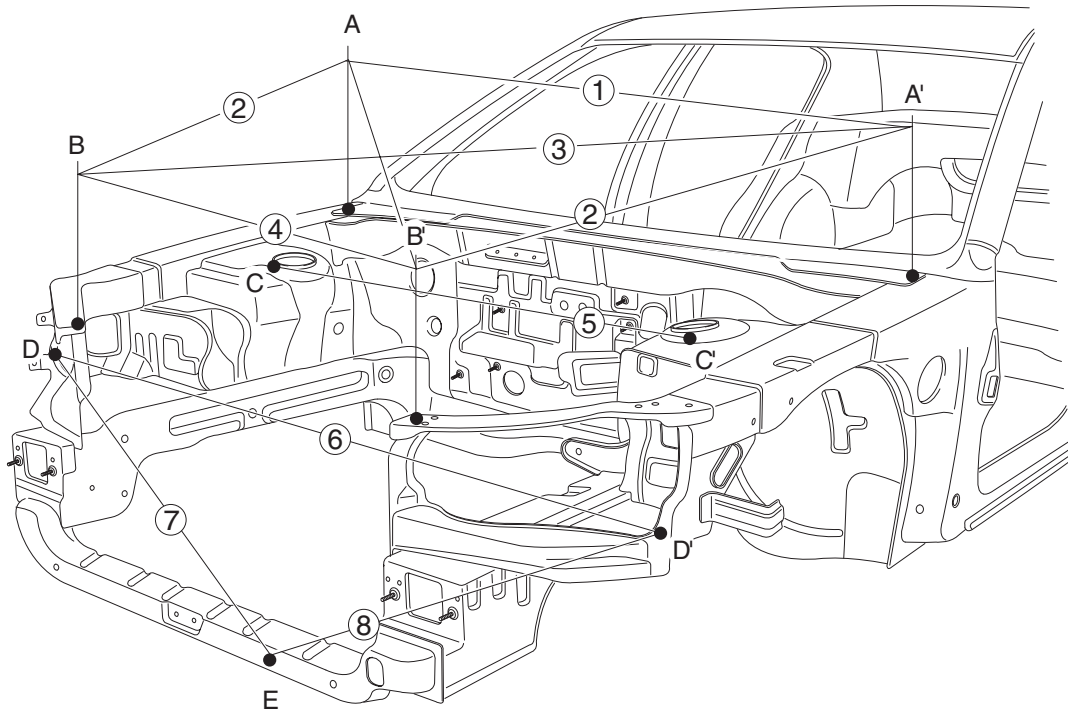
Tooling hole

ø10



Ambient sensor mounting hole

ø 7

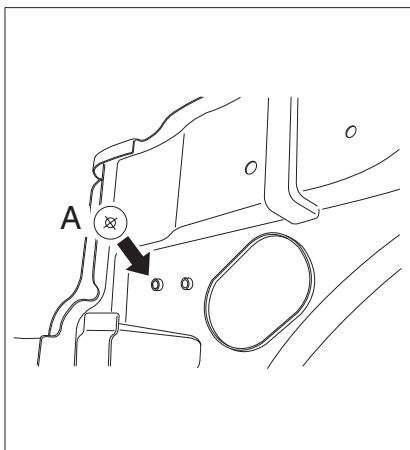


GH21001

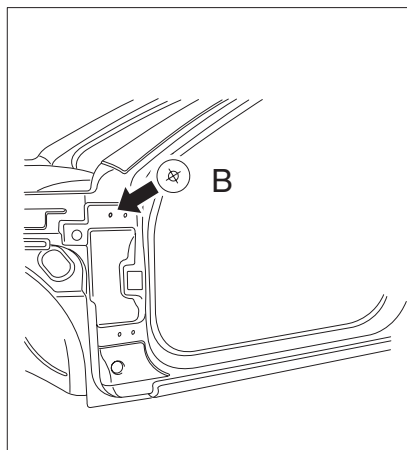
Measurement point	①	②	③	④	⑤	⑥	⑦	⑧	
Dimension (mm)	1103	1380	844	1684	1060	1514	1053	730	

31-4 Body dimensions

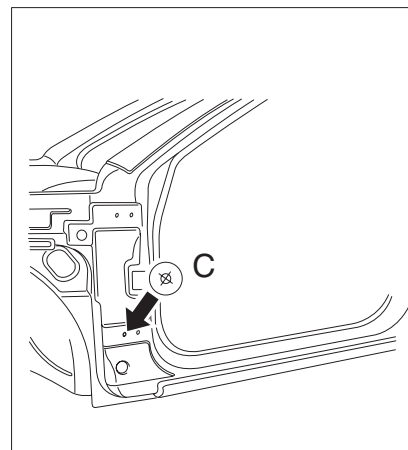
Side frame straight - line dimensions



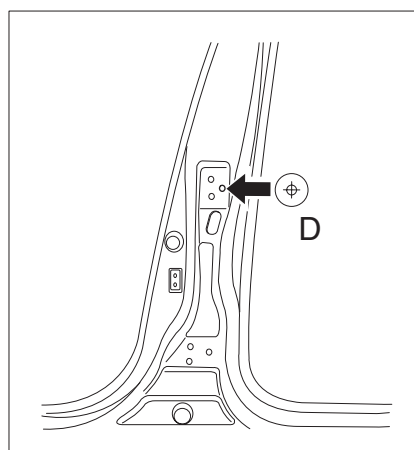
Earth wiring mounting hole $\varnothing 6.6$



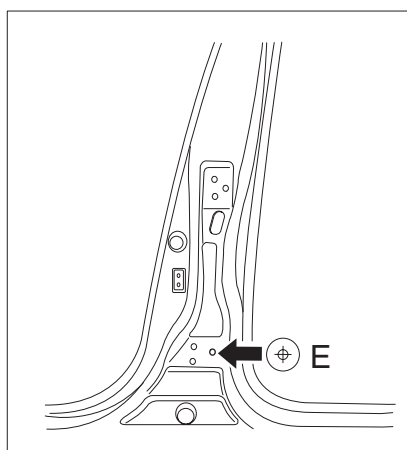
Front door upper hinge mounting hole $\varnothing 13$



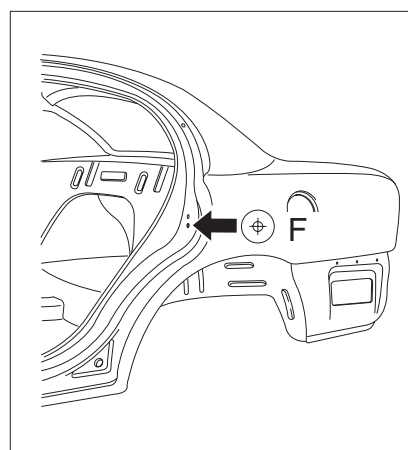
Front door lower hinge mounting hole $\varnothing 13$



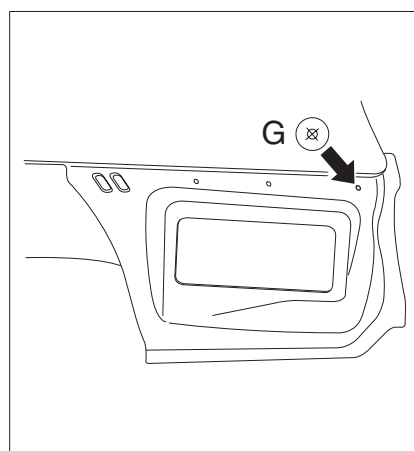
Rear door upper hinge mounting hole $\varnothing 11$



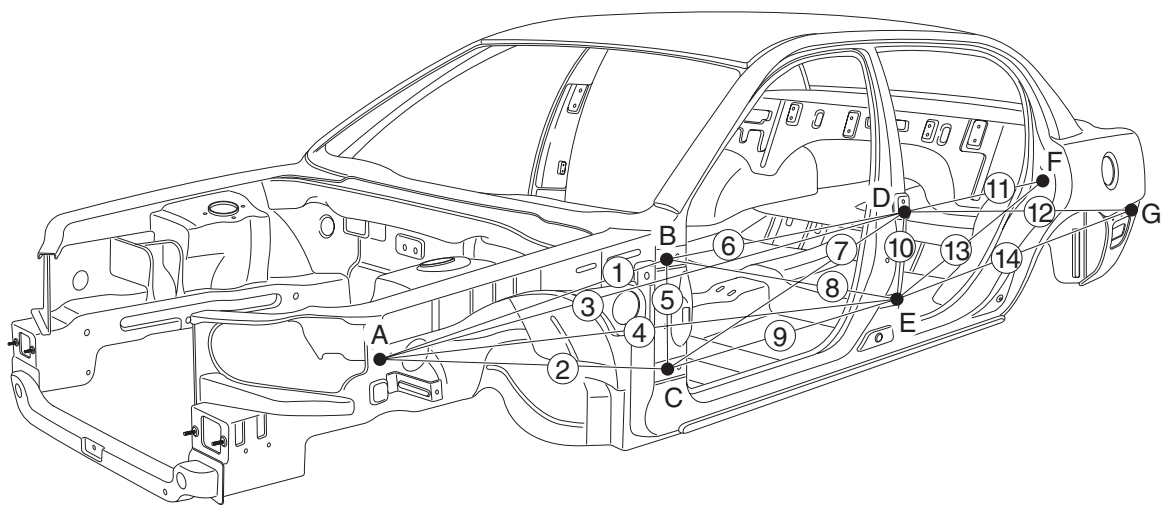
Rear door lower hinge mounting hole $\varnothing 13$



Door switch mounting hole 17.3 X 27.3



Rear bumper mounting hole $\varnothing 6.5 \times 7$

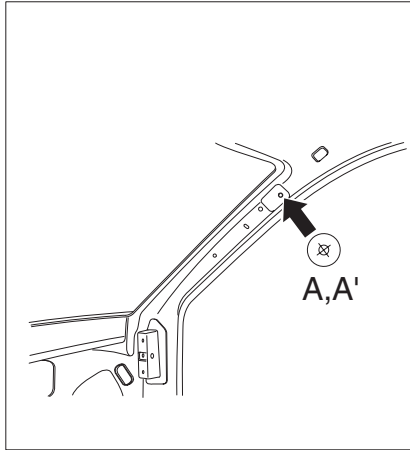


GH21003

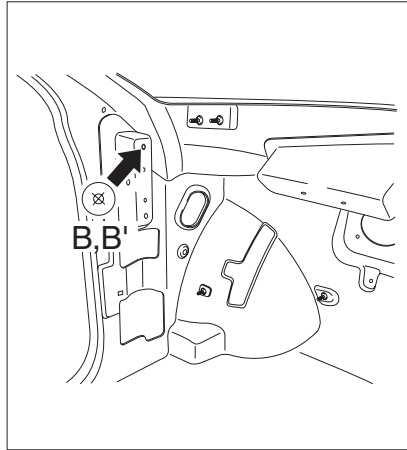
Measurement point	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Dimension (mm)	1806	1826	2583	2569	350	1142	1197	1161	1112
Measurement point	⑩	⑪	⑫	⑬	⑭				
Dimension (mm)	340	959	1947	1030	1971				

31-6 Body dimensions

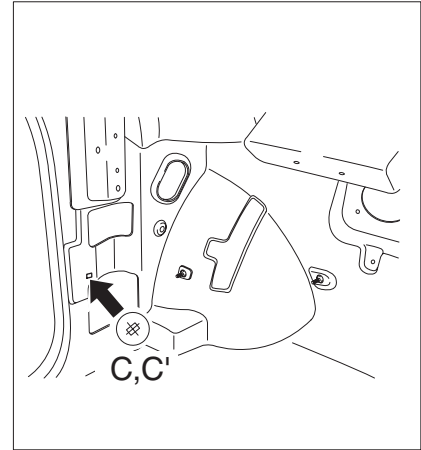
Interior A straight - line dimensions



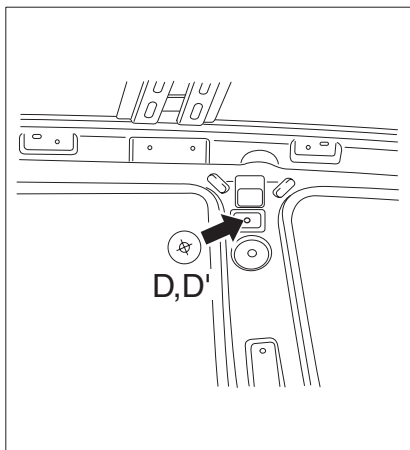
Front pillar upper trim mounting hole $\varnothing 8.5$



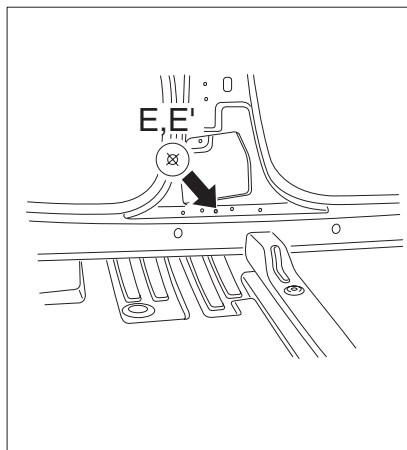
Gusset front pillar to cowl mounting hole $\varnothing 6.6$



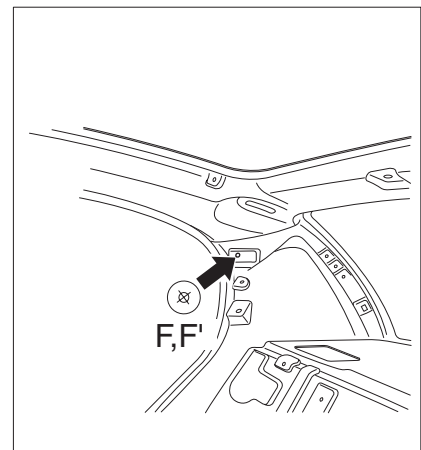
Hood release handle mounting hole 8.4X8.4



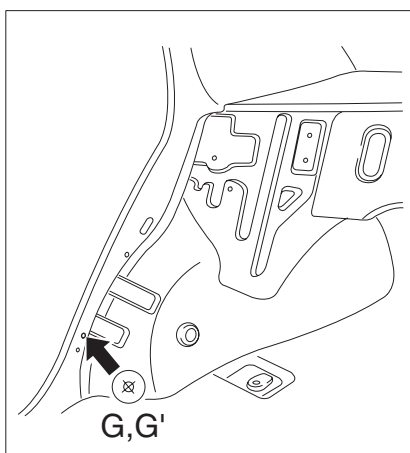
Trim mounting hole $\varnothing 15$



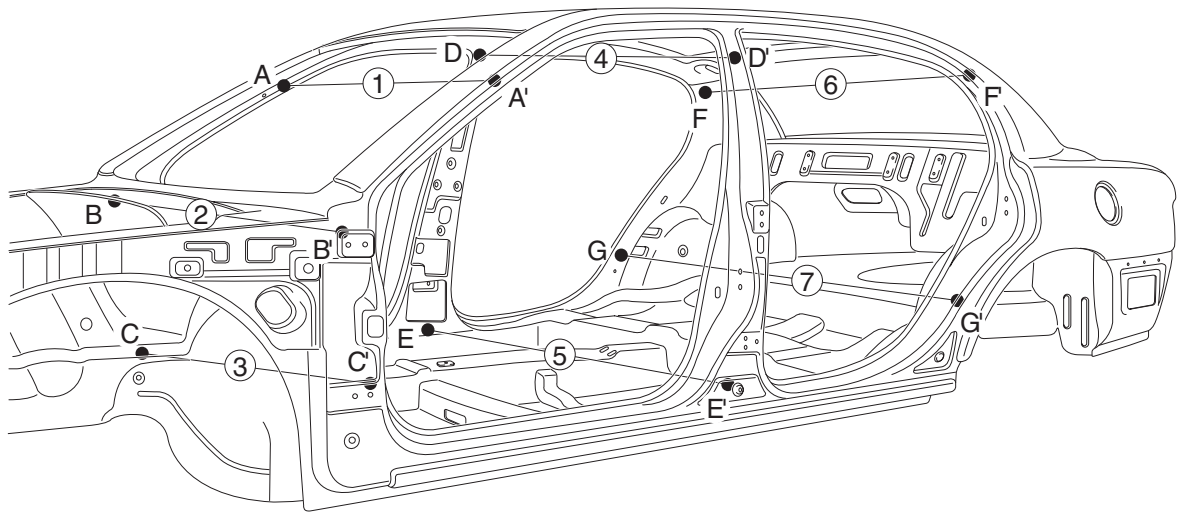
Fixing side airbag sensor hole $\varnothing 15$



Quarter upper trim mounting hole $\varnothing 8.5$



Wiring mounting hole $\varnothing 7 \times 12$

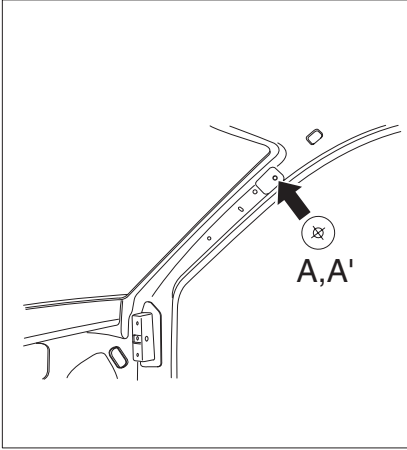


GH21005

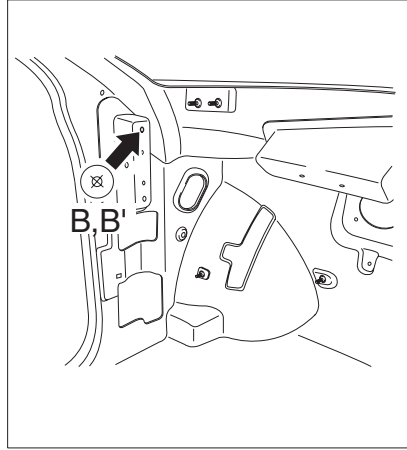
Measurement point	①	②	③	④	⑤	⑥	⑦		
Dimension (mm)	1231	1373	1470	1228	1469	1250	1500		

31-8 Body dimensions

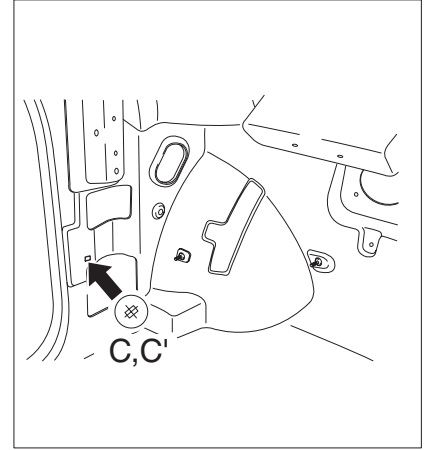
Interior B straight - line dimensions



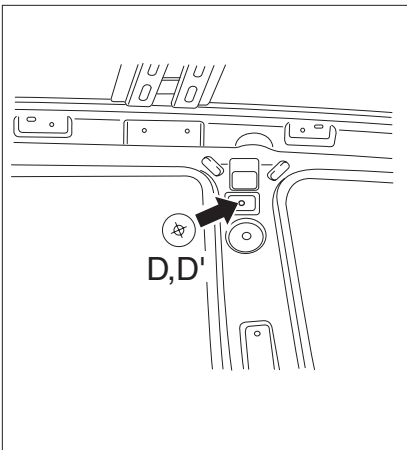
Front pillar upper trim mounting hole $\varnothing 8.5$



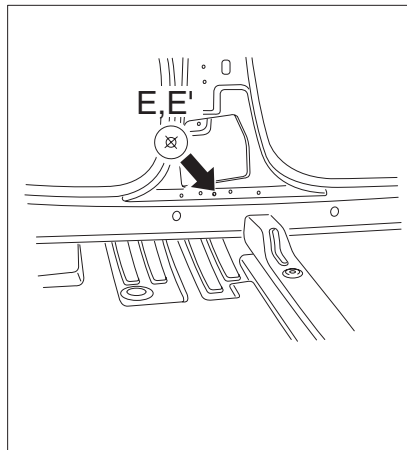
Gusset front pillar to cowl mounting hole $\varnothing 6.6$



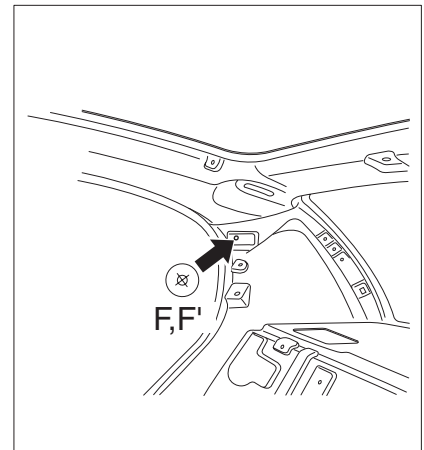
Hood release handle mounting hole 8.4X8.4



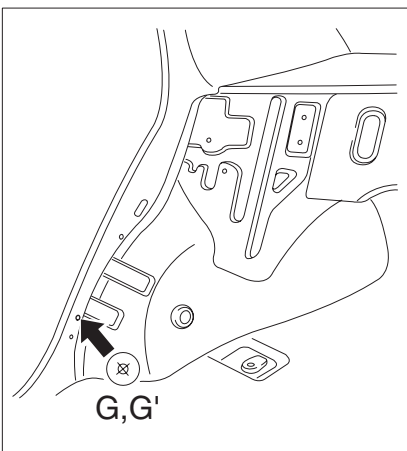
Trim mounting hole $\varnothing 15$



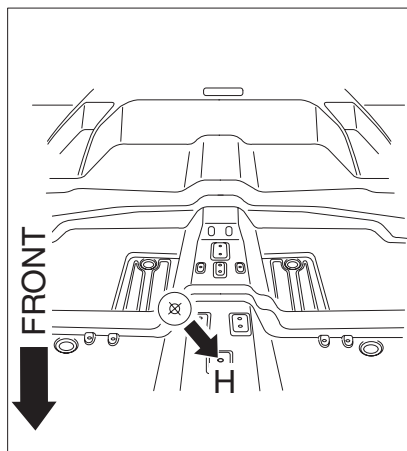
Fixing side airbag sensor hole $\varnothing 15$



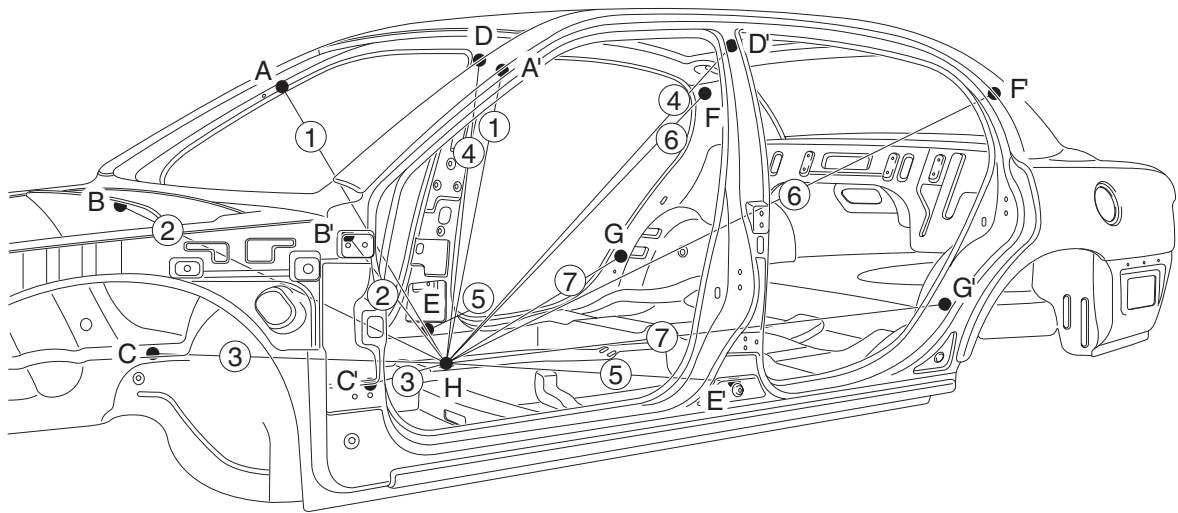
Quarter upper trim mounting hole $\varnothing 8.5$



Wiring mounting hole $\varnothing 7 \times 12$



Parking brake mounting hole $\varnothing 11$

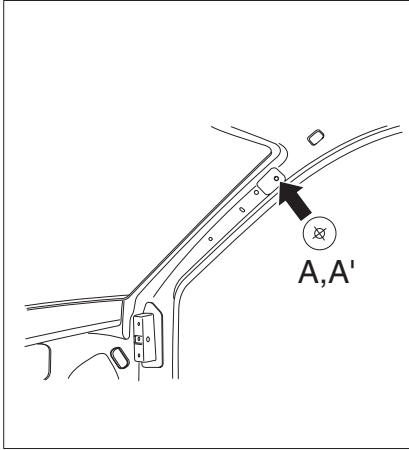


GH21007

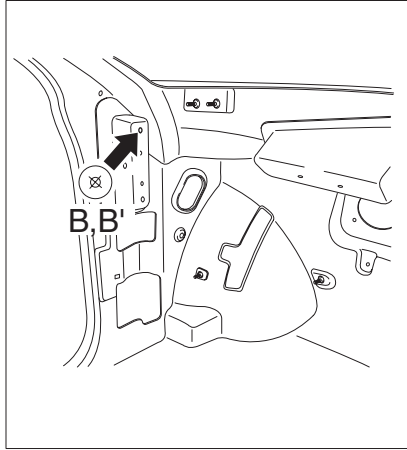
Measurement point	①	②	③	④	⑤	⑥	⑦		
Dimension (mm)	1109	1098	1010	1197	804	1797	1414		

31-10 Body dimensions

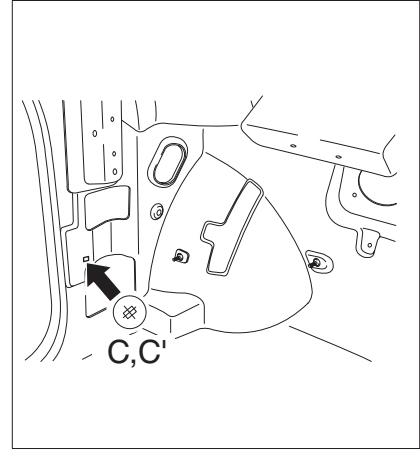
Interior C straight - line dimensions



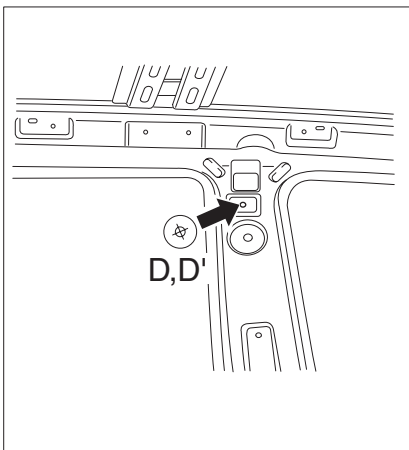
Front pillar upper trim mounting hole $\varnothing 8.5$



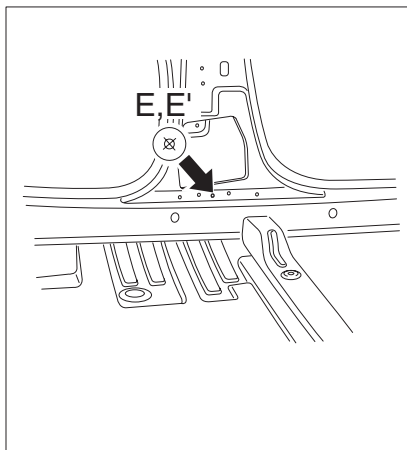
Gusset front pillar to cowl mounting hole $\varnothing 6.6$



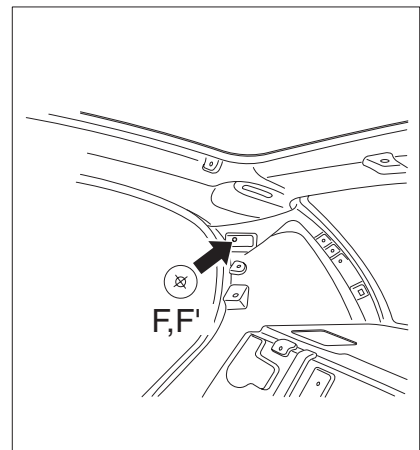
Hood release handle mounting hole 8.4X8.4



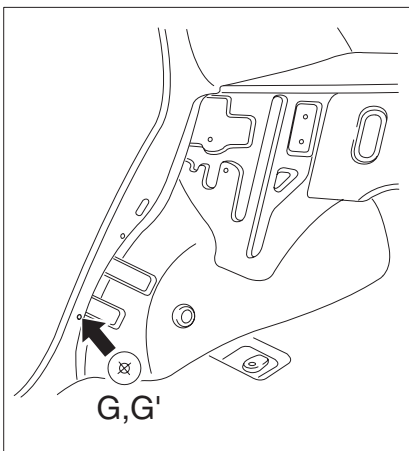
Trim mounting hole $\varnothing 15$



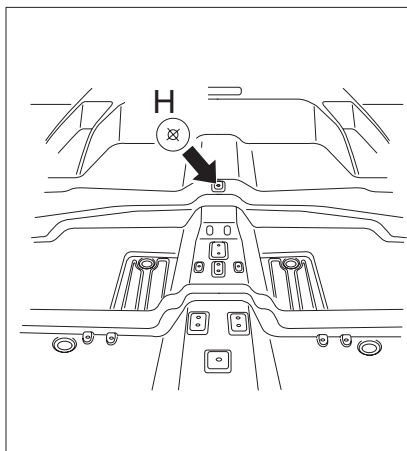
Fixing side airbag sensor hole $\varnothing 15$



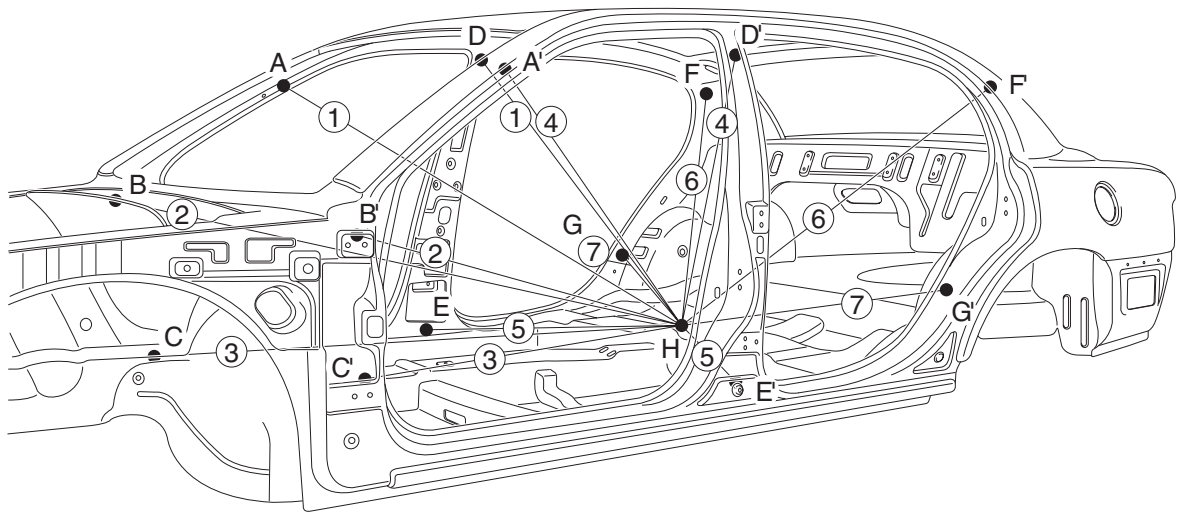
Quarter upper trim mounting hole $\varnothing 8.5$



Wiring mounting hole $\varnothing 7 \times 12$



Carpet mounting hole $\varnothing 7$

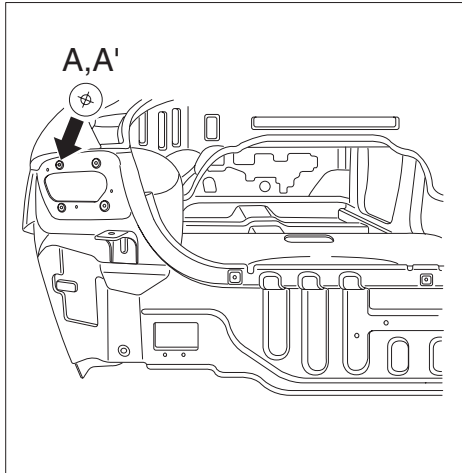


GH21009

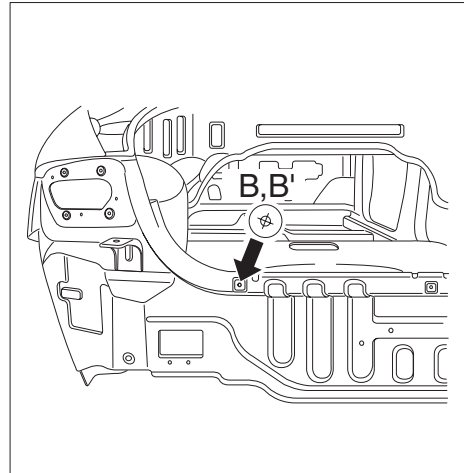
Measurement point	①	②	③	④	⑤	⑥	⑦		
Dimension (mm)	1435	1703	1643	1109	874	1225	861		

31-12 Body dimensions

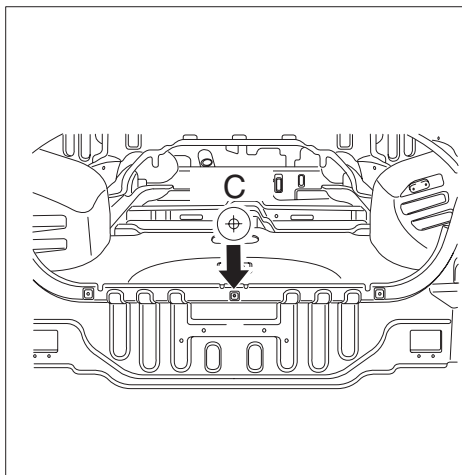
Rear body straight - line dimensions



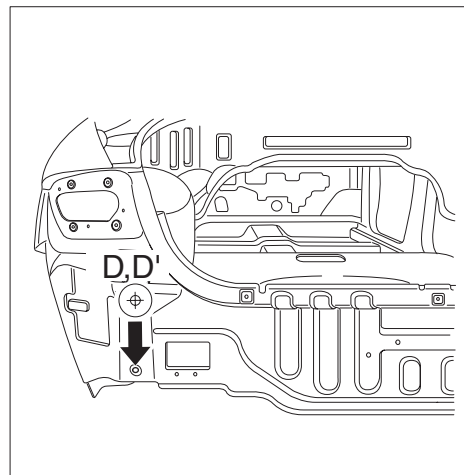
Rear combining lamp guide hole $\varnothing 7$



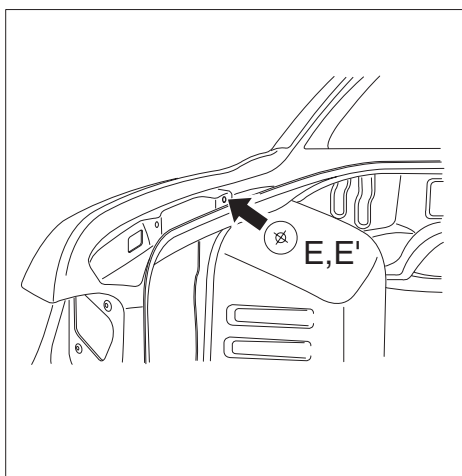
Rear bumper mounting hole $\varnothing 6.6$



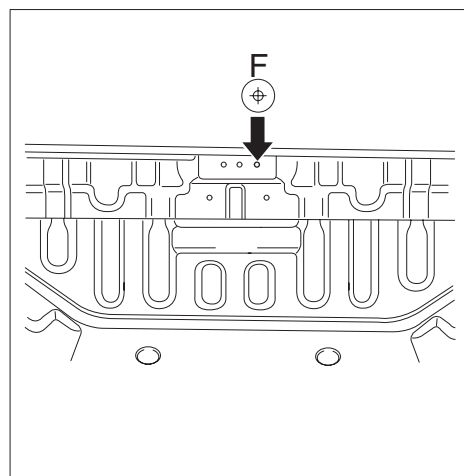
Rear bumper mounting hole $\varnothing 6.6$



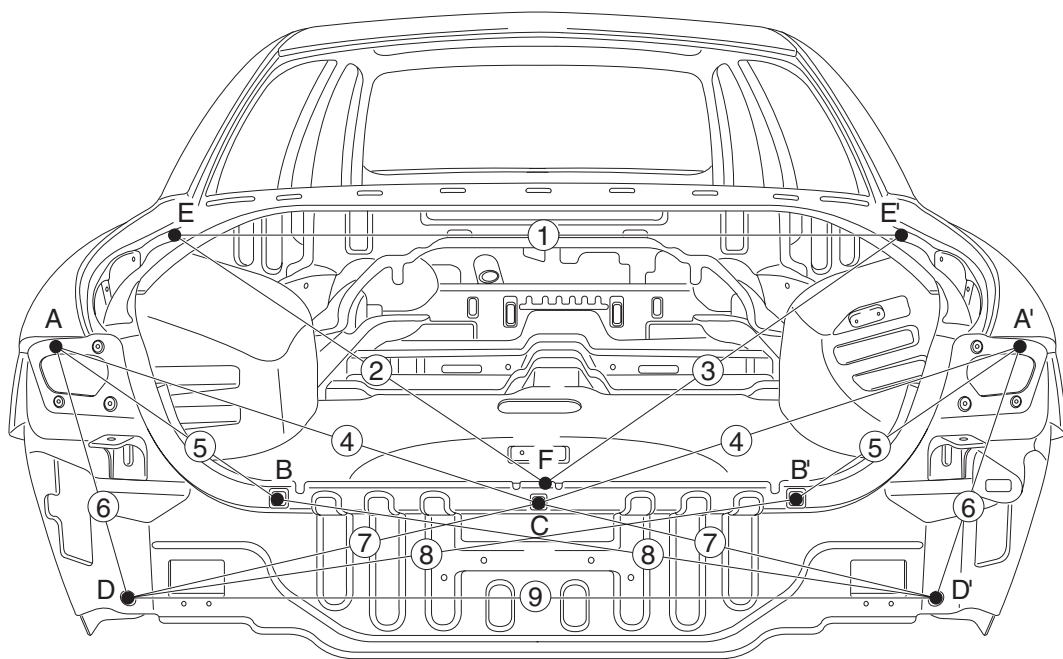
Tooling hole $\varnothing 16$



Trunk hinge mounting hole $\varnothing 9$



Trunk lid latch mounting hole $\varnothing 8$



GH21011

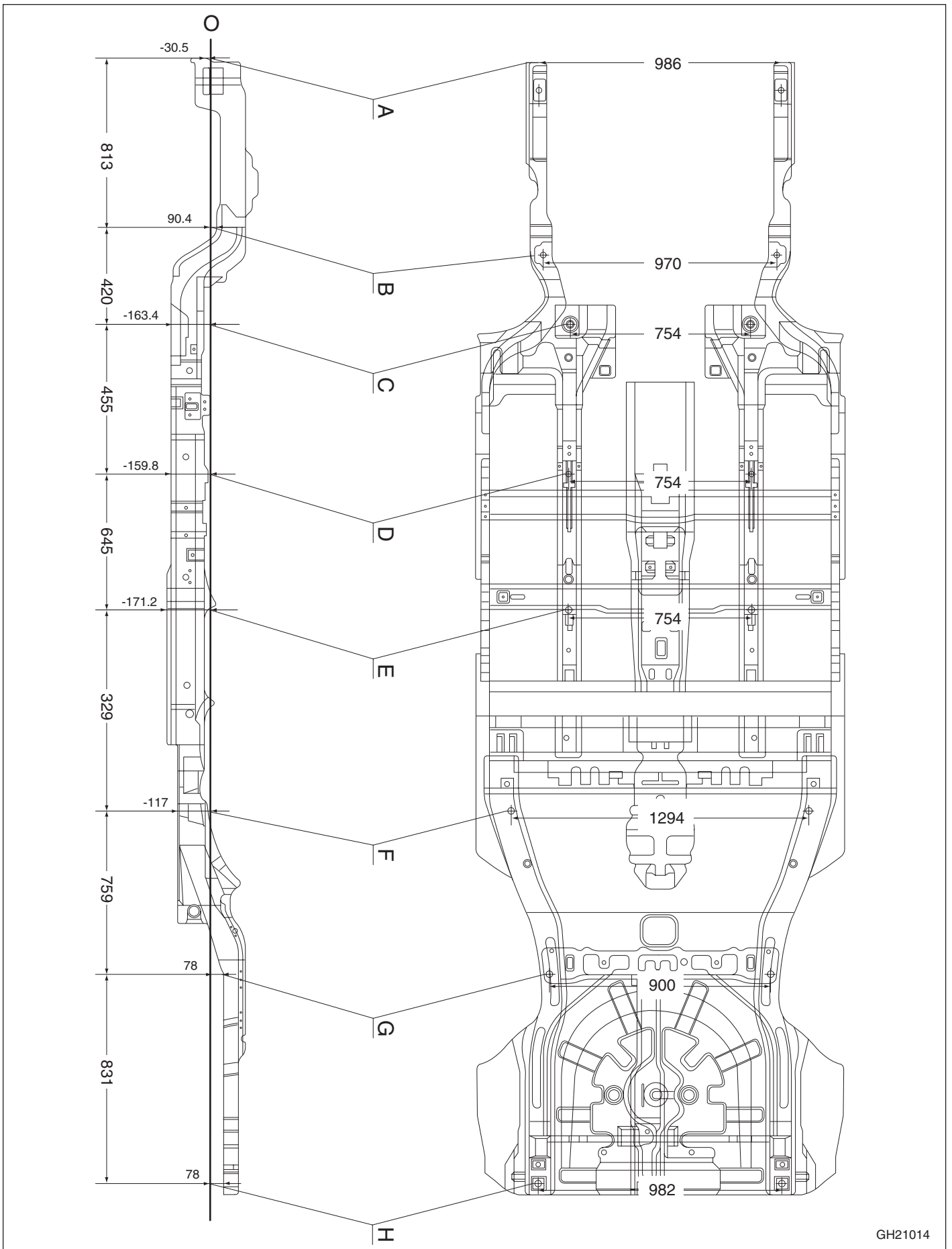
Measurement point	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Dimension (mm)	1410	955	908	829	512	454	634	970	1196

31-14 Body dimensions

Under body dimensions

Projected dimensions

Measurement point	Description	Hole size
A	Under cover for mouning hole	ø6.6
B	sub frame mounting hole	ø10.5
C	Tooling mounting hole	ø28.2
D	Tooling mounting hole	ø20
E	Tooling mounting hole	ø25
F	Drain hole	ø15
G	Rear suspension mounting hole	ø16
H	Rear bumper mounting hole	ø16

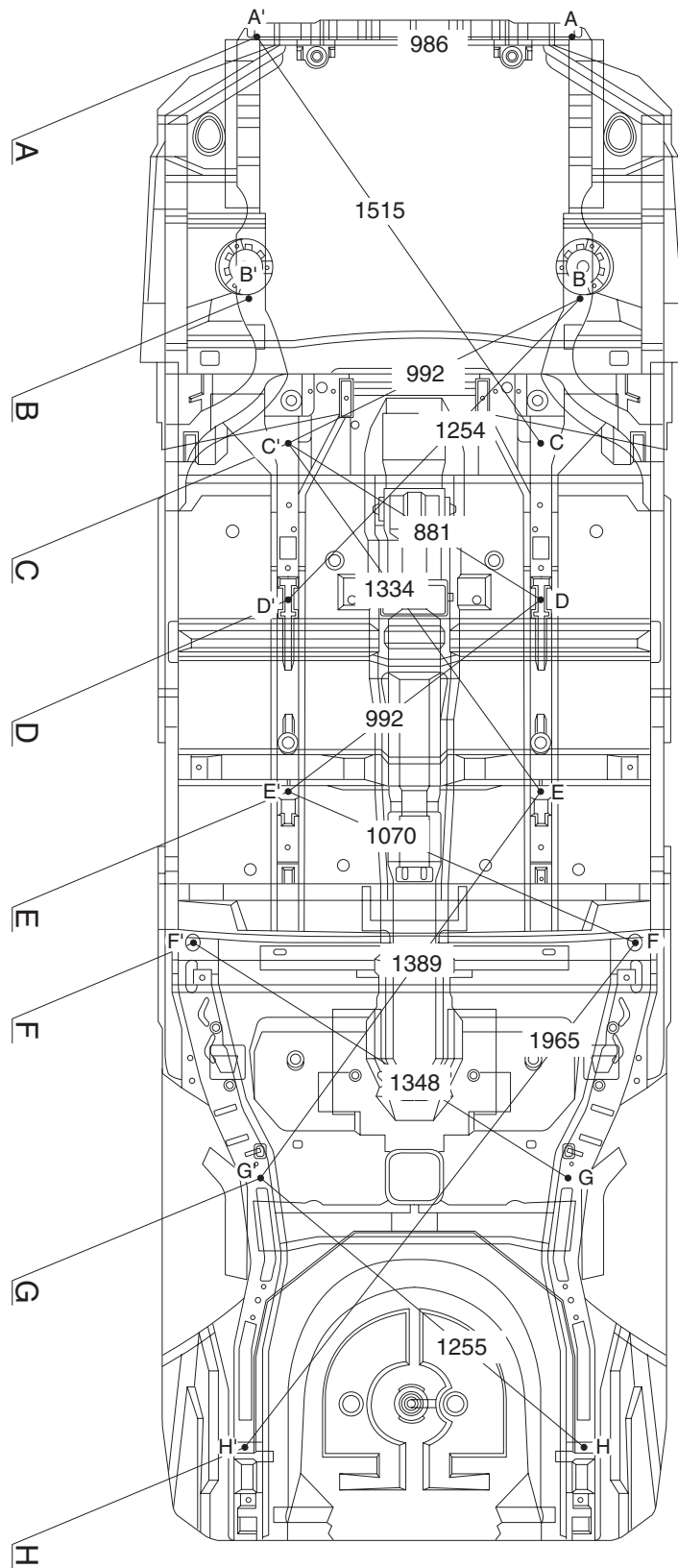


GH21014

31-16 Body dimensions

Straight - line dimensions

Measurement point	Description	Hole size
A	Under cover for mounting hole	ø6.6
B	Sub frame mounting hole	ø10.5
C	Tooling mounting hole	ø28.2
D	Tooling mounting hole	ø20
E	Tooling mounting hole	ø25
F	Drain hole	ø15
G	Rear suspension mounting hole	ø16
H	Rear bumper mounting hole	ø16



Body dimensions

Body dimensions

Body dimension indications	31- 1
Projected dimensions	31 - 1
Straight-line dimensions	31- 1
Front body	31- 2
Side frame panel	31- 4
Interior A	31- 6
Interior B	31- 8
Interior C	31-10
Rear body	31-12
Under body	31-14

Body dimensions

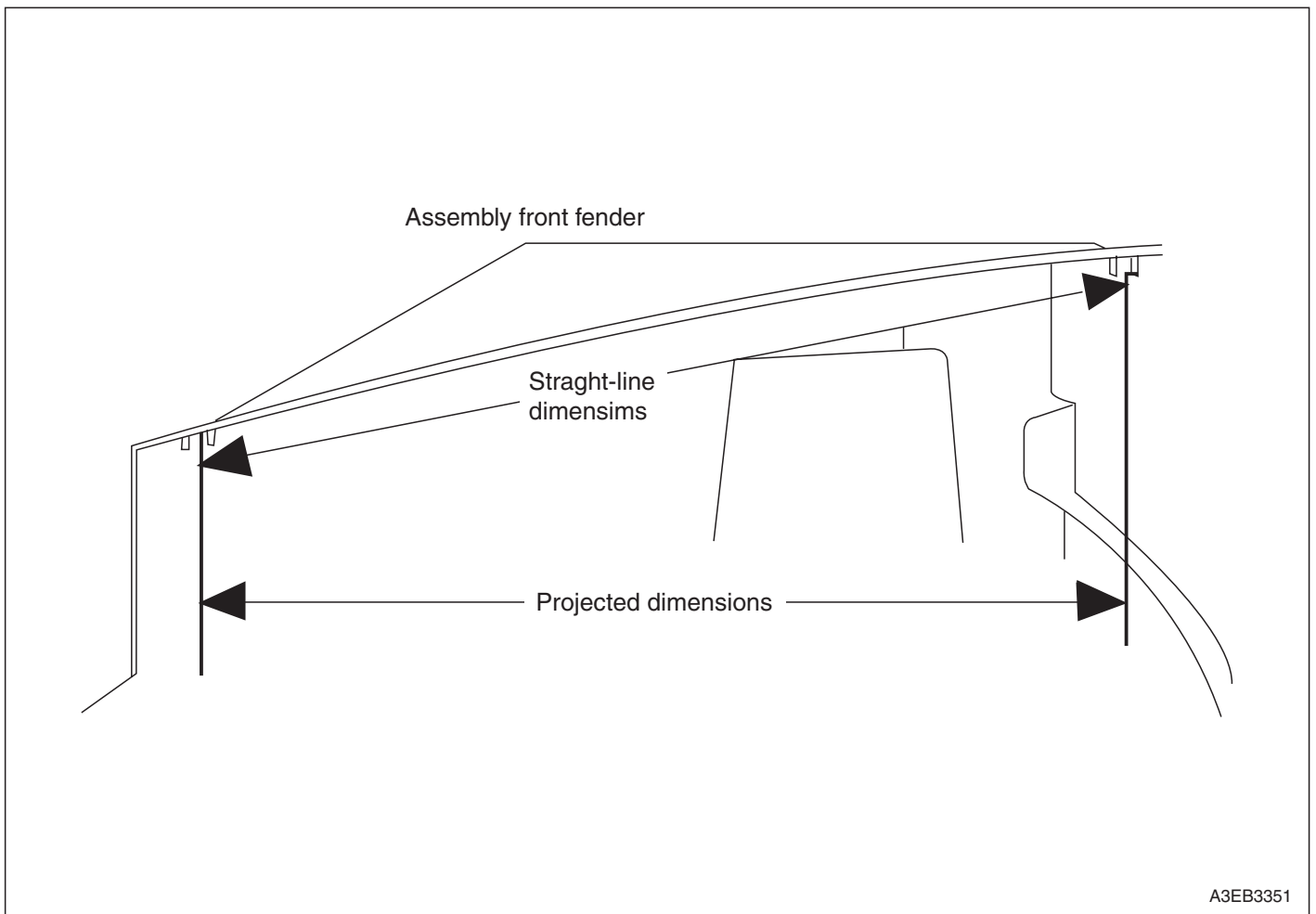
Body dimension indication

Projected dimensions

The projected dimension indicates a dimension from a reference point on the body. (Height may be different in some cases)

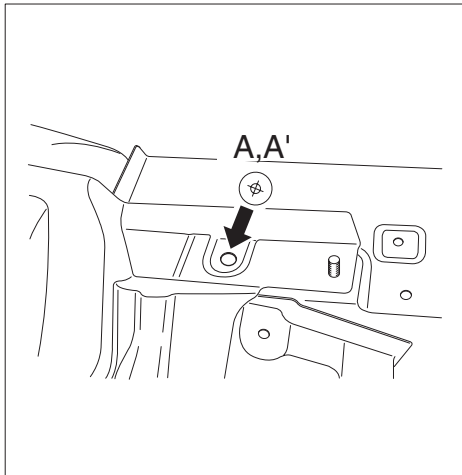
Straight-line dimensions (Actual measured dimensions)

The straight-line dimension indicates a actual measured dimension between the measurement reference points.

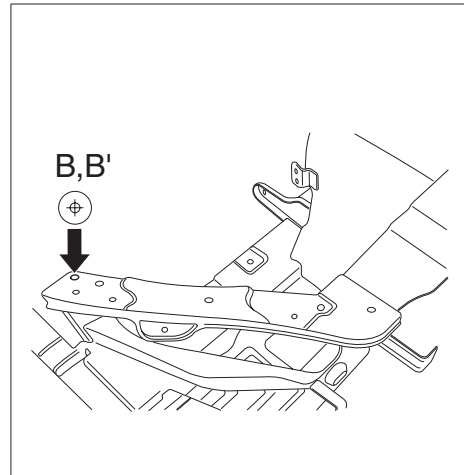


31-2 Body dimensions

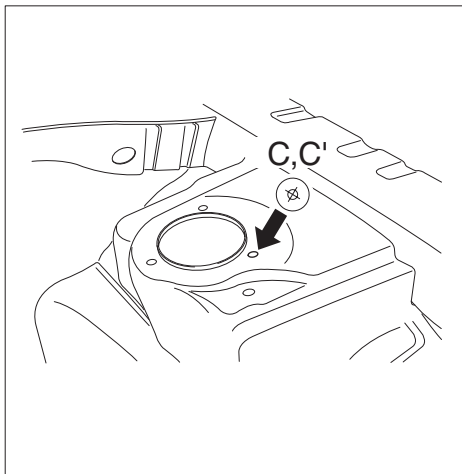
Front body straight - line dimensions



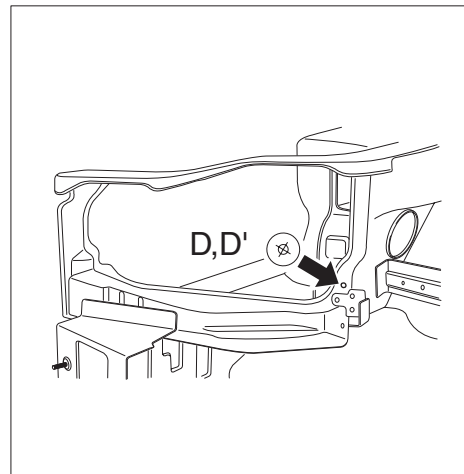
Hood hinge mounting hole $\varnothing 13$



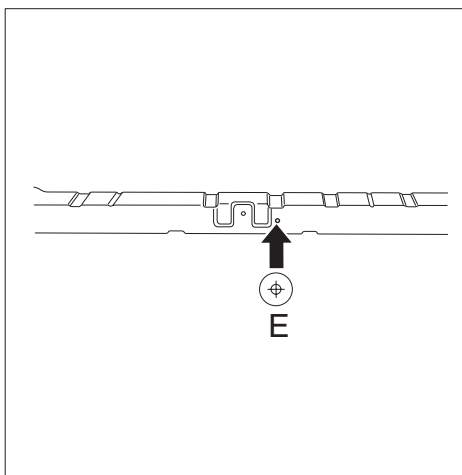
Engine room cover mounting hole $\varnothing 8.5$



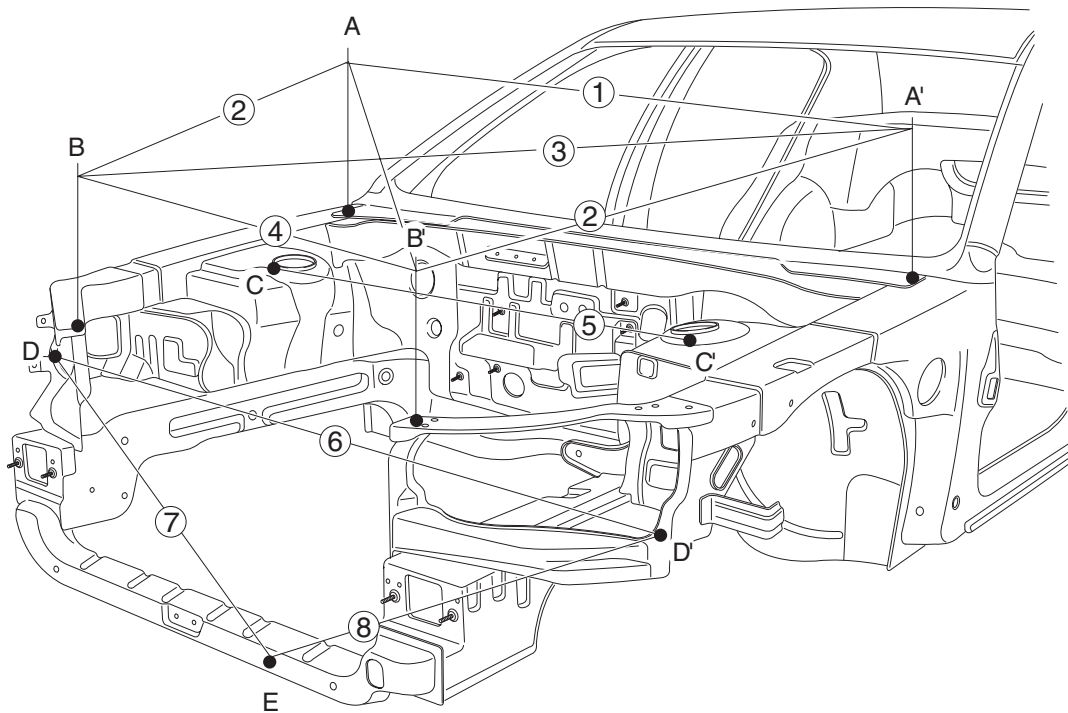
Front suspension housing hole $\varnothing 12$



Tooling hole $\varnothing 10$



Ambient sensor mounting hole $\varnothing 7$

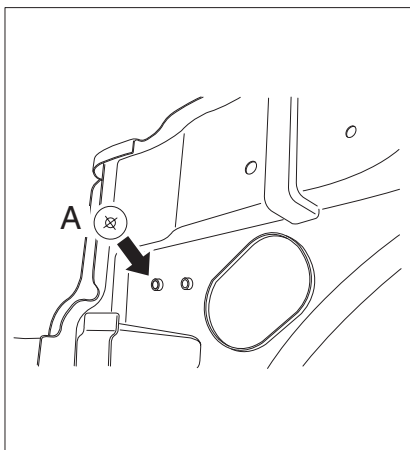


GH21001

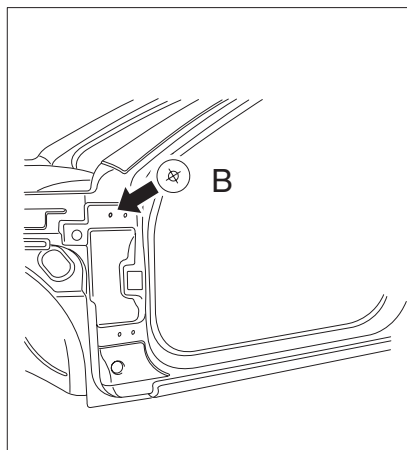
Measurement point	①	②	③	④	⑤	⑥	⑦	⑧	
Dimension (mm)	1103	1380	844	1684	1060	1514	1053	730	

31-4 Body dimensions

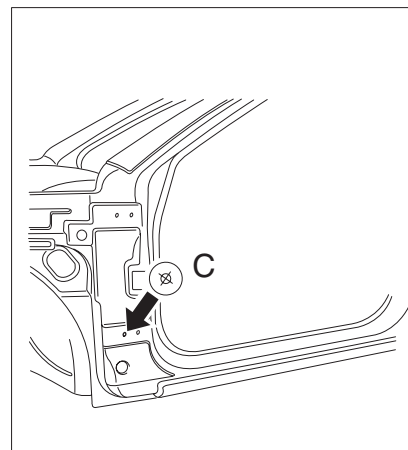
Side frame straight - line dimensions



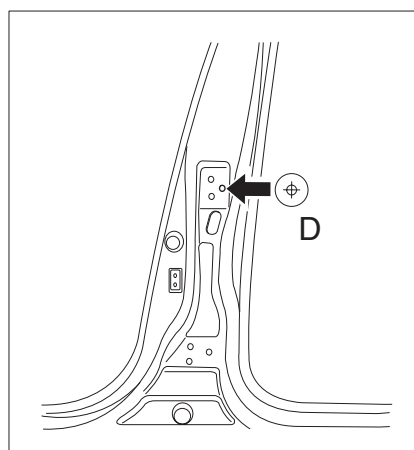
Earth wiring mounting hole $\varnothing 6.6$



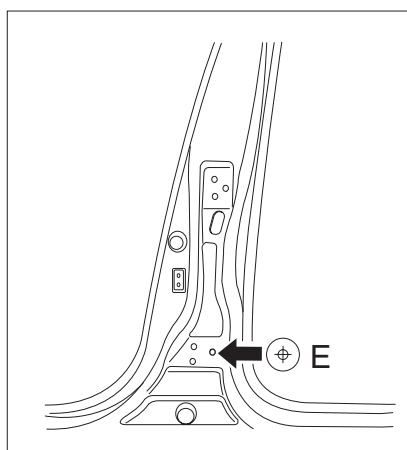
Front door upper hinge mounting hole $\varnothing 13$



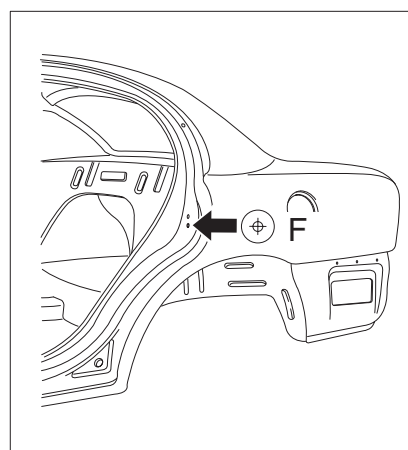
Front door lower hinge mounting hole $\varnothing 13$



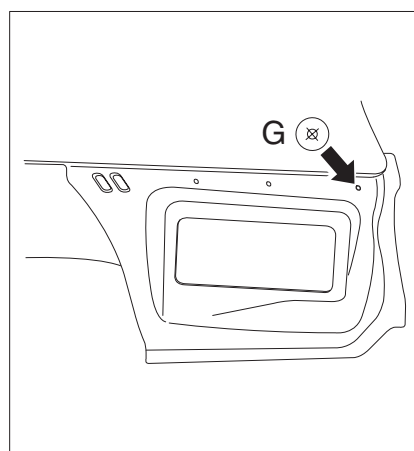
Rear door upper hinge mounting hole $\varnothing 11$



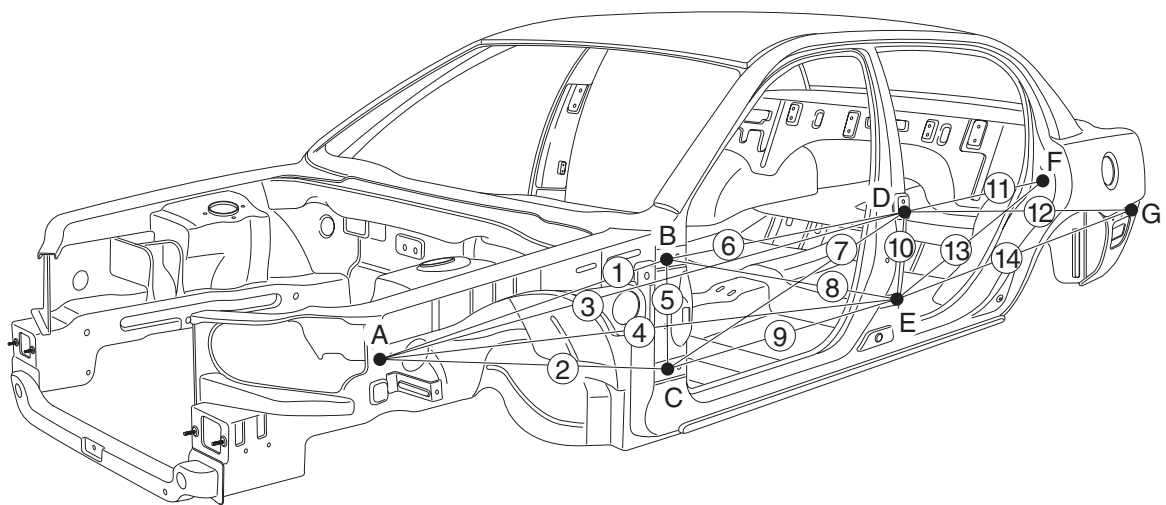
Rear door lower hinge mounting hole $\varnothing 13$



Door switch mounting hole 17.3 X 27.3



Rear bumper mounting hole $\varnothing 6.5 \times 7$

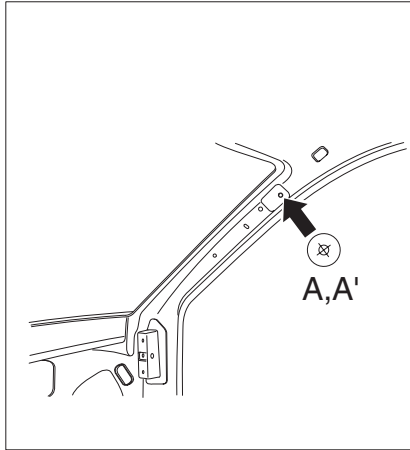


GH21003

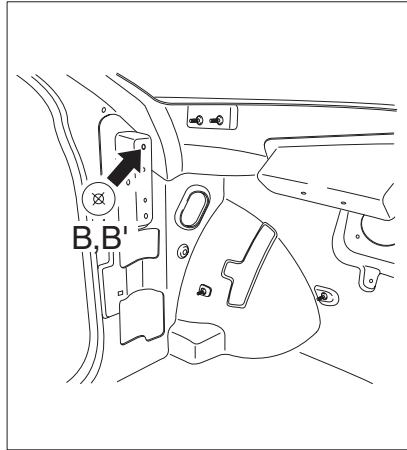
Measurement point	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Dimension (mm)	1806	1826	2583	2569	350	1142	1197	1161	1112
Measurement point	⑩	⑪	⑫	⑬	⑭				
Dimension (mm)	340	959	1947	1030	1971				

31-6 Body dimensions

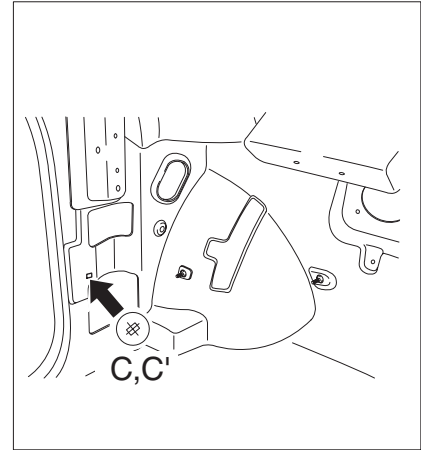
Interior A straight - line dimensions



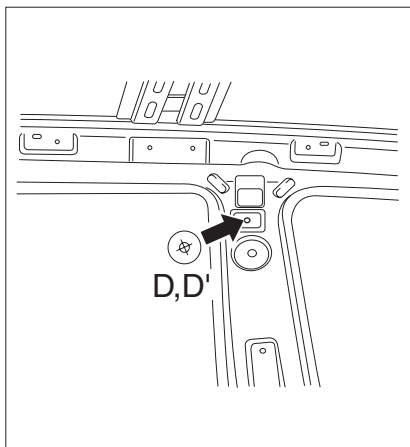
Front pillar upper trim mounting hole $\varnothing 8.5$



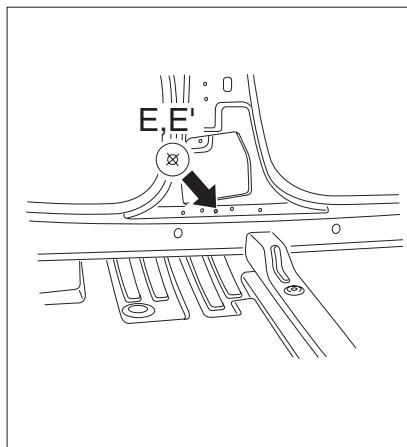
Gusset front pillar to cowl mounting hole $\varnothing 6.6$



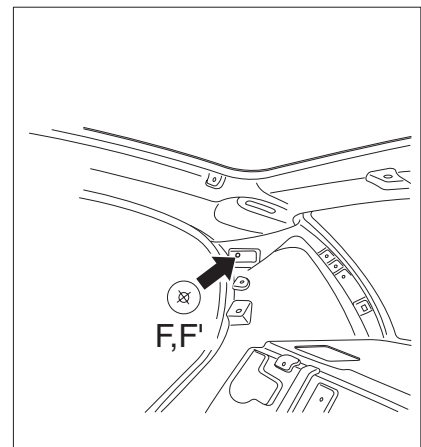
Hood release handle mounting hole 8.4X8.4



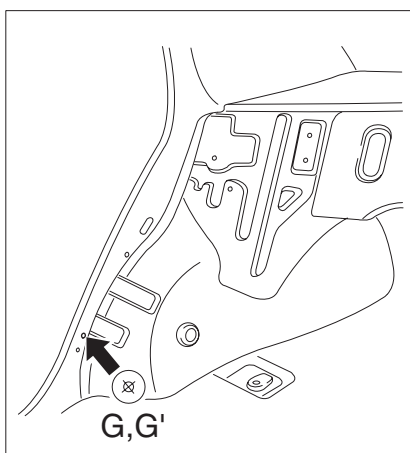
Trim mounting hole $\varnothing 15$



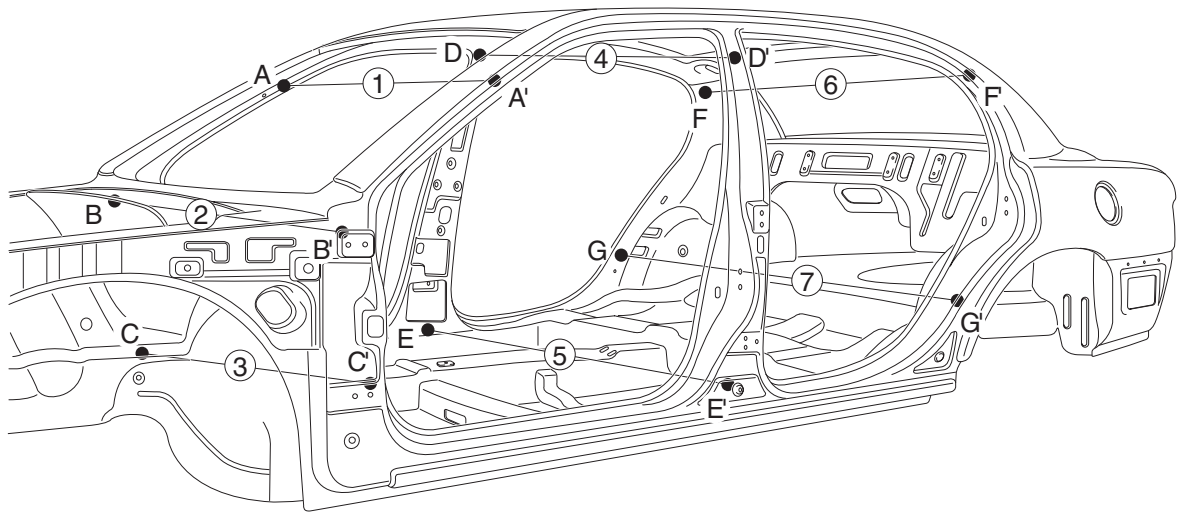
Fixing side airbag sensor hole $\varnothing 15$



Quarter upper trim mounting hole $\varnothing 8.5$



Wiring mounting hole $\varnothing 7 \times 12$

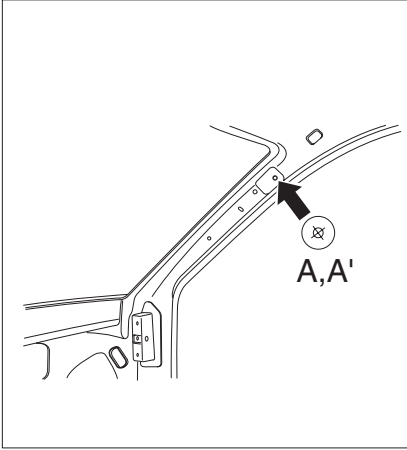


GH21005

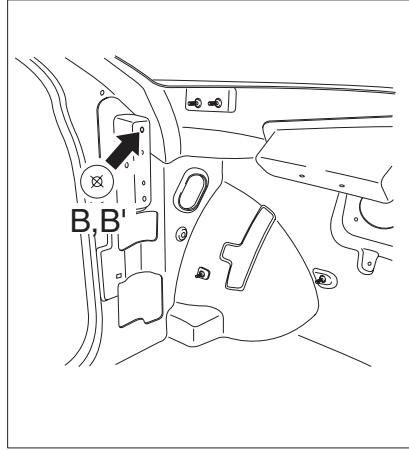
Measurement point	①	②	③	④	⑤	⑥	⑦		
Dimension (mm)	1231	1373	1470	1228	1469	1250	1500		

31-8 Body dimensions

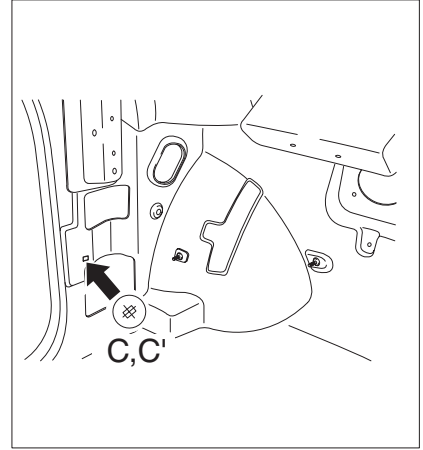
Interior B straight - line dimensions



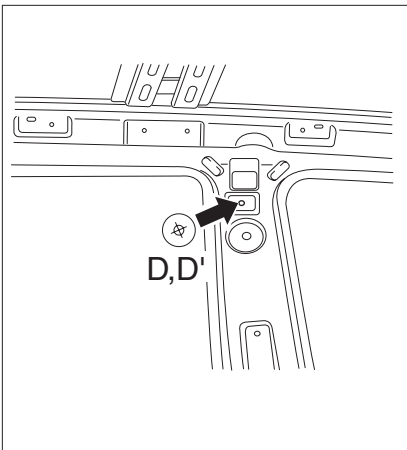
Front pillar upper trim mounting hole $\varnothing 8.5$



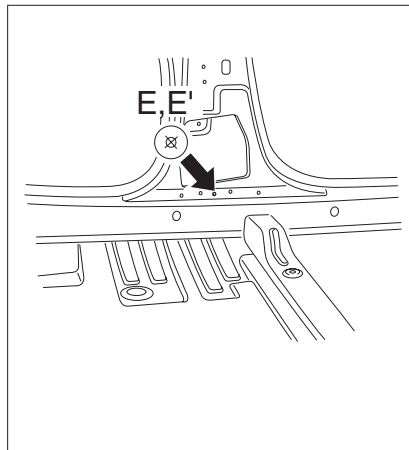
Gusset front pillar to cowl mounting hole $\varnothing 6.6$



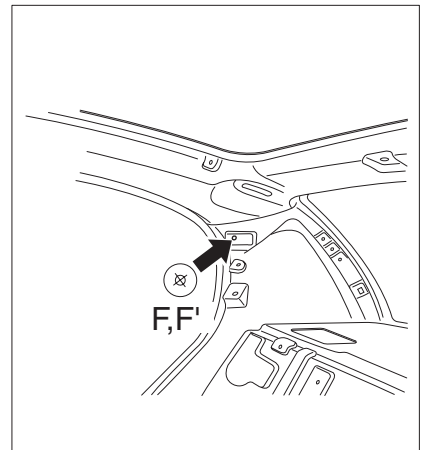
Hood release handle mounting hole 8.4X8.4



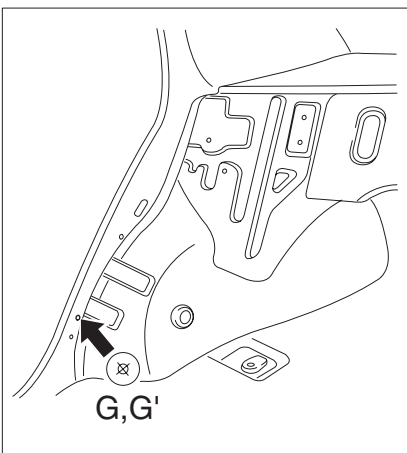
Trim mounting hole $\varnothing 15$



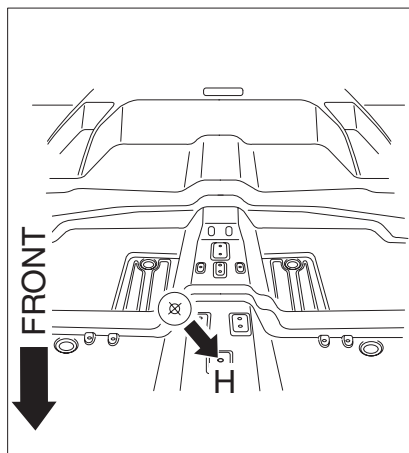
Fixing side airbag sensor hole $\varnothing 15$



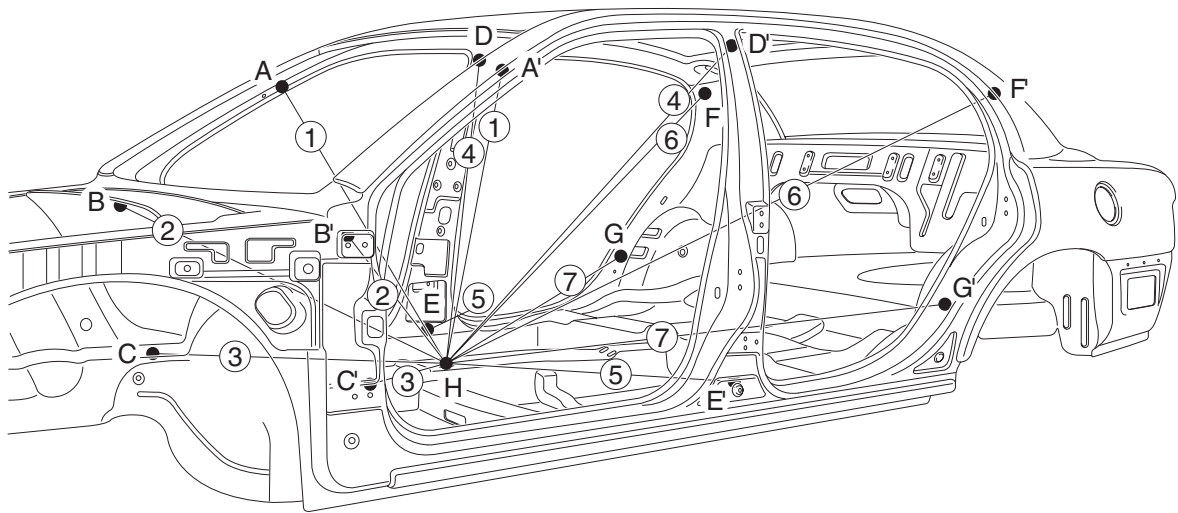
Quarter upper trim mounting hole $\varnothing 8.5$



Wiring mounting hole $\varnothing 7 \times 12$



Parking brake mounting hole $\varnothing 11$

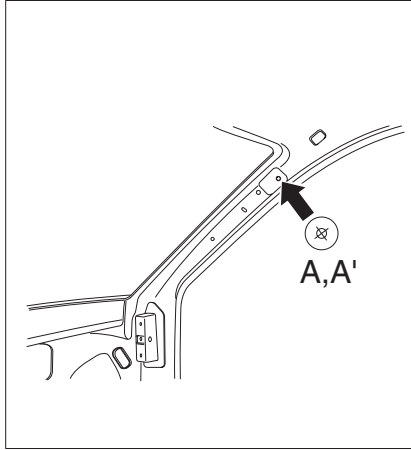


GH21007

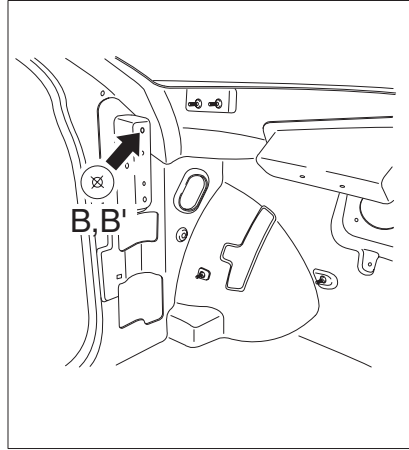
Measurement point	①	②	③	④	⑤	⑥	⑦		
Dimension (mm)	1109	1098	1010	1197	804	1797	1414		

31-10 Body dimensions

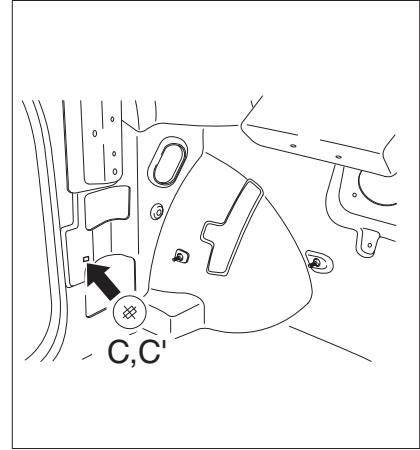
Interior C straight - line dimensions



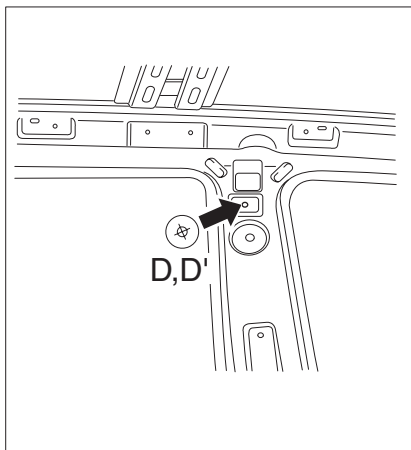
Front pillar upper trim mounting hole $\varnothing 8.5$



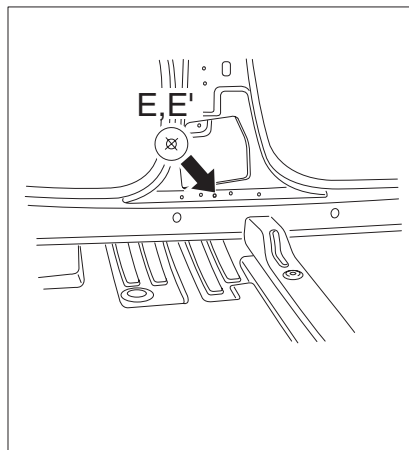
Gusset front pillar to cowl mounting hole $\varnothing 6.6$



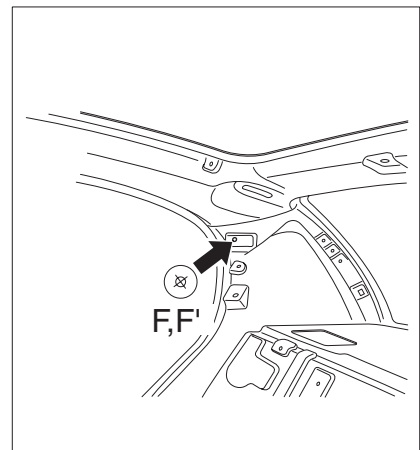
Hood release handle mounting hole 8.4X8.4



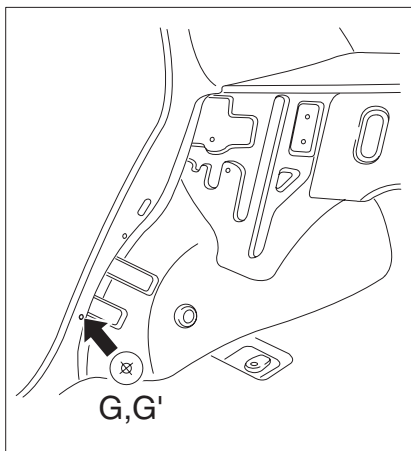
Trim mounting hole $\varnothing 15$



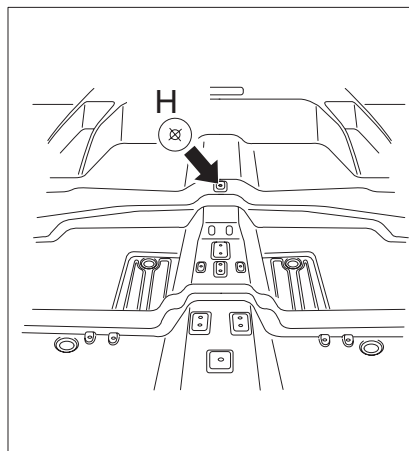
Fixing side airbag sensor hole $\varnothing 15$



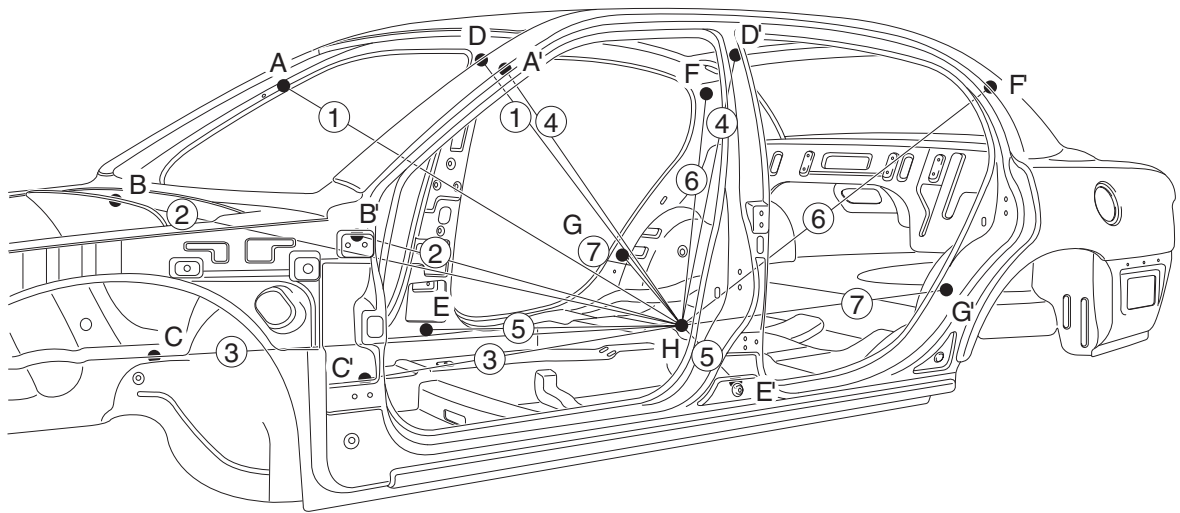
Quarter upper trim mounting hole $\varnothing 8.5$



Wiring mounting hole $\varnothing 7 \times 12$



Carpet mounting hole $\varnothing 7$

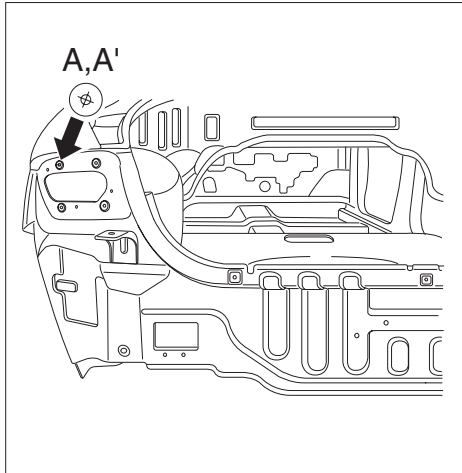


GH21009

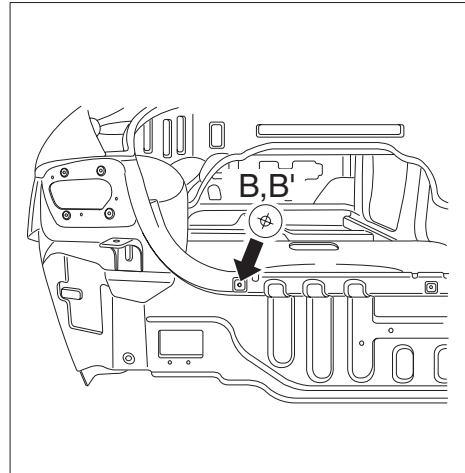
Measurement point	①	②	③	④	⑤	⑥	⑦		
Dimension (mm)	1435	1703	1643	1109	874	1225	861		

31-12 Body dimensions

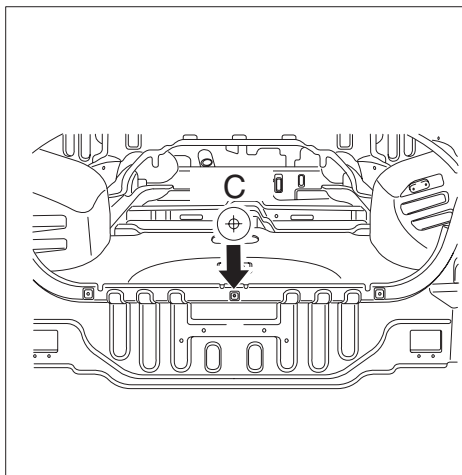
Rear body straight - line dimensions



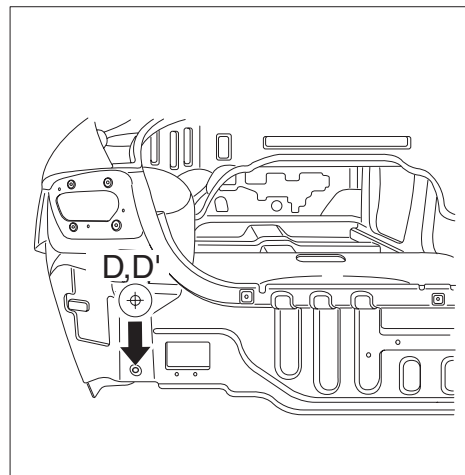
Rear combining lamp guide hole $\varnothing 7$



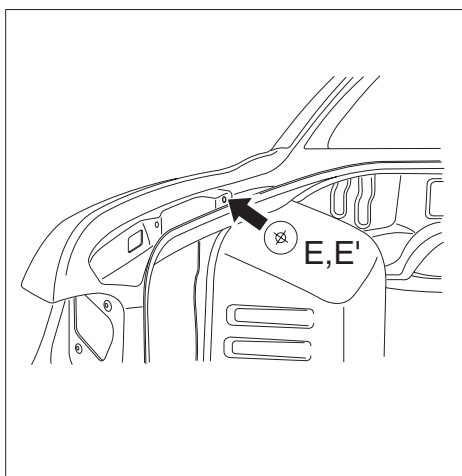
Rear bumper mounting hole $\varnothing 6.6$



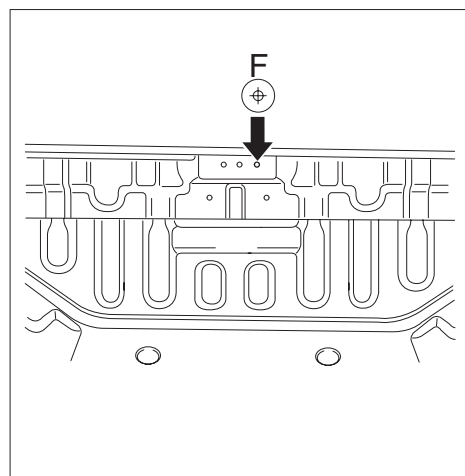
Rear bumper mounting hole $\varnothing 6.6$



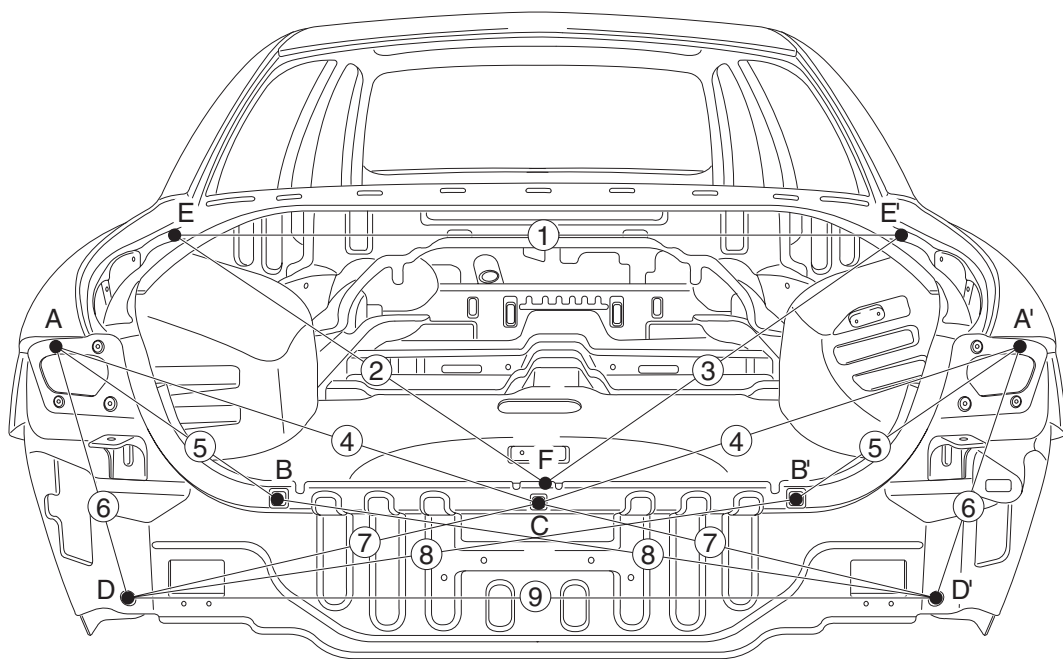
Tooling hole $\varnothing 16$



Trunk hinge mounting hole $\varnothing 9$



Trunk lid latch mounting hole $\varnothing 8$



GH21011

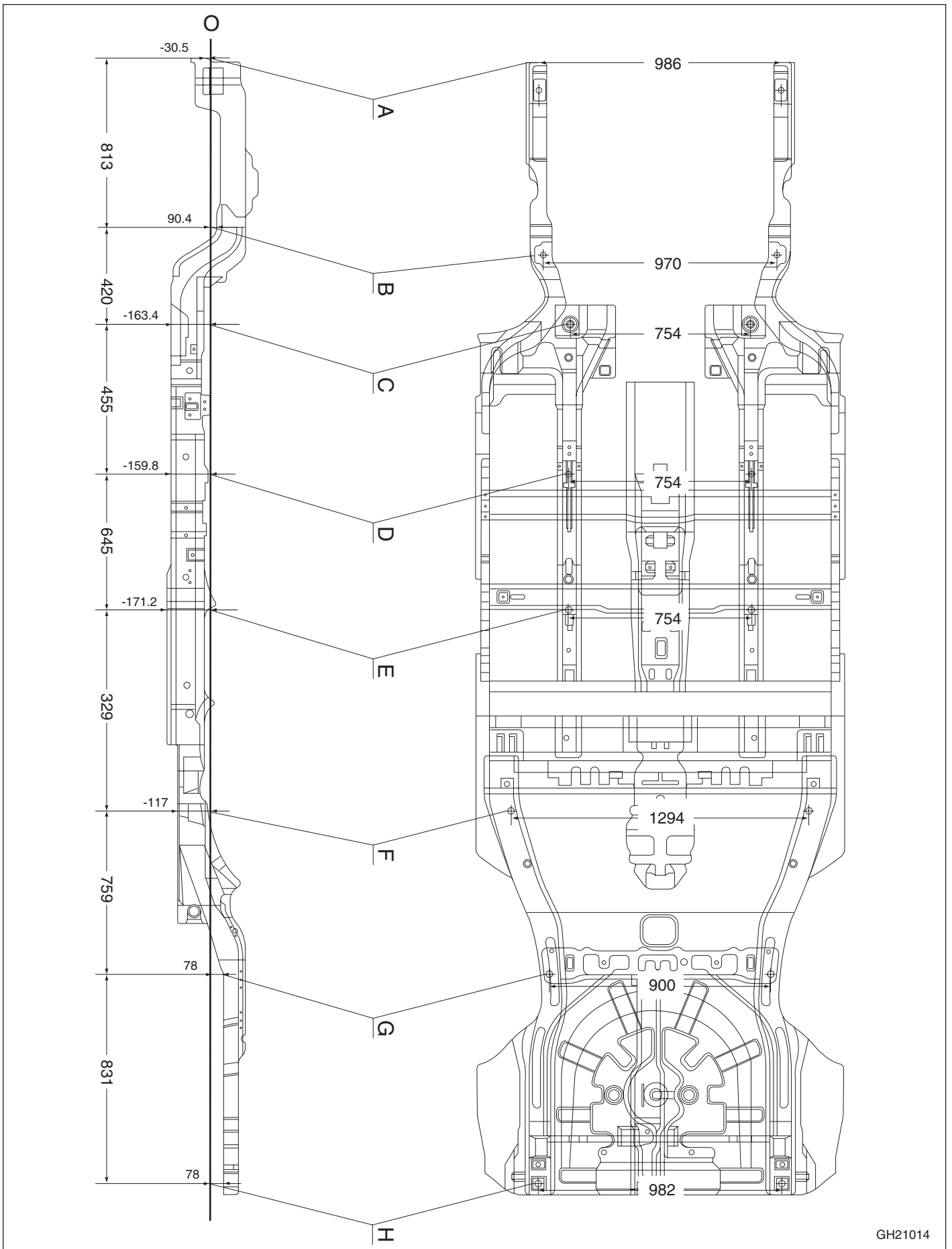
Measurement point	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Dimension (mm)	1410	955	908	829	512	454	634	970	1196

31-14 Body dimensions

Under body dimensions

Projected dimensions

Measurement point	Description	Hole size
A	Under cover for mounging hole	ø6.6
B	sub frame mounting hole	ø10.5
C	Tooling mounting hole	ø28.2
D	Tooling mounting hole	ø20
E	Tooling mounting hole	ø25
F	Drain hole	ø15
G	Rear suspension mounting hole	ø16
H	Rear bumper mounting hole	ø16

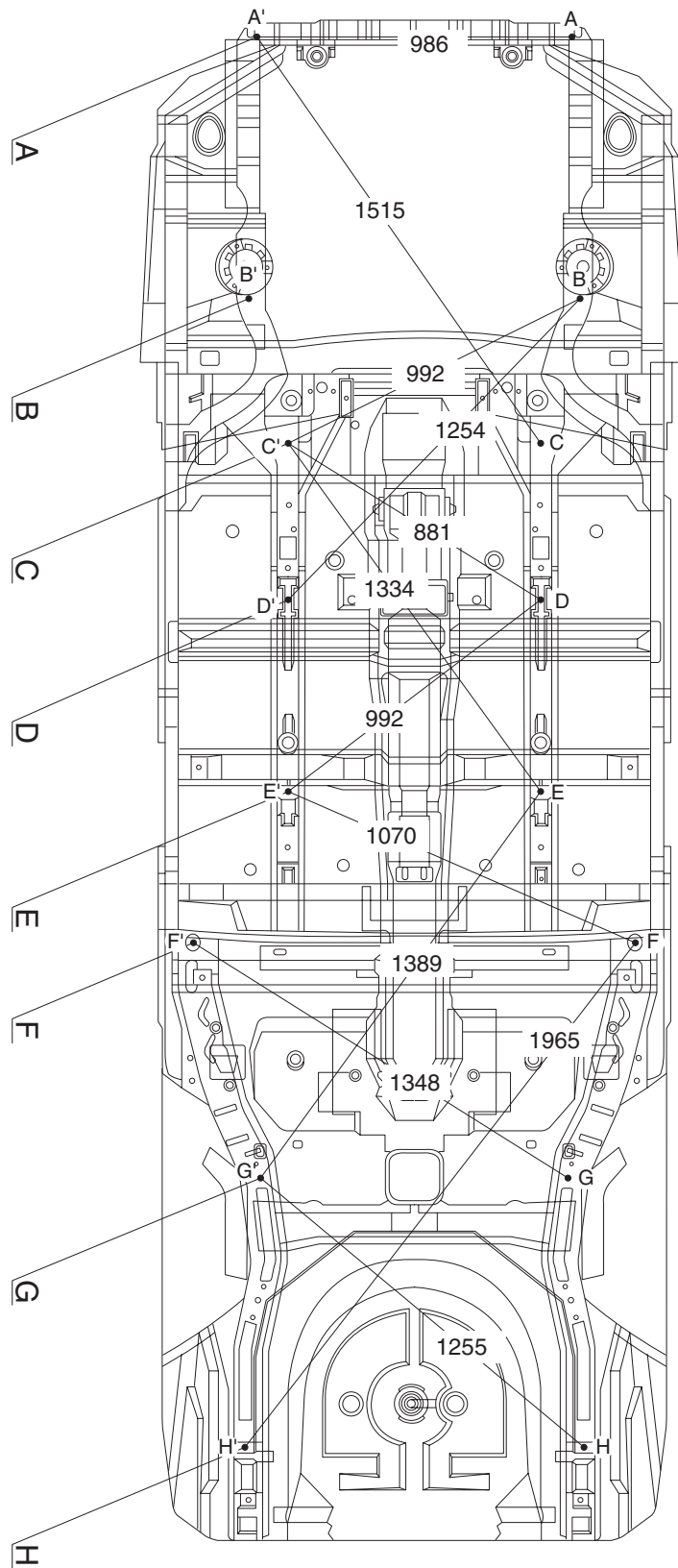


GH21014

31-16 Body dimensions

Straight - line dimensions

Measurement point	Description	Hole size
A	Under cover for mounting hole	ø6.6
B	Sub frame mounting hole	ø10.5
C	Tooling mounting hole	ø28.2
D	Tooling mounting hole	ø20
E	Tooling mounting hole	ø25
F	Drain hole	ø15
G	Rear suspension mounting hole	ø16
H	Rear bumper mounting hole	ø16



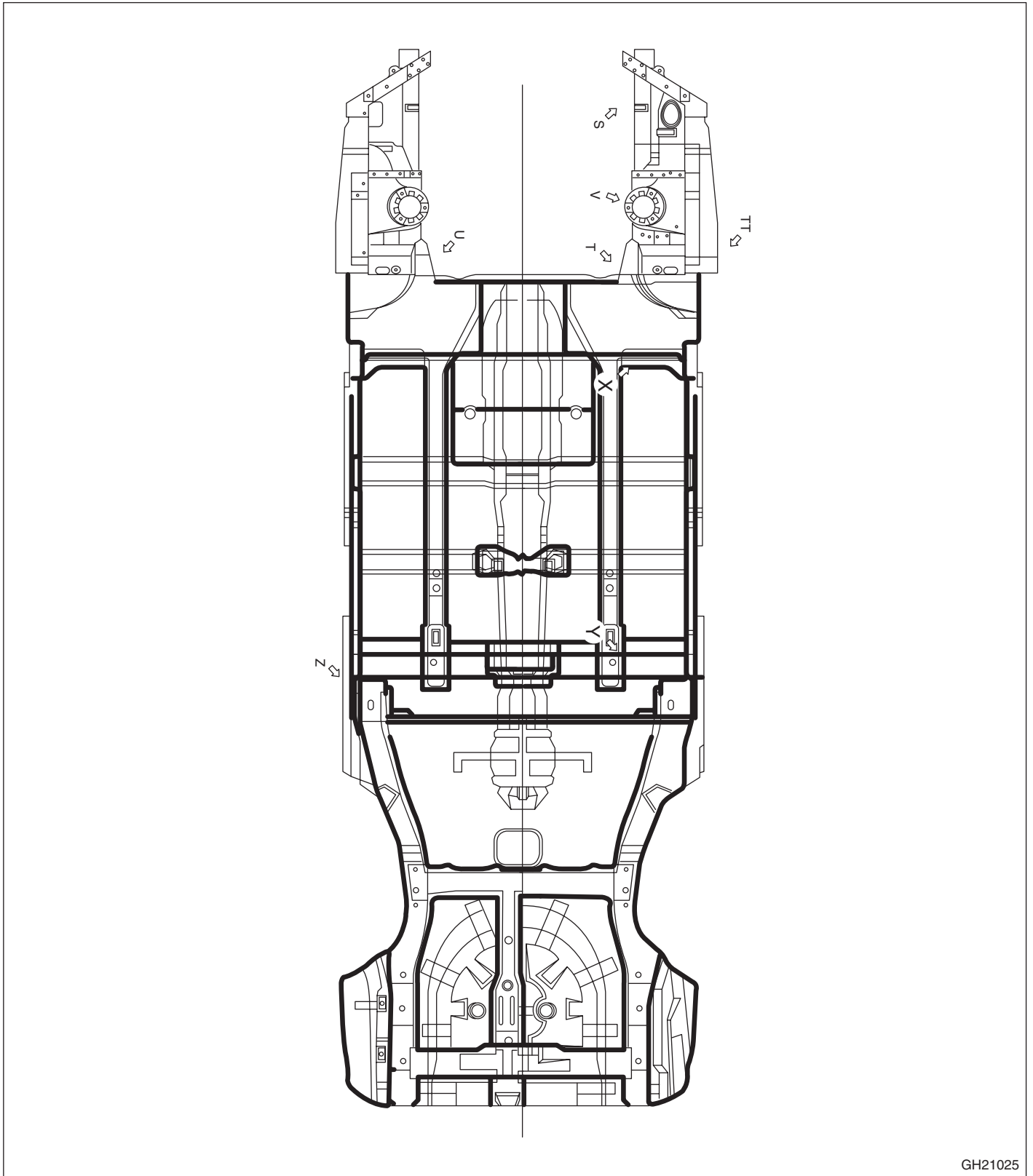
Waterproof and rustproof

Body sealing	41- 1
Body (Floor)	41- 1
Body (Front)	41- 2
Body (Center)	41- 3
Body (Side)	41- 4
Door	41- 5
Hood & Trunk lid	41- 6
Under coating	41- 7
Under coating(Under)	41- 7
Under coating(Side)	41- 8
Applying urstproofing material	41- 9
Applying rustproofing material(Body)	41- 9
Applying urstproofing material(Door)	41- 10
Applying urstproofing material(Hood and Trunk lid)	41- 11

Body sealing

To waterproof and rustproof the vehicle, apply sealer on assembled area of the body panel and on any areas in contact with the body, such as doors(inner/outer), hood(inner/outer), and trunk lid(inner/outer).

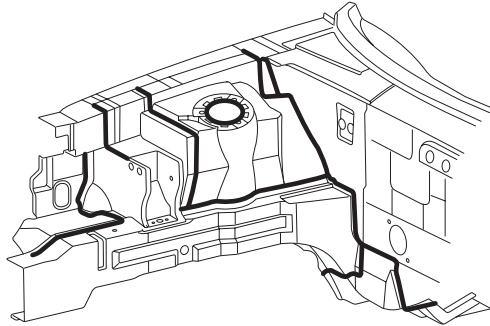
Body (Floor)



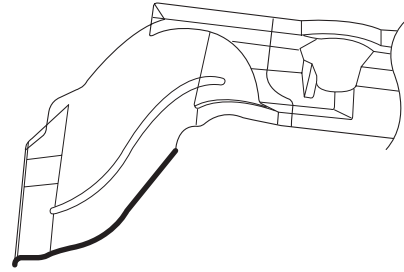
GH21025

41-2 Waterproofing and rustproofing

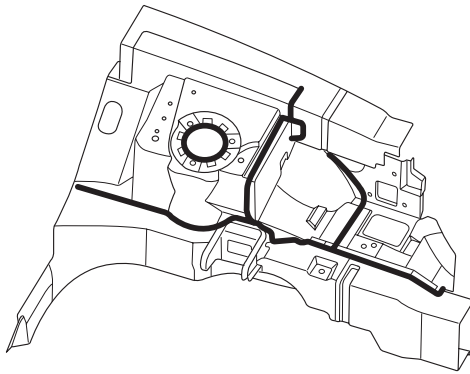
Body (Front)



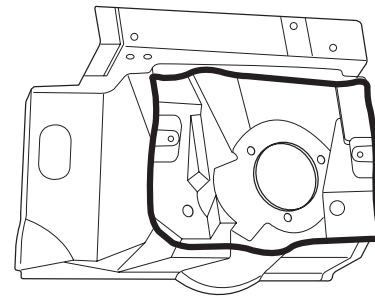
T



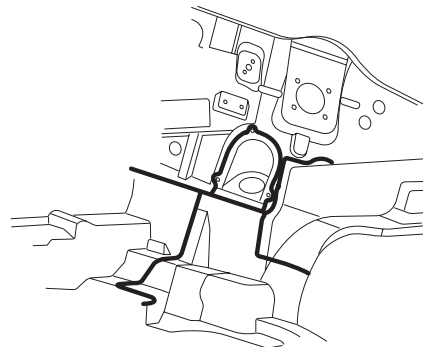
TT



U

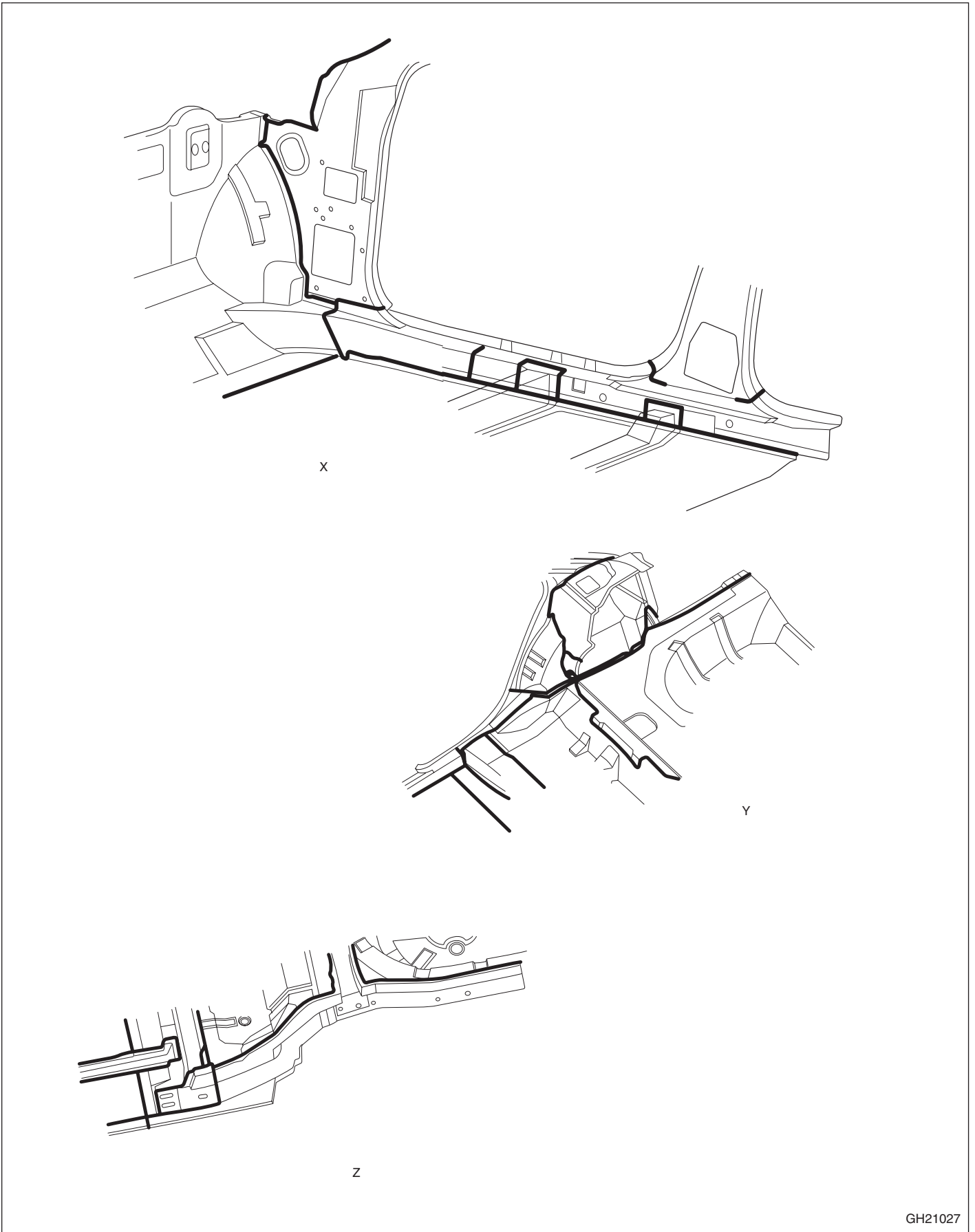


V



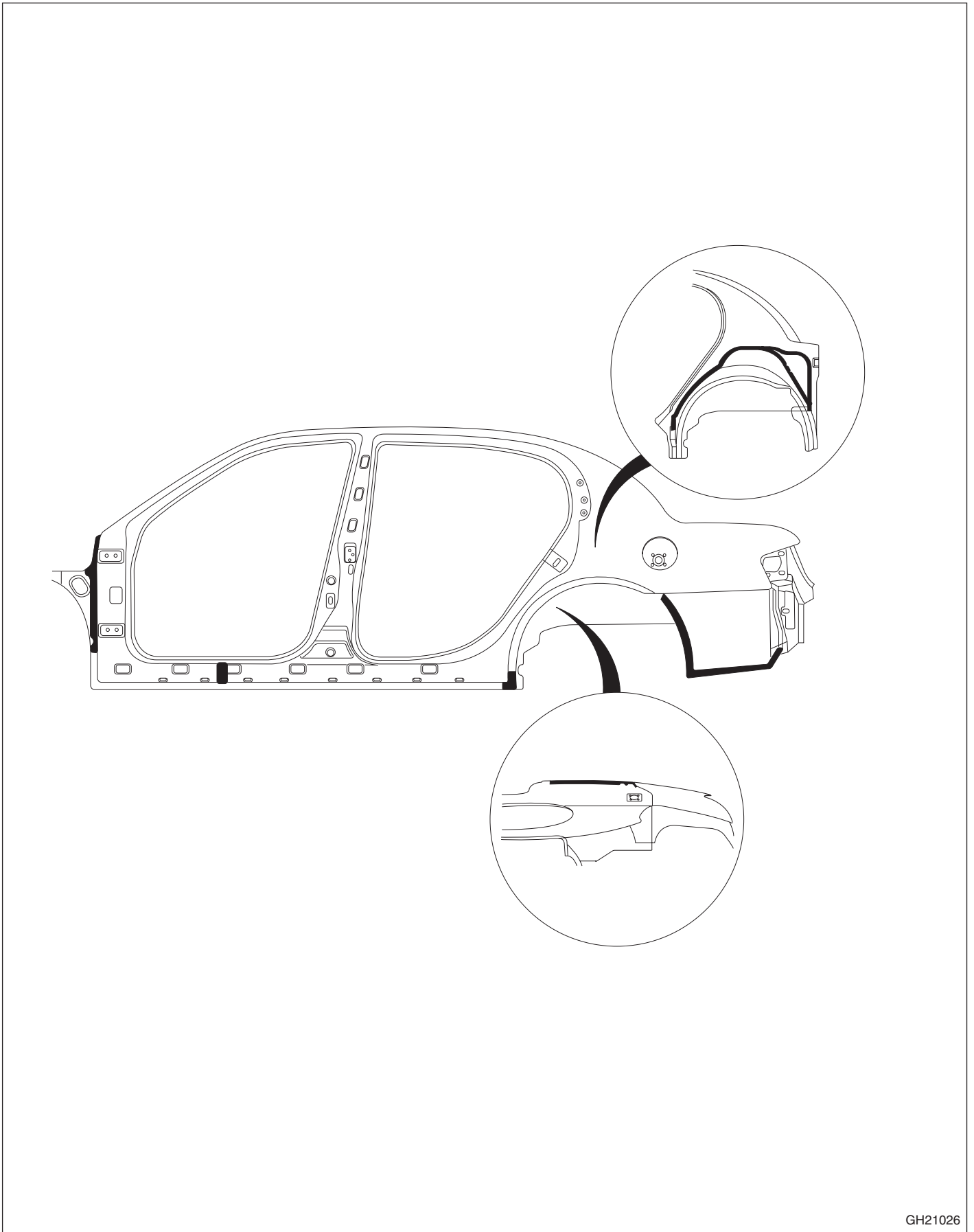
S

Body (Center)



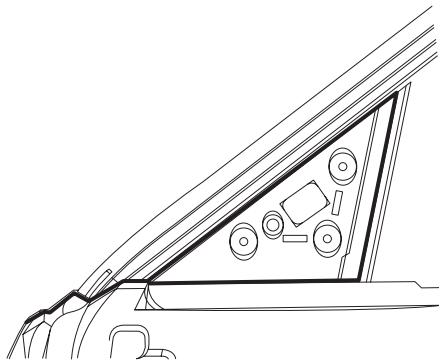
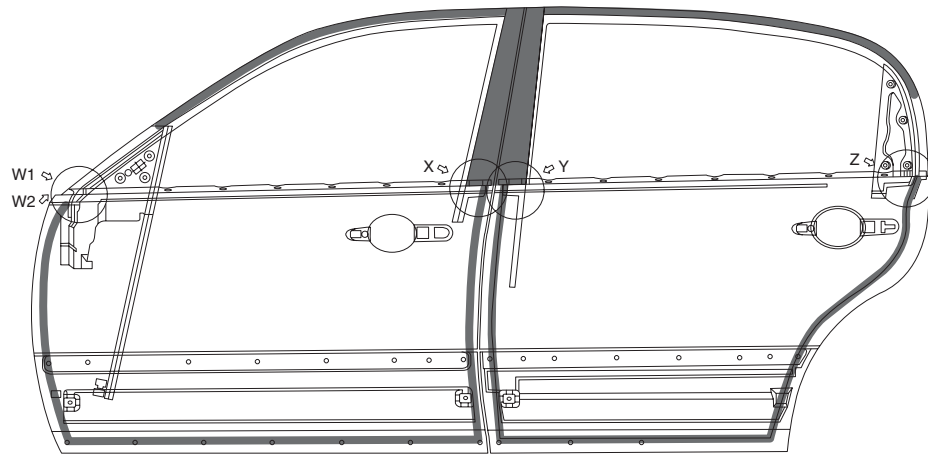
41-4 Waterproofing and rustproofing

Body (Side)

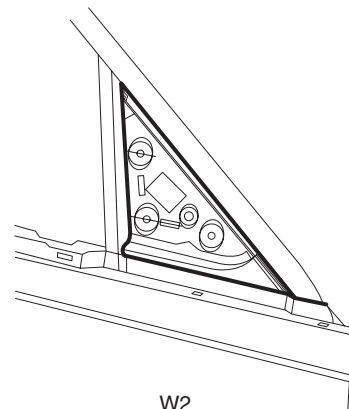


GH21026

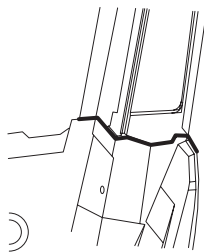
Door



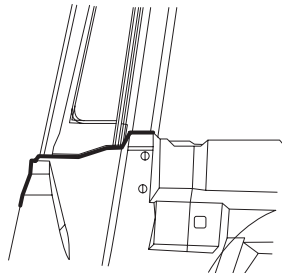
W1



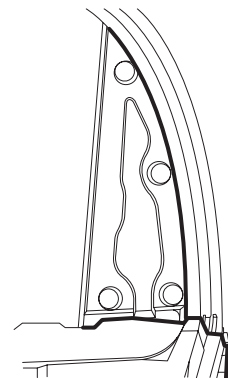
W2



X

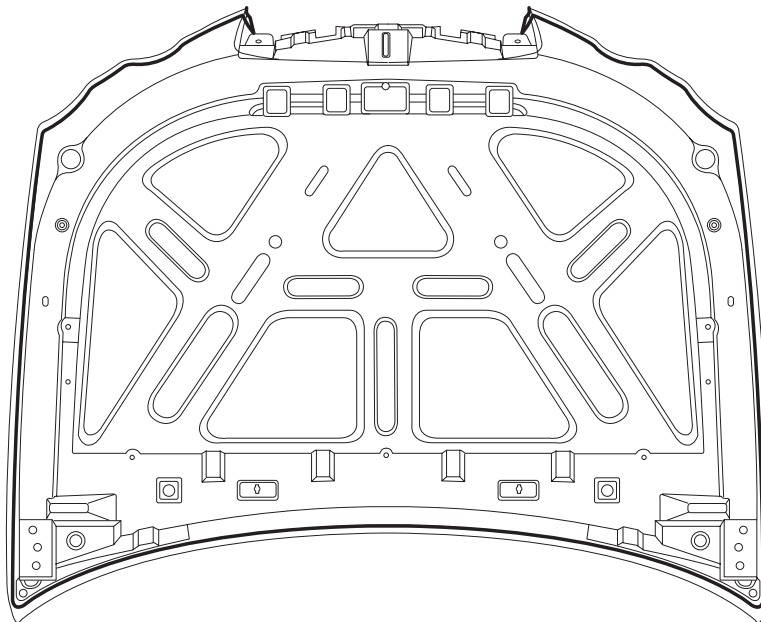
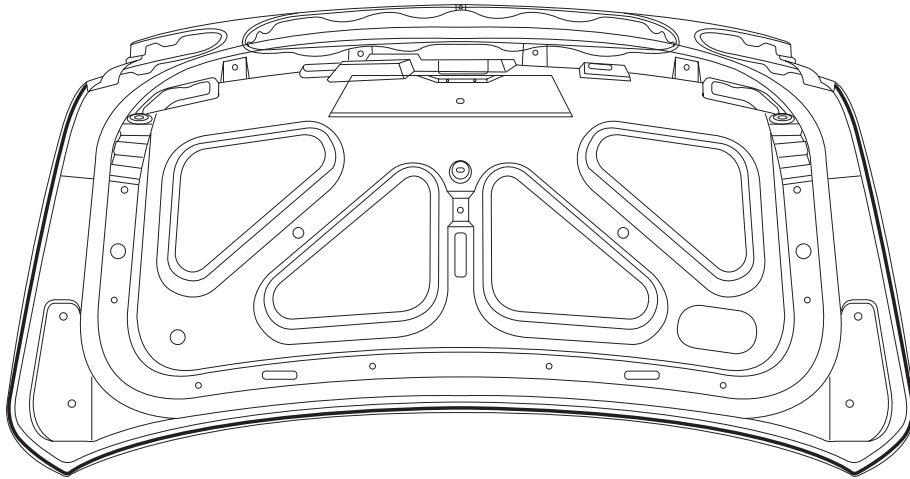
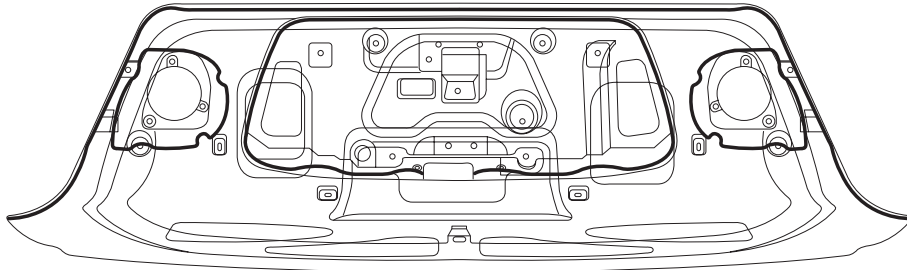


Y

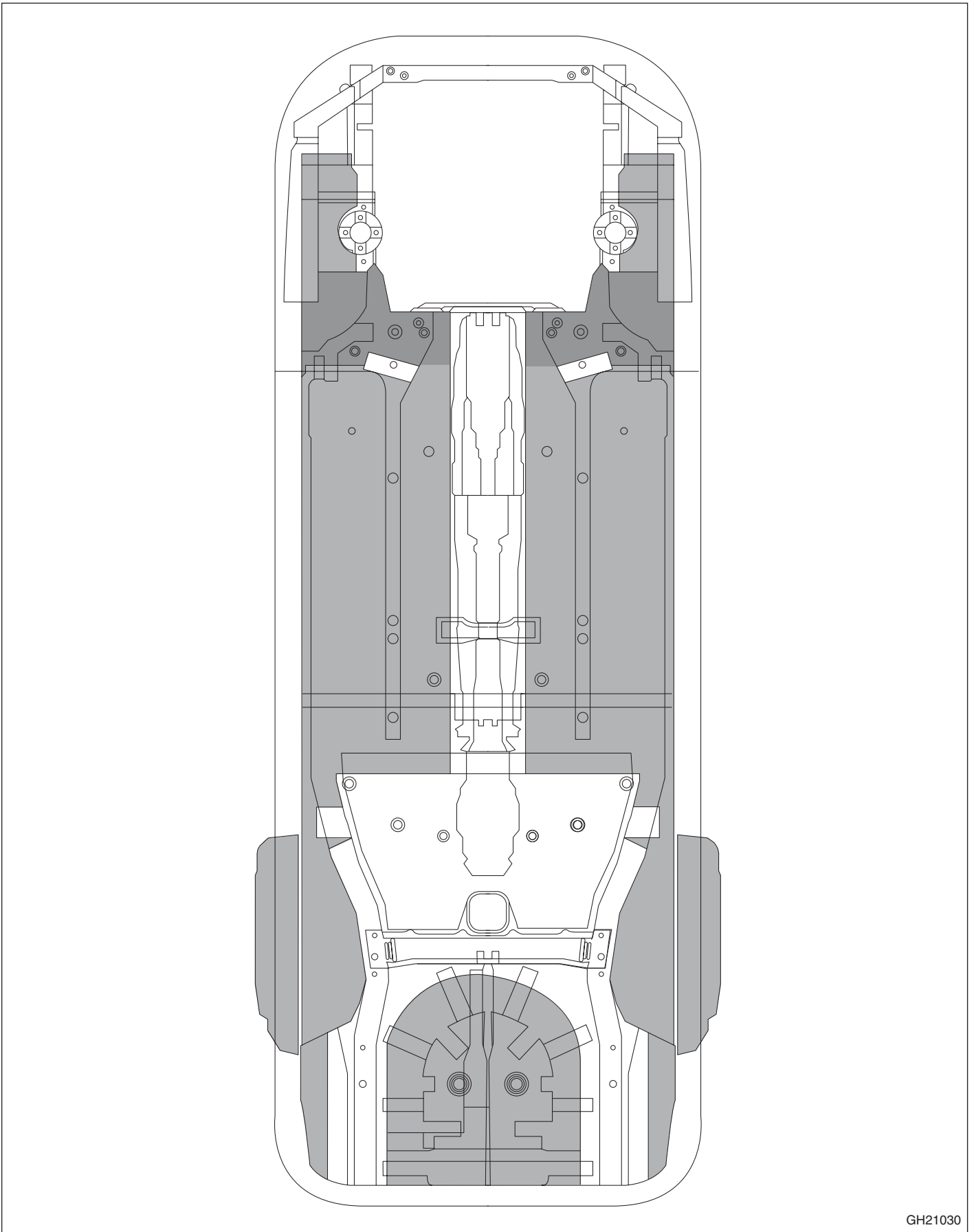


Z

Hood & Trunk lid



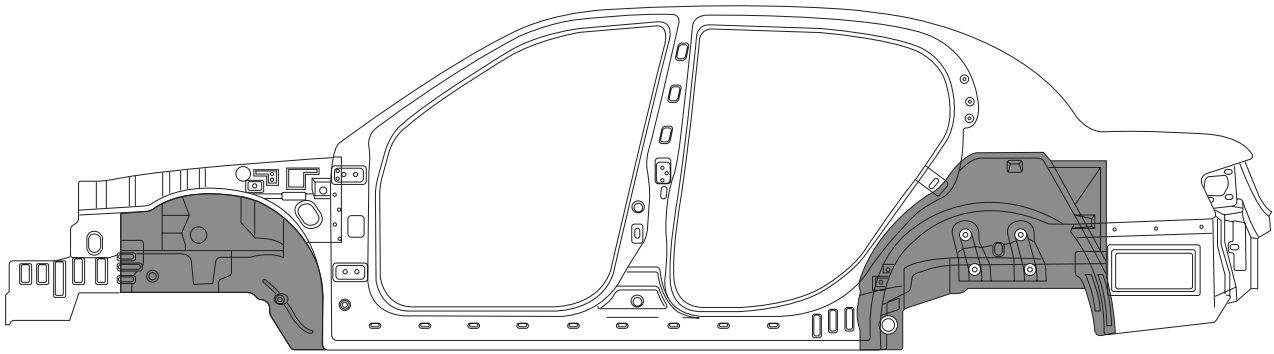
Under coating (Under)



GH21030

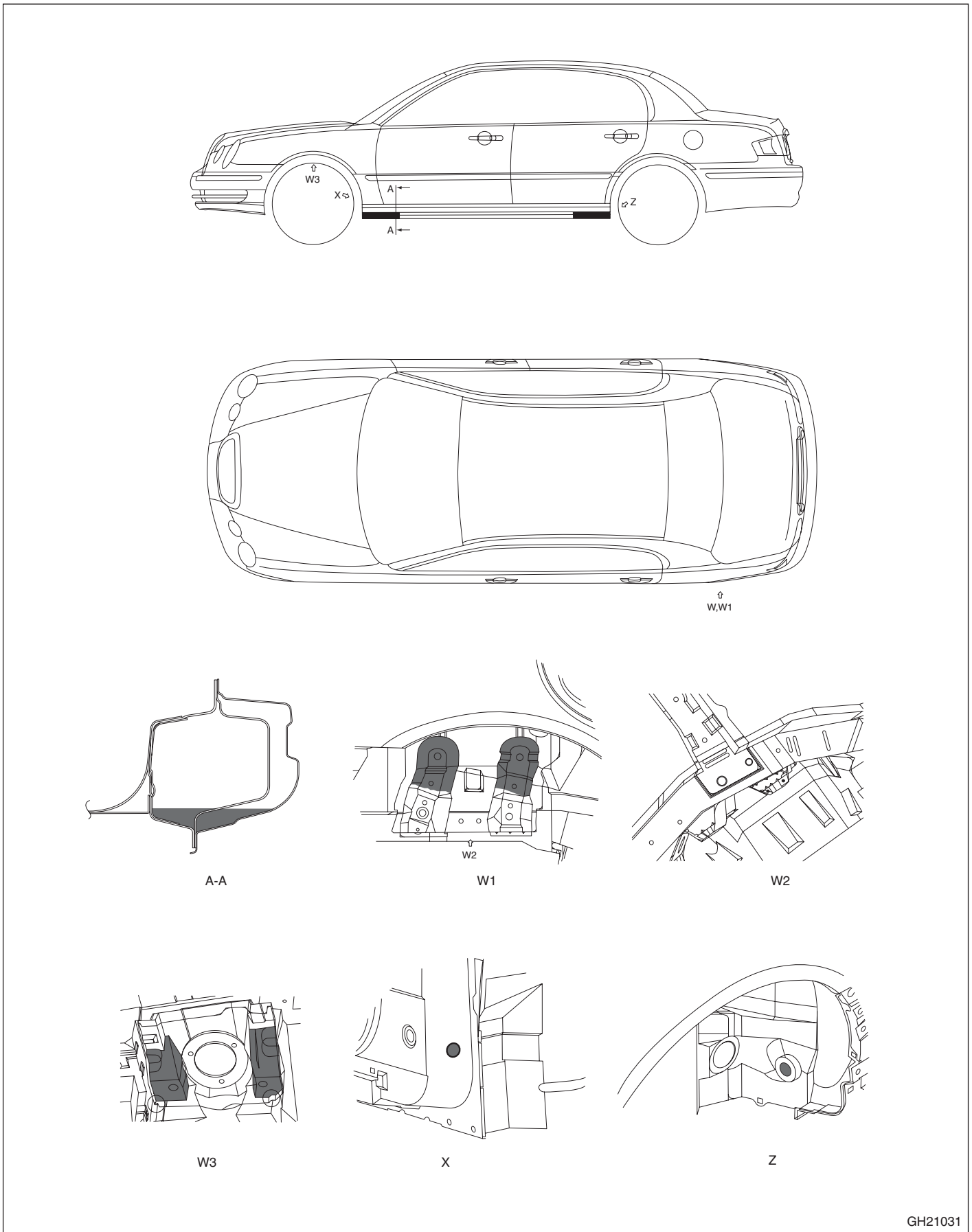
41-8 Waterproofing and rustproofing

Under coating(Side)

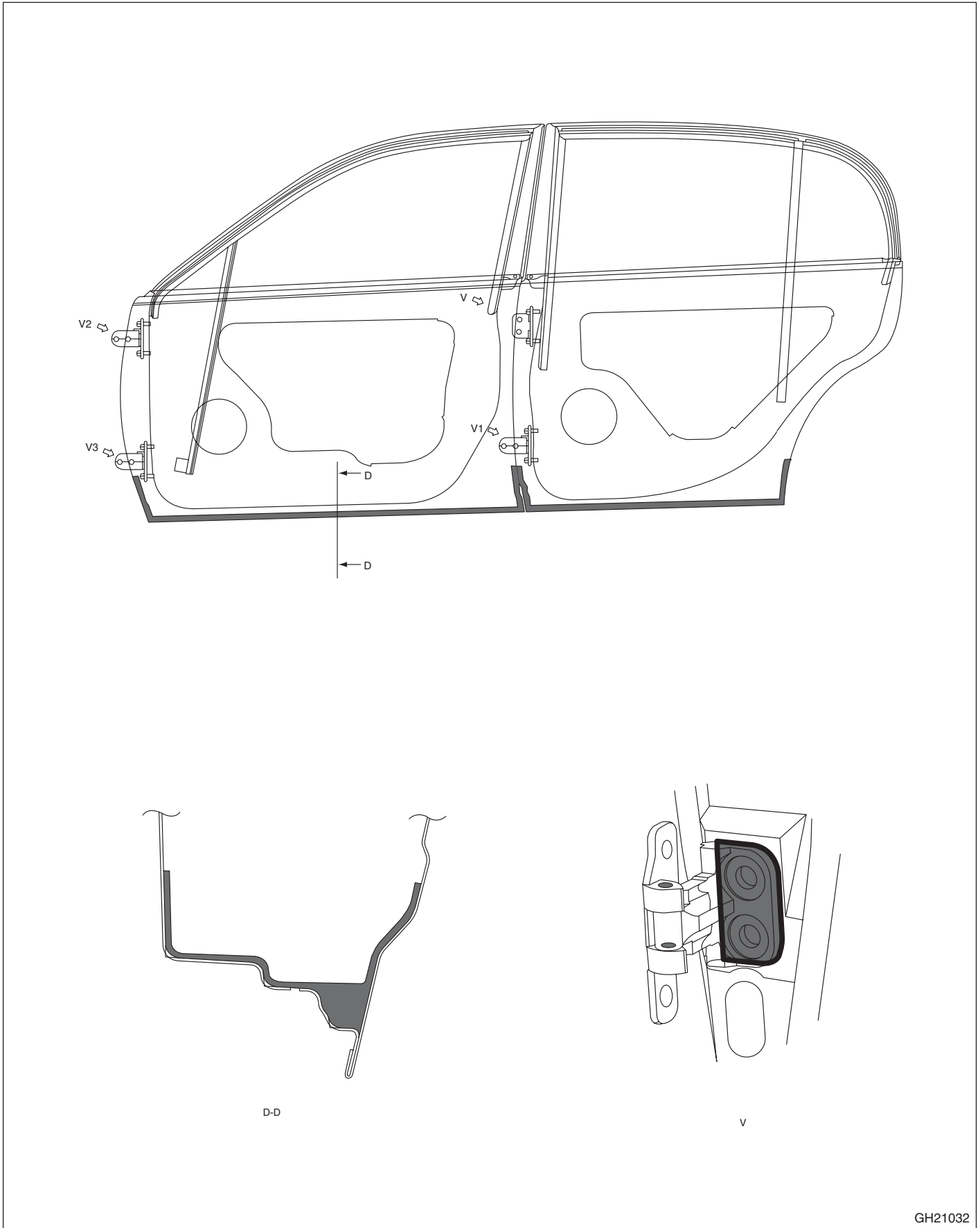


GH21030

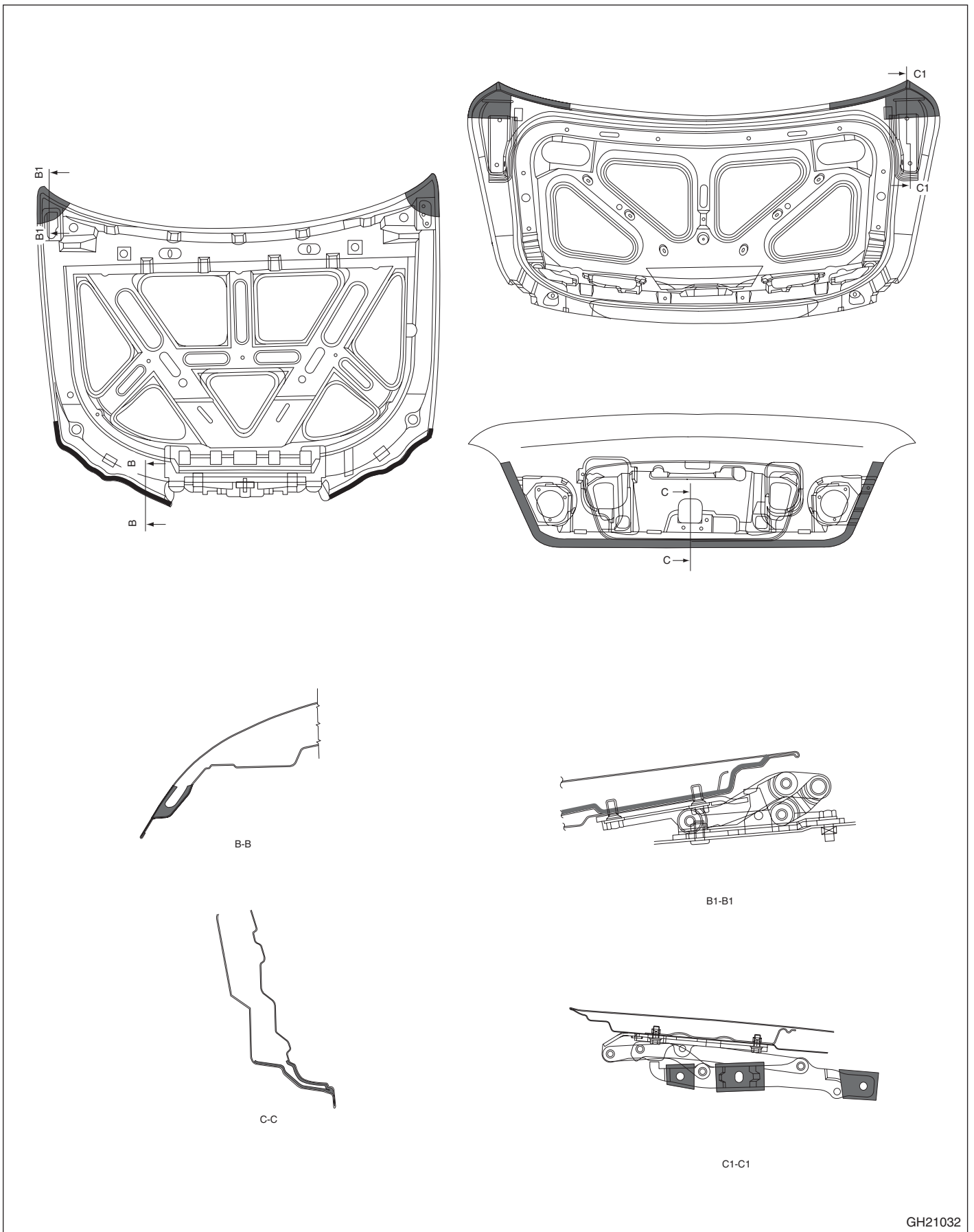
Applying rustproofing material



Applying rustproofing material(Door)



Applying rustproofing material (Hood & Trunk lid)

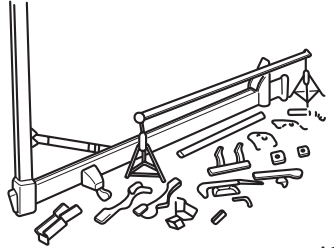

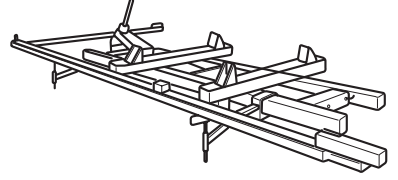
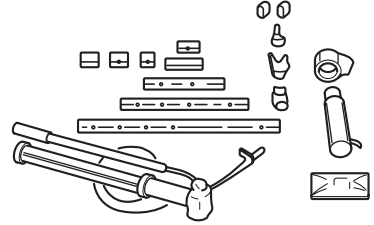
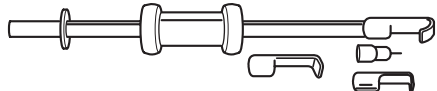


Body modification tools

Body modification tools	
Modification tools	51- 1
Cut and disassembly tools	51- 2
Assembly tools	51- 3
Measurement tools	51- 3
Welding machine	51- 4
Buffing and grinding tools	51- 5
Handheld tools	51- 7
Repair tools set	51- 8


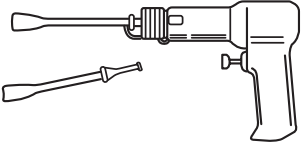
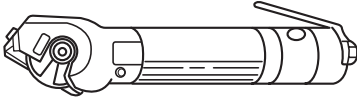
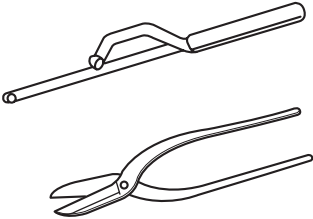
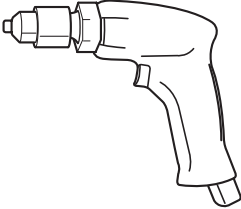
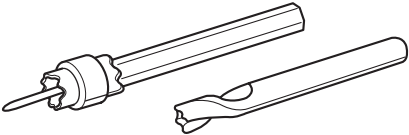
Body modification tools

Modification tools

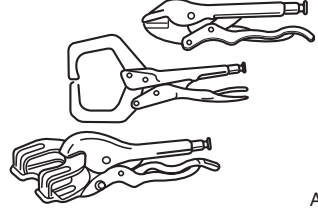
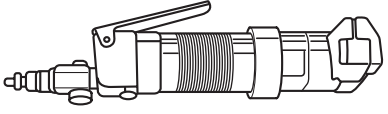
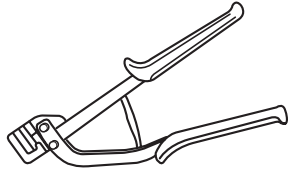
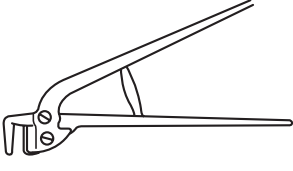
Name	Used for	Figure
Frame straightener	Modify twisted or bent body	 A3EB3501
		 A3EB3502
		 A3EB3503
Port power	Push out, stretch, pull in damaged area	 A3EB3504
Body puller	Stretch damaged area	 A3EB3505

51-2 Body modification tools

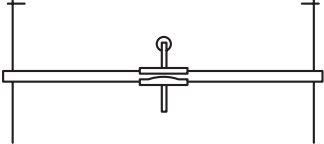
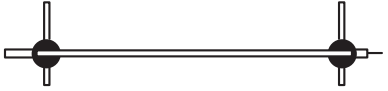
Cut and disassembly tools

Name	Used for	Figure
Air saw	Cut a panel	 A3EB3506
Air diesel	Cut or bend a panel, cut and disassemble spot welded area	 A3EB3507
Rotary cutter	Cut a panel	 A3EB3508
Hand saw and metal scissors	Cut a panel	 A3EB3509
Air drill	Fix a spot cutter or drill to cut or disassemble spot welding area, to finish a hole.	 A3EB3510
Spot cutter	Cut and disassemble spot welded area	 A3EB3511

Assembly tools


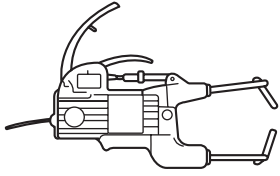

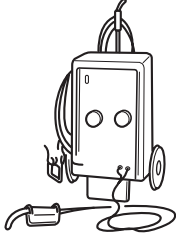
Name	Used for	Figure
Vice pliers	Fix a panel or area to weld	 A3EB3512
Air bench	Finish contact area of flange and finish a hole for plug welding	 A3EB3513
Quick bench	Finish a hole for plug welding	 A3EB3514
Flanging tool	Finish contact area of flange	 A3EB3515

Measurement tools

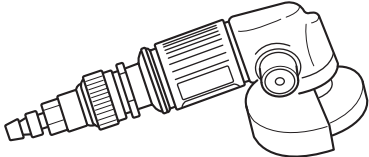
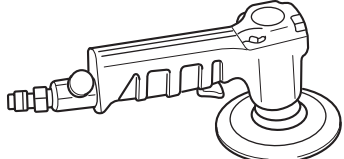
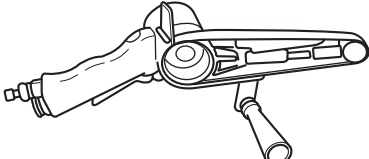
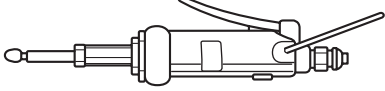
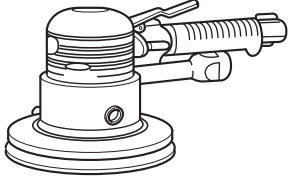
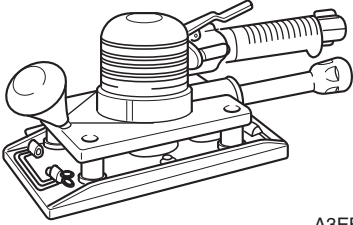
Name	Used for	Figure
Centering gauge	Measure distortion of body and frame	 A3EB3516
Tracking gauge	Measure body and frame	 A3EB3517

51-4 Body modification tools

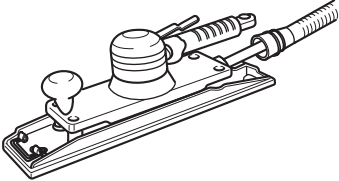
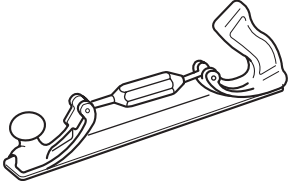
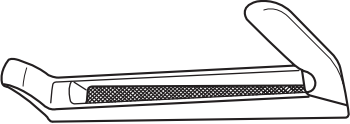
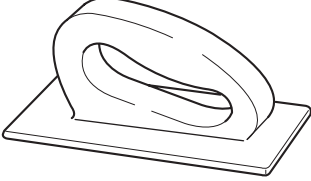
Welding machine

Name	Used for	Figure
Gas welding machine	Cut a panel	 A3EB3518
Spot welding machine	Weld a panel	 A3EB3519
Carbon arc welding machine	Weld a panel	 A3EB3520
Stud welding machine	Stretch a panel, weld a stud bolt to fix front window mold clip	 A3EB3521

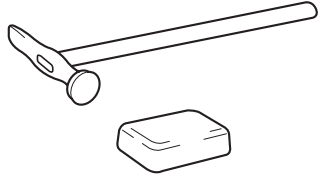
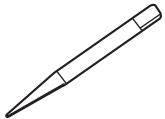
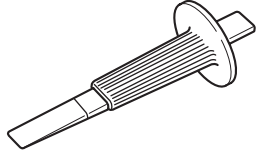
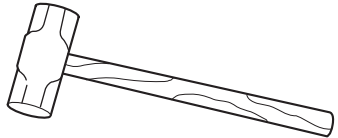
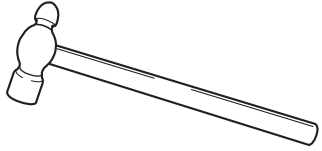
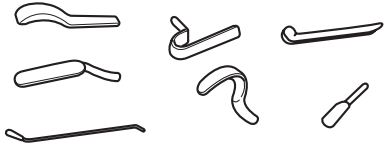
Buffing and grinding tools

Name	Used for	Figure
Disk grinder	Buff	 A3EB3522
Disk sander	Buff	 A3EB3523
Belt sander	Buff paints	 A3EB3524
Small sized grinder	Buff paints or smooth finishing	 A3EB3525
Double action sander	Grind rough area of puttee assembled area	 A3EB3526
Orbital sander(short)	Grind rough area of puttee assembled area	 A3EB3527

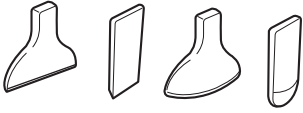
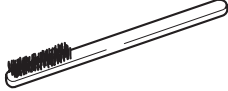
51-6 Body modification tools

Name	Used for	Figure
Orbital sander(long)	Used for puttee grinding of wide area	 A3EB3528
Flexible file	Grind touch up area, uneven area of a panel	 A3EB3529
Surform tool	Buff rough area of puttee area	 A3EB3530
Hand file	Grind body puttee, pulley, finish puttee	 A3EB3531

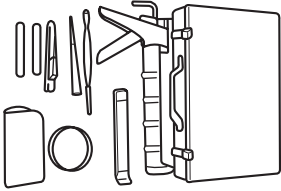
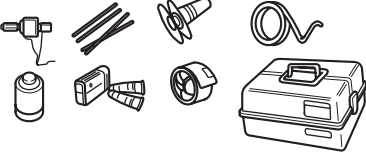
Handheld tools

Name	Used for	Figure
Body hammer and dolly	-	 A3EB3532
Center punch	Punch a hole in the middle of a spot welding area	 A3EB3533
Plane chisel	Cut and disassemble a panel	 A3EB3534
Weight hammer	Used when greater force is required	 A3EB3535
Bowl pin hammer	Used when smaller force is required	 A3EB3536
Spoon	Used for an area where not reached by hand	 A3EB3537

51-8 Body modification tools

Name	Used for	Figure
Body chisel	Bend rough body line damaged or sheet metal etc.	 A3EB3538
Wire brush	Remove paints, rust, slag on welded area which are hard to recognize	 A3EB3539

Repair tools set

Name	Used for	Figure
Window tool set	Repair window collar	 A3EB3540
Repair tool set for plastics	Repair plastic parts	 A3EB3541

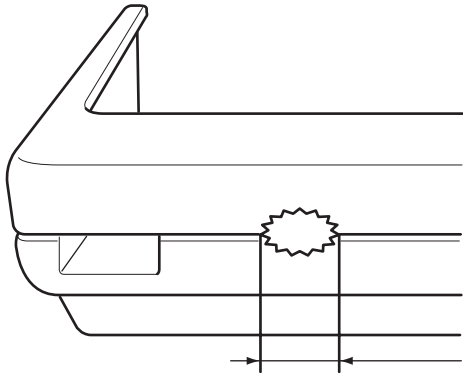
Plastic parts

Polypropylene (PP) bumper repairability	61- 1
Bumper repair procedure	61- 2
Repair method for PP bumper	61- 3

Polypropylene(PP) bumper repairability

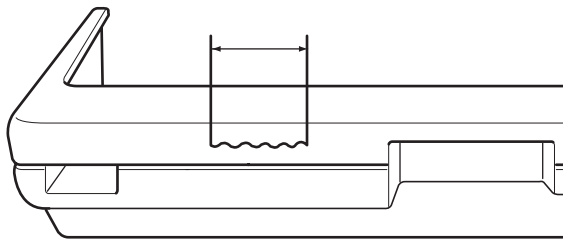
The three types of damaged bumpers shown below can be repaired. Because of cost and quality considerations, bumpers with more damage may be repaired, but replacing the bumper is encouraged.

1. If a hole on a bumper is less than 2 in.(50 mm).



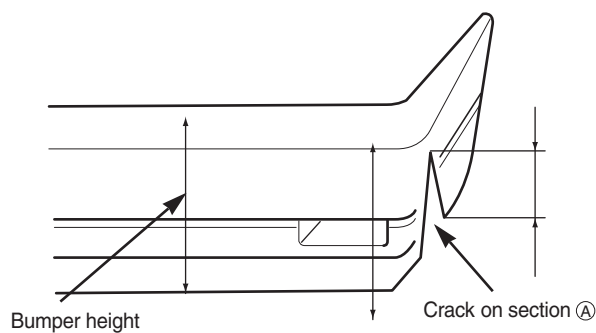
A3EB3601

2. If a crack on a bumper is less than 4 in.(100 mm).



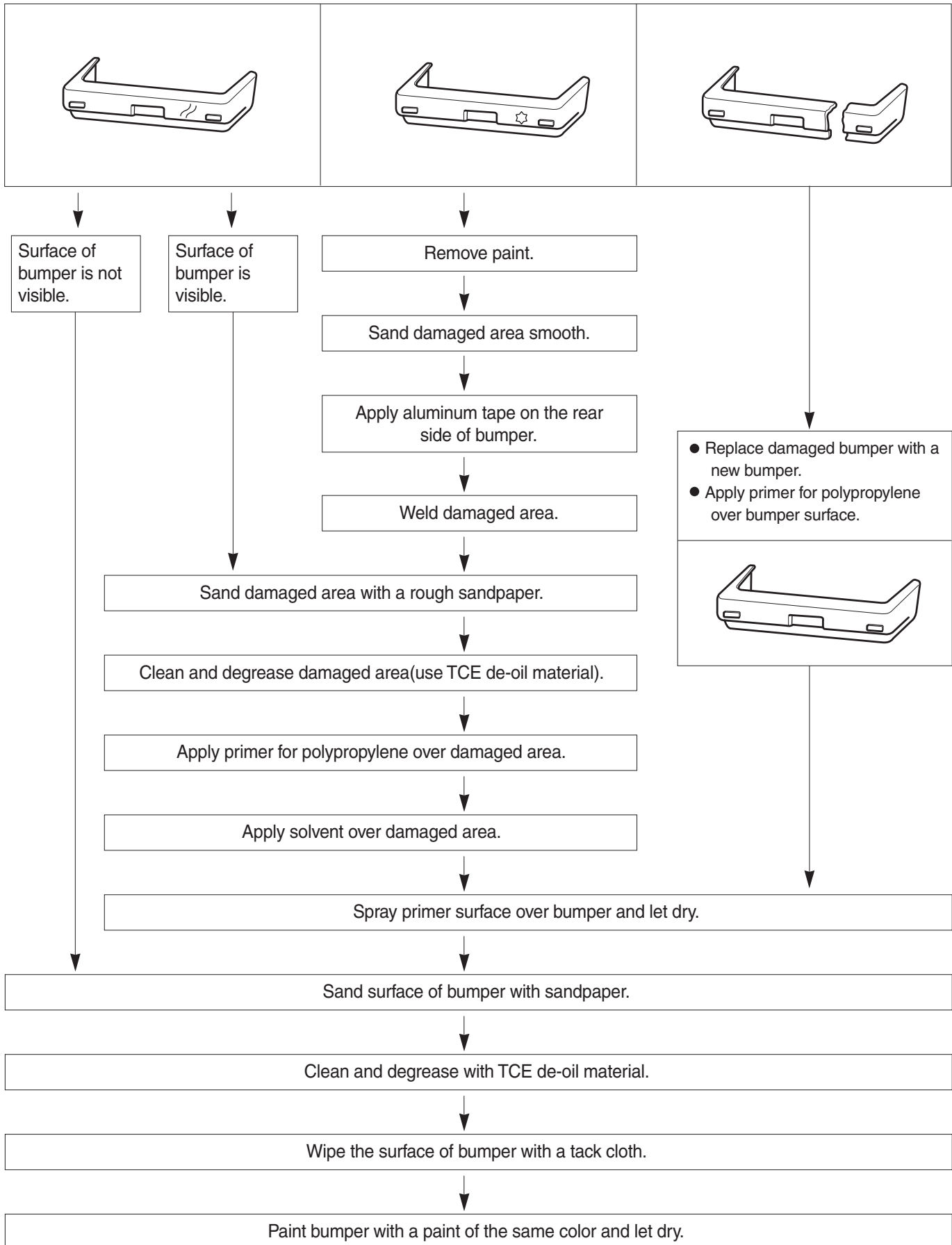
A3EB3602

3. If a crack on bumper section (A) is less than 4 in.(100 mm) (less than half of the bumper height).



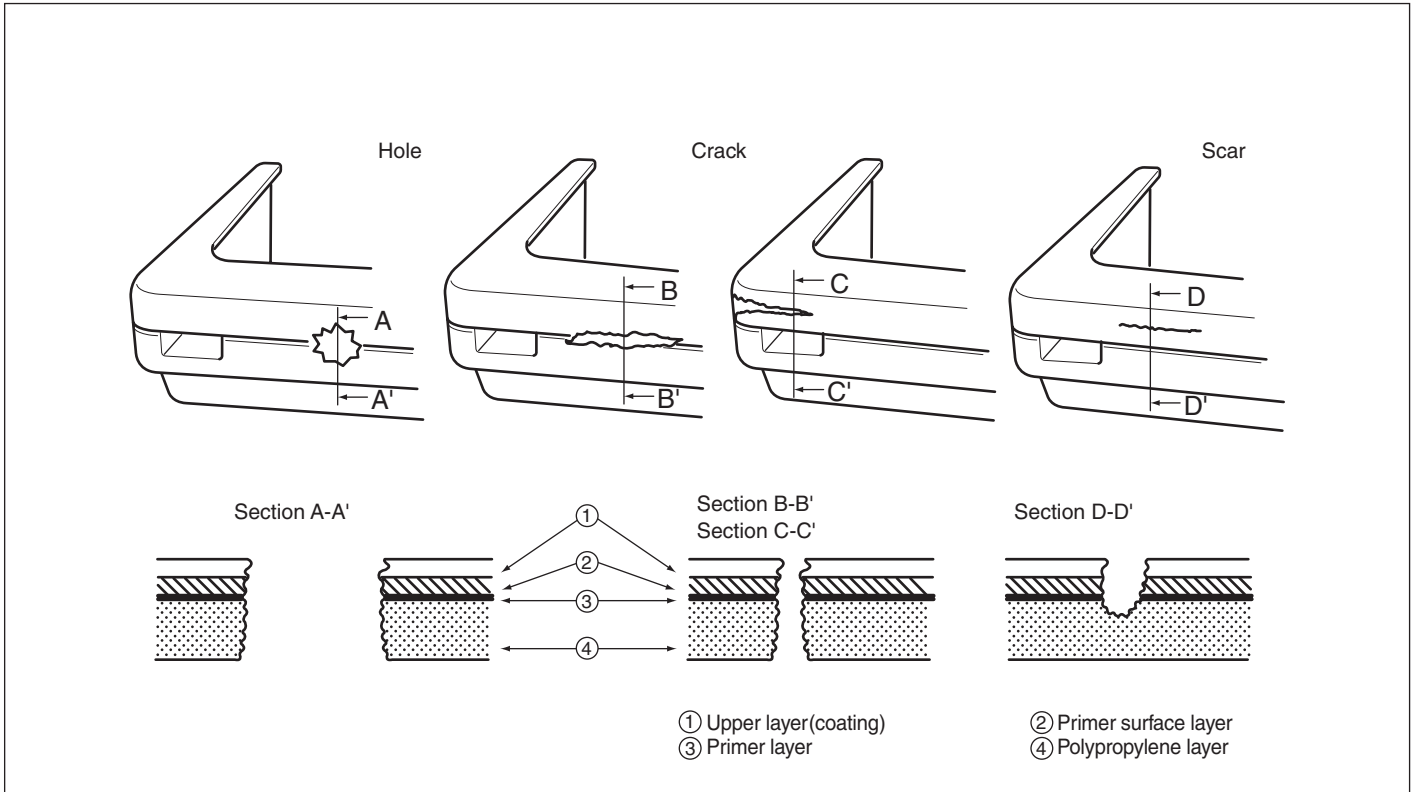
A3EB3603

Bumper repair procedure

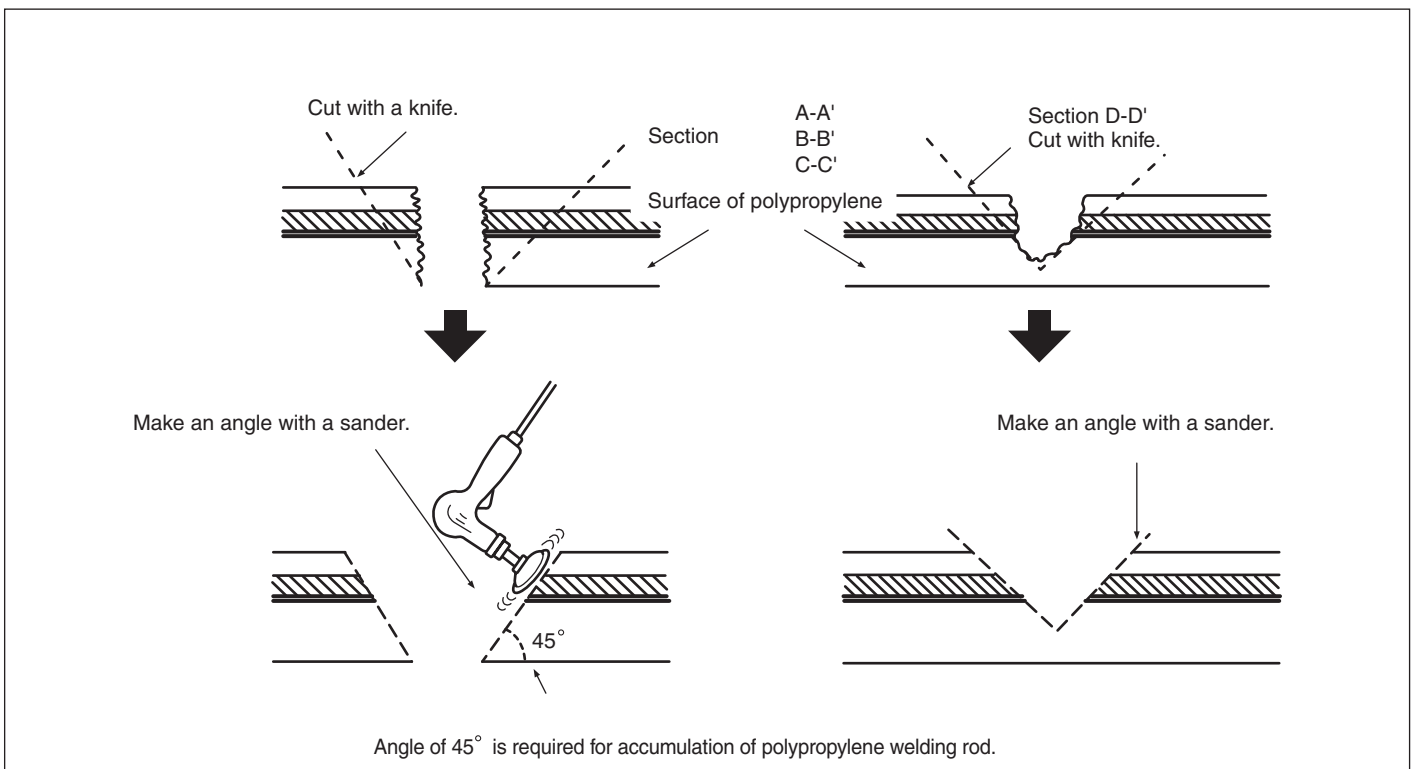


Repair method for PP bumper

Damage to the bumper that reaches the surface of the polypropylene cannot be fixed just by painting. Use the repair methods shown below to repair damage that reaches the surface of the polypropylene.



1. Rough cut the damaged area 45° using a knife and then sand the angle smooth.

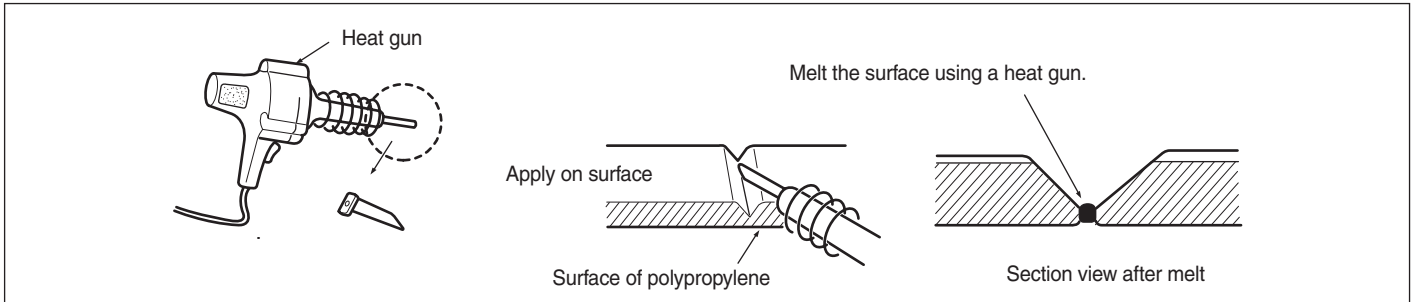


Angle of 45° is required for accumulation of polypropylene welding rod.

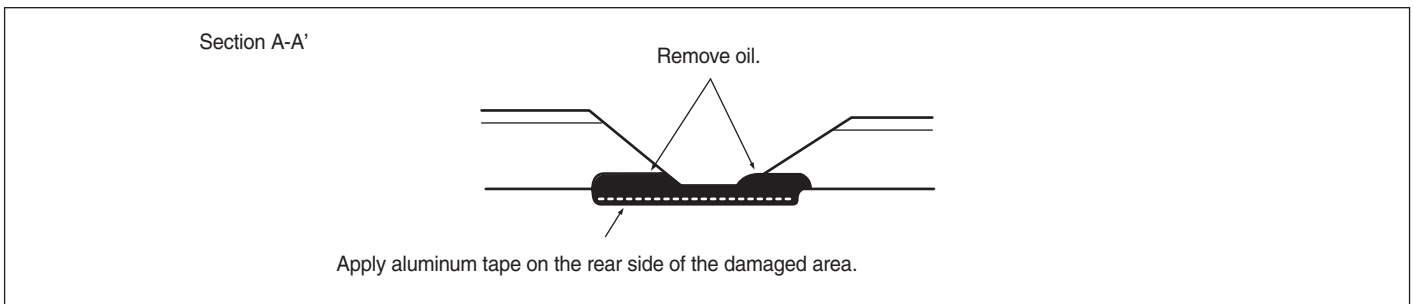
61-4 Plastic parts

2. Welding damaged area

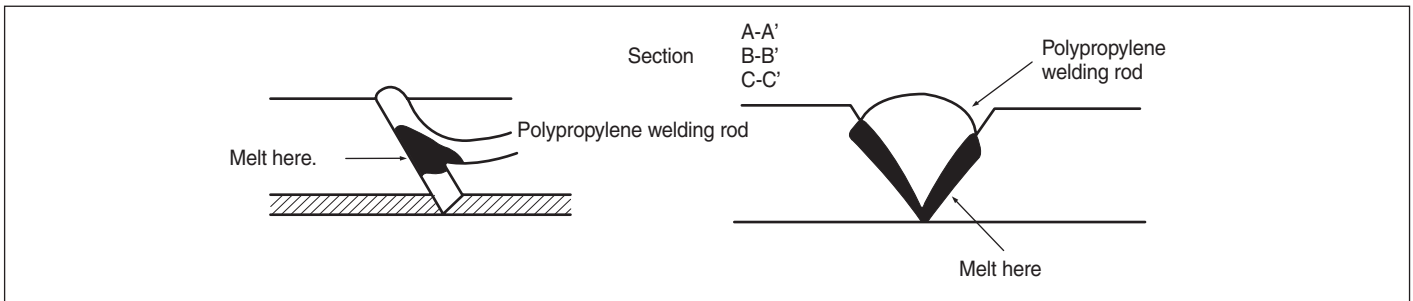
a) To repair cracked area, melt the area using a heat gun and attachment.



b) To repair a hole, remove oil from the damaged area and apply aluminum tape to the rear side of the damaged area.

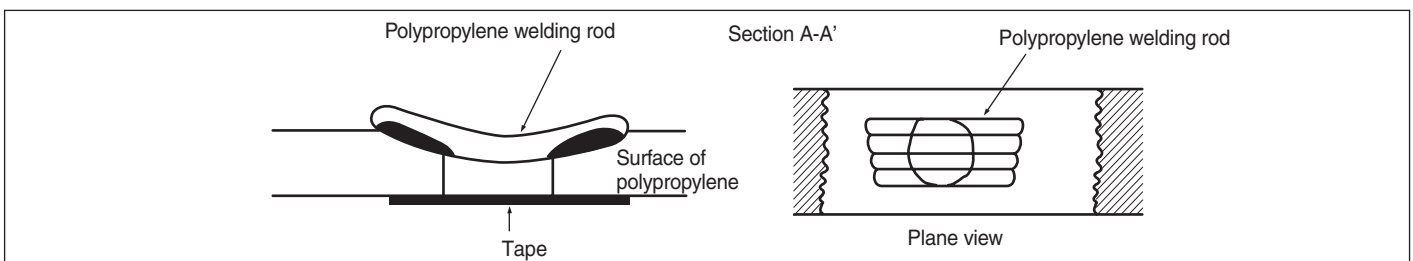


3. Melt polypropylene welding rod using a heat gun and fill in the cracked area.

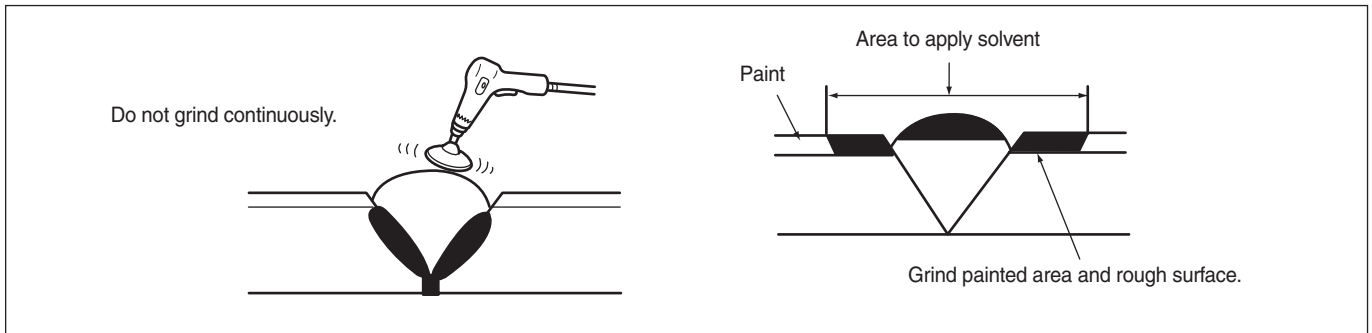


* Notice

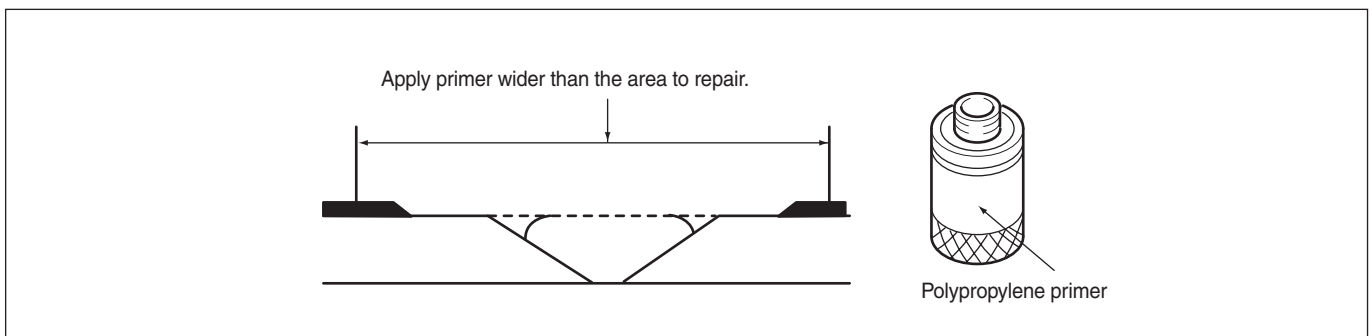
- Heat and melt the area indicated.
- Melt the welding rod carefully so that it does not over-melt. If the welding rod over-melts like jelly, the welding strength will deteriorate.
- Use the heat gun 0.4~0.8 in. (10~20 mm) away from the repair area to be welded.
- Welding rod should not move until the welded area is cooled.



4. Grind polypropylene surface carefully. It melts easily due to the heat generated by friction. If melted, remove that area. Also, grind the area where solvent is to be applied.



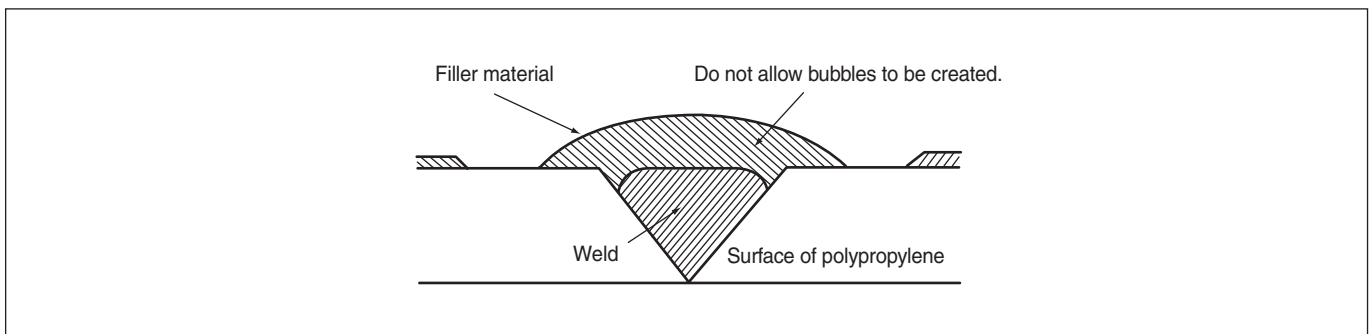
5. Apply polypropylene primer evenly with a brush over an area wider than the area to be repaired. Dry it at 20°C(68°F) for more than 10 minutes.



6. Mix main filler material and hardener at a ratio depending on paint specifications. Mix filler material and apply over the damaged area.

*** Notice**

- Mix main filler material and hardener so that no bubbles are made.
- Work immediately after mixing filler material because the filler material hardens quickly (in about 5 minutes).
- Dry it at 20°C(68°F) for about 30 minutes before sanding.



- Filler material consists of two types of epoxy. When the filler material hardens, you will have a desirable finish with flexibility like polypropylene.
- Use only filler material designed for use on polypropylene bumpers.

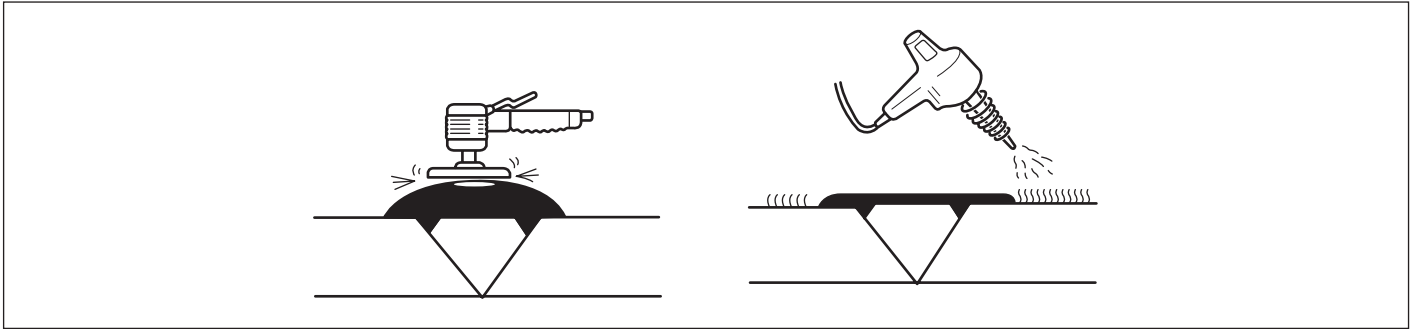
61-6 Plastic parts

7. Sand the damaged area with sandpaper using #180~#240 grit paper.

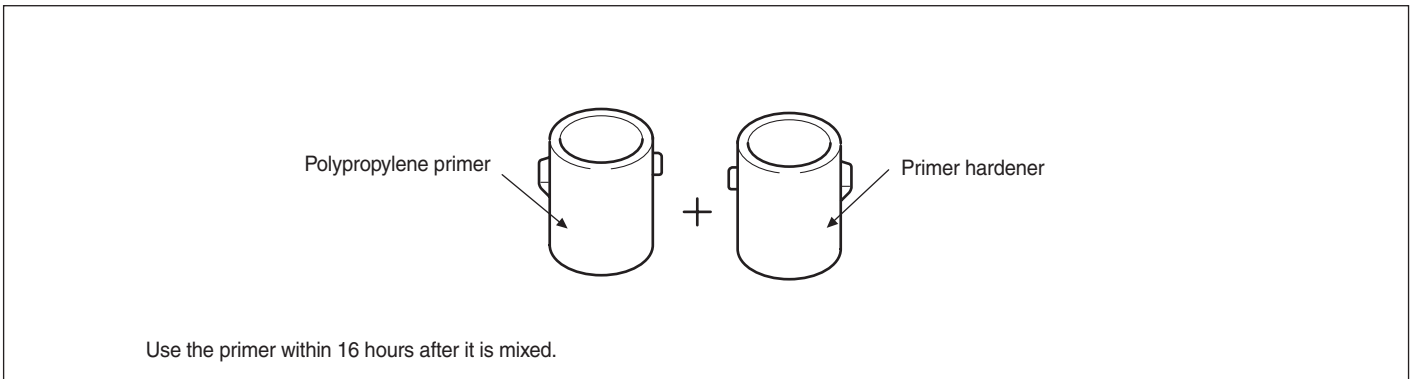
*** Notice**

- The surface will not be even if excessive force is applied during sanding.
- If there is fuzz in the damaged area, heat it a little bit with a heater gun and melt it.

8. Degrease the painted surface.



9. Mix polypropylene primer and hardener at a ratio depending on paint specifications. Spray polypropylene primer on the surface of the damaged area and the bumper.



10. Apply polypropylene primer.

*** Notice**

- Use only water to clean after applying polypropylene primer. Solvent, if used, will melt the primer.

11. Lightly sand the sprayed area using a primer surfacer, and finish the surface of the bumper with a sandpaper(#400~#600).

The polypropylene surface should not be exposed.(Either wet sanding or dry sanding is all right.)

12. Use agent(TCE(Tir Chloro Ethane) degreasing material) to remove any grease or oil, and wipe the finished surface of the bumper quickly with a clean cloth.

*** Notice**

- *The painting method for the polypropylene bumper is the same used to paint the urethane bumper.*
- *Therefore, use urethane primer only on urethane bumpers and polypropylene primer on polypropylene bumpers.*

14. Air dry at 20°C(68°F) for about 8 hours, or dry in 60°C(140°F) for about 2 hours.

(Since drying time varies according to the type of paint used, follow paint manufacturers directions for drying times.)

*** Notice**

- *Air dry if possible. Forced drying may create air bubbles on the top layer.*