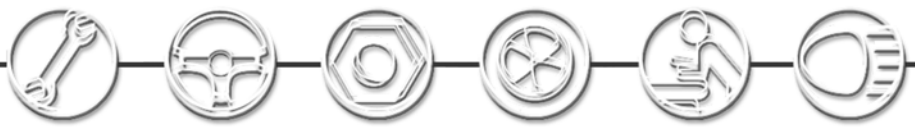
Great Wall

SERVICE MANUAL



VOLEEX C30

Great Wall Motor

FOREWORD

Warning: Following instructions must be strictly observed to avoid personal injury and/or property damage:

This maintenance manual is provided by Great Wall Motor Company Limited and prepared for qualified specialized technical personnel. The repair or maintenance by the person without proper training or without proper tools and devices may lead to the injury the maintenance personnel or other person and damage of vehicle or disability of vehicle.

The correct vehicle maintenance and repair is critical to the personal safety of maintenance personnel and the safe and reliable operation of all motor vehicles. When replacing the parts, please use same part number or the part number appointed by Great Wall Motor Company Limited. It is not allowable to use the replacement parts not approved by Great Wall Motor Company Limited.

The maintenance procedures recommended or described in this manual are of effective repair and maintenance methods, among which some procedures require to use specially designed tools.

Therefore, it is necessary to confirm that they will do harm to personal safety or safe operation of vehicle before using the replacement parts, maintenance procedures or tools not recommended or approved by Great Wall Motor Company Limited.

The “Warning” and “Precautions” in this manual must be strictly observed so as to minimize the risk of injury during repair or maintenance. Improper maintenance and repair may damage the vehicle or lead to potential safety hazard of vehicle. These “Warning” and “Precautions” are not exhaustive. It is impossible for Great Wall Motor Company Limited to provide warnings for all potential risk results from infringement to these instructions.

This manual includes the maintenance procedures for the vehicle equipped with air bags. According the precautions, refer to the airbag component and circuit position figure before maintenance for air bag components or circuit or surroundings. The infringement to these requirements may lead to expansion of air bag, personal injury or unnecessary maintenance of air bag.

To avoid the accident expansion of air bag and personal injury, if the air bag and other vehicle system require to be repaired, it is commended to firstly repair the airbag and then other system.

Although we took great effort to prepare this manual, it can not be guaranteed that all contents in this manual are quite correct. Due to continuous updating of models, we can not guarantee timely delivering you the latest information. The user must not bring forward any unreasonable requirements to Great Wall Motor Company Limited for this manual. For the loss resulted from usage of this manual, we will not assume any liability. Due to the limit ability of editor, there are unavoidable defects and errors in this manual and we are sincerely appreciate the comments and advices from the reader.

Great Wall Motor Company Limited reserves the final interpretation right of this manual.

Editor

May in 2010

CONTENT

GENERAL
MAINTENANCE SPECIFICATION
ENGINE ACCESSORIES
TRANSMISSION
DRIVE SYSTEM
SUSPENSION SYSTEM
STEERING SYSTEM
BRAKE SYSTEM
AIR CONDITIONING SYSTEM
AUXILIARY SAFETY SYSTEM
VEHICLE BODY
INTERIOR
EXTERIOR
ELECTRIC CIRCUIT DIAGRAM

GENERAL

INTRODUCTION2

INTRODUCTION 2
IDENTIFICATION INFORMATION 3

SERVICE INSTRUCTIONS 4

ATTENTIONS 4
VEHICLE LIFTING AND SUPPORTING POSITIONS 14
CIRCUIT INSPECTION 16

INTRODUCTION

INTRODUCTION

For your reference, the chapter/section names and main headings are listed at upper part of each page.

The precautions for all related maintenance operation in the chapter are described at the beginning of each chapter.

Please read these precautions before maintenance operation.

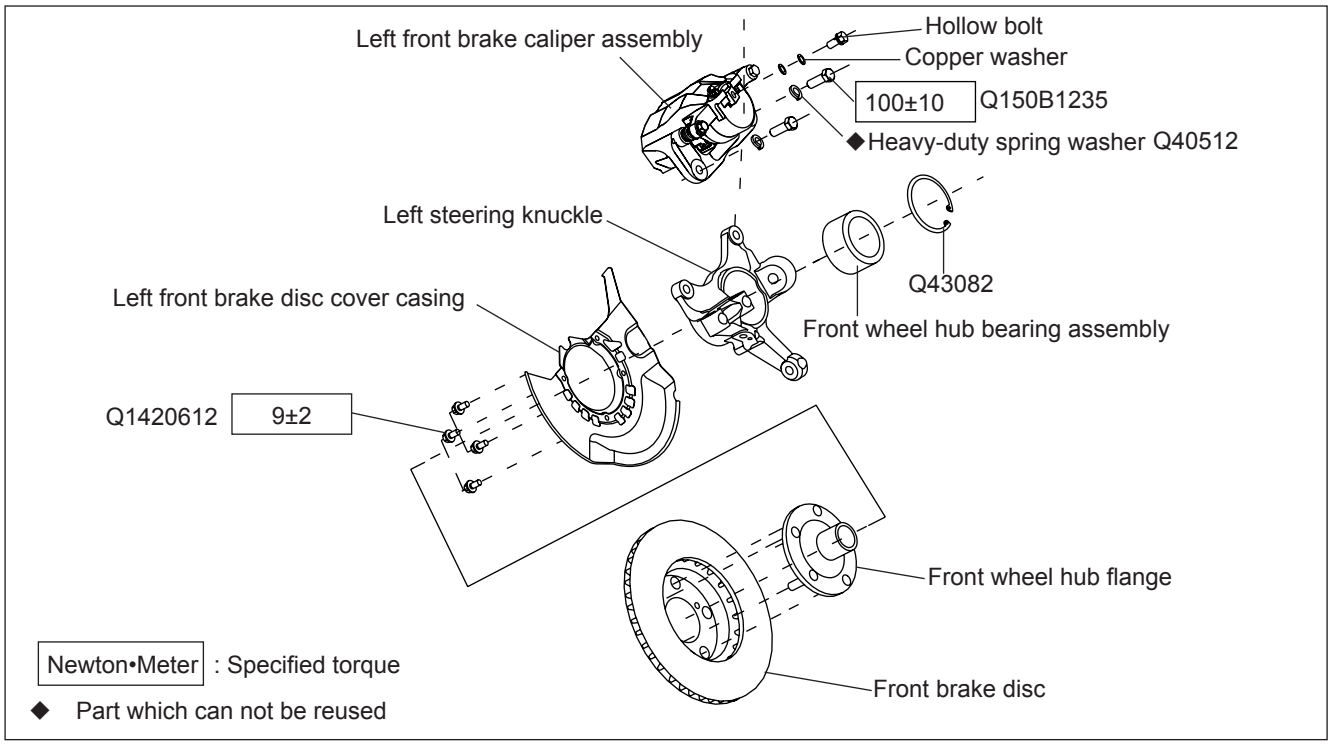
The failure diagnosis table of each system can help you diagnose the failure of system and find out the causes.

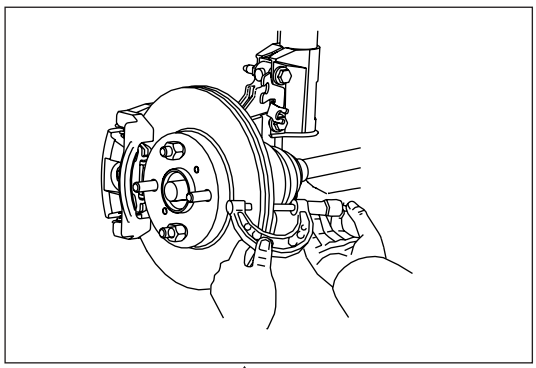
The repair methods for possible causes are listed in the column of repair methods so that you can quickly get the solution.

Maintenance Procedures

The most repair operations can begin be referring to the illustrations. There illustration can help you identify the parts and get aware of their mutual relationships.

For example:





Illumination: what to do and where to be done

The repair steps are described in form of stage by stage:

1. **The illumination shows what to do and where to be done.**
2. **The heading of repair work indicates what you are to do.**
3. **The detail descriptions tell you how to finish the repair works and introduces other items such as specs and warning.**

For example: Work heading: what to do

4. **Check front brake disc thickness.** Specs
   Standard thickness: 22.0mm
   Minimum thickness: 20.0mm
   When the thickness is less than minimum thickness, replace the brake disc.

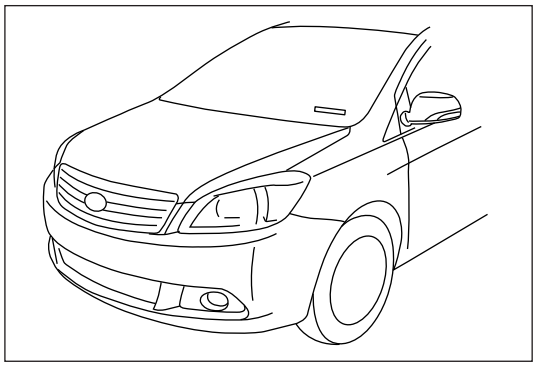
Detail description: how to do

Specs

The related specs for each repair step is indicated with bold face in the whole manual so that it is not needed to pause the repair work to find the specs.
This format can help skilled technical personnel quickly find out the cause of failure. The inspection/repair personnel can browse the work headings and refer to the detailed instruction below only if necessary. The important specs and warnings are indicated with black face.

Terms Definition

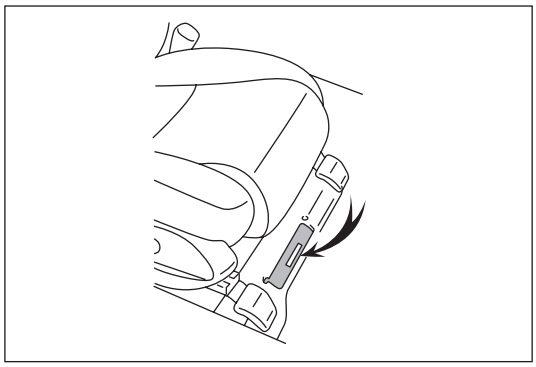
Warning	The warning is in black face, indicating the injury potentiality to people.
Notice	The notice is in black face, indicating the rick of damaging the part under repaired.
Remark	The remark is independent from the description, but not in black face. It is mainly used for some additional description to enhance the operation efficiency.

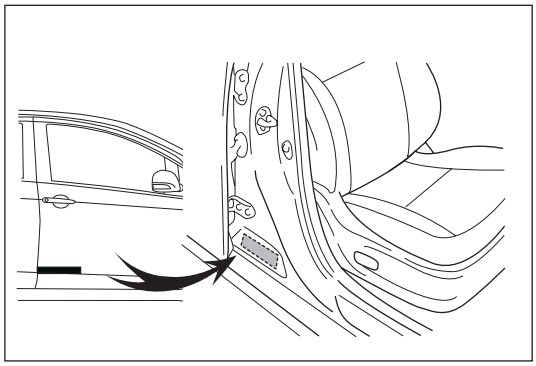


IDENTIFICATION INFORMATION

Vehicle Identification Mark (VIN Number)

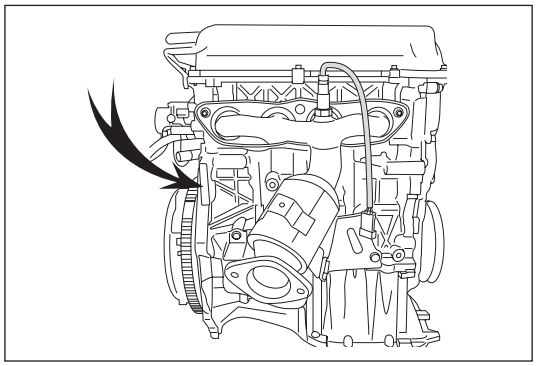
The VIN number is the unique 17-digital code to identify the vehicle. This code is located at three different positions: left upper part of instrument panel, front passenger seat seat cross beam and vehicle nameplate.





Vehicle Nameplate

The vehicle nameplate is at the bottom of right side B post.



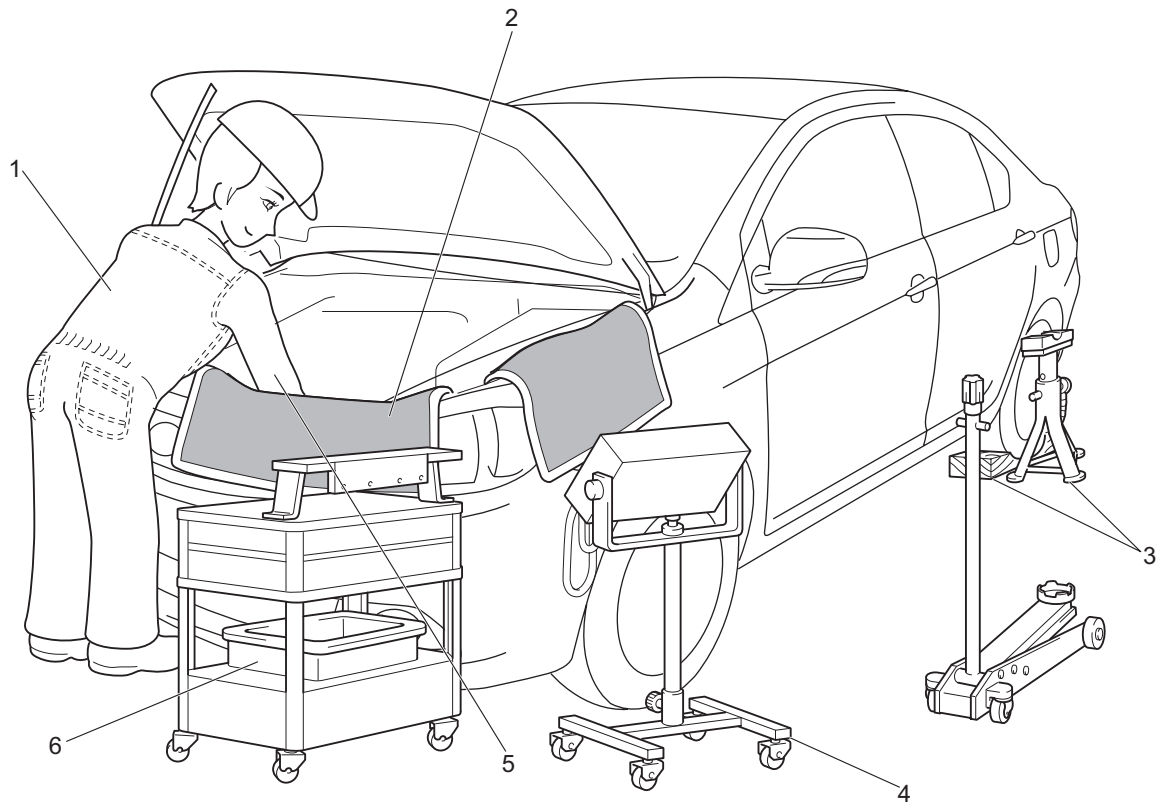
Engine Production Number

The engine production number is inscribed at left side of engine cylinder block.

SERVICE INSTRUCTIONS

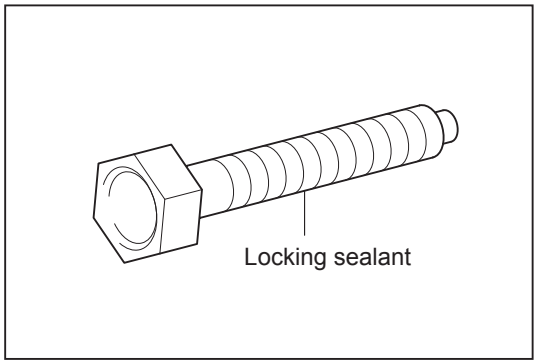
ATTENTIONS

Operation Tips



1	**Clothing**	Be sure to wear clean work clothes. Be sure to wear hat and safety shoes
2	**Vehicle protection**	Before starting operation, get radiator grille cover, fender guard, seat shield and floor mat ready.
3	**Safe operation**	When two or more persons are working together, they must check each other's safety. When you have to operate with engine running, note that your workshop must be ventilated. When servicing hot, rotating, moving or vibrating parts, be careful not to be burned or injured. When jacking up your vehicle, be sure to support specified points with safety stands. When lifting your vehicle, use safety equipment.
4	**Preparation of tools and measuring instruments**	Before starting operation, get tool stand, SST, meters, engine oil, cotton silk cloth and replacement parts ready.
5	**Removal and installation, disassembly and assembly operations**	Diagnose and perform effective operations after you have fully understood the symptoms. Before removing a part, check general condition of its assembly to identify whether deformation or damage has occurred. When reassembling a part of complex construction, keep records or make assembly marks properly to avoid mistake. If necessary, clean assemble parts and then resemble them after a thorough inspection.

6	**Removed parts**	Place removed parts in the correct order to prevent them from being confused or fouled. As for non-reusable parts such as gaskets, O-rings and self-locking nuts, replace them with new ones in accordance with the instructions in this manual. If necessary, sort out replaced parts and keep them for customer inspection.



Basic Operations:

1. **Jacking up and supporting your vehicle**
   When jacking up and supporting your vehicle, ensure the work is done at correct positions.
2. **Precoated parts**
   (a) Precoated parts refer to the parts coated with locking sealant in the factory (e.g. bolts and nuts).
   (b) If a precoated part has been retightened, loosened or moved in any way, it must be recoated with the specified locking sealant.
   (c) When a precoated part is to be reused, be sure to remove old locking sealant and blow dry the part with compressed air. Then apply corresponding new locking sealant to the bolt, nut, etc.
   Note:
   - **Tighten within the torque tolerance lower limit.**

   (d) After locking sealant application, you may need to settle the sealant for a specified time until it cures.
4. **Gaskets**
   When necessary, coat gaskets with locking sealant to prevent leakage.
5. **Bolts, nuts and screws**
   Strictly observe all tightening torque related maintenance specifications. Be sure to use torque wrenches.
6. **Fuses**
   When replacing a fuse, ensure correct amperage rating of the new fuse as replacement. It is forbidden to use a fuse of higher or lower amperage rating.

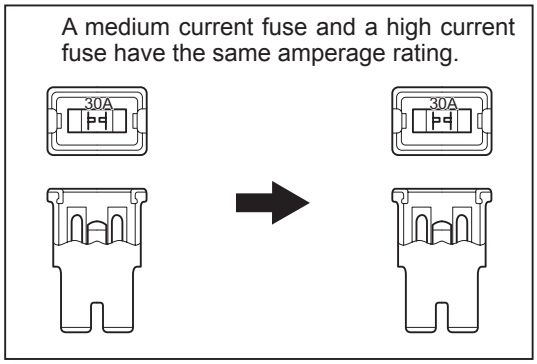
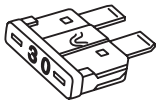
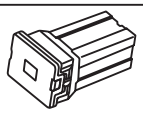
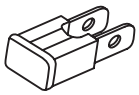


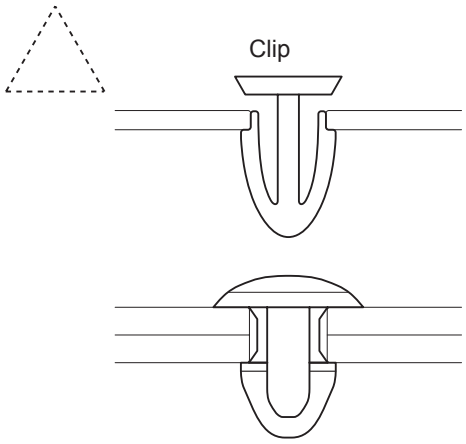
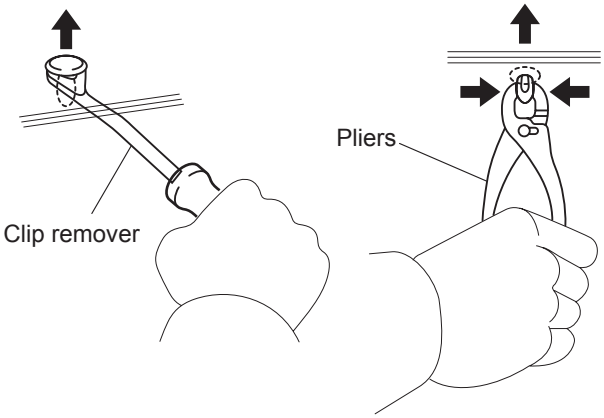
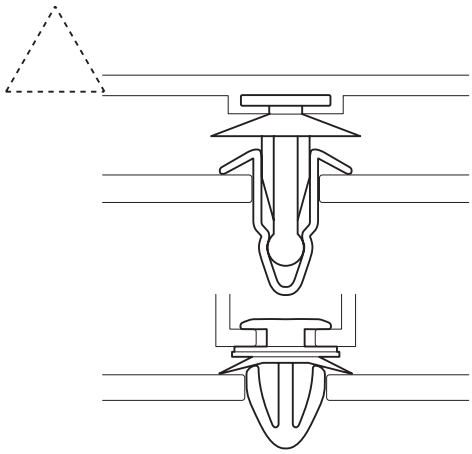
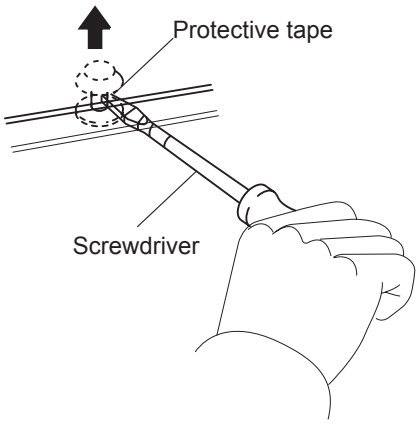
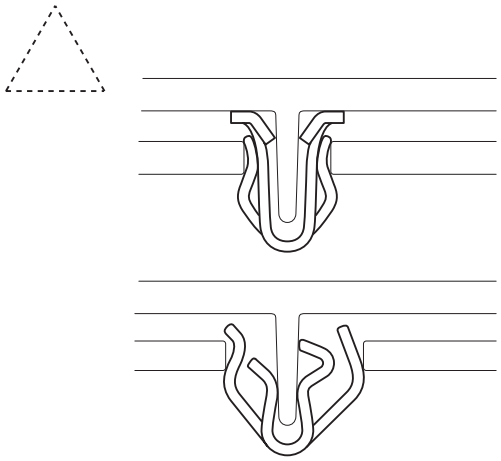
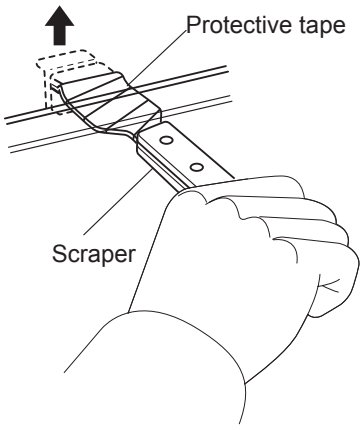
Figure	Symbol	Part name	Abbreviation
		Fuse	FUSE
		Medium current fuse	M-FUSE
		High current fuse	H-FUSE

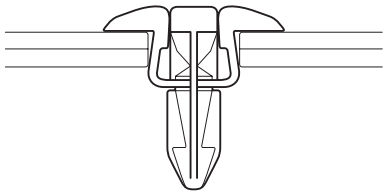
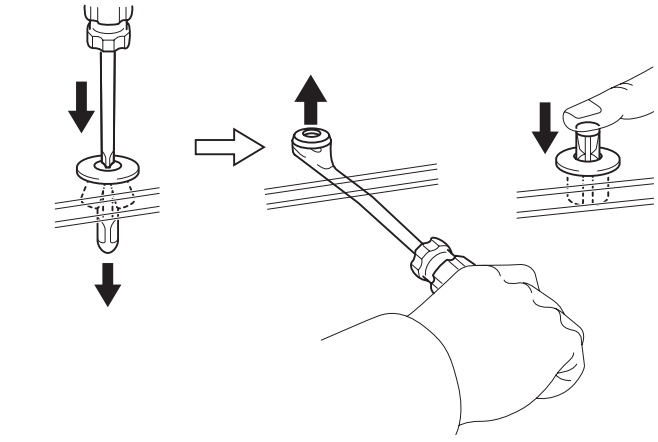
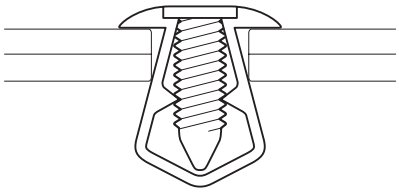
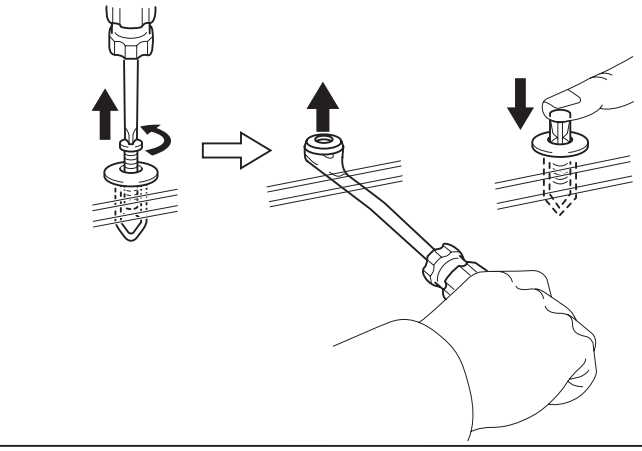
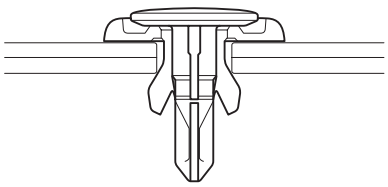
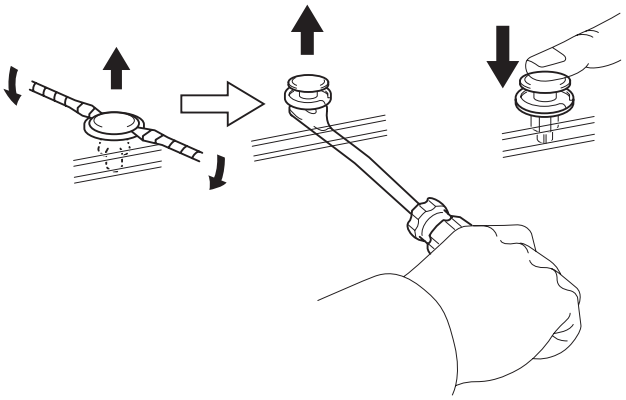
7. Clips

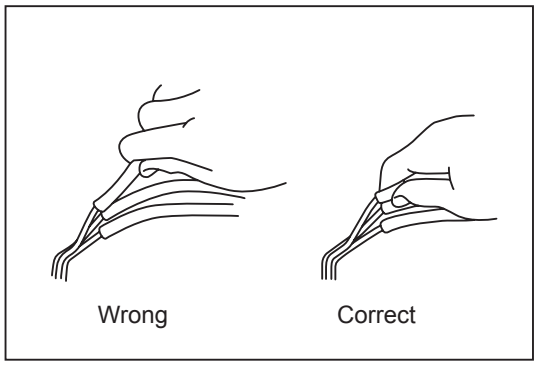
The methods for installation and removal of the typical clips used on body parts are illustrated in the table below.

Tip:

If a clip is damaged during operation, be sure to replace it with a new one.

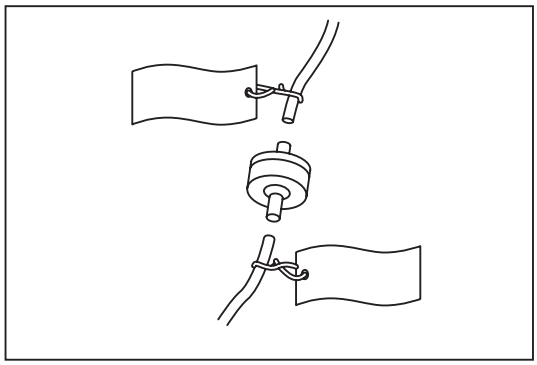
Shape (example)	Removal/installation
	
	
	

Shape (example)	Removal/installation
	Remove Install 
	Remove Install 
	Remove Install 



8. Vacuum hose removal and installation

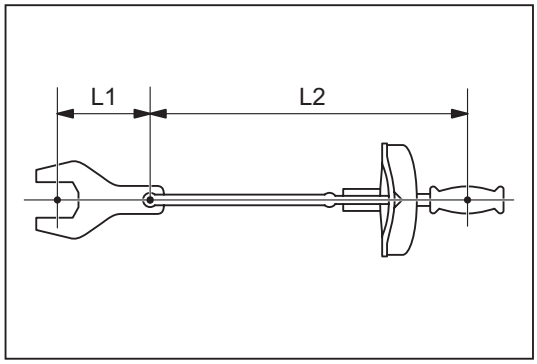
(a) To disconnect the vacuum hose, pull its end instead of middle.



(b) When disconnecting the vacuum hose, label it for reconnection.

(c) After finishing the work, check the vacuum hose carefully for proper connection. The label under the engine hood label shows the correct connection.

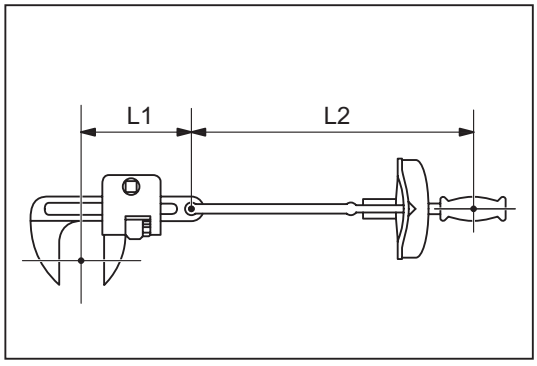
(d) When using a vacuum gauge, do not insert the hose onto an oversized connector forcedly. Instead, adjust by using a reducing adapter. It may result to air leak if the hose is stretched.



9. Torques applied when a torque wrench is used in conjunction with an extension tool

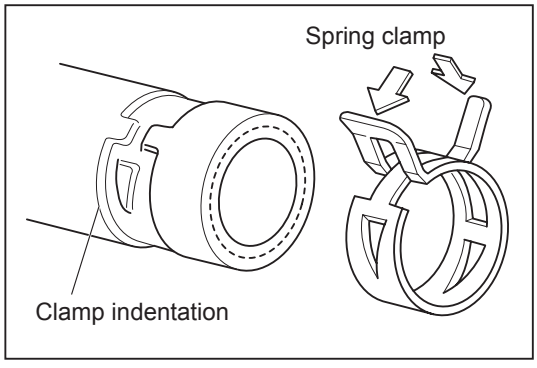
(a) When a SST or extension tool is used in conjunction with a torque wrench in order to extend the entire length, the actual torque will be excessive if the tightening is made until the reading on the torque wrench reaches the specified torque.

(b) This manual only describes the specified torques. In case a SST or extension tool is used, follow the formula below to calculate the reading of the torque wrench.



(c) Formula T' = T × L2/(L1 + L2)

T'	Reading of torque wrench N•m
T	Torque N•m
L1	Length of SST or extension tool (cm)
L2	Length of torque wrench (cm)



10. Hose clamping

(a) Before removing a hose, check position of its clamp in order to return the clamp to the same location later.

(b) Replace any deformed or dented clamp with a new one.

(c) If the hose is to be reused, secure the clamp to the indentation where the old clamp was.

(d) After installing a spring clamp, you can take up it by lightly pulling the spring plate in the direction of the arrow.

For Vehicles Equipped with "Air Bag"(SRS) and "Seat Belt Pre-Tensioner"

Remark:

This vehicle is equipped with "air bag" (SRS) and "seat belt pre-tensioner".

The incorrect order of maintenance operation may cause SRS air bag to deploy accidentally during maintenance, which resulting in serious accident.

In addition, SRS malfunction may result from mistakes made during maintenance of the unit.

Before starting maintenance (including removal or installation and inspection or replacement of parts), please read the following precautions carefully and then follow the correct procedures described in this manual to conduct maintenance.

1. General attentions

(a) When the safety system indicator light indicates a malfunction, you can diagnose using the diagnostic tester (X431). Keep the battery connected during diagnosis; otherwise the diagnostic tester can not work. When removing and installing the air bag, clock spring, air bag ECU and front passenger side air bag, be sure to take out the key or disconnect the battery.

(b) To avoid serious injury, you can not start to service the SRS until 90 seconds have passed after the following conditions had been met:

- The ignition switch is shifted to "LOCK" position.
- The battery negative (-) terminal cable is disconnected.
- (The SRS is equipped with a reserve power supply, so it may deploy if you start to work in 90 seconds after the battery negative (-) terminal cable is disconnected.) Disconnecting the battery negative (-) terminal cable will clear clock memory and audio system presetting.
- Before disconnecting the cable, if necessary, you can record data as needed. To avoid clearing memory setting, never use the reserve power supply.

(c) In the case of a minor collision which does not deploy the SRS, you should check the driver side air bag assembly, front passenger side air bag assembly and seat belt pre-tensioner before reusing your vehicle.

(d) Never use the SRS parts on other vehicles. When replacing SRS parts, use new ones.

(e) If you may touch the air bag ECU assembly during maintenance, remove it before starting any maintenance job.

(f) Never disassemble and service the air bag ECU assembly, driver side air bag assembly, and front passenger side air bag assembly or seat belt pre-tensioner.

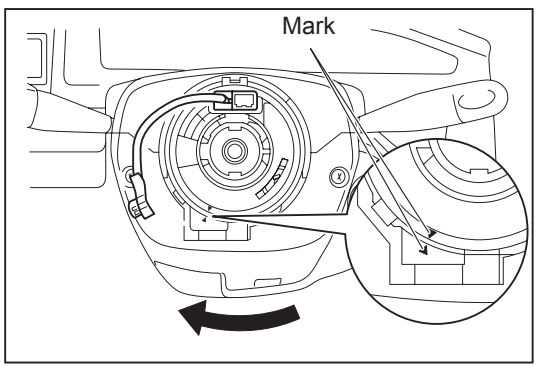
(g) If either of the following situations occurs, replace the air bag ECU assembly, driver side air bag assembly or front passenger side air bag assembly: 1) damage caused by dropping; 2) fracture, dent or other defects on any shell, bracket or connector.

(h) It is strictly forbidden to expose the air bag ECU assembly, driver side air bag assembly, front passenger side air bag assembly or seat belt pre-tensioner directly to hot air or flame.

(i) It is strictly forbidden to measure the driver side air bag assembly and front passenger side air bag assembly with a multimeter; otherwise air bag may deploy to result in injury.

(j) An information label is affixed to each SRS component. You should follow the instructions in the precautions.

(k) After finishing working on the SRS, check the SRS warning light.



2. Clock spring

The steering wheel must be installed onto the steering column properly with the clock spring at the middle position. Otherwise cable disconnection and other malfunctions may take place.

3. Driver side air bag assembly (with air bag)

(a) When removing the driver side air bag assembly or handling a new electric horn button, place it with the upper surface of its cover up (refer to the figure below).
Serious accident may result from accidental inflation of the air bag if it is placed with its cover surface down. In addition, do not put any thing on the top of the electric horn button.

(b) Never measure the resistance of the air bag igniter; otherwise the air bag may inflate and result in serious injury.

(c) It is strictly forbidden to apply any type of grease or detergent to the steering wheel cover.

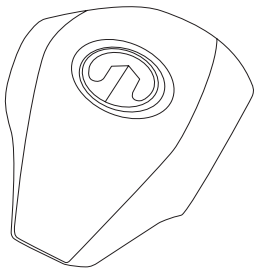
(d) Store the driver side air bag assembly at a place where is clear of electrical noise interference with ambient temperature below 93°C and humidity moderate.

(e) When perform electric welding on any part of the vehicle, be sure to disconnect the air bag ECU connectors. These connectors have built-in shorted spring which can reduce the possibility of deployment of air bag or seat belt pre-tensioner caused by current entering igniter wire.

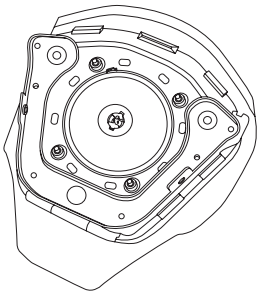
(f) When discarding the vehicle or only discarding the driver side air bag assembly, inflate the air bag using the SST before such disposal. Please perform this operation at a safe place where is clear of electrical noise interference.

For example:

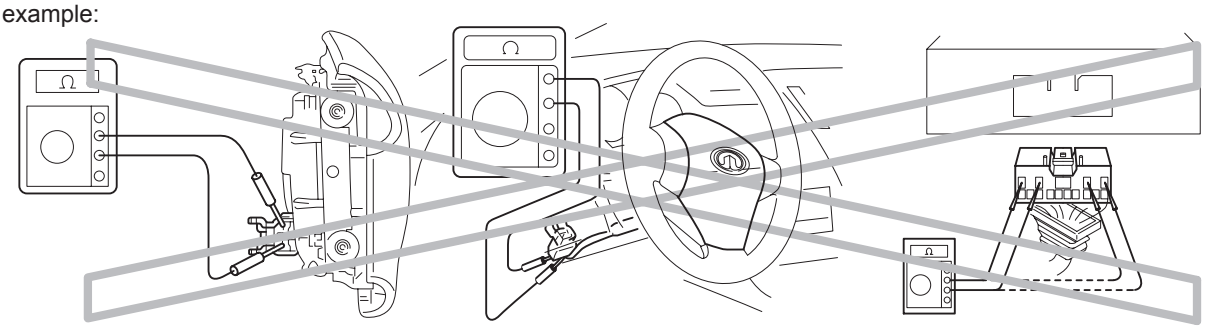
Correct



Wrong



For example:



4. Front passenger side air bag assembly

(a) When placing a removed or new front passenger side air bag assembly, be sure to keep its deployment direction up. If the deployment direction is left down when you place the air bag assembly, serious accident may result once the air bag is inflated.

(b) Never measure the resistance of the air bag igniter; otherwise the air bag may inflate thus resulting in serious injury.

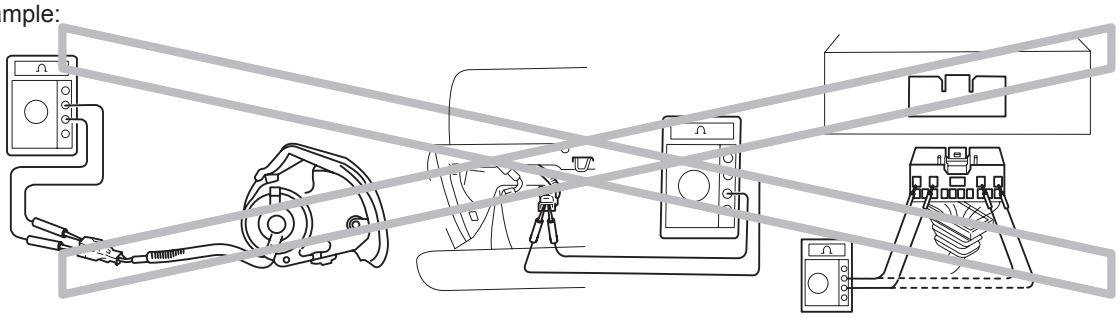
(c) It is strictly forbidden to apply any type of grease or detergent to the front passenger side air bag assembly.

(e) Store the air bag assembly at a place where is clear of electrical noise interference with ambient temperature below 93°C and humidity moderate.

(f) When perform electric welding on any part of the vehicle, be sure to disconnect the air bag ECU connectors.
These connectors have built-in shorted spring which can reduce the possibility of deployment of air bag or seat belt pre-tensioner caused by current entering igniter wire.

(g) When discarding the vehicle or only discarding the air bag assembly, deploy the air bag using the SST before such disposal. Activate the air bag at a place where is clear of electrical noise interference.

For example:



5. Seat belt pre-tensioner

(a) Never measure resistance of the seat belt pre-tensioner. This may activate the seat belt pre-tensioner thus resulting in serious personal injury.

(b) Never disassemble the seat belt pre-tensioner.

(c) Never install the seat belt pre-tensioner onto other vehicles.

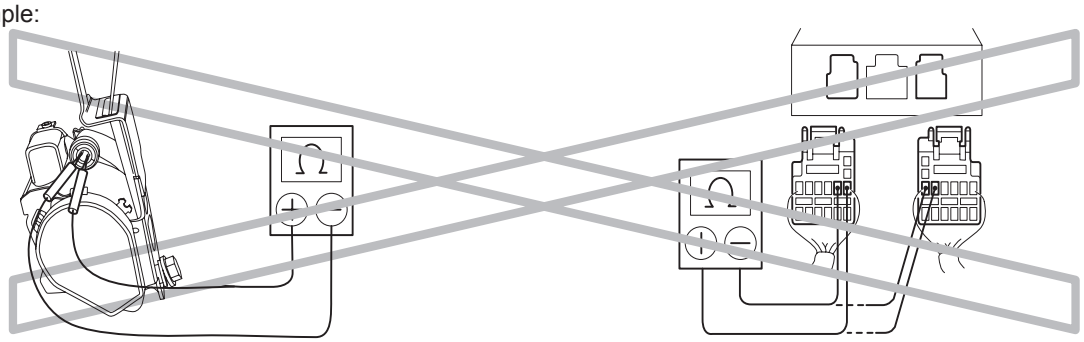
(d) Store the seat belt pre-tensioner at a place where is clear of electrical noise interference with ambient temperature below 80°C and humidity moderate.

(e) When perform electric welding on any part of the vehicle, be sure to disconnect the air bag ECU connectors.
These connectors have built-in shorted spring which can reduce the possibility of deployment of air bag or seat belt pre-tensioner caused by current entering igniter wire.

(f) As a safety measure, be sure to activate the seat belt pre-tensioner before discarding it. Activate the pre-tensioner at a place where is clear of electrical noise interference. (The seat belt pre-tensioner will become hot after being activated. Cool it down before discarding it. Never cool the seat belt pre-tensioner with water.)

(g) It is strictly forbidden to put oil or water on the front seat outer belt or clean the belt with any type of detergent.

For example:



6. Air bag ECU assembly

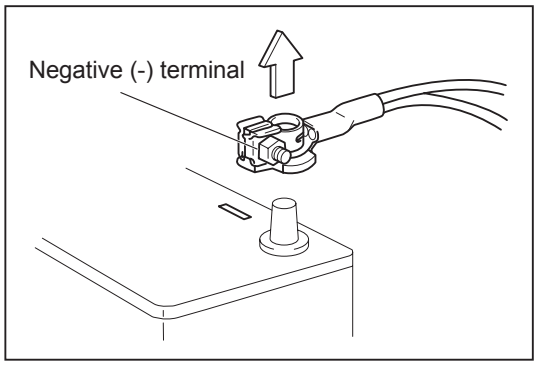
(a) If the SRS has ever been deployed during a crash, never reuse the air bag ECU assembly.

(b) When connecting or disconnecting connectors of the air bag ECU assembly, put the ECU on the floor. Failure to do so may cause the SRS to deploy accidentally.

(c) To avoid serious injury, you can not start to service the SRS until 90 seconds have passed after the following conditions had been met:
- The ignition switch is shifted to “LOCK” position.
- The battery negative (-) terminal cable is disconnected.

7. Harnesses and connectors

The SRS harness has been incorporated with the instrument panel harness assembly. All connectors in the system are in the standard color (yellow). In the case of SRS harness disconnection or connector fracture, service or replace.



Electronic Control

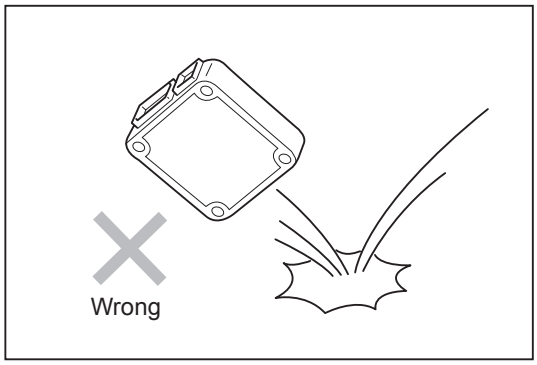
1. Battery terminal removal and installation

(a) Before starting any electrical work, disconnect the battery negative (-) terminal cable to prevent it from being shorted and blown.

(b) When disconnecting and installing a terminal cable, turn off ignition switch and lighting switch, and then loosen the terminal nut completely. When performing these operations, do not twist or pry the terminal.

(c) When a battery terminal cable is removed, all memory data (clock, CD player, DTC, etc.) will be cleared. Before removing the cable, note down settings of memory systems.

(d) When the battery negative (-) terminal cable is disconnected, memory of all systems will be cleared. Refer to pre-inspections of these systems to confirm if the systems require initialization after the battery negative (-) terminal cable is disconnected. If necessary, they must be initialized.



2. Disposal of electronic parts

(a) Do not open the ECU cover or shell, unless absolutely necessary.
(If you touch any IC terminal, the IC may get out of order due to static electricity.)

(b) When disconnecting an electronic connector, pull out the connector itself instead of its harness.

(c) Be careful not to drop electronic components such as a sensor or relay. If they have ever dropped onto a hard floor, replace them and never use them again.

(d) When cleaning your engine with steam, prevent water from entering electronic components, air cleaner and emission related components.

(e) It is forbidden to remove or install any temperature switch or sensor with an impact wrench.

(f) When checking continuity at a harness connector, be careful when inserting the tester probe so as to prevent terminal bending.

Fuel Control Parts Removal and Installation

1. Place for removal and installation of fuel system parts

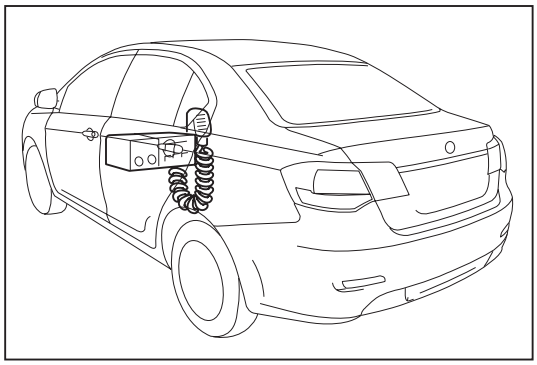
(a) Select a place where is well ventilated and free of any ignition source such as a welder, grinder, drill, motor or stove for your operation.

(b) Never operate in or near a tunnel as vaporized fuel will gather there.

2. Removing and installing fuel system parts

(a) Please get a fire extinguisher ready before starting operation.

(b) To prevent static electricity, install an earth cord on your vehicle and fuel tank. In addition, water spray is forbidden in these areas; otherwise the operation surfaces will be slippery. It is strictly forbidden to clear gasoline spill with water; otherwise gasoline diffusion may result and a fire may be caused.
(c) Never use motor or working light like electrical equipment as they may produce sparks or heat.
(d) Never use iron hammers as they may produce sparks.
(e) Clean up fuel-stained cotton silk cloth in a flame-proof container separately.



For Vehicles Equipped with Mobile Communication System

1. The antenna should be installed to a place where is as far away as possible from the vehicle electronic system ECU and sensors.
2. The antenna feeder should be installed to a place where is at least 20 cm away from the vehicle electronic system ECU and sensors. For more information of locations of the ECU and sensors, please refer to the sections related to corresponding components.
3. Keep the antenna feeder as far away as possible from other harnesses. This can prevent the mutual interference between the signals from the communication equipment and the vehicle equipment.
4. Check that the antenna and the feeder have been adjusted properly.
5. Do not install any high-power mobile communication system.

For Vehicles Equipped With Catalytic Converter

Caution:

• In case a large amount of unburned gasoline or gasoline vapor enters the catalytic converter, excess temperature may result and a fire may be caused. To prevent this, you should follow the precautions below.

1. Use unleaded gasoline only.
2. Avoid extended engine idling.
3. Avoid arcing test.
(a) Perform arcing test only when absolutely necessary and the test should be completed as quickly as possible.
(b) During testing, never run your engine at high speed.
4. Avoid extended engine compression pressure measurement.
The measurement must be completed as quickly as possible.

VEHICLE LIFTING AND SUPPORTING POSITIONS

ATTENTIONS

1. Jacking up condition of vehicle

(a) Before jacking up your vehicle, be sure to keep it unladen. Never jack up/lift a vehicle with heavy load.

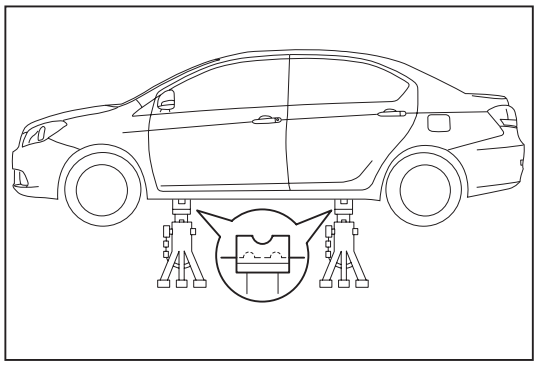
(b) When you remove a heavy facility such as the engine or transmission, the center of gravity of the vehicle may transfer. To stabilize the vehicle, you can either place a balance weight at the place where rolling and moving will not take place or use a transmission jack to fix the lift stand.

2. Using a 4-pole lift

(a) Follow the safety procedure described in the manual to operate.

(b) Take preventive actions to prevent free wheel beams from damaging tires or wheels.

(c) Please use wheel chocks to fix your vehicle.



3. Using jacks and safety stand

(a) When operating on a flat ground, please be sure to use wheel chocks.

(b) As shown in the figure, please use a safety stand with rubber attachment.

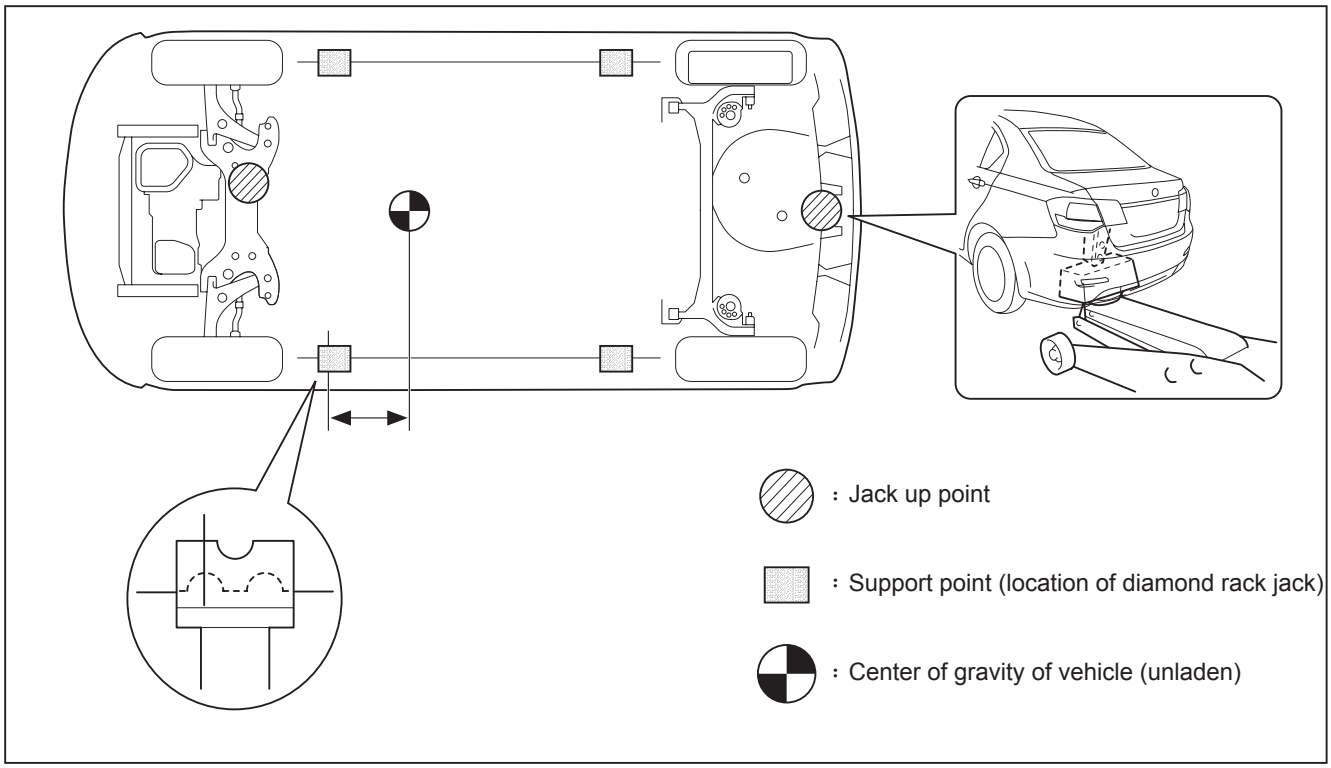
(c) Place the jacks and rigid support at the specified points under the vehicle accurately.

(d) When jacking up front wheels, release parking brake and place wheel chocks behind rear wheels only; when jacking up rear wheels, place wheel chocks ahead of front wheels only.

(e) It is strictly forbidden to use the jacks without a rigid support.

(f) When only front or rear wheels are jacked up, please apply wheel chocks to both sides of the wheels contacting the ground.

(g) When jacking down a vehicle with front wheels jacked up, release parking brake and place wheel chocks ahead of rear wheels only; when jacking down a vehicle with rear wheels jacked up, place wheel chocks behind front wheels only.



4. Using a rocker lift

(a) Follow the safety procedure described in the manual.
(b) As shown in the figure, please use a stand with rubber attachment.
(c) When using the lift, position it so that its center is as close as possible to the center of gravity of the vehicle.
(d) Place the vehicle on the stand as flatly as possible and then allow the stand channel to match the support point of the rigid support. Do not lift your vehicle excessively; otherwise it may become unstable.
(e) Please keep the rocker locked during operation.
(f) Lift the vehicle off the ground and ensure it is stationary by shaking it.

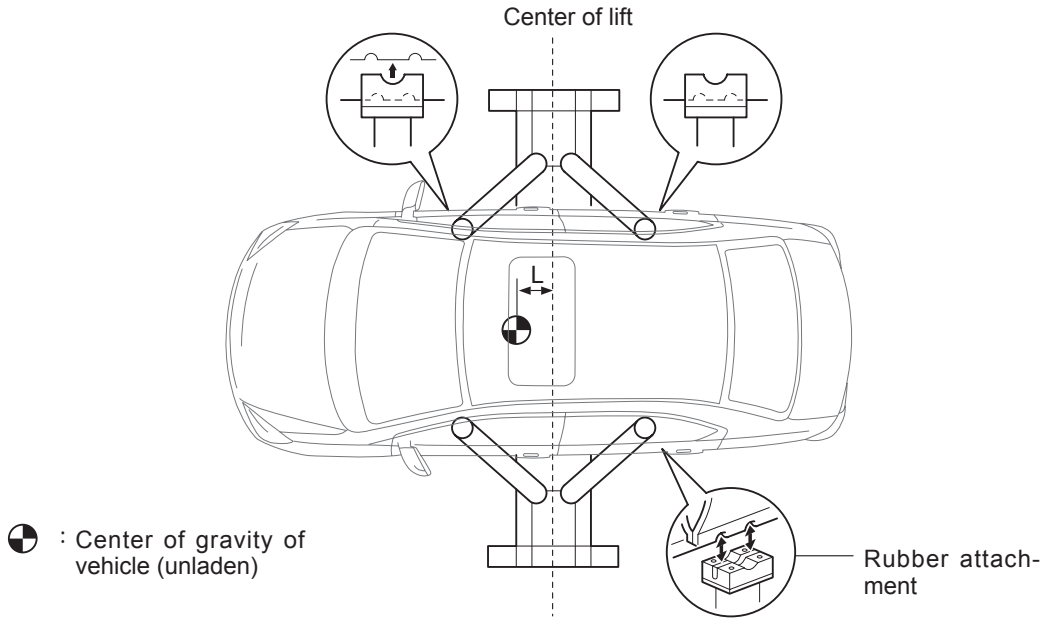
5. Using a board lift

(a) Follow the safety procedure described in the manual.
(b) Use board-on attachments.
(c) Refer to the following for how to set your vehicle properly.

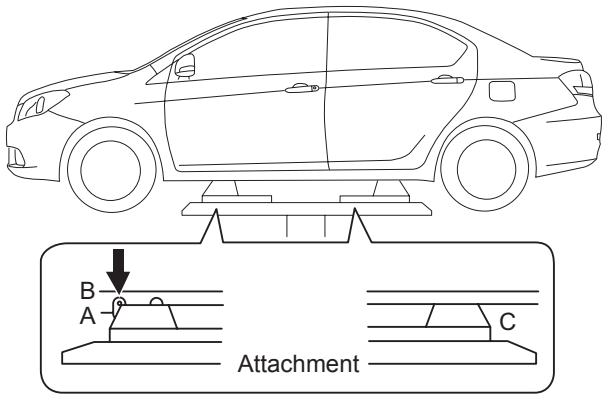
Left and right fixtures	Put your vehicle at middle of the lift.
Front and rear fixtures	Align rubber pad ends of the board with lower ends (A and C) of the attachments respectively. Align upper end (B) of the attachment with the groove on foreside of the door sill flange.

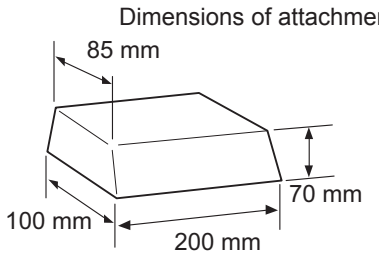
(d) Lift the vehicle off the ground and ensure it is stationary by shaking it.

Rocker lift



Board lift

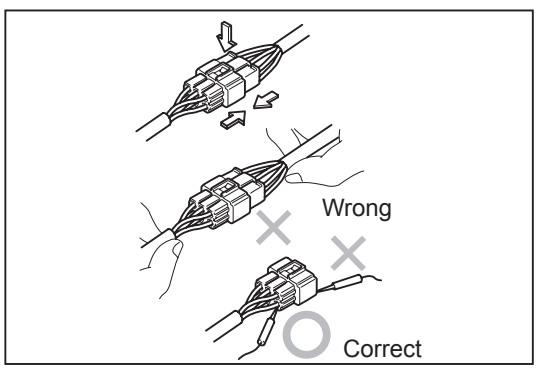




CIRCUIT INSPECTION

Basic Checks

1. **All the resistance should be measured at ambient temperature of20°C,otherwise mention.**
   In case of high temperature, for instance,when the vehicle is just starting up, the measured resistance may fail to meet the requirement. The measurement should be performed after the engine is complete cooling down.

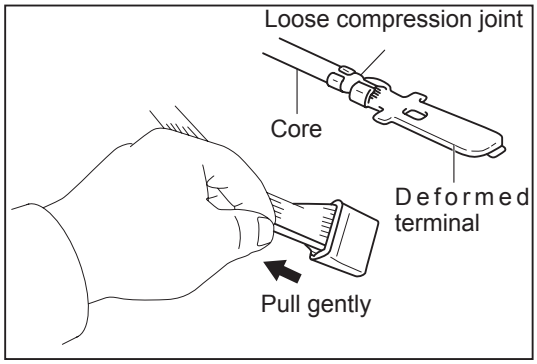


2. **Connector handling**
   (a) When disconnecting a connector, press mating parts of its two halves together first to unlock them, then depress the locking claw to separate the connector.
   (b) When disconnecting the connector, it is strictly forbidden to pull its harness hard. Instead, hold on the connector directly to separate it.
   (c) Before connecting the connector, check its terminals for deformation, damage, looseness or missing.
   (d) When connecting the connector, press it hard until the lock “clicks” to indicate lockup.

(e) If you need to check the connector using an electronic tester, do this from backside (harness side) using small test lead.

Note:

- **You should check a liquid tight connector by mean of sub-harness connection because it is impossible to check it from its backside.**
- **Do not move the inserted tester probe so as to avoid damage to the terminals.**



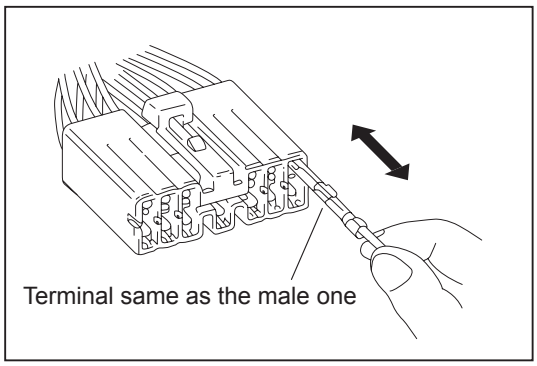
3. Connector check points

(a) Check when connecting the connector: Press it to make sure it has been fully inserted and locked.

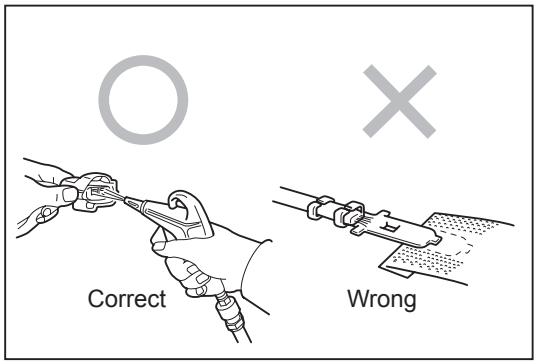
(b) Check after the connector is disconnected: Check by gently pulling the harness from the rear of the connector for loose or missing terminals, loose compression point, and broken wires.

Remark:

When testing a gold-plated female terminal, be sure to use a gold-plated male terminal.



(c) Check contact pressure of terminal: Prepare a standby male terminal. Insert it into a female terminal. Check for adequate tension when it is being inserted and after they are completely lapped.



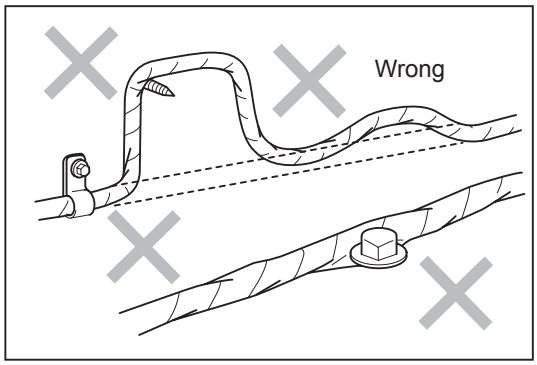
4. Connector terminal maintenance method

(a) If foreign materials are found on a terminal, clean its contact point using air pressure gun or cotton silk cloth. It is strictly forbidden to rub the contact point with sand paper; otherwise, cladding material will come off.

(b) In the case of abnormal contact pressure, replace the female terminal.

If the male terminal is gold-plated (golden yellow), use a gold-plated female terminal; if the male terminal is silver-plated (silver white), use a silver-plated female terminal.

(c) If a terminal is damaged, deformed or corroded, replace it. If a terminal can not lock up in its shell, the shell may require replacement.



5. Harness handling

(a) If a harness is to be removed, check it wiring and clamp position for easier reinstallation before starting operation.

(b) Never twist, pull or loosen the harness excessively.

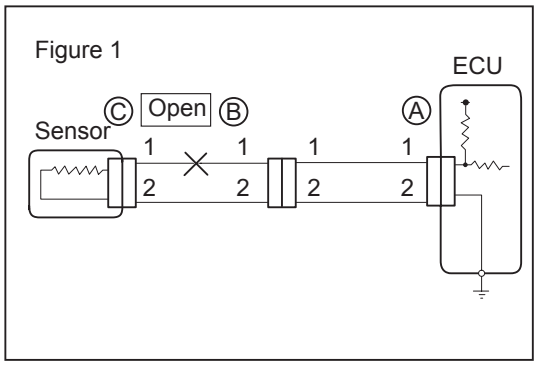
(c) Keep the harness clear of hot, rotating, moving, vibrating or sharp parts. Avoid panel edges, screw tips and similar sharp objects.

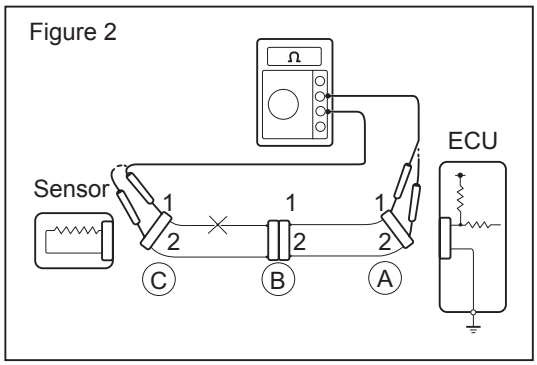
(d) When installing parts, never squeeze the harness.

(e) It is strictly forbidden to scratch or damage the harness jacket.
If its jacket is scratched or broken, replace the harness or repair using PVC insulating tape.

Checking for “open circuit”

1. Perform resistance check (step 2) or voltage check (step 3) to find open circuit in the harness in figure 1.





2. Check resistance.

(a) Disconnect connectors “A” and “C” and measure the resistance between them.

Resistance: ≤1Ω

Remark:

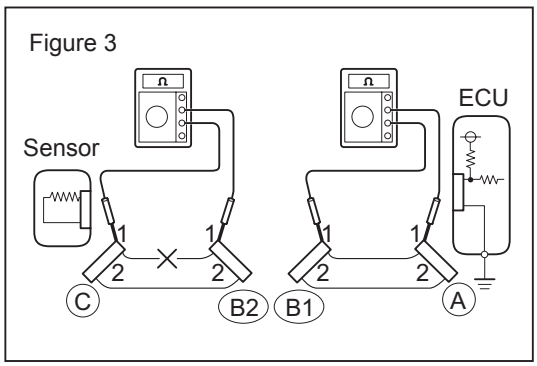
Measure the resistance while joggling the harness vertically and horizontally.

Figure 2:

Between terminal 1 of connector A and terminal 1 of connector C → ≥ 10kΩ

Between terminal 2 of connector A and terminal 2 of connector C → < 1Ω

Then open exists between terminal 1 of connector “A” and terminal 1 of connector “C”.



(b) Disconnect connector B and measure the resistance between connectors.

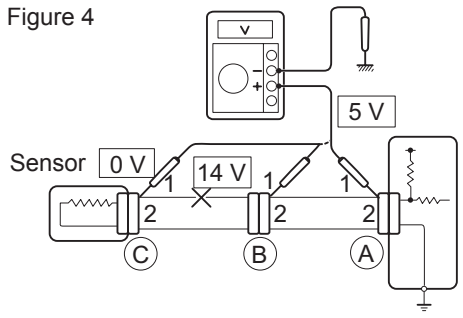
Figure 3:

Between terminal 1 of connector A and terminal 1 of connector B1 → < 1Ω

Between terminal 1 of connector “B2” and terminal 1 of connector “C” → ≥ 10kΩ

Then open exists between terminal 1 of connector “B2” and terminal 1 of connector “C”.

Figure 4



3. Check voltage.

(a) In a circuit where a voltage is applied to the ECU connector terminal, you can check for open by means of voltage check.

Figure 4:

With all connectors connected, measure the voltages between body ground and terminal 1 of connector “A”, terminal 1 of connector “B”, and terminal 1 of connector “C” at ECU 5V output terminal in turn.

(b) Results of the example:

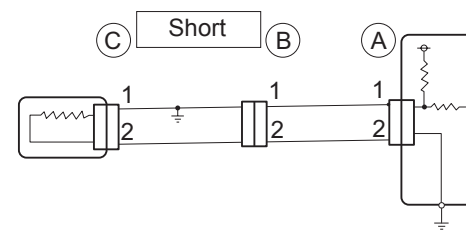
5V: Between terminal 1 of connector “A” and body ground

5V: Between terminal 1 of connector “B” and body ground

0V: Between terminal 1 of connector “C” and body ground

If the results conform to the above example, open exists in the harness between terminal 1 of connector “B” and terminal 1 of connector “C”.

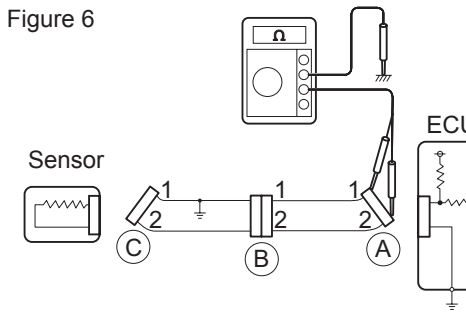
Figure 5



Checking A Circuit for “Shorts”

1. In the case of short to ground in a harness (figure 5), check resistance to body ground to find the shorts.

Figure 6



2. Check resistance to body ground.

(a) Disconnect connectors “A” and “C” and measure resistances to body ground of terminals 1 and 2 of connector “A” respectively.

Resistance: ≥ 10kΩ

Tip:

Measure the resistance while joggling the harness vertically and horizontally.

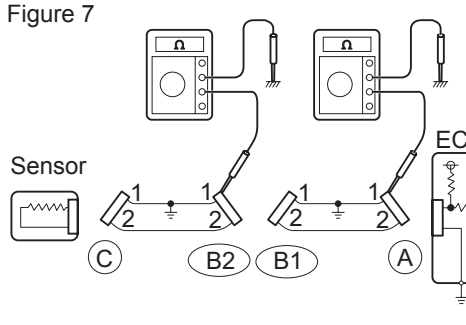
Results of the sample in figure 6:

Between terminal 1 of connector A and body ground → < 1Ω

Between terminal 2 of connector A and body ground → ≥ 10kΩ

Then short exists between terminal 1 of connector “A” and terminal 1 of connector “C”.

Figure 7



(b) Disconnect connector “B”, and measure the resistances between terminal 1 of connector “A”, terminal 1 of connector “B2” and body ground respectively.

Figure 7:

Between terminal 1 of connector “A” and body ground → ≥ 10kΩ

Between terminal 1 of connector “B2” and body ground → < 1Ω

Then short exists between terminal 1 of connector “B2” and terminal 1 of connector “C”.

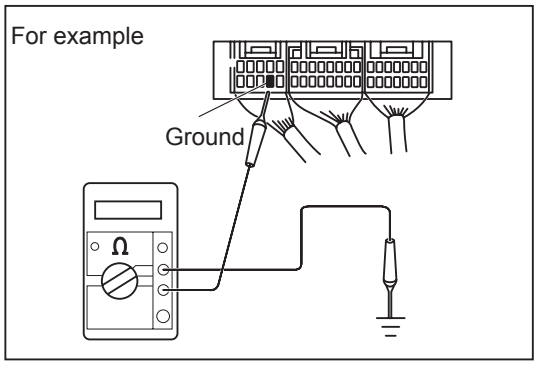
Checking and Replacing ECU

Note:

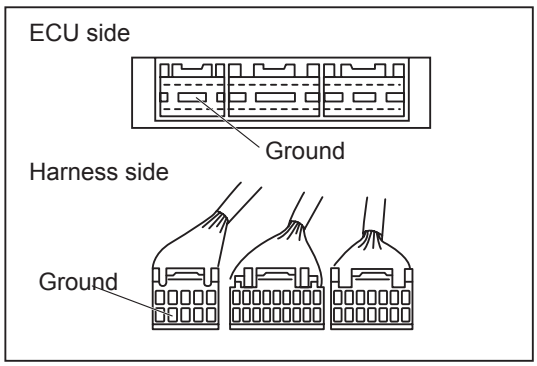
- **When connecting the connectors to the ECU, start checking from backside of the harness side connector.**
- **When measurement conditions are not specified, stop engine and turn ignition switch to ON position before starting the check.**
- **Check that connectors are fully in place. Check wires for looseness, corrosion or fracture.**

1. Check ECU ground circuit first. (If out of order, service.)

If OK, the ECU may be malfunctioning. Replace the original ECU with a normally operating one and then check if the symptom recurs.



(a) Measure the resistance between ECU ground terminal and body ground.
Resistance: ≤1Ω



(b) Disconnect ECU connectors. Check ground terminals (ECU side and harness side) for bending, corrosion or evidence of foreign material accumulation. Finally check contact pressure of female terminal.

MAINTENANCE SPECIFICATION

MAINTENANCE AND INSPECTION

GENERAL MAINTENANCE OUTSIDE THE VEHICLE.....2
GENERAL MAINTENANCE INSIDE THE VEHICLE.....2
GENERAL MAINTENANCE UNDER THE HOOD 4
ON-VEHICLE INSPECTION-ENGINE 5
ON-VEHICLE INSPECTION-BRAKES.....5
ON-VEHICLE INSPECTION-CHASSIS 6
ON-VEHICLE INSPECTION-BODY 6
POWER SYSTEM INSPECTION 7

BASIC CORRECTION DIMENSIONS OF BODY

SUBFRAME 8
REAR TORSION BAR.....9
FRONT WINDSHIELD.....9
LUGGAGE COMPARTMENT.....10
RIGHT SIDE WALL 11
LEFT SIDE WALL.....11

SERVICE DATA

BASIC COMPLETE VEHICLE PARAMETERS.....12
WORKING AGENTS FILL 12
MAIN PARAMETERS AND PERFORMANCE DATA OF THE ENGINE 13
MAIN PARAMETERS AND PERFORMANCE DATA OF THE TRANSMISSION.....13
MAIN PARAMETERS AND PERFORMANCE DATA OF THE CLUTCH.....13
SUSPENSION SYSTEMS.....14
BRAKE SYSTEM 14
LIGHTING SYSTEM.....15
DOORS 15

TORQUE SPECIFICATIONS

ENGINE ACCESSORIES.....16
DRIVE SYSTEM.....16
SUSPENSION SYSTEM 17
STEERING SYSTEM 18
BRAKE SYSTEM 18
INTERIOR AND EXTERIOR TRIMS 19
BODY 19
ELECTRICAL 20
CVT 22

MAINTENANCE AND INSPECTION

GENERAL MAINTENANCE OUTSIDE THE VEHICLE

Owners have the responsibility to service and check their vehicles. They can either perform DIY vehicle maintenance or send their vehicles to maintenance centers.

Routine inspection should be made for the following vehicle parts. In most cases, no special tools are required.

The general maintenance procedure is as follows:

1. **General precautions**
   - Maintenance requirements vary with countries.
   - The appropriate time for vehicle maintenance is determined according to vehicle kilometers traveled or elapsed travel time (months), whichever comes first.
   - Perform periodic maintenance as far as possible, unless otherwise specified.
   - Failure to check vehicle parts may result in poor engine performance and increase in exhaust emissions.
2. **Tires**
   (a) Check tire pressure with an air pressure gauge. If necessary, adjust.
   (b) Check treads for cuts, damage or excessive wear.
3. **Wheel nuts**
   (a) Check for loose or missing nuts. If necessary, tighten the nuts or replace.
4. **Tire rotation**
   (a) Check tire wear.
5. **Windshield wiper blades**
   (a) Check wiper blades for wear or cracks if they can not clean the windshield properly. If necessary, replace them.
6. **Fluid leaks**
   (a) Check under the vehicle for fuel, engine oil, water or other fluid leaks.
   (b) If you should smell gasoline fumes or notice any leaks, check for the cause and repair it.
7. **Doors and engine hood**
   (a) Check that all doors and the tailgate operate smoothly and that all latches lock securely.
   (b) Make sure that the secondary latch keeps the hood from opening when the primary latch is released.

GENERAL MAINTENANCE INSIDE THE VEHICLE

Owners have the responsibility to service and check their vehicles. They can either perform DIY vehicle maintenance or send their vehicles to maintenance centers.

Routine inspection should be made for the following vehicle parts. In most cases, no special tools are required.

The general maintenance procedure is as follows:

1. **General attentions**
   - Maintenance requirements vary with countries.
   - The appropriate time for vehicle maintenance is determined according to vehicle kilometers traveled or elapsed travel time (months), whichever comes first.
   - Perform periodic maintenance as far as possible, unless otherwise specified.
   - Failure to check vehicle parts may result in poor engine performance and increase in exhaust emissions.
2. **Lights**
   (a) Check if the combination headlights, brake lights, combination taillights, turn signal lights and other lights light up or flash. In addition, check the lights for adequate illumination.
   (b) Check headlights for accurate aiming.

3. Warning lights and buzzers
(a) Check that all warning lights and buzzers are operating properly.
4. Electric horns
(a) Check that all electric horns operate properly.
5. Windshield
(a) Check for scratches, dents or wear.
6. Windshield wiper and washer
(a) Check if the windshield washer operates within its appropriate range. In addition, check if washer fluid spray is just located at center of working range of each wiper on the windshield.
(b) Check if the wiper streaks the glass after wiping.
7. Windshield defroster
(a) Check that the air comes out of the defroster outlets properly when the heater or air conditioner is in DEFROST mode.
8. Rear-view mirror
(a) Check that the rear-view mirror is installed securely.
9. Sun visor
(a) Check that the sun visor can move freely and is installed securely.
10. Steering wheel
(a) Check that it has an appropriate free play. In addition, check it for hard steering and abnormal noises.
11. Seats
(a) Check seat adjusters, seat back recliners and other front seat controls for smooth operation.
(b) Check that the locks hold securely in all latched positions.
(c) Check that the headrests move up and down smoothly and that the locks hold securely in all latched positions.
(d) Check that the latches lock securely when you fold down the rear seat backs.
12. Safety belts
(a) Check that the seat belt system (e.g. buckles, retractors and locking devices) operate properly and smoothly.
(b) Check that the belt webbing is free of cuts, wear or damage.
13. Accelerator pedal
(a) Check the pedal for smooth operation and make sure the pedal does not catch or require uneven effort.
14. Clutch pedal
(a) Check the pedal for smooth operation.
(b) Check that it has an appropriate free play.
15. Brake pedal
(a) Check the pedal for smooth operation.
(b) Check that it has an appropriate reserve and an appropriate free play.
(c) Start the engine and check the vacuum booster function.
16. Brakes
(a) At a safe place, check that the brake does not pull the vehicle to one side when applied.
17. Parking brake
(a) Check that the lever can move within an appropriate range.
(b) On a low slope, check that the vehicle is held securely with the selector lever in the P (Park) position without applying any brakes.

GENERAL MAINTENANCE UNDER THE HOOD

1. General attentions

- Maintenance items may vary with countries. Please lock up the maintenance schedule given in the Supplement of the Owner's Manual.
- All maintenance items in the periodic maintenance schedule must be performed.
- Be sure to perform periodic maintenance according to the odometer readings (km) or intervals (months) (whichever comes first) in the periodic maintenance schedule.
- After previous maintenance is completed, continue the maintenance at the same intervals as previous ones, unless otherwise specified.
- Poor engine running and increase in exhaust emissions may result even if only one of the items is missed.

2. Windshield washer fluid

(a) Check that there is adequate fluid in the reservoir.

3. Engine coolant level

(a) Check that the coolant level is between scales “F” and “L” on the transparent reservoir tank.

4. Radiator and hoses

(a) Check that the front of the radiator is clean and free of clogging caused by leaves, dust or insects.

(b) Check the hoses for cracks, twist, deterioration or loose connections.

5. Brake fluid level

(a) Check that the brake fluid level is near the upper scale line on the transparent reservoir tank.

Tip:

Brake fluid and clutch fluid share the same reservoir tank.

6. Engine drive belts

(a) Check the drive belts for frayed, broken, worn or oily cords.

7. Engine oil level

(a) Check the level on the dipstick with the engine off.

8. Power steering fluid level

(a) Check the level mark on the steering fluid reservoir body.

(b) Depending on power steering fluid temperature, the level should be within the “HOT” or “COLD” range.

9. Manual transmission fluid level

(a) Park your vehicle on a level ground.

(b) Set the shift lever to neutral position and set parking brake with the engine idling.

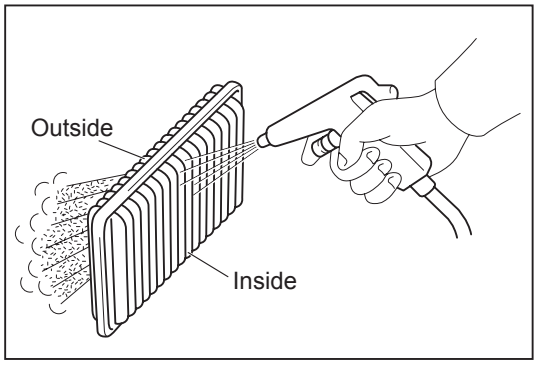
(c) Loosen the transmission fluid filler plug with a wrench.

(d) Check that the fluid level is 10-15 mm below lower edge of the filler. If below this level, fill transmission fluid; on the contrary, drain fluid.

10. Exhaust system

(a) If you should notice any change in sound of the exhaust or smell of exhaust fumes, locate the trouble and correct it.

ON-VEHICLE INSPECTION-ENGINE

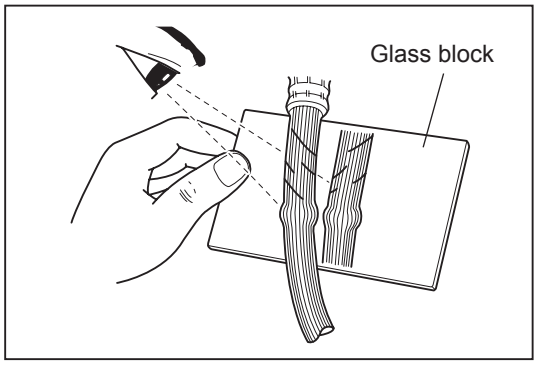


Tip:

Check these items when the engine is cold.

1. **Check drive belts.**
2. **Replace spark plugs.**
3. **Check air cleaner.**
   (a) Remove the air cleaner.
   (b) Visually check that the air cleaner is free of excessive damage, dirt or oil stains. If necessary, replace the air cleaner element.
   (c) Clean the filter element using compressed air. Blow clean thoroughly from inside of the filter element first, and then blow clean from outside.
   (d) Reinstall the air cleaner element.
4. **Replace air cleaner element.**
   (a) Replace with a new air cleaner element.
5. **Change engine oil and replace oil filter.**
6. **Change engine coolant.**
7. **Check fuel tank cap gasket.**
8. **Check fuel lines and connections, fuel tank vapor ventilation system hoses and fuel tank.**
   (a) Visually check fuel lines for fracture, leaks, loose joints, deformation or loose fuel tank bolts.
9. **Check exhaust pipe and its fittings.**
   (a) Visually check lines, suspensions, and joints for serious corrosion, leakage or damage.

ON-VEHICLE INSPECTION-BRAKES



1. **Check brake lines.**

   Tip:

   Operate in a luminous area. Before starting inspection, turn front wheels to the rightmost or leftmost position.
   (a) Check all brake lines and hoses for the following situations:
   - Damage
   - wear
   - Deformation
   - Fracture
   - Corrosion
   - Leakage
   - Bending
   - Distortion

   (b) Check all clamps for proper tightening and connections for leakage.
   (c) Check that the hoses and lines are kept far away from sharp parts, moving parts and the exhaust system.
   (d) Check that the lines are installed so that they pass centers of gaskets.
2. **Check front brake pads and discs.**
3. **Check rear brake linings and drums.**
4. **Check or change brake fluid.**

   Brake fluid: DOT4 synthetic brake fluid

ON-VEHICLE INSPECTION-CHASSIS

1. Check steering linkage.
(a) Check free play of steering wheel.
(b) Check steering linkage for looseness or damage.
(1) Check that tie rod end gap is moderate.
(2) Check that dustproof gasket and dust cover are free of damage.
(3) Check that dust cover clamp does not loosen.

2. Check oil in steering gear housing.
(a) Check steering gear for leakage.
If oil leakage is found, check for the cause and service the unit.

3. Check ball joint and dust cover.
(a) Check ball joint for excessive looseness.
(1) Jack up the front of the vehicle and put 180-200 mm height wood blocks under front tires.
(2) Lower the vehicle until its front helical spring receives half of normal load. For safety purposes, you should put a bench under the vehicle.
(3) Check that front wheels of the vehicle are in straight ahead position. In addition, use wheel chocks.
(4) Pry up end of lower arm with a crow bar to check the gap.
Maximum vertical clearance of ball joint: 0 mm
If any clearance exists, replace the ball joint.
(b) Check dust cover for damage.

4. Check dust boot of propeller shaft.
(a) Check dust boot of propeller shaft for clamping, looseness, grease leak, distortion or damage.

5. Check transaxle oil (liquid).
(a) Visually check for oil (liquid) leaks.
If oil leakage is found, check for the cause and service the unit.

6. Tire rotation

ON-VEHICLE INSPECTION-BODY

1. Tighten bolts and nuts on chassis and body.
(a) If necessary, tighten bolts and nuts of the following chassis parts.
- Front axle and suspension
- Drive system
- Rear axle and suspension
- Brake system
- Engine mounting
- Other chassis parts

(b) If necessary, tighten bolts and nuts of the following body parts.
- Seat belt system
- Seats
- Doors and engine hood
- Body support
- Fuel tank
- Exhaust pipe system
- Other body parts

2. Check and replace A/C filter.

(a) Remove glove box assembly.
(b) Remove filter case from filter outlet.
(c) Remove element from filter case.
(d) Check that A/C filter is free of excessive damage, dirt or oil stains. If necessary, replace A/C filter element.
(e) Install in the reverse order of removal.

POWER SYSTEM INSPECTION

1. Generator

(a) Check generator for proper cooling.
(b) Check generator belt tension and pulley installation.
(c) Check brush pressure and commutator surface.
(d) Check battery line connections.
(e) Check for damaged connectors.
(f) Check rectifier for scaling.
(g) Check degree of bearing wear.

2. Battery

(a) Check battery container for cracks, fracture or damage.
(b) Check battery ground wire.
(c) Check battery level according to working condition of headlights.

3. Charge indicator light

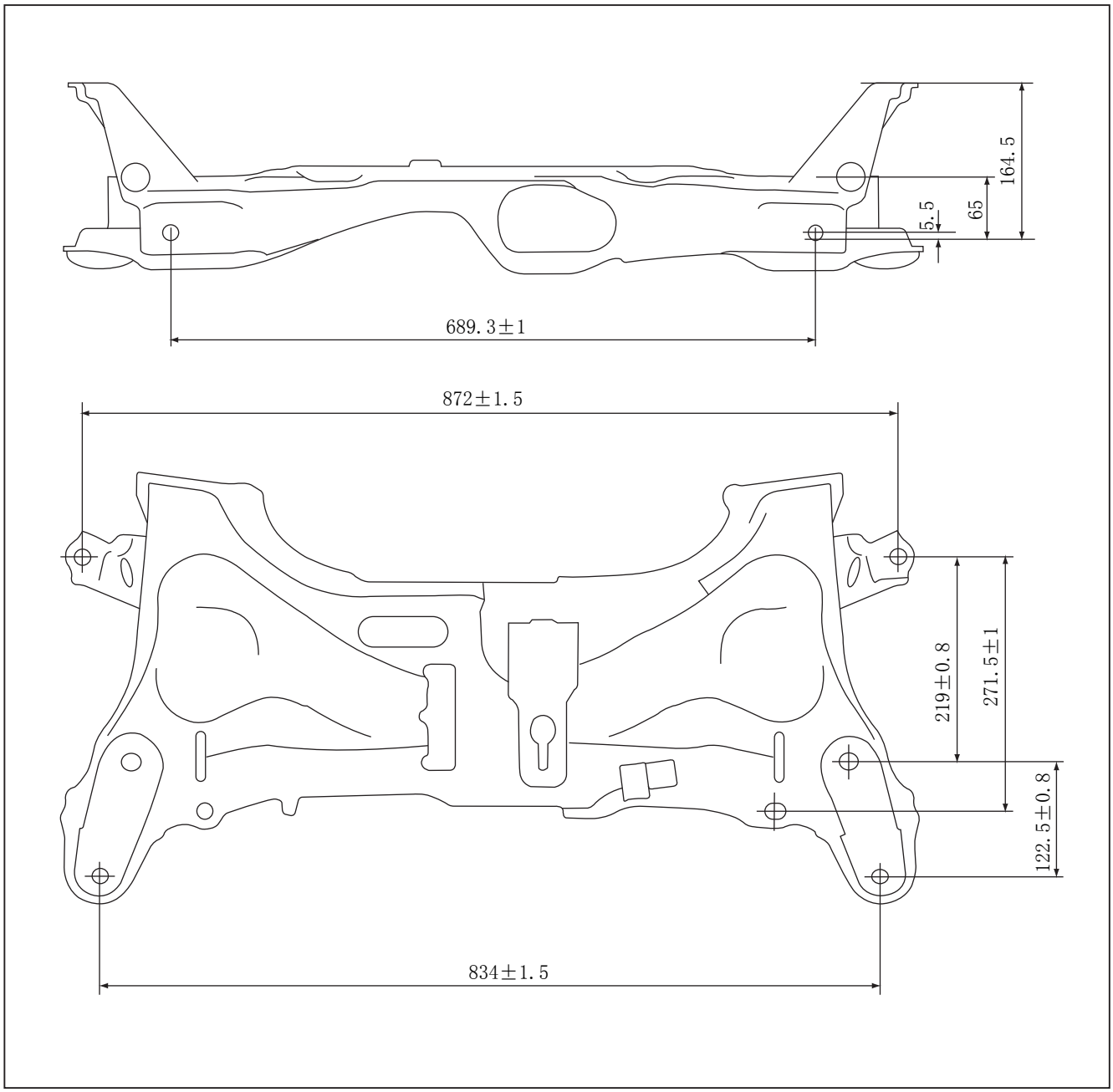
(a) Check charge indicator light circuit.
(b) Check for burned filament.
(c) Check generator for proper power generation.

BASIC CORRECTION DIMENSIONS OF BODY

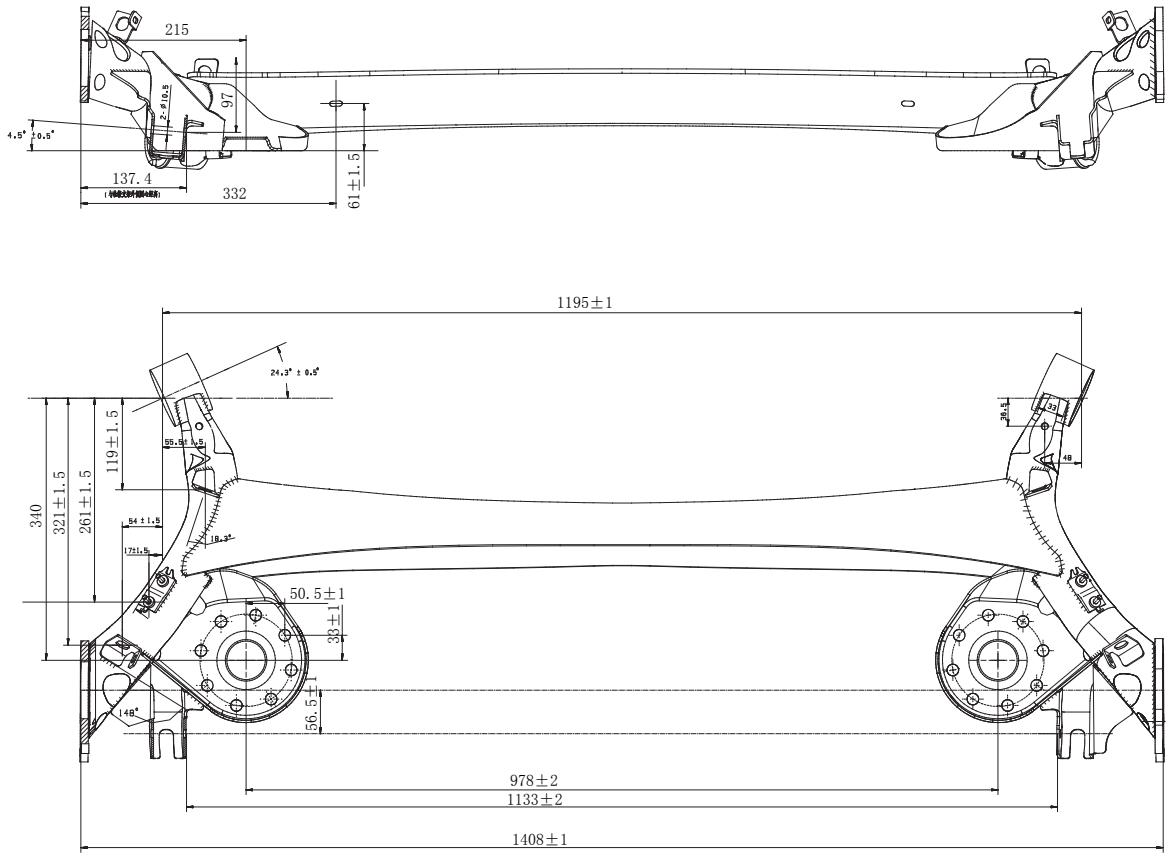
This section gives basic vehicle dimensions for your comparison and reference during servicing.

- All numerical dimensions are actual dimensions.
- Center of mounting hole is selected as measuring point.
- When a gauge is used, adjust its two measuring probes to equal length, and then test the probes and the gauge themselves to ensure no use gap exists.
- When a measuring tape is used, ensure it is free of stretch, twist and bending.
- The asterisk (*) following a measuring point value means that the same value is obtained from the measuring point at the symmetrical position on the other side.
- Coordinates of a measuring point refer to the distances measured between the point and the normal lines “X”, “Y” and “Z” respectively.
- The bilaterally symmetrical points of coordinates of a measuring point indicate the point coordinates on the left side. The point coordinates on the right side are symmetric to those on the left side.

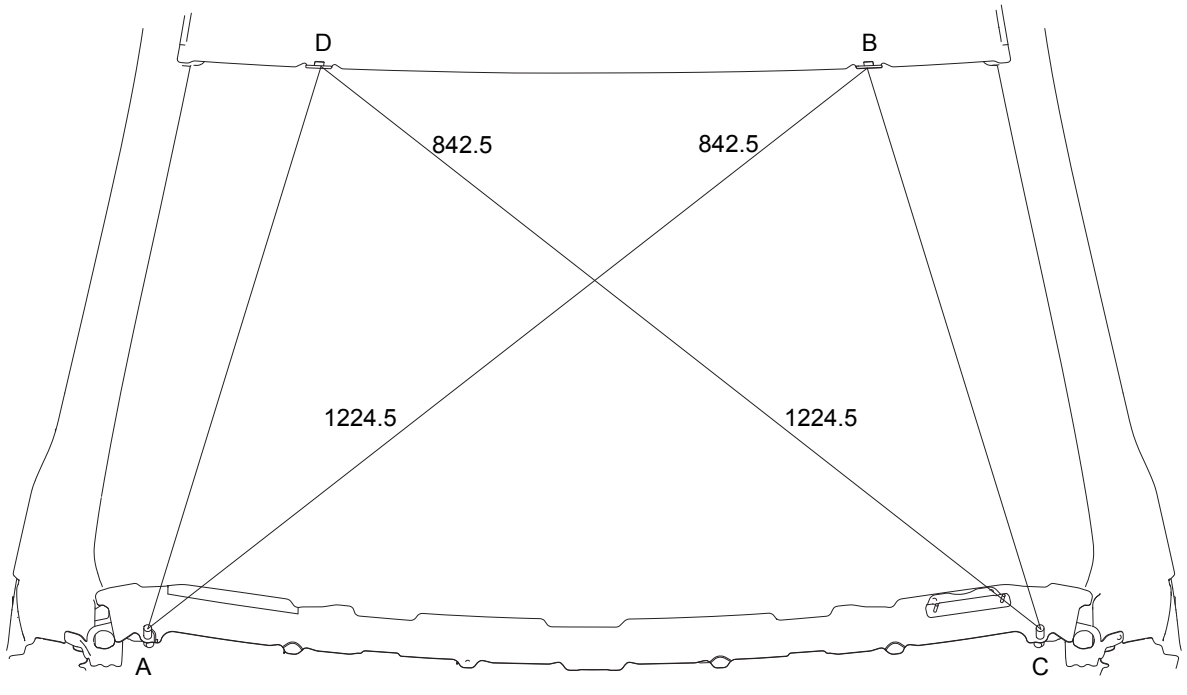
SUBFRAME



REAR TORSION BAR

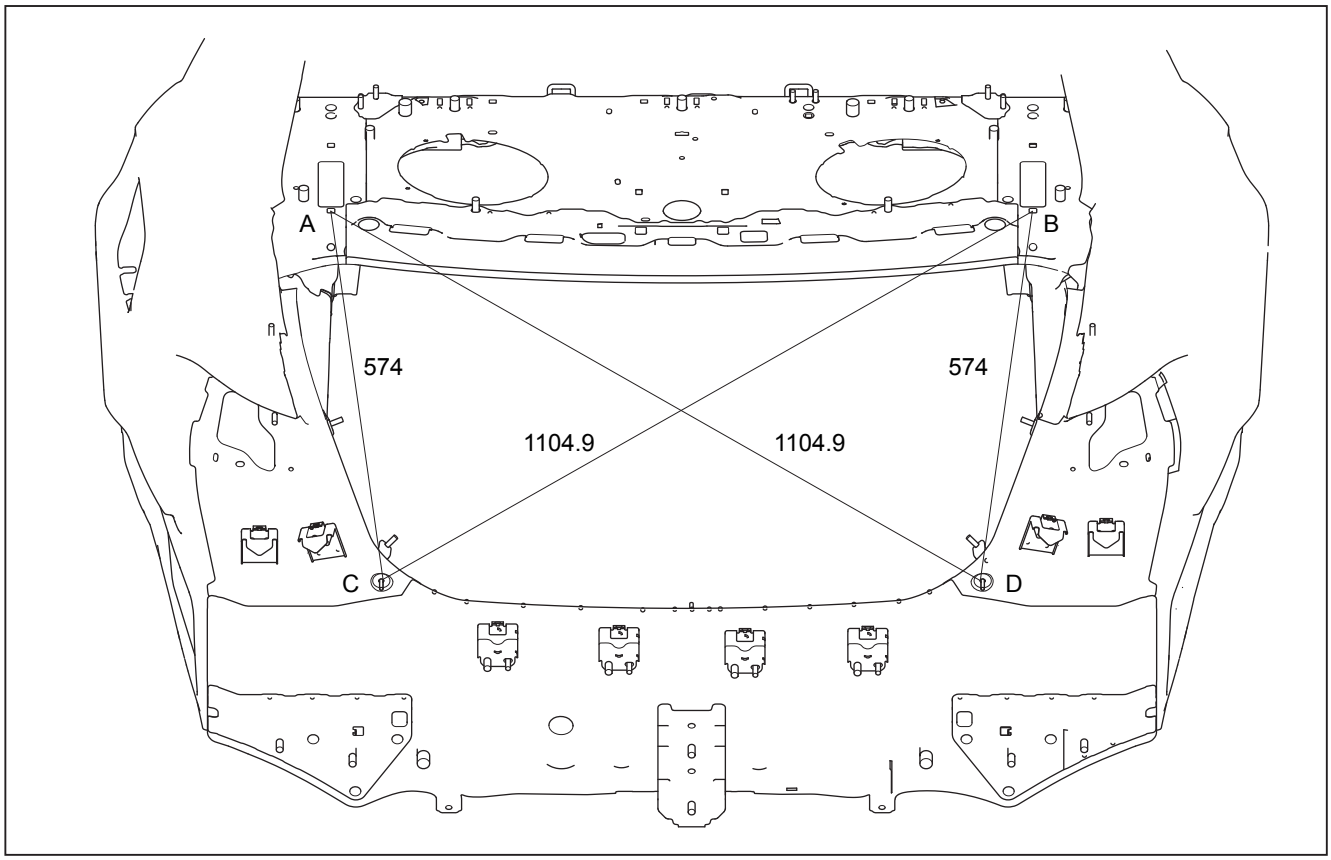


FRONT WINDSHIELD



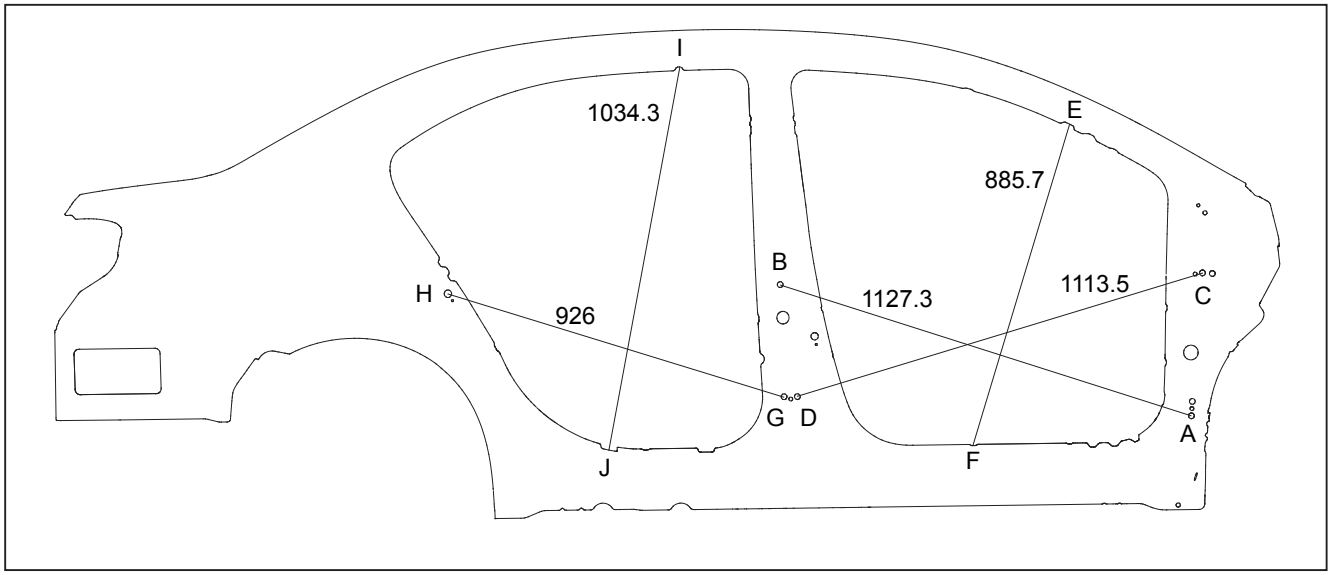
Mark	Name	Bore (mm)		Mark	Name	Bore (mm)
A	Front windshield glass fixing clip mounting hole	Profile hole		B	Front windshield lower cross sill upper body locating hole	10
C	Front windshield glass fixing clip mounting hole	Profile hole		D	Front windshield lower cross sill upper body locating hole	10

LUGGAGE COMPARTMENT



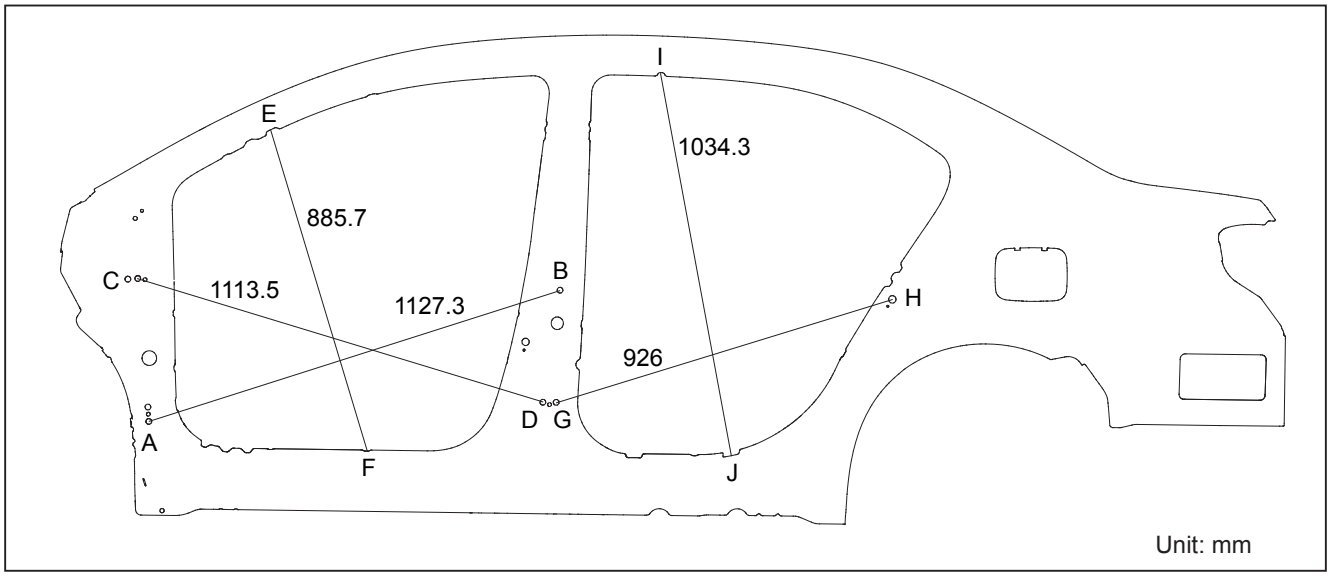
Mark	Name	Bore (mm)		Mark	Name	Bore (mm)
A	Luggage compartment hinge mounting via hole	Square hole 10×10		C	Rear bumper mounting hole (locating hole)	7
B	Luggage compartment hinge mounting via hole	Square hole 10×10		D	Rear bumper mounting hole (locating hole)	7

RIGHT SIDE WALL



Mark	Name	Bore (mm)		Mark	Name	Bore (mm)
A	Front door lower hinge mounting via hole	φ15		B	Rear door upper hinge mounting via hole	φ15
C	Front door upper hinge mounting hole	φ15		D	Rear door lower hinge mounting via hole	φ15
E	Process notch			F	Process notch	
G	Rear door lower hinge mounting via hole	φ15		H	Rear door contact switch via hole	φ19
I	Process notch			J	Process notch	

LEFT SIDE WALL



Unit: mm

Mark	Name	Bore (mm)		Mark	Name	Bore (mm)
A	Front door lower hinge mounting via hole	φ15		B	Rear door upper hinge mounting via hole	φ15
C	Front door upper hinge mounting hole	φ15		D	Rear door lower hinge mounting via hole	φ15
E	Process notch			F	Process notch	
G	Rear door lower hinge mounting via hole	φ15		H	Rear door contact switch via hole	φ19
I	Process notch			J	Process notch	

SERVICE DATA

BASIC COMPLETE VEHICLE PARAMETERS

Item	Unit	Parameter
Overall length	mm	4452
Overall width	mm	1705
Overall height (unladen)	mm	1488
Wheelbase	mm	2608
Front overhang	mm	868
Rear overhang	mm	976
Front tread	mm	1471
Rear tread	mm	1457
Approach angle (laden)	(°)	18.5
Departure angle (laden)	(°)	15.4
Minimum ground clearance (laden)	mm	113.4
Minimum turning diameter	m	10.8
Luggage compartment capacity	L	330

WORKING AGENTS FILL

Working part	Quantity	Specification	
Engine fuel	40L	93# above premium unleaded gasoline (GB17930-2006)	
Engine oil	3.5±0.1L(dry) 3.2±0.1L(wet)	SJ 10W-40	Domestic models, exported models for tropical areas
		SM 5W-30	Type for exported models for alpine areas
Coolant	5±0.5L	Ethylene-ethylene glycol base -35°C antifreeze	Type for domestic models
		Ethylene-ethylene glycol base -45°C antifreeze	Type for exported models for alpine areas
Brake fluid	0.56L	DOT4 synthetic brake fluid	
Transmission oil (CVT)	4.35±0.05Kg	ESSO EZL799A	
Transmission oil (MT)	1.9±0.15Kg	For domestic models, fill GL-4 80W-90 oil all year round.	
		For exported models for alpine areas, fill GL-4 75W-90 oil.	
		For exported models for tropical areas, fill GL-5 140 oil.	
Power steering fluid	0.75±0.02L	ATF DEXRON III hydraulic transmission oil	
Battery terminals	1.0±0.03g	Industrial Vaseline	
Windshield washer fluid	3.0±0.1L	Normal temperature: Use clean water with hardness less than 205g/1000 kg. Low temperature (-18°C±3°C): Use methanol aqueous solution with concentration of 50%.	
A/C refrigerant	420±10g	R134a	
Other kinetic friction pairs	---	3# general purpose lithium base grease for automobile	
Tires	---	Inflation pressure 220±10kPa	
Spare tire	---	Inflation pressure 420±10kPa	

MAIN PARAMETERS AND PERFORMANCE DATA OF THE ENGINE

Item	Unit	Data
Engine model	---	GW4G15
Type	---	In-line 4-cylinder, 4-stroke, water-cooled, OHC, gasoline engine
Fuel supply mode	---	Electronically controlled multiport fuel injection
Bore x stroke	mm×mm	75×84.7
Total displacement	L	1.497
Compression ratio	---	10.5 : 1
Number of valves/ cylinders	---	16/4
Minimum specific fuel consumption	g/kW•h	≤265
Rated power/RPM	kW/(r/min)	77±3/6000
Maximum torque/ RPM	N•m/(r/min)	138±4/4000-5500
Total dry weight	Kg	145±2
Idle speed	r/min	700±25
Fuel type and grade	---	Unleaded gasoline, 93#
Cooling mode and performance parameters	---	Forced circulation and water cooling, thermostat opening temperature 82°C±2°C, normal working temperature of coolant 85°C±5°C, coolant surge tank pressure limiting valve opening pressure 108±15kpa
Starting mode and performance	---	Motor start
Lubrication mode	---	Pressure and splash

MAIN PARAMETERS AND PERFORMANCE DATA OF THE TRANSMISSION

Item	Data		
Transmission model	CC0012E		VT2-11D
Transmission type	Mechanical, 5-speed, manual transmission		Continuously variable transmission (CVT)
Final drive ratio	4.3125		5.76
Gear ratios (Transmission ratios)	I	3.545	0.443-2.416
	II	1.905	
	III	1.31	
	IV	0.97	
	V	0.816	
	R	3.25	
Maximum bearing torque (N•m)	160		170
Maximum input speed (r/min)	6000		6200

MAIN PARAMETERS AND PERFORMANCE DATA OF THE CLUTCH

Item	Data
Clutch type	Single disc, dry type, diaphragm spring; driven disc diameter: 200mm; lever ratio 1.59 (111.8:70.3); maximum stroke 8.5mm; release stroke 6mm
Clutch hydraulic control system	Total stroke of clutch pedal 101.7mm;

SUSPENSION SYSTEMS

Parameters for Front Wheel Alignment (unladen)		
Item	**Scope**	**Left/right wheel deviation**
Front wheel camber angle	-18′±30′	±30′
Front wheel kingpin inclination angle	11°16′±30′	±30′
Front wheel caster angle	4°20′±45′	±36′
Front wheel toe-in	4.7′±15′	/

Parameters for Rear Wheel Alignment (unladen)		
Item	**Scope**	**Left/right wheel deviation**
Rear wheel camber angle	-41′±30′	±30′
Rear wheel toe-in	9.5′±15′	/

Wheel size	15×6J rim standard, offset 45mm
Tire size	185/65 R15 88H, tire pressure 220±10KPa
Spare tire size	T125/70R16 96M, tire pressure 420±10KPa
Overseas configuration	Tire size 185/65R1588H, 15×6J aluminum rim standard, steel rim optional, tire pressure 220±10kPa; spare tire model consistent with vehicle tires.

Main Parameters and Performance Data of the Steering System

Steering gear	Hydraulically boosted pinion and rack type, drive ratio 47.02mm/r.
Steering column	Energy-absorbing steering column with adjustable angle (up/down 3.8°)
Steering wheel	Three-spoke softened steering wheel with air bag, diameter 370mm, number of maximum turns of steering wheel in steering system 2.978
Wheel angle	Maximum value for inner wheel (30~35)°; theoretical maximum value for outer wheel (34.5~39.5)°

BRAKE SYSTEM

Front wheel			Rear wheel	
Floating caliper disc brake			Floating caliper disc brake	
Item	**Parameter**		**Item**	**Parameter**
Wheel cylinder diameter	Φ54 mm		Wheel cylinder diameter	Φ34 mm
Brake disc diameter	Φ255 mm		Brake disc diameter	Φ263.5 mm

Brake booster and master cylinder	Single-stage Φ9” vacuum booster; dual-chamber tandem brake master cylinder, bore Φ20.64 mm, total stroke 42 mm.
Parking brake	The parking brake system controls rear wheel brakes by means of a mechanical remote ratchet cable control mechanism with an effective working stroke of 5-9 teeth.

Item		Unit (mm)
Front brake disc	Diameter	255
	Repair limit thickness	19
	Maximum permissible face runout after assembly	0.06
	Maximum permissible scratch depth	1
	Maximum permissible thickness deviation	0.01
	Minimum thickness after repair	-
	Thickness (new)	22
Rear brake disc	Diameter	263.5
	Repair limit thickness	7.5
	Maximum permissible face runout after assembly	0.08
	Maximum permissible scratch depth	1
	Maximum permissible thickness deviation	0.01
	Minimum thickness after repair	-
	Thickness (new)	9
Front lining	Initial thickness of friction material	12
	Service limit thickness of friction material	2
Rear lining	Initial thickness of friction material	10
	Service limit thickness of friction material	2
Front brake caliper	Cylinder bore	54
	Effective radius	101.6
Rear brake caliper	Cylinder bore	34
	Effective radius	112.15

LIGHTING SYSTEM

Headlights	Headlight: high and low beams H4/60/55W
Position lights	Front position light: white, 5W, 1 per side (LH/RH); rear position light: red, 5W, 1 per side (LH/RH)
Turn lights	Amber. Front turn light: PY21W, 1 per side (LH/RH); rear turn light: WY21W, 1 per side (LH/RH); side turn light: LED, 1W, 1 per side (LH/RH), on rear-view mirror body
Fog lights	Front fog light: H11; rear fog light: P21W
Brake lights	Brake light: red, P21/5W; high mount brake light: W16W
License lights	License light: white, 5W, 1 per side (LH/RH)
Backup lights	Backup light: white, W16W, 1 per side (LH/RH)
Reading lights and ceiling light	Reading light: white, 5W, 2; ceiling light: white, 10W, 1
Luggage compartment light	Luggage compartment light: white, 5W, 1

DOORS

Closure parameters	Front door opening angle	36°/60°	Engine hood working opening angle	75°
	Rear door opening angle	36°/63°	Tailgate maximum opening angle	91°

TORQUE SPECIFICATIONS

ENGINE ACCESSORIES

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Left mounting bracket to transmission	55±5	4	Adhesive	Grade 10.9
Left mounting bracket to left mounting	78±5	1	Adhesive	Grade 10.9
Left mounting bracket to left mounting	78±5	1	Adhesive	Grade 10
Left mounting to left side rail	78±5	5	Adhesive	Grade 10.9
Right mounting to body	78±5	3	Adhesive	Grade 10.9
Right mounting to engine	78±5	2	Adhesive	Grade 10.9
Right mounting to engine	78±5	1	Adhesive	Grade 10
Rear mounting to subframe	164±8	1	Adhesive	Grade 10.9
Rear mounting to its bracket	164±8	1	Adhesive	Grade 10.9
Rear mounting bracket to transmission	55±5	4	Adhesive	Grade 10.9
Front oxygen sensor to exhaust manifold	50±10	1	---	---
Rear oxygen sensor to exhaust pipe	50±10	1	---	---
Starter to engine	60±2	2	---	---
Transmission to engine	46±5	7	Adhesive	Grade 10.9
Fuel tank to body	26±3	2	Adhesive	Grade 10.9
Fuel tank guard to fuel tank	9	4		*
Fuel tank rear mounting bracket assembly to body	26±3	6		
Fuel tank to fuel tank rear mounting bracket assembly	26±3	2	Adhesive	Grade 10.9
Two-hole hose clamp IV to engine	9	1	---	---
Filler pipe assembly to body	63	1	---	---
Accelerator pedal mounting bracket to body	10±1	3	---	---
Accelerator pedal to mounting bracket	10±1	3	---	---
Fuel filter mounting bracket to fuel tank	9	2	---	---
Mounting plate on electronic fuel pump to fuel tank	6	8	---	---
Intake pipe assembly to body	9	1	---	---
Air cleaner assembly to transmission	9	3	---	---
Front exhaust pipe with three way catalytic converter assembly to engine	60±6	2	---	---
Main muffler to auxiliary muffler	60±6	2	---	---
Front exhaust pipe with three way catalytic converter assembly to auxiliary muffler	60±6	2	---	Grade 10.9
Front thermal baffle to body	9	1	---	---
Rear thermal baffle to body	9	3	---	---
Middle thermal baffle I to body	9	2	---	---
Middle thermal baffle II to body	9	1	---	---
Middle thermal baffle II to body	9	2	---	---
Radiator filler assembly to support	9	2	---	---
Electronic fan to radiator	9	4	---	---

DRIVE SYSTEM

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Clutch pedal to clutch master cylinder	23±3	2	---	---
Clutch pedal assembly to tubular girder	23±3	1	---	---

Clutch tube support I to body	23	1	---	---
Clutch tube support II to transmission	46±5	1	---	---
Clutch tube support III to support IV	23	1	---	---
	16±2		---	---
	16±2		---	---
	33±3	1	---	---
Transmission control mechanism assembly to body	20±2	4	---	---
Transmission control cable assembly to body	9	3	---	---
Front propeller shaft to steering knuckle	225±20	2	---	---

SUSPENSION SYSTEM

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Subframe assembly to body	120±10	2	Adhesive	Grade 10.9
Subframe assembly to body	180±15	2	Adhesive	Grade 10.9
Subframe assembly to body	120±10	2	Adhesive	Grade 10.9
Left lower swing arm assembly to subframe	200±15	1	Adhesive	Grade 10.9
Lower swing arm ball pin assembly to left lower swing arm	145±8	1	---	Grade 10.9
Lower swing arm ball pin assembly to left lower swing arm	145±8	2	---	Grade 10
Swing arm ball joint to left steering knuckle	80±10	1		
Right lower swing arm assembly to subframe	200±15	1	Adhesive	Grade 10.9
Lower swing arm ball pin assembly to right lower swing arm	145±8	1	---	Grade 10.9
Lower swing arm ball pin assembly to right lower swing arm	145±8	2	---	Grade 10
Swing arm ball joint to right steering knuckle	80±10	1	---	---
Left front shock absorber to left steering knuckle	164±8	2	---	---
Left front shock absorber to upper mounting pad	40±5	1	---	Grade 10
Left front shock absorber to front helical spring upper erection support	40-60	1	---	Grade 10
Right front shock absorber to right steering knuckle	164±8	2	---	---
Right front shock absorber to upper mounting pad	40±5	1	---	Grade 10
Right front shock absorber to front helical spring upper erection support	40-60	1	---	Grade 10
Front stabilizer bar link assembly	63±5	4	---	---
Front stabilizer bar mounting bracket to subframe	63±5	4	Adhesive	---
Rear axle protection bracket to body	26±3	4	---	---
Rear torsion bar assembly to body	120±10	2	Adhesive	Grade 10.9
Rear shock absorber to rear torsion bar	80±10	2	Adhesive	Grade 10.9
Rear shock absorber to washer	35±3	2x2	---	---
Wheel	110±10	16	---	Steel wheel
Wheel	110±10	16	---	Aluminum wheel
Spare wheel to body	23	1	---	---

STEERING SYSTEM

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Power steering oil pump with bracket assembly to engine	30±3	1	---	---
Tension adjustment bracket to engine	40±4	1	---	---
Tension adjustment bracket to power steering oil pump assembly	40±4	1	---	---
Power steering fluid reservoir mounting bracket assembly to body	9	2	---	---
Steering gear to subframe	107±7	2	Adhesive	Grade 10.9
Steering gear to subframe	107±7	2	Adhesive	Grade 10.9
Steering gear to steering knuckle	50±5	2	---	---
Steering wheel to steering column	50±5	1	---	Grade 10
Steering column to tubular girder	25±3	1	---	---
Steering column to tubular girder	25±3	2	---	---
Steering linkage drive shaft assembly	25±3	2	---	---
Steering drive shaft to universal joint	25±3	1	---	---
Steering oil pipe assembly to power steering oil pump	30±4	1	---	---
Steering oil pipe assembly to steering gear	16±2	2	---	---
Steering gear assembly	74±7	2	---	---

BRAKE SYSTEM

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Left front brake disc case to left steering knuckle	9	3	---	---
Left front brake caliper assembly to left steering knuckle	99±6	2	---	---
Right front brake disc case to right steering knuckle	9	3	---	---
Right front brake caliper assembly to right steering knuckle	99±6	2	---	---
Rear brake assembly to rear suspension	99±6	8	---	---
Brake pedal assembly to tubular girder	23±3	1	---	---
Brake pedal assembly to brake master cylinder	23±3	4	---	---
Rear brake intermediate pipe union to body	9	1	---	---
Left front brake hose assembly to body	23	1	---	---
Left front brake hose assembly to left front brake caliper assembly	40±5	1	---	---
Right front brake hose assembly to body	23	1	---	---
Right front brake hose assembly to right front brake caliper assembly	40±5	1	---	---
Left rear brake hose fixing bracket to body	23	1	---	---
Rear brake tube support to rear torsion bar	9	2	---	---
Right rear brake hose fixing bracket to body	23	1	---	---
	16±2		---	---
	16±2		---	---
Parking brake control mechanism assembly to bracket assembly	23	2	---	---
Parking brake control mechanism bracket assembly to body	23	4	---	---

Left parking brake cable assembly to body (For drum brakes only. N/A on disc brakes.)	9	1	---	---
Left parking brake cable assembly to body	9	4	---	---
Right parking brake cable assembly to body (For drum brakes only. N/A on disc brakes.)	9	1	---	---
Right parking brake cable assembly to body	9	4	---	---
Brake vacuum hose support to body	9	1	---	---
ABS mounting bracket assembly to body	23	3	---	---
Left front wheel speed sensor with bracket assembly to left steering knuckle	9	1	---	---
Left front wheel speed sensor with bracket assembly to body	9	1	---	---
Right front wheel speed sensor with bracket assembly to right steering knuckle	9	1	---	---
Right front wheel speed sensor with bracket assembly to body	9	1	---	---
Left rear wheel speed sensor with bracket assembly to rear wheel hub	9	1	---	---
Left rear wheel speed sensor with bracket assembly to body	9	1	---	---
Left rear wheel speed sensor with bracket assembly to rear torsion bar	9	1	---	---
Right rear wheel speed sensor with bracket assembly to rear wheel hub	9	1	---	---
Right rear wheel speed sensor with bracket assembly to body	9	1	---	---
Right rear wheel speed sensor with bracket assembly to rear torsion bar	9	1	---	---
Rear brake caliper to rear wheel hub support	63±5	4	---	---

INTERIOR AND EXTERIOR TRIMS

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Instrument panel stiffening beam assembly	20±2	9	Adhesive	---
Driver's seat assembly	45±5	4	Adhesive	---
Front seat assembly	45±5	4	Adhesive	---
Rear twin seat assembly	15±2	1	Adhesive	---
Rear twin seat assembly	45±5	7	Adhesive	---
Rear single seat assembly	15±2	1	Adhesive	---
Rear single seat assembly	45±5	6	Adhesive	---

BODY

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Side wall assembly	9±2	4	---	---
Roof stiffening beam I fixing bracket	9±2	6	---	---
Wiper motor bracket	9	2	---	---
Vent panel mounting plate	9	8	---	---
Rear crash bar assembly	23±3	6	---	---
Door hinge	23±3	8	---	---
Door hinge	23±3	16	---	---
Tailgate hinge	50±5	2	---	---
Tailgate hinge	23±3	4	---	---

Radiator upper cross member assembly	9	4	---	---
Engine hood lock bracket	9	2	---	---
Front bumper	50±5	8	---	---
Front crash bar	40±5	6	---	---
Radiator lower cross member	9±2	6	---	---
Front crash bar strut	9±2	4	---	---
Headlight upper cross member	9±2	6	---	---
Fender mounting bracket	9±2	4	---	---
Fender	9±2	12	---	---
Fender	9±2	2	---	---
Center console mounting bracket	9	2	---	---
Front seat rear inner mounting bracket	23±3	8	---	---
Curtain air bag mounting bracket	9	4	---	---
Instrument panel stiffening beam mounting bracket	23	4	---	---
Front wall to side wall connection stiffener	9±2	4	---	---
Glass run	9	8	---	---
Glass run	23	4	---	---
Seat belt retractor to body	45±5	4	---	---
Front/rear seat belt	45±5	4	---	---
Front/rear seat belt	45±5	4	---	---
Height adjuster assembly to body	45±5	4	---	---
Filler cap zip fastener handle	9	1	---	---
Shift control cable protective wire assembly	9	1	---	---
Front door glass	9	4	---	---
Front door check	9	4	---	---
Front door check	23±3	2	---	---
Rear door check	9	4	---	---
Rear door check	23±3	2	---	---
Tailgate gas spring	9	4	---	---
Engine hood lock	23	3	---	---

ELECTRICAL

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Backup radar ECU with bracket to body	9	2	---	---
Anti-theft ECU assembly	9	2	---	---
Engine ECU with bracket assembly to front panel	9	3	---	---
Engine ECU assembly to engine ECU assembly bracket	9	4	---	---
Air bag ECU assembly to body	9±2	3	---	---
Hook to pressure plate	9	2	---	---
Battery support assembly to body	24	5	---	---
Electric horn to body	24	1	---	---
1# fuse block with support assembly to interior and exterior trims	9	2	---	---
1# fuse block with support assembly to interior and exterior trims	9	1	---	---

2# fuse block with support assembly to body	9	1	---	---
Clutch switch assembly to chassis	20	1	---	---
Central door lock controller with bracket assembly to interior and exterior trims	9	2	---	---
Vehicle speed sensor assembly	24	1	---	---
Battery ground harness assembly	10±2	1	---	---
Battery ground harness assembly	22±3	1	---	---
Left A-pillar harness clamp to body	9	1	---	---
Right A-pillar harness clamp to body	9	1	---	---
Windshield harness clamp	9	2	---	---
Engine harness bracket to chassis	9	1	---	---
Rear oxygen sensor bracket to body	9	1	---	---
Left combination headlight assembly to body	9	4	---	---
Right combination headlight assembly to body	9	4	---	---
Left combination taillight assembly to body	9	3	---	---
Right combination taillight assembly to body	9	3	---	---
Parking brake switch assembly to chassis	5	1	---	---
Front wiper linkage motor assembly to body	9	2	---	---
Left front wiper arm assembly to wiper motor output shaft	24	1	---	---
Washer fluid reservoir assembly to body	9	3	---	---
Front passenger side air bag assembly to interior and exterior trims	9	2	---	---
Left front door window regulator assembly to body	9	6	---	---
Right front door window regulator assembly to body	9	6	---	---
Left rear door window regulator assembly to body	9	4	---	---
Right rear door window regulator assembly to body	9	4	---	---
Rear door latch to body	24	2	---	---
Tailgate latch to body	24	2	---	---
Tailgate lock to body	9	2	---	---
Tailgate handle to body	9	1	---	---
Antenna harness assembly to body	9	1	---	---

CVT

Position	Tightening torque (N•m)	Quantity (pcs)	Surface coating	Remark
Left mounting bracket assembly to transmission	78±5	1	Adhesive	Grade 10.9
Left mounting bracket assembly to transmission	78±5	2	Adhesive	Grade 10.9
Left mounting bracket assembly to left mounting assembly	56±6	1	Adhesive	Grade 10.9
Left mounting assembly to left side rail	78±5	5	Adhesive	Grade 10.9
Right mounting assembly to body	78±5	3	Adhesive	Grade 10.9
Right mounting assembly to engine	78±5	2	Adhesive	Grade 10.9
Right mounting assembly to engine	78±5	1	Adhesive	Grade 10
Rear mounting assembly to subframe	164±8	1	Adhesive	Grade 10.9
Rear mounting assembly to rear mounting bracket assembly	164±8	1	Adhesive	Grade 10.9
Rear mounting bracket assembly to transmission	78±5	4	Adhesive	Grade 10.9
Intake pipe assembly to body	9±2	1	---	---
Air cleaner mounting bracket assembly to transmission	45±3	2	---	---
Air cleaner mounting bracket assembly to transmission	26±3	1	---	---
Air cleaner assembly to air cleaner mounting bracket assembly	9±2	3	---	---
Cooler to cooler left and right mounting brackets	9±3	2	---	---
Cooler to cooler lower mounting bracket	9±3	1	---	---
Cooler to oil inlet and return pipe joints	35±3	2	---	---
Oil inlet and return pipe joints to transmission	35±3	2	---	---
Front propeller shaft to wheels	225±20	2	---	---

Note: Others borrow the tightening torques for the chassis fasteners of the base models.

ENGINE ACCESSORIES

MOUNTING UNIT

BRIEF DESCRIPTION 2
ENGINE MOUNTINGS 2

FUEL SUPPLY SYSTEM

BRIEF DESCRIPTION 5
FUEL TANK 6
FUEL PUMP AND CHARCOAL CANISTER 7
FUEL FILTER ASSEMBLY 8
FILLER PIPE ASSEMBLY 9
FUEL LINES 10

INTAKE SYSTEM

BRIEF DESCRIPTION 12
AIR CLEANER 13

EXHAUST SYSTEM

BRIEF DESCRIPTION 14
EXHAUST PIPE ASSEMBLY 15

COOLING SYSTEM

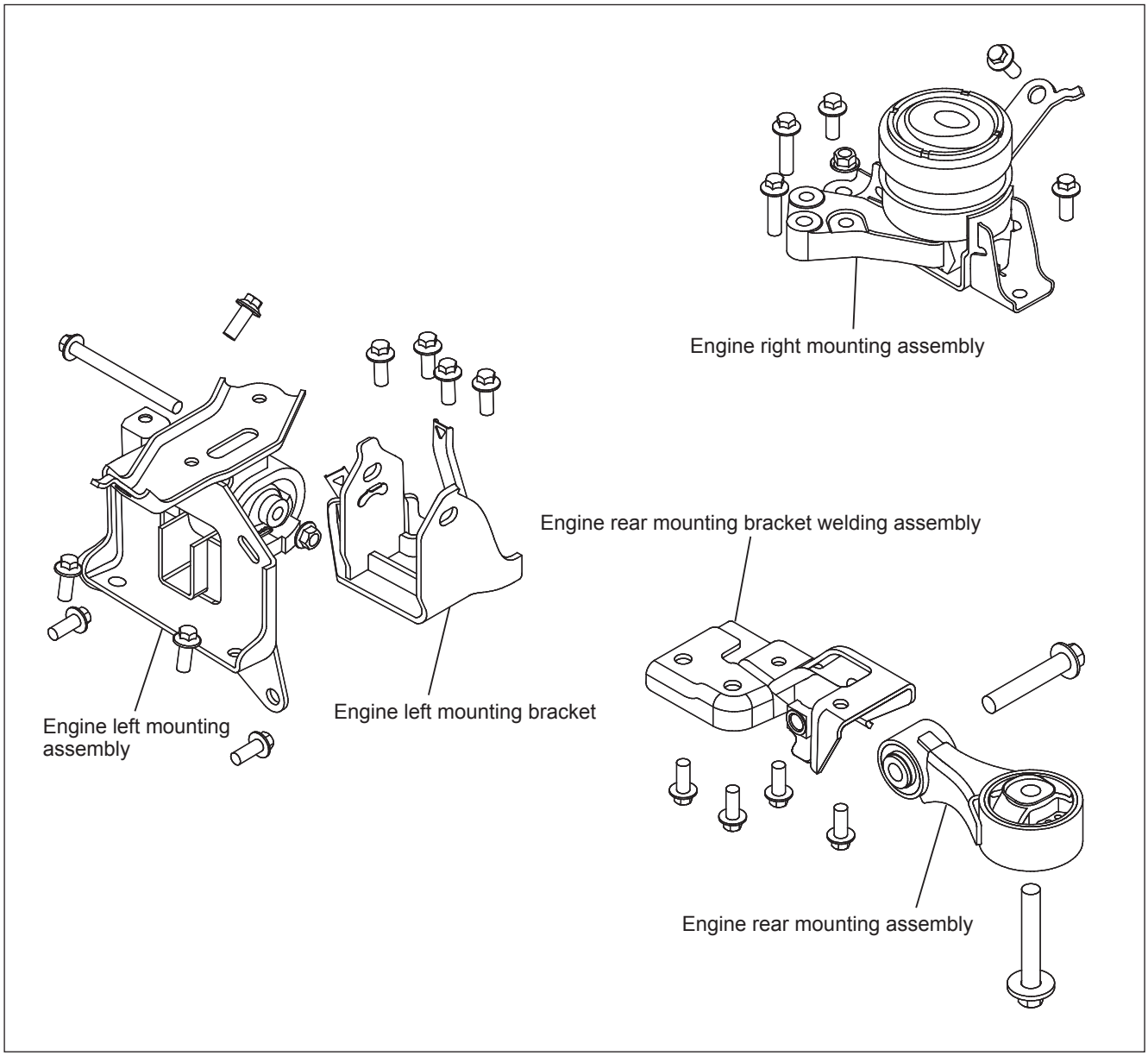
BRIEF DESCRIPTION 17
FAILURE DIAGNOSIS 18
ON-VEHICLE INSPECTION 20
COOLING FAN 21
ENGINE COOLANT 23
RADIATOR ASSEMBLY 24

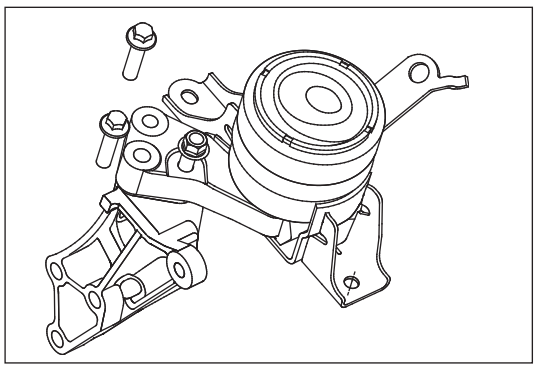
MOUNTING UNIT

BRIEF DESCRIPTION

The powertrain is secured to the body and subframe by means of three-point mounting. The left and rear mountings are of compression rubber type while the right mounting is of hydraulic type.

Structure Diagram

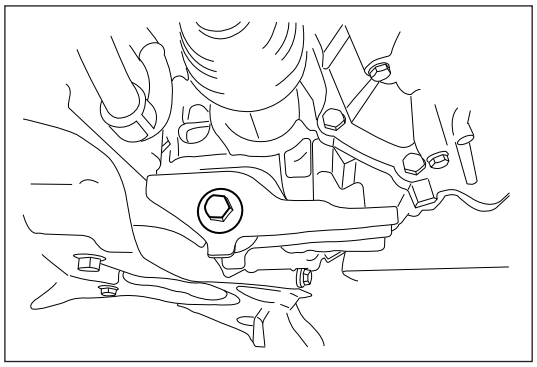




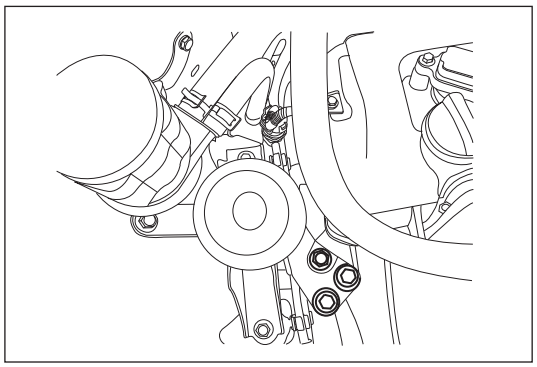
ENGINE MOUNTINGS

Removal

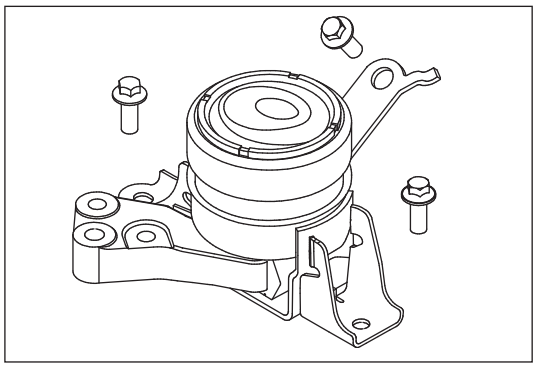
1. **Separate engine.**
   (a) Hoist the engine with a crane.
   (b) Using socket, ratchet wrench and extension bar, remove the 2 bolts and the nut from the right mounting.



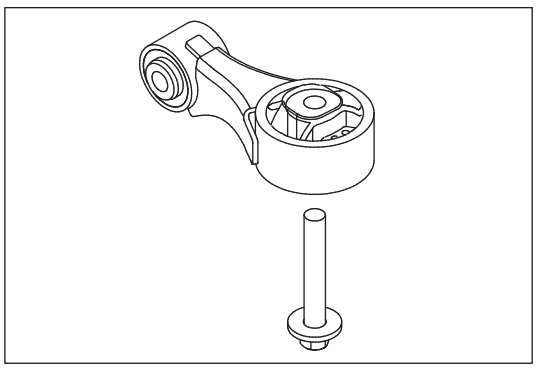
(c) Using socket, ratchet wrench and extension bar, remove the bolt from the rear mounting assembly.



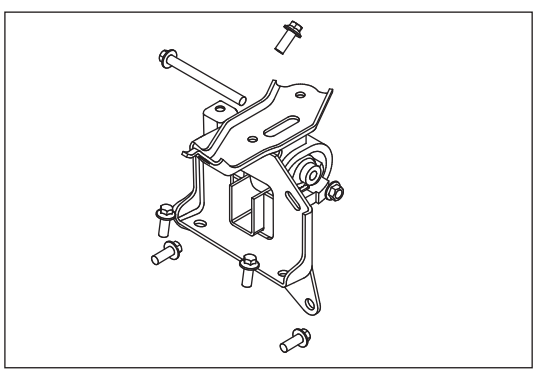
(d) Using socket, ratchet wrench and extension bar, remove the left mounting assembly bolts, and then remove the engine.



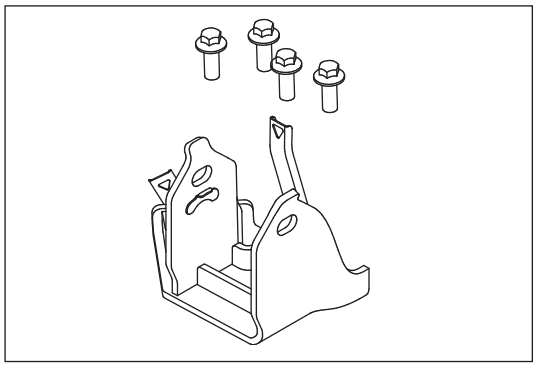
2. Remove engine right mounting.
Using socket and ratchet wrench, remove the 3 bolts and the right mounting on the body.



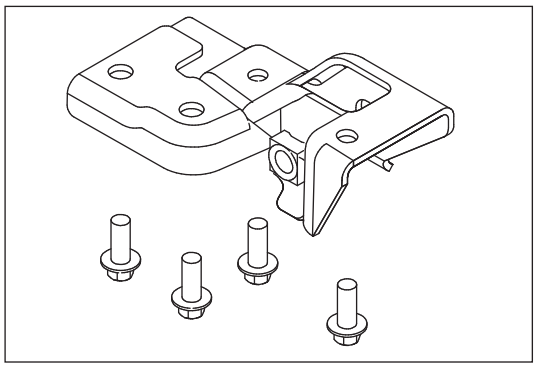
3. Remove engine rear mounting.
Using socket and ratchet wrench, remove the bolt and the rear mounting on the subframe.



4. Remove engine left mounting.
Using socket wrench, remove the 6 bolts and the left mounting on the left mounting bracket.



5. **Remove left mounting bracket.**
   Using socket wrench, remove the 4 bolts and the left mounting bracket on the transmission.



6. **Remove rear mounting bracket.**
   Using socket wrench, remove the 4 bolts and the rear mounting bracket on the transmission.

Installation

Install in the reverse order of removal.

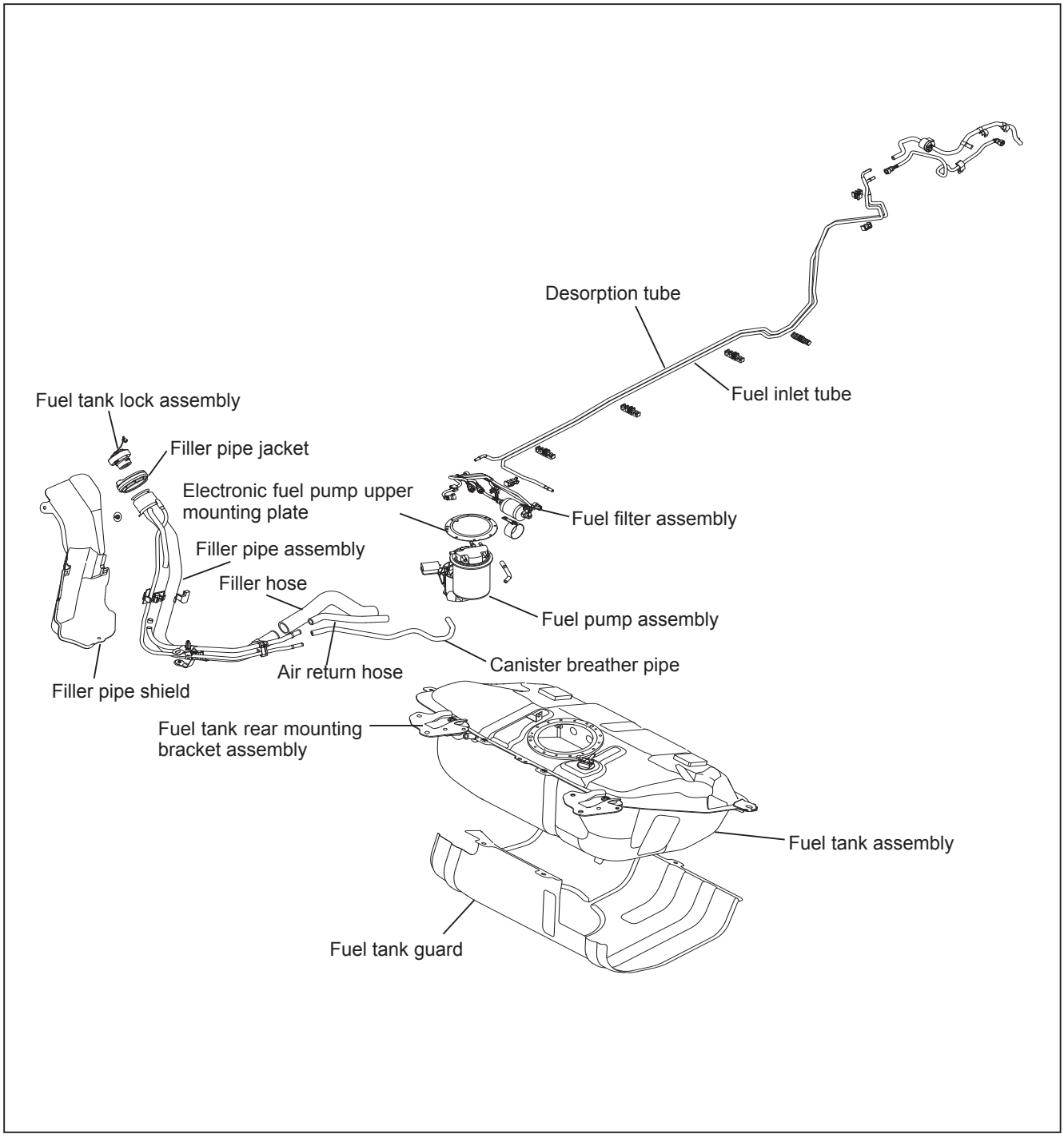
FUEL SUPPLY SYSTEM

BRIEF DESCRIPTION

The fuel supply system mainly consists of such components as fuel tank, fuel pump, fuel filter, fuel lines and rails, fuel pressure regulator, and fuel injection nozzles.

With built-in electronic fuel pump and canister, the fuel tank is a metal one having a capacity of 40L; the evaporative emission control system features a solenoid-operated charcoal canister; fuel supply control is enabled through the electronic accelerator pedal.

Structure Diagram



Attentions

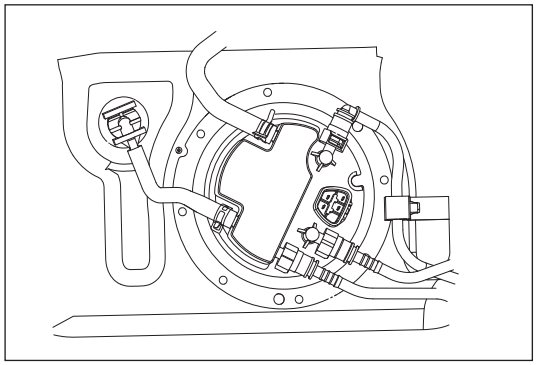
Warning: Be sure to observe the following before performing any fuel system maintenance item:

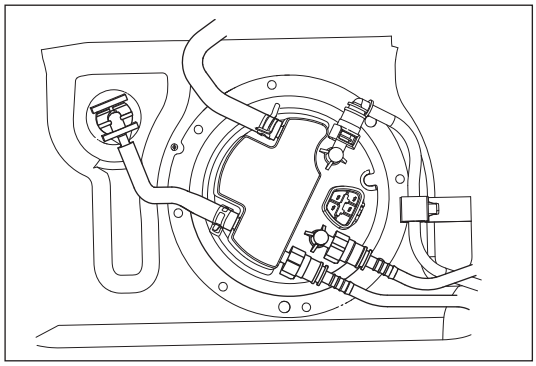
- Disconnect battery negative cable.
- Do not smoke in the workplace. In addition, set a “No Smoking” warning sign.
- Be sure to get dry chemical fire extinguishers ready in the vicinity of the workplace.
- Maintenance must be made at a workplace where is well ventilated and is kept away from open flames (e.g. natural gas heater).
- Remember to wear safety goggles.
- Before disconnecting any fuel feed line, be sure to release pressure in fuel system. Otherwise fire and/or personal injury may be caused. The fuel injection system is under pressure, even after engine shut-down.
- After fuel feed pipe is disconnected, a small amount of fuel may spill out. To reduce incidence of personal injury, you should block disconnected pipe fittings using wiping cloth. After finishing work, put wiping cloth in a designated container.

FUEL TANK

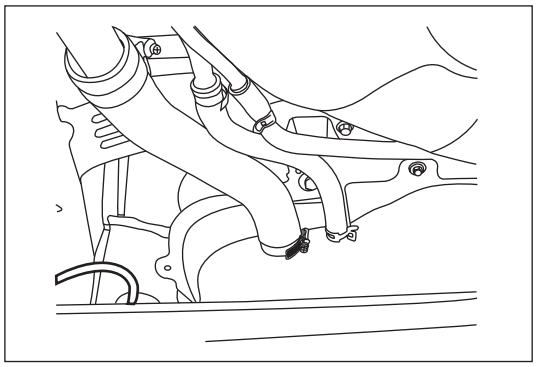
Removal

1. **Lift rear seat.**
2. **Remove body cover.**
3. **Unplug electrical plug of fuel pump from top of fuel tank.**

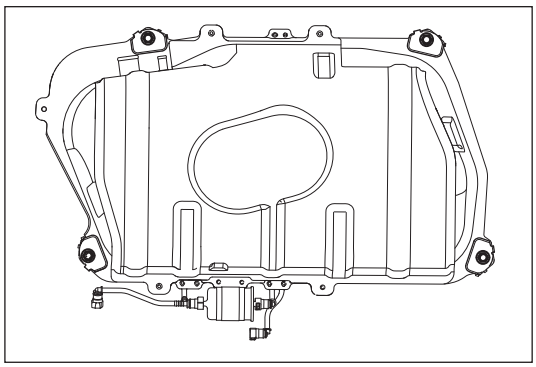




4. **Pull out quick connectors connecting integrated fuel inlet and return pipe with fuel inlet tube and desorption hose I with desorption tube, and then block joints with cotton cloth to avoid high-pressure fuel jet.**



5. Remove hoops and clips from filler hose, canister breather pipe and air return hose at rear of fuel tank.



6. Remove the 4 bolts and 4 stiffener plates securing the fuel tank using the specified torque.
Torque specification: 26±3 N•m

Inspection

1. If exterior is deformed.
2. Check fuel tank for fuel leakage and damage.
3. Check fuel pump and fuel level sensor gasket for oil leakage.
4. Check hoses and fuel pipes connected with fuel tank for oil leakage, loose connections, aging or damage.
5. If charcoal canister in ventilation circuit is in good condition.
6. If fuel tank cap is in good condition.
7. If filler pipe and restriction orifice are in good condition.

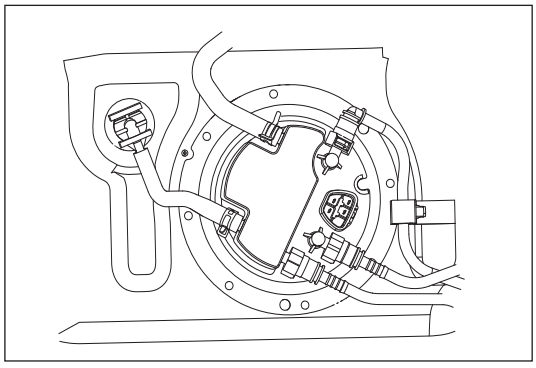
Installation

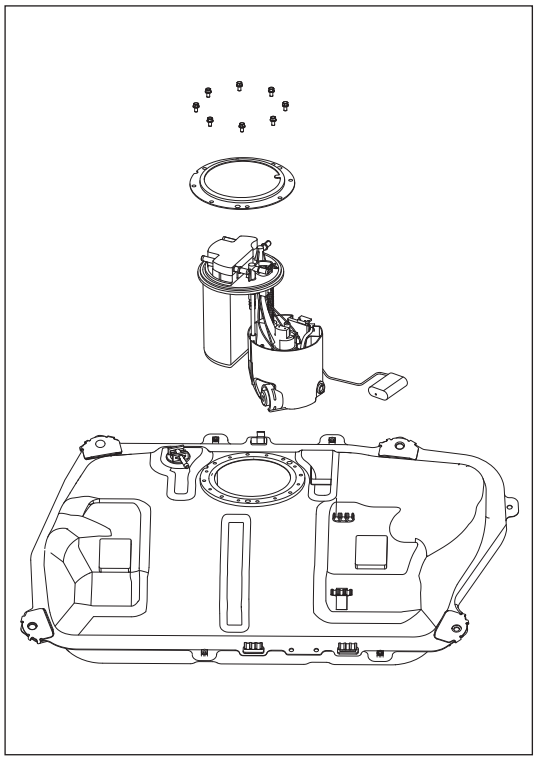
Install in the reverse order of removal.

FUEL PUMP AND CHARCOAL CANISTER

Removal

1. **Lift rear seat.**
2. **Remove body cover.**
3. **Unplug electrical plug of fuel pump from top of fuel tank.**





4. **Remove fuel pump.**
   (a) Clear all dirt buildup around fuel pump flange.
   (b) Remove lines connected with fuel pump.
   (c) Remove the 8 small bolts on the fuel pump mounting plate diagonally in turn with a wrench.
   (d) Take out fuel pump assembly from inside of fuel tank.

   Note:

   Do not damage the fuel level sensor.

   The fuel chamber in the fuel pump unit can not be drained. When this unit is removed, the fuel in the fuel chamber may spill.

   (e) Remove the seal ring and discard it.

Installation

1. **Install fuel pump and charcoal canister assembly as well as fuel level sensor carefully to protect them from damage.**
2. **Ensure that the line joints connected with fuel pump and charcoal canister are correct.**
3. **Install seal and mounting plate, and tighten bolts.**

   Note:

   Error-proofing identifications of mounting plate, fuel pump assembly and fuel tank must be uniform.

   Specified torque: 6±2 N•m

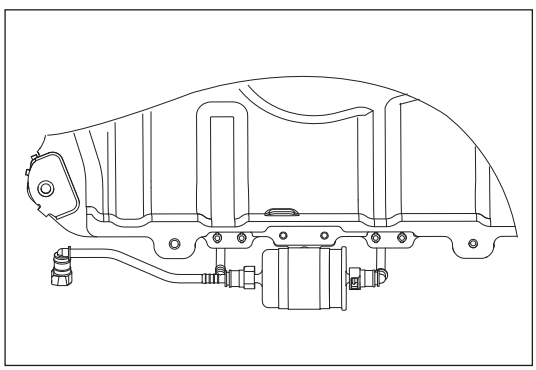
FUEL FILTER ASSEMBLY

Removal

1. **Release pressure in fuel system.**
2. **Disconnect battery negative cable.**
3. **Lift and securely support your vehicle.**
4. **Unplug the quick couplings of the 2 nylon tubes connected with fuel filter assembly.**

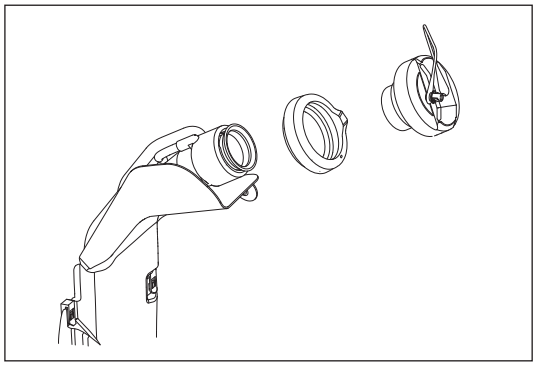
   Note:

   After fuel feed pipe is disconnected, a small amount of fuel may spill out. To reduce incidence of personal injury, you should block disconnected pipe fittings using wiping cloth. After finishing work, put wiping cloth in a designated container.
5. **Loosen the bolts on fuel filter bracket.**
6. **Remove fuel filter assembly.**

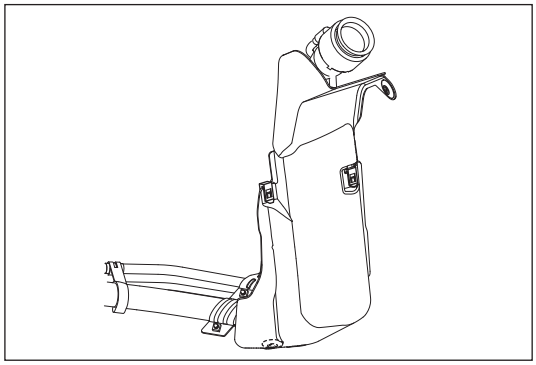


FILLER PIPE ASSEMBLY

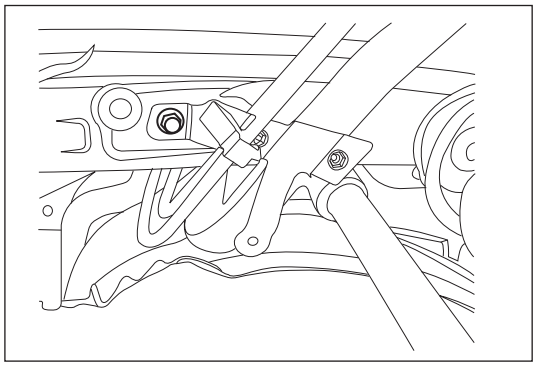
Removal



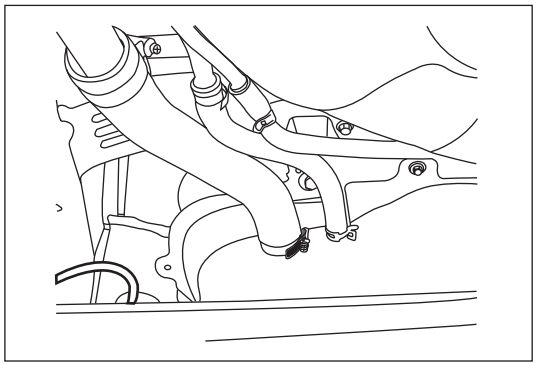
1. Remove fuel tank lock assembly and filler pipe jacket.



2. Remove the 2 mounting clips of filler pipe shield, and dismount the shield from filler pipe assembly.



3. Remove the bolts securing filler pipe assembly bracket to body.



4. Remove hoops and clips from filler hose, air return hose and canister breather pipe.
5. Remove filler pipe assembly.

FUEL LINES

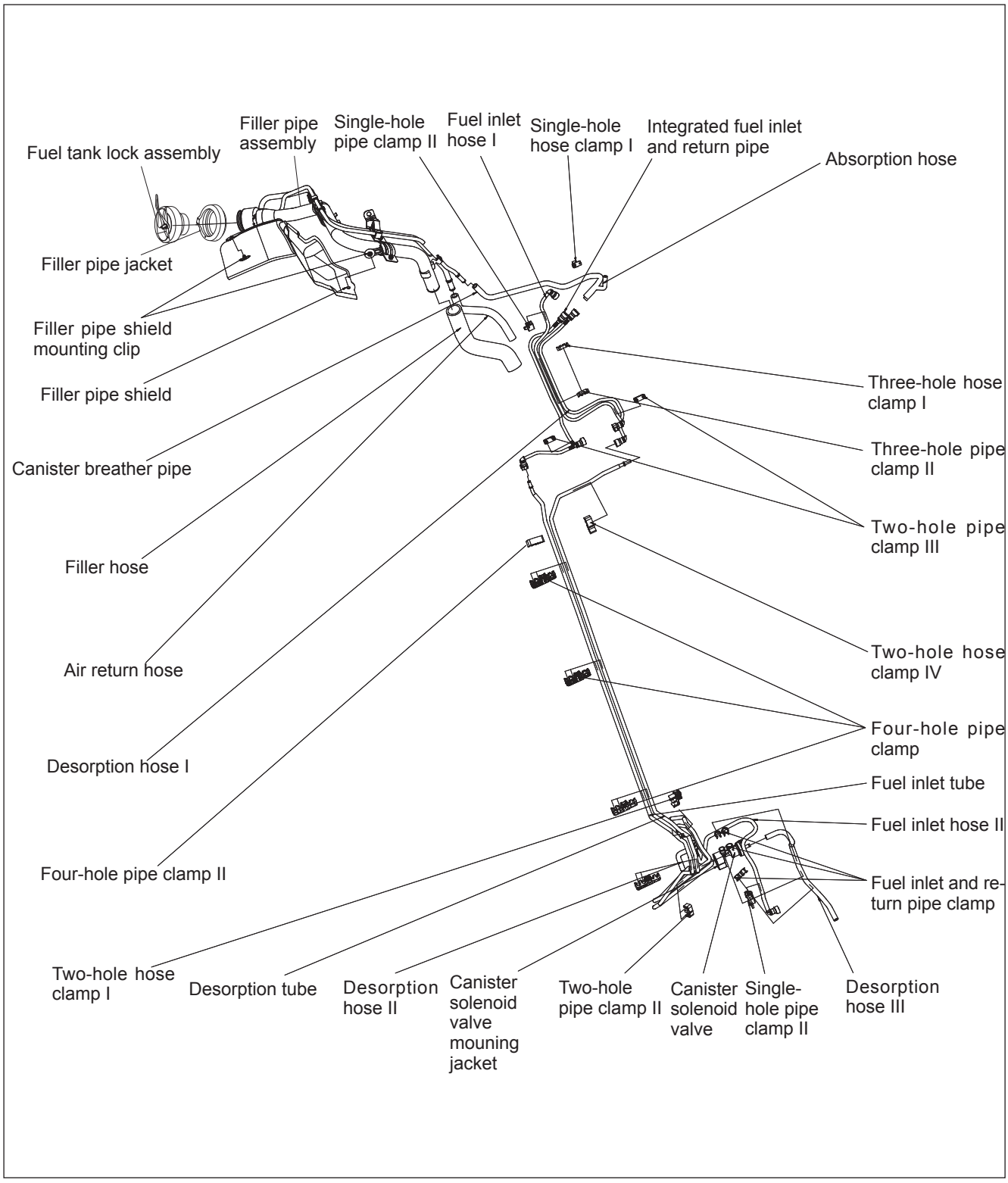
Warning:

Fuel feed lines are under high pressure, so you should use extra care when servicing them.

Inspection:

Visually check fuel lines for oil leak and hoses for cracks, aging or damage. Check all pipe clips for proper tightening. When needed, replace parts.

Structure Diagram



Removal

1. **Release pressure in fuel system.**
2. **Disconnect battery negative cable.**
3. **Disconnect fuel hoses from front and rear ends of fuel pipes.**
   Warning:
   After a fuel hose is disconnected, a small amount of fuel may spill out. To prevent personal injury, you should block disconnected hoses and fuel pipes using wiping cloth. After finishing pipe removal work, put wiping cloth in a designated container.
4. **Remove fuel pipe cover from bodywork.**
5. **Make position marks on bodywork and fuel pipes so that pipe clips can be reinstalled to their original positions.**
6. **Remove fuel pipes and pipe clips from bodywork.**
7. **Remove pipe clips from fuel pipes.**

Installation

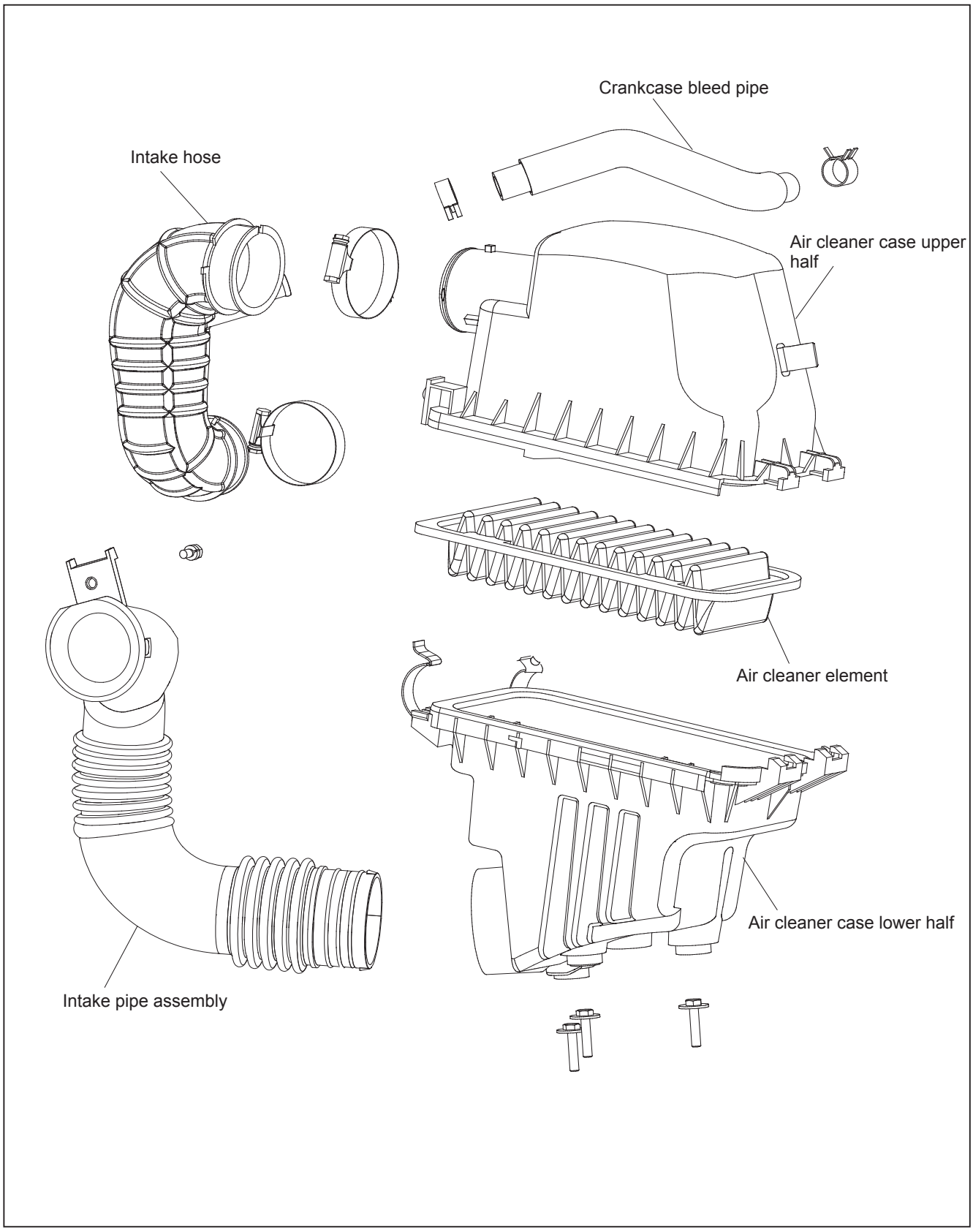
1. **Install pipe clips to mark positions on fuel pipes.**
   If any pipe clip is deformed or its claw is bended or damaged, replace with a new one.
2. **Secure fuel pipes to the vehicle using pipe clips.**
3. **Install fuel pipe cover onto bodywork. Be sure to use new nuts.**
4. **Install fuel hoses onto fuel pipes.**
5. **Check for oil leak with engine stopped and ignition switch ON.**

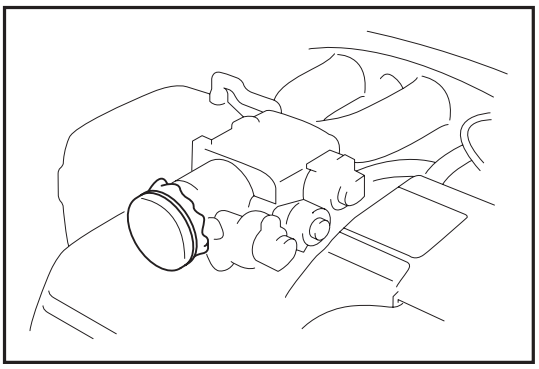
INTAKE SYSTEM

BRIEF DESCRIPTION

The intake system consists of intake pipe assembly, intake hose, crankcase bleed pipe, air cleaner, etc. It is used to provide the engine with sufficient dry and clean air with smallest possible intake air temperature rise.

Structure Diagram





ATTENTISONS

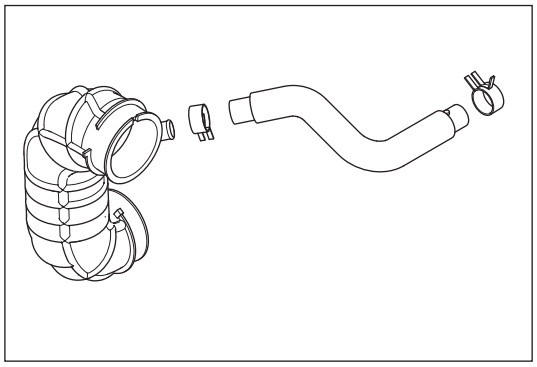
1. Any metal particles entering inlet passage may damage the engine.
2. When removing and installing intake system parts, seal openings of the parts removed and the engine openings with cotton silk cloth, tape or other appropriate materials.
3. When installing intake system parts, check that no metal particles enter the engine or the parts to be installed.

AIR CLEANER

Filter Element Replacement

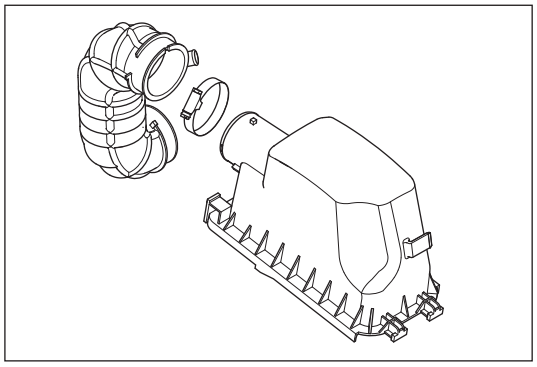
Replace air cleaner element every 10,000km. In severe environments, do the job as appropriate.

The air cleaner element must be cleaned on a regular basis. Remove dust by using pressurized air flow to blow the front of the air cleaner element so as to ensure intake flow and reduce intake resistance thus reducing fuel consumption.



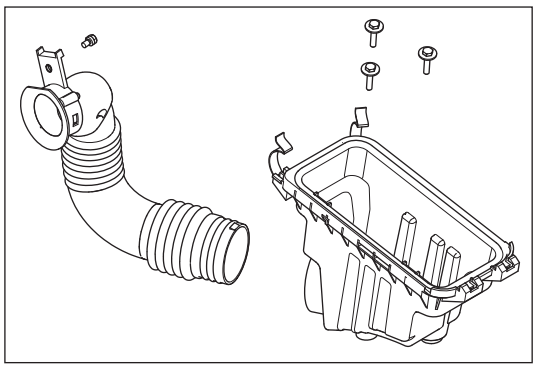
Removal

1. Open the steel strip elastic hoop using pliers, and remove the crankcase bleed pipe.



2. Screw off the type B worm drive hose hoop connecting throttle body with air cleaner case upper half, and remove intake hose.

3. Open the dog to remove air cleaner case upper half, then simply take out air cleaner element and replace it.



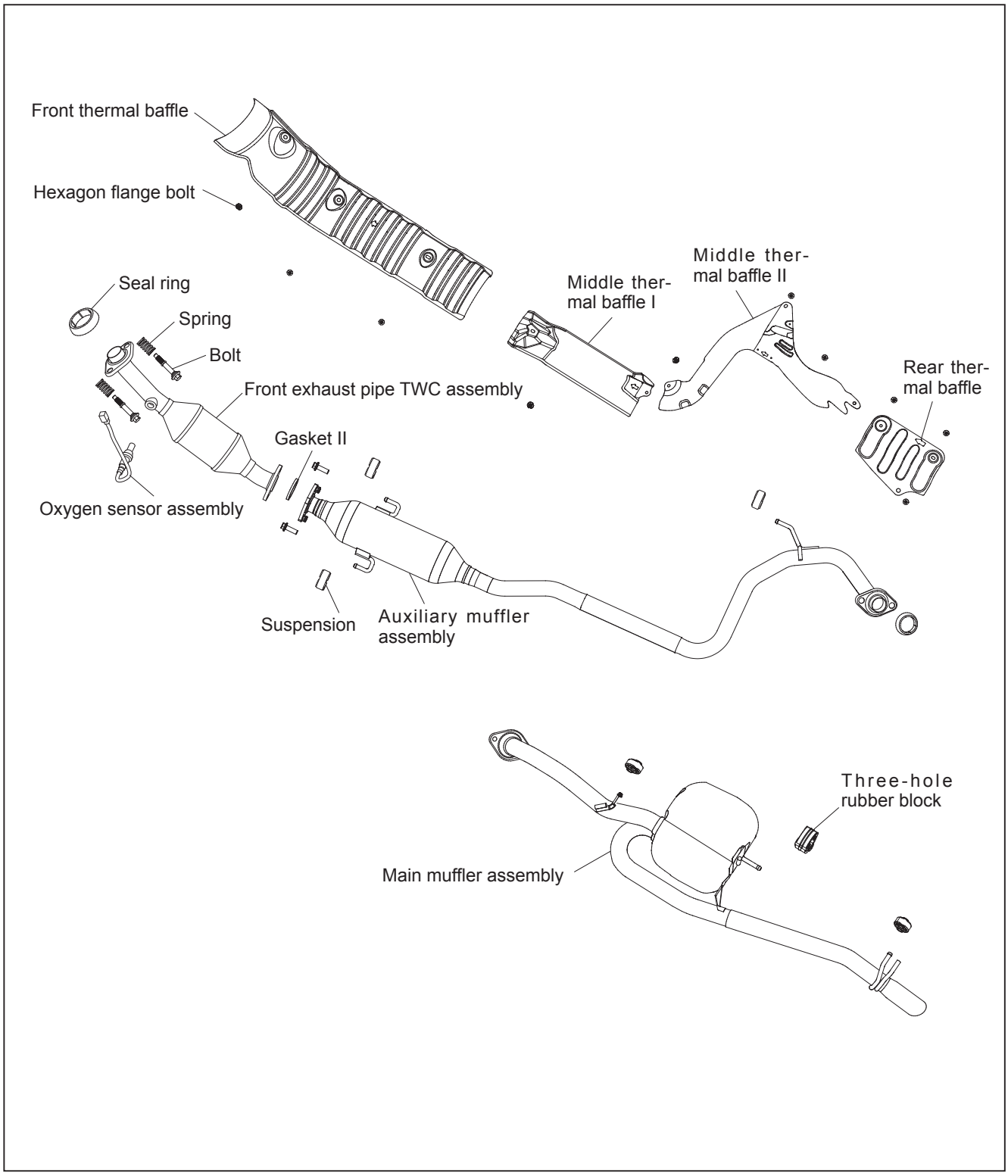
4. Remove the 3 bolts connected with air cleaner bracket, and remove the bolts connecting intake pipe assembly with body.

EXHAUST SYSTEM

BRIEF DESCRIPTION

The exhaust system consists of two-stage muffler (with two-stage three way catalytic converter) and front and rear oxygen sensors.

Structure Diagram

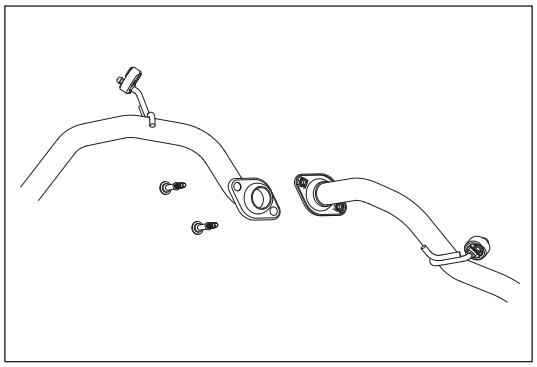


EXHAUST PIPE ASSEMBLY

Removal

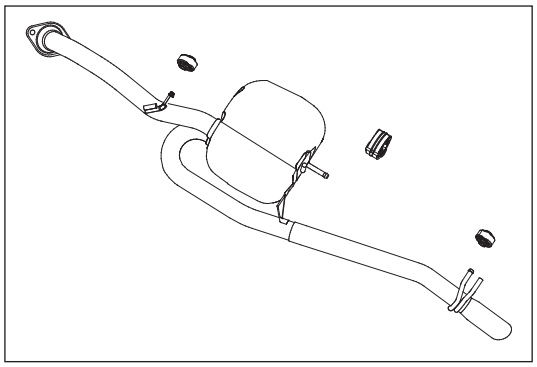
Note:

It is required that removal of any part of the exhaust system be made 30 minutes after shutdown so as to avoid personal injury caused by hot components.



1. Remove main muffler assembly.

(a) Remove the spring bolts connecting front flange of main muffler assembly with rear flange of auxiliary muffler assembly, and take out the seal ring between the flanges.



(b) Remove the 3 rubber suspensions on main muffler.

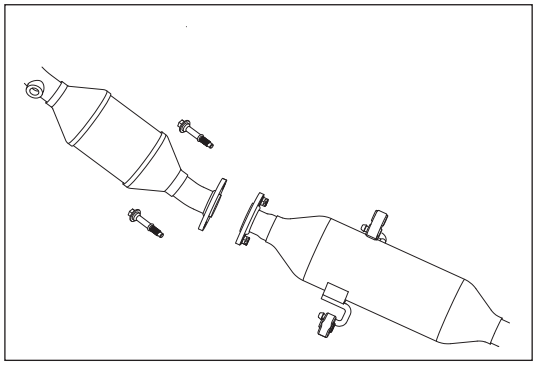
(c) Dismount main muffler assembly.

Note:

The seal ring between front flange of main muffler and rear flange of auxiliary muffler mainly plays the role of sealing. It may deform significantly after having ever been installed so that its sealing effect will degrade. It is suggested that you should not reuse the seal ring. If necessary, reuse it once only.

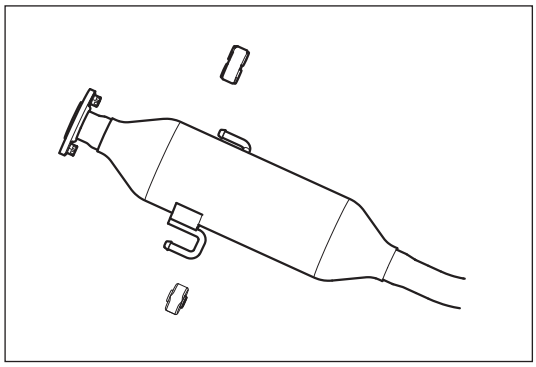
Warning:

When performing this operation, you must have some one hold main muffler to prevent it from dropping which will cause injury to the operator.



2. Remove auxiliary muffler assembly.

(a) Remove the bolts connecting front flange of auxiliary muffler assembly with rear flange of rear catalytic converter assembly.



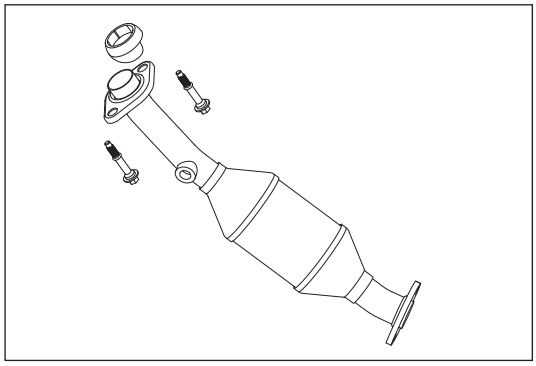
(b) Remove the 2 two-hole rubber suspensions connecting auxiliary muffler with frame.
(c) Remove auxiliary muffler assembly.

Note:

The seal ring between front flange of auxiliary muffler and rear flange of rear catalytic converter assembly plays the role of sealing. It may deform significantly after having ever been installed so that its sealing effect will degrade. It is suggested that you should not reuse the seal ring. If necessary, reuse it once only.

Warning:

When performing this operation, you must have some one hold auxiliary muffler to prevent it from dropping which will cause injury to the operator.



3. Remove rear-stage catalytic converter assembly.
(a) Remove the spring bolts connecting front flange face of rear-stage catalytic converter assembly with rear flange of exhaust manifold assembly, and take out the seal ring between the flanges.
(b) Remove rear-stage catalytic converter assembly.

Installation

1. **Clearances between parts on each side of exhaust pipe assembly should not be less than 15mm.**
2. **Before installation, apply just enough silicone oil to inside of mounting holes of rubber suspensions. After installation, rubber suspensions should be weighted evenly.**
3. **After rear-stage catalytic converter has been installed, ensure oxygen sensor plugs are connected properly.**

COOLING SYSTEM

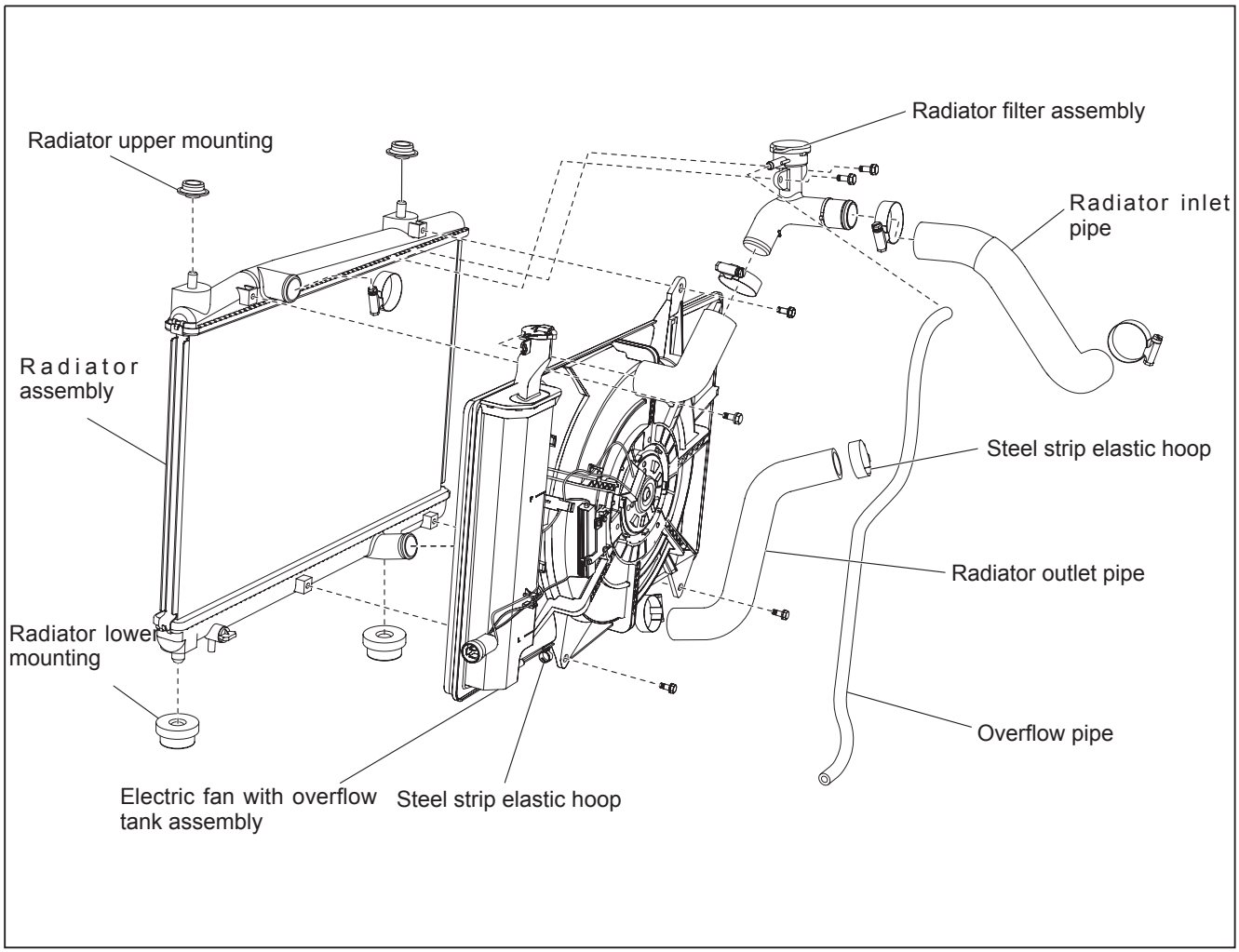
BRIEF DESCRIPTION

The closed type forced recirculating water cooling system features a two-stage electronically governed fan which is integrated with the overflow tank and an aluminum ribbon-tubular radiator with upper and lower water chambers. The opening pressure of the pressure limiting valve in the cooling system is (108 ±15) kPa while the operating temperature of the valve is (85±5) °C.

The cooling system is used to allow comfort cooling of hot parts on the engine under any conditions so that the engine can always operate within the optimum temperature range. At the same time, the cooling system also provides heat source for the heating system.

The common cooling system faults include engine overheating, engine overcooling, coolant leak, and noise from working chamber, etc.

Structure Diagram



FAILURE DIAGNOSIS

Coolant temperature too high (engine overheating)

Symptoms

When the engine is running, the coolant temperature gauge pointer always points to the position of the red scale line or the coolant temperature alarm indicator light comes on, and the actual coolant temperature read using a test is consistent with the gauge reading. This symptom is accompanied by coolant boiling and the engine is prone to knocking, premature combustion, etc.

Sources of failure

The major causes of engine coolant temperature too high mainly include: firstly, heat-sinking capability drop of the cooling system and, secondly, increase in heat produced by the engine.

The causes in the cooling system itself include:

Coolant level too low, circulating water shortage, or coolant leak;

Cooling system filled with non-antifreeze coolant or antifreeze coolant of improper grade;

Heat-sinking capability drop resulted from excessive clogging, rust or scaling in radiator, cooling jacket, water distributor tube, etc.;

Coolant major cycle malfunction caused by the inoperative thermostat's failure to open normally;

Electronic fan out of work resulted from line failure or malfunction in the motor itself;

Water shortage in water pump, water pump belt too slack or slipping due to oil stains, water pump impeller broken, poor sealing of water seal, etc.

Causes outside of coolant:

Delayed engine ignition;

Combustible mixture too rich or too lean;

Knocking or unsmooth engine exhaust caused by increased compression ratio due to excessive combustion chamber deposit;

Poor engine lubrication;

High-temperature gases entering cooling system due to cylinder head gasket being washed away.

Failure Diagnosis

Check pipe joints of cooling system and connections of radiator upper and lower water chambers for evidence of antifreeze leak.

Check radiator surface for clogging. If any, clean or replace; if OK, go to the next step.

Check water pump drive belt for slipping. If any, adjust tension of the belt to an appropriate level according to the technical requirements; if OK, go to the next step.

Check high and low speed electronic fans for normal operation and observe if corresponding electronic fan rotates when engine coolant temperature reaches its ON/OFF level. If no fans rotate, check their related lines and the motor itself for malfunction; if the fans operate properly, go to the next step.

Feel temperatures of radiator inlet and outlet pipes when coolant temperature gauge reading reaches above the opening temperature of the thermostat valve after the engine has been started and run for a period of time. If the inlet pipe is hot while the outlet pipe is warm, you can judge that the thermostat can not open so that the engine is always in minor cycle mode; if the coolant surface in the radiator filler remains calm when engine coolant temperature reaches the full opening temperature of the main valve of the thermostat, you can judge that the thermostat is still closed; if then you feel that the temperature of the radiator is significantly lower than that of the engine body, you can judge that thermostat failure occurs. If result of above check is OK, go to the next step.

Perform on-vehicle inspection for pumping capacity of the water pump after engine coolant temperature reaches the opening temperature of the main valve of the thermostat. When checking, handhold the radiator inlet pipe and then rev up the engine abruptly from idle speed. If you feel that the flow rate in the radiator inlet pipe increases as the engine revs up, it shows that the water pump operates properly; on the contrary, it shows that the water pump operates improperly, and then you should overhaul it.

If result of above check is OK but significant engine power drop accompanied by too high coolant temperature is noticed and high-temperature gases gush from the filler while rolling bubbles appear after the radiator cap is opened or water vapor is discharged from the exhaust pipe, you should check if the cylinder head gasket has been washed away.

If result of above check is OK and no symptoms such as cylinder head gasket wash away are found while high engine coolant temperature occurs, you should check for the related causes outside of the cooling system.

Excessive Coolant Consumption

Symptoms

Water leakage is found on the engine; coolant level in the overflow tank drops quickly; coolant adding is frequently required.

Sources of failure

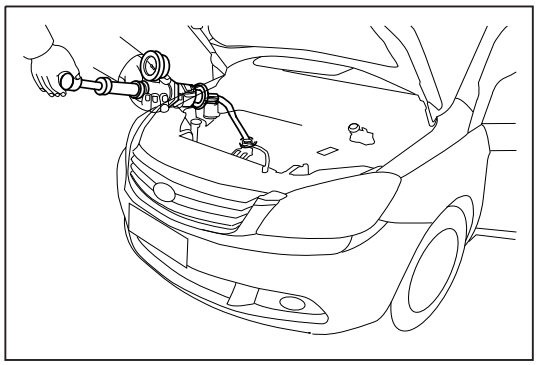
Antifreeze leakage caused by poor sealing of upper and lower water chambers due to radiator damage; Poor sealing caused by loose pipe fittings of overflow tank, water pump junction surface and cooling system lines;

High-temperature high-pressure gases in cylinders entering cooling system resulted from cylinder head gasket damage, flatness out of tolerance and warpage on junction surface between cylinder head and cylinder block, and loose cylinder head fastening bolts, etc.

Failure Diagnosis

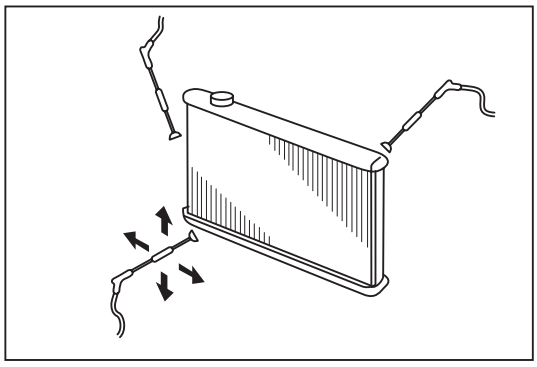
Check pipe joints of the cooling system for evidence of external coolant leakage. Antifreeze is often dye colored, so the external leakage area is noticeable. You should mainly check such areas as pipe joints, overflow tank, water pump junction surface, radiator, and radiator cap for sign of antifreeze leakage.

Check the cooling system for internal leakage. Internal leakage is generally accompanied by such symptoms as weak engine acceleration, white smoke from exhaust pipe, bubbles in radiator, oil level rise, and ivory oil. Then you should overhaul cylinder head and cylinder head gasket.



ON-VEHICLE INSPECTION

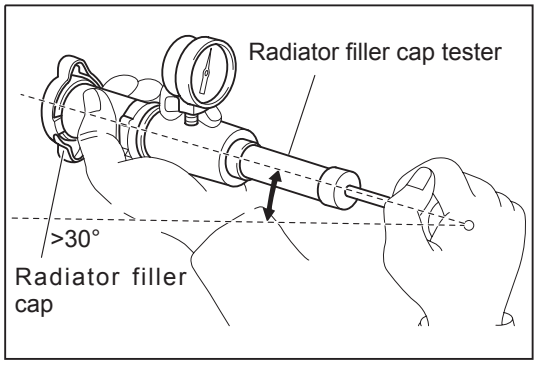
1. **Check cooling system for leakage.**
   Note:
   To avoid being scalded, do not remove radiator filler cap when engine and radiator are still hot. Heat expansion will result in hot engine coolant and steam spilling out of radiator.
   (a) Fill radiator with coolant, and connect a radiator filler cap tester.
   (b) Warm up engine.
   (c) Pump in the system to 137kPa and Check that the pressure does not drop.
   In the case of pressure drop, check pipes, radiator and water pump for leakage. If no external evidence of liquid leakage is found, check heater core, cylinder block, and cylinder head.
2. **Check engine coolant level in reservoir tank.**
   The engine coolant level should be between lines “L” and “F” when engine is cold. If too low, check for leakage and fill ethylene glycol antifreeze (-35°C) up to “F” line.
3. **Check quality of engine coolant.**
   (a) Remove radiator filler cap.
   Note:
   To avoid being scalded, do not remove radiator filler cap when engine and radiator are still hot. Heat expansion will result in hot engine coolant and steam spilling out of radiator.
   (b) Check radiator filler cap and radiator filler for rust and stains. There should be no oil stains in the coolant.
   If too dirty, change coolant.
   (c) Reinstall radiator filler cap.



4. **Check radiator fins for blocking.**
   (a) If any radiator fin is blocked, clean it with water or steam cleaner and dry it with compressed air.
   Note:
   If the steam cleaner is too close to the radiator core, radiator fins may be damaged. Therefore, keep the following spraying distance.

Jet pressure (kpa)	Spraying distance mm
2,942 ~ 4,903	300
4,903 ~ 7,845	500

   - If any radiator fin is bended, straighten it with a screwdriver or pliers.
   - Do not expose any electronic component to water.



5. Check radiator filler cap subassembly.

Note:

- **If the radiator filler cap is dirty, flush it with water.**
- **Before using the radiator filler cap tester, wet pressure relief valve and vacuum valve with engine coolant or water.**
- **When performing the following steps (a) ~ (b), maintain the tester at a place 30° from the horizontal axis.**

(a) Using the radiator filler cap tester, pump out the tester slowly to check that air enters from the vacuum valve.

Pumping speed: 1 pulling out motion takes 3 seconds or longer.

Caution: Pump out at a constant speed.

If air does not enter from the vacuum valve, replace the radiator filler cap.

(b) Pump in the tester and measure opening pressure of pressure relief valve.

Pumping speed: 1 motion in 1 second

Caution: The above pumping speed applies to the first pumping in only (to close the vacuum valve). After the first pumping in, the pumping speed may decrease.

Standard opening pressure: 93~123kPa

Minimum opening pressure: 78kPa

If the opening pressure is less than the minimum value, replace the radiator filler cap.

Remark:

Use the maximum reading of the tester as the opening pressure.

COOLING FAN

On-Vehicle Inspection

1. Check low-temperature operation of cooling fan (below 88°C).

(a) Set ignition switch to ON position.

(b) Check that the cooling fan stops.

If it does not stop, check cooling fan relay and engine coolant temperature sensor. Check between them for break or open.

(c) Disconnect engine coolant temperature sensor connector.

(d) Check that the cooling fan rotates.

If it does not rotate, check fuse, cooling fan relay, ECM, and cooling fan. Check between cooling fan relay and engine coolant temperature sensor for short.

(e) Reconnect engine coolant temperature sensor connector.

2. Check high-temperature operation of cooling fan (above 93°C).

(a) Start the engine and raise coolant temperature to above 93°C.

Remark:

The engine coolant temperature sensor detects coolant temperature at the water outlet.

(b) Check that the cooling fan rotates.

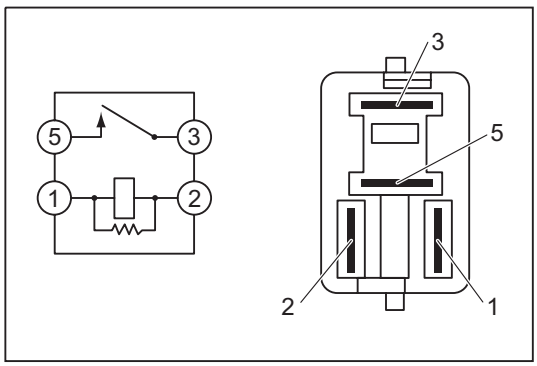
If it does not rotate, replace the engine coolant temperature sensor.

Note: Cooling fan operation

Direction of rotation (View from radiator direction)	Low speed (r/min)	High speed (r/min)
Counterclockwise	1850 ± 150	2500 ± 150

3. Check cooling fan.

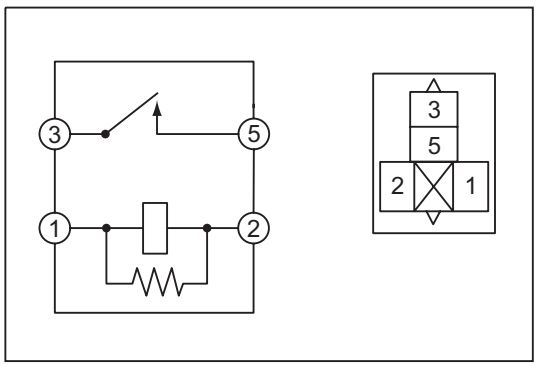
(a) Disconnect cooling fan connector.
(b) Connect the battery and ammeter to the cooling fan.
(c) Check that the cooling fan rotates smoothly. At the same time, check reading of the ammeter.
Standard amperage: 11.7 ~ 14.7 A
(d) Reconnect cooling fan connector.



4. Check 1# cooling fan relay.

Check continuity between terminals with an ohm meter.
Specified status:

Terminal number	Specified status
1 - 2	Continuity
3 - 5	No continuity
	Continuity (When battery voltage is applied to terminals 1 and 2)



5. Check 2# cooling fan relay.

Check continuity between terminals with an ohm meter.
Specified status:

Terminal number	Specified status
1 - 2	Continuity
3 - 5	No continuity
	Continuity (When battery voltage is applied to terminals 1 and 2)

6. Check cooling fan resistor.

Measure resistances between terminals with an ohm meter.
Resistance: 1.17~1.43 Ω at 20°C

ENGINE COOLANT

Change

1. **Drain engine coolant.**

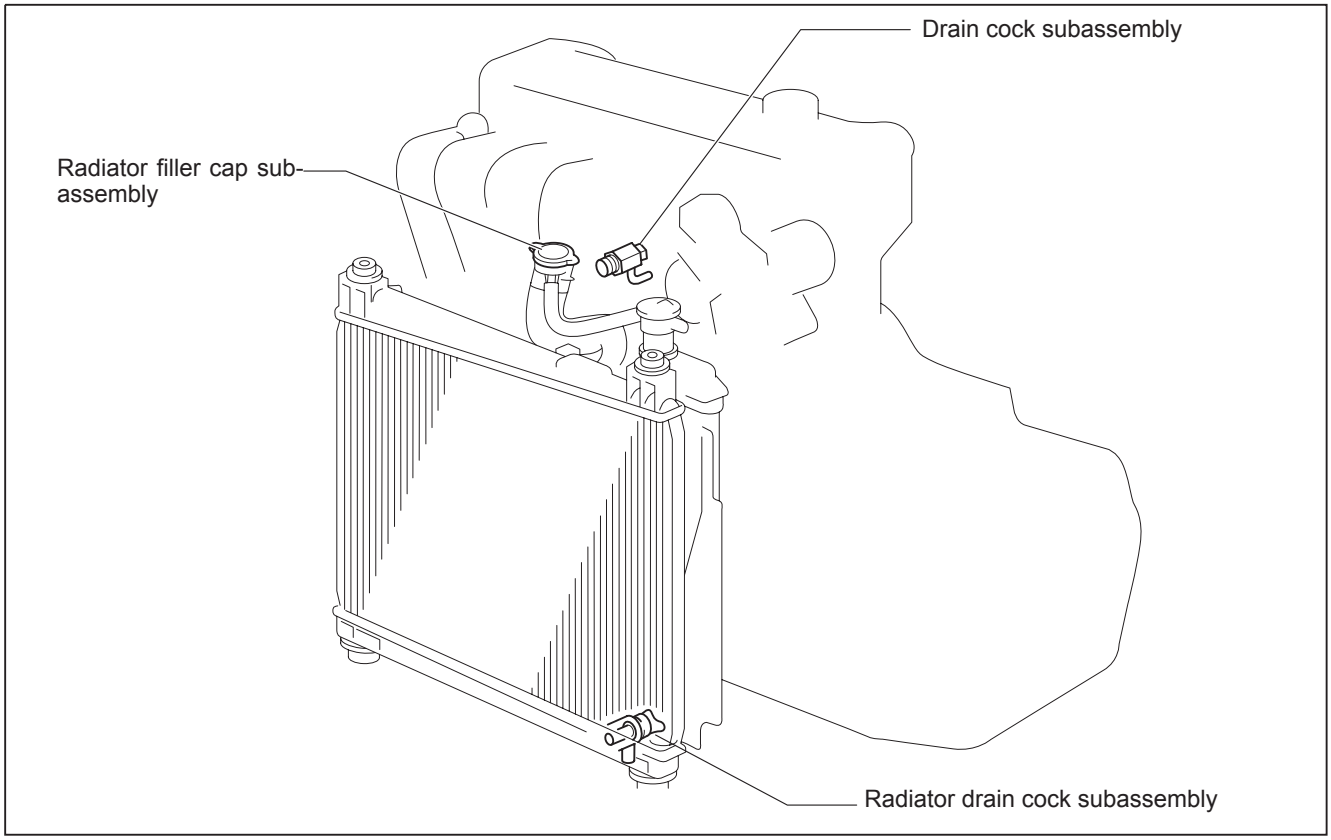
   Note:

   To avoid being scalded, do not remove radiator filler cap when engine and radiator are still hot. Heat expansion will result in hot engine coolant and steam spilling out of radiator.

   (a) Move COLD/WARM switch to warm position, and open heat control valve fully.

   (b) Remove radiator filler cap.

   (c) Loosen radiator drain cock and drain engine coolant.



2. **Fill engine coolant.**

   (a) Tighten radiator drain cock, and fill radiator with coolant until coolant spills.

   Capacity: 5L

   Tip:

   Press radiator inlet and outlet pipes several times by hand.

   If coolant level drops, fill coolant.

   (b) Tighten radiator filler cap.

   (c) Fill reservoir tank with engine coolant until the liquid level reaches the full level line.

   (d) Warm up the engine until thermostat valve is fully opened.

   Tip:

   During warmup, press radiator inlet and outlet pipes several times by hand.

   (e) Shut down the engine and wait until coolant cools down.

(f) Then remove radiator filler cap and check coolant level.
(g) If the level drops, perform steps (a) through (f) again.
(h) If the level does not drop, fill engine coolant to adjust the coolant level in the reservoir tank.

3. **Check for engine coolant leak.**
   (a) Fill radiator with engine coolant, and connect a radiator filler cap tester.
   (b) Pump in to 137kPa and check for leakage.

Failure Diagnosis

Too high coolant temperature

Symptoms: Coolant temperature gauge reading above 115°, radiator boiling, engine overheating, and liability to detonation.

Cause:

1. Coolant shortage caused by water leaks at such parts as joints, hoses, water seals and water plugs
2. Major cycle disabled due to thermostat failure
3. Radiator scaling too thick or clogging, or radiator fins too dirty, deformation or damage
4. Electric cooling fan motor damage, temperature control switch damage
5. Water pump malfunction, driving belt slipping
6. Cooling water passage clogging or scaling too thick
7. Poor radiator cap sealing or valve malfunction

RADIATOR ASSEMBLY

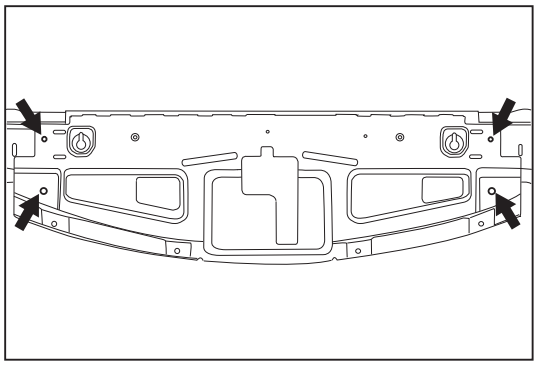
Cleaning

Note:

1. **Fins of radiator are necessary for good heat conduction. Do not brush the fins; otherwise, they may be damaged and heat conduction may be reduced.**
2. **You can use compressed air or water to clean radiator fins. Keep compressed air pressure below 150Kp. Pressure above 150Kp will damage the radiator. Clean the front of the radiator yearly.**
3. **Clean front of condenser.**
4. **Purge through radiator using compressed air to blow off bugs and leaves, etc.**
5. **Blow from back to front. If compressed air is not available, you can introduce water in through radiator using a water pipe.**
6. **Flush with water only when the engine does not**

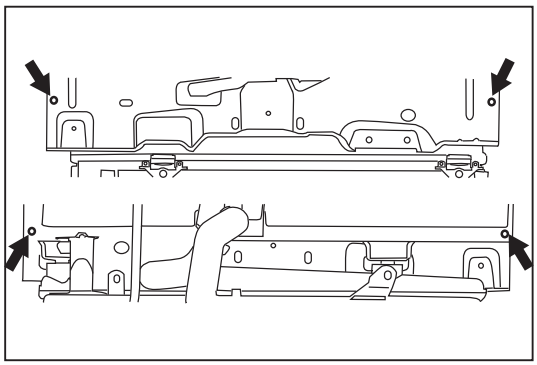
Replacement

1. **Disconnect battery negative terminal.**
2. **Drain engine coolant.**
3. **Disconnect radiator inlet pipe.**
4. **Disconnect radiator outlet pipe.**
5. **Remove front bumper.**

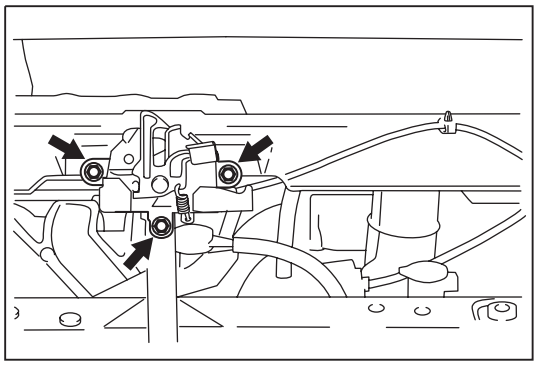


6. Remove radiator upper cross member.

(a) Remove the 4 bolts on upside of radiator upper cross member.

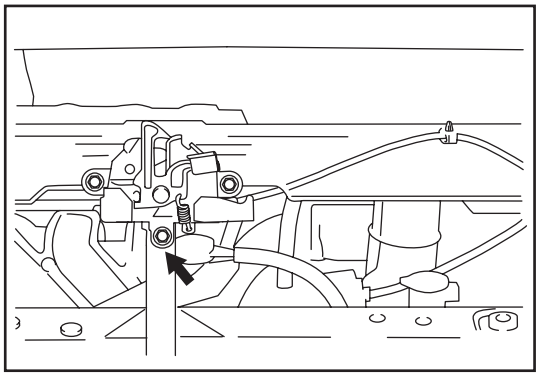


(b) Remove the 4 bolts at front and rear of radiator upper cross member.

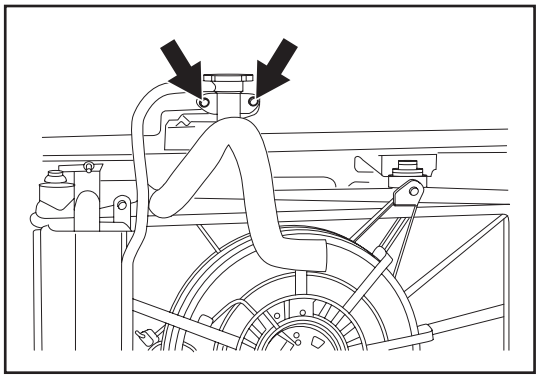


7. Remove hood lock assembly.

Remove the 3 bolts securing hood lock.

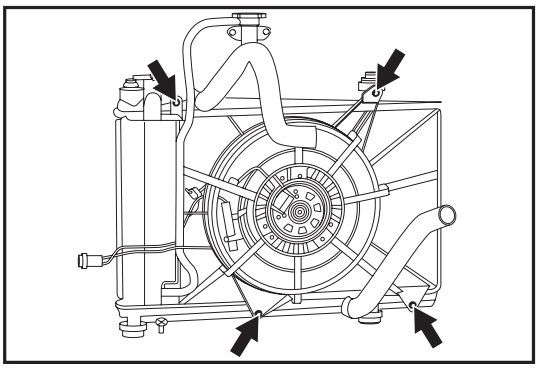


8. Remove hood lock bracket.

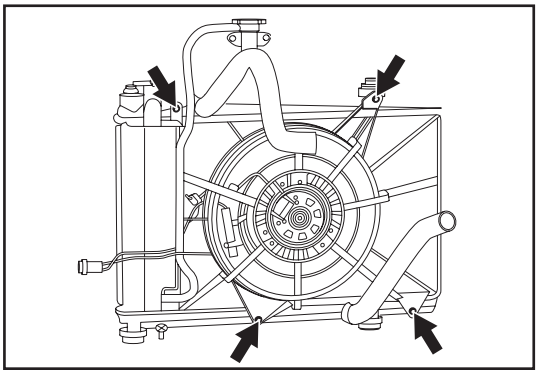


9. Remove radiator assembly.

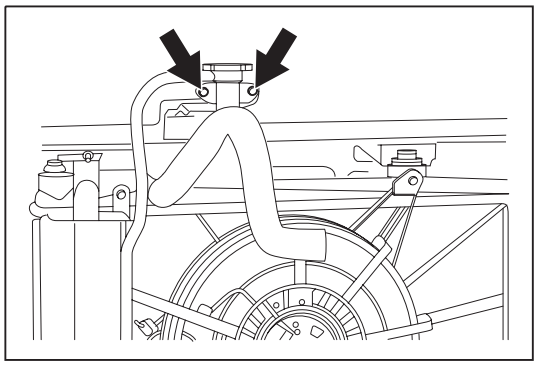
(a) Remove the 2 bolts and the radiator filler upper cross member.



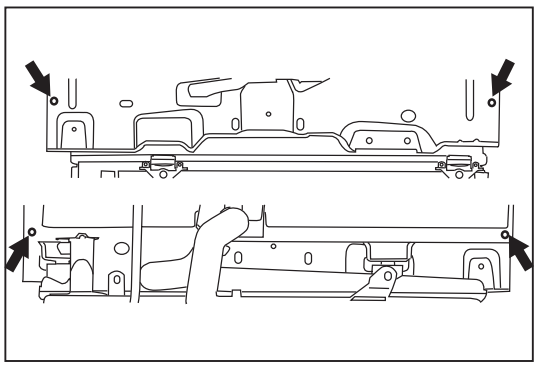
(b) Disconnect the attachment plug from the cooling fan motor, and then remove the radiator assembly from the engine room.
(c) Remove the 2 radiator upper mountings and the 2 radiator lower mountings.
(d) Remove the 4 bolts and separate the electronic fan with overflow tank assembly.



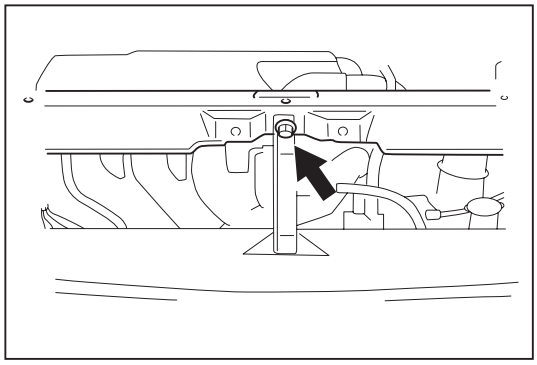
10. Install radiator assembly.
(a) Install electric fan with overflow tank assembly using the 4 bolts.
(b) Install the 2 radiator upper mountings and the 2 radiator lower mountings onto the radiator.
(c) Install the radiator assembly and connect its connector to the cooling fan motor.



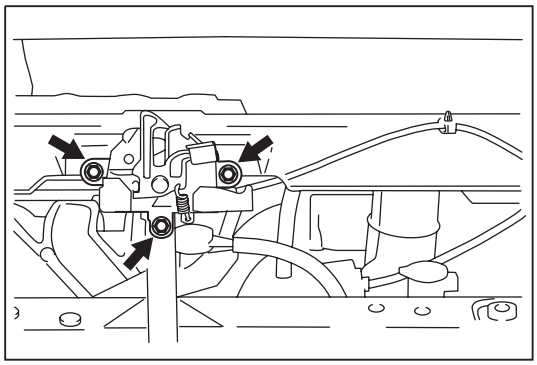
(d) Secure the coolant filler using the 2 bolts.



11. Install radiator upper cross member.
(a) Install the 4 anchorages at front and rear of the radiator upper cross member using the 4 bolts.

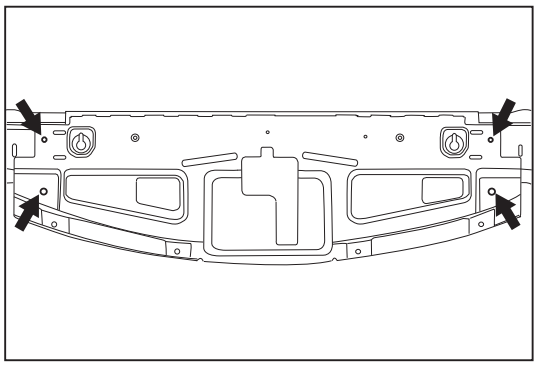


12. Install hood lock bracket.



13. Install hood lock assembly.

(a) Install the hood lock assembly using the 3 bolts.



(b) Install the 4 anchorages on upside of the radiator upper cross member using the 4 bolts.

14. Install front bumper.
15. Fill engine coolant.
16. Check for engine coolant leak.
17. Connect battery negative terminal.

TRANSMISSION

0012E TRANSMISSION

BRIEF INTRODUCTION 2
TECHNICAL PARAMETERS 4
TIGHTENING TORQUE TABLE 5
FAILURE DIAGNOSIS TABLE 6
ATTENTISONS 7
TRANSMISSION ASSEMBLY 8
DIFFERENTIAL ASSEMBLY 16
INPUT SHAFT ASSEMBLY 20
OUTPUT SHAFT ASSEMBLY 25
CLUTCH HOUSING ASSEMBLY 31
TRANSMISSION CLUTCH ASSEMBLY 34
OTHER COMMON WEARING PARTS 37

VT2-11D TRANSMISSION

OVERVIEW 42
PROFILE 43
THE BASIC PRINCIPLE 44
DRIVING MODE 51
GENERAL DESCRIPTION 53
SERVICE INSTRUCTIONS 57
COMPONENT LIST AND TORQUE REQUIREMENT 59
SST 68
PARTS REPLACEMENT INSTRUCTIONS 70
ELECTRONICS INSPECTION 83
OIL LEAKAGE DIAGNOSIS 84
TROUBLE CODES AND TROUBLESHOOTING 84

COOLING SYSTEM

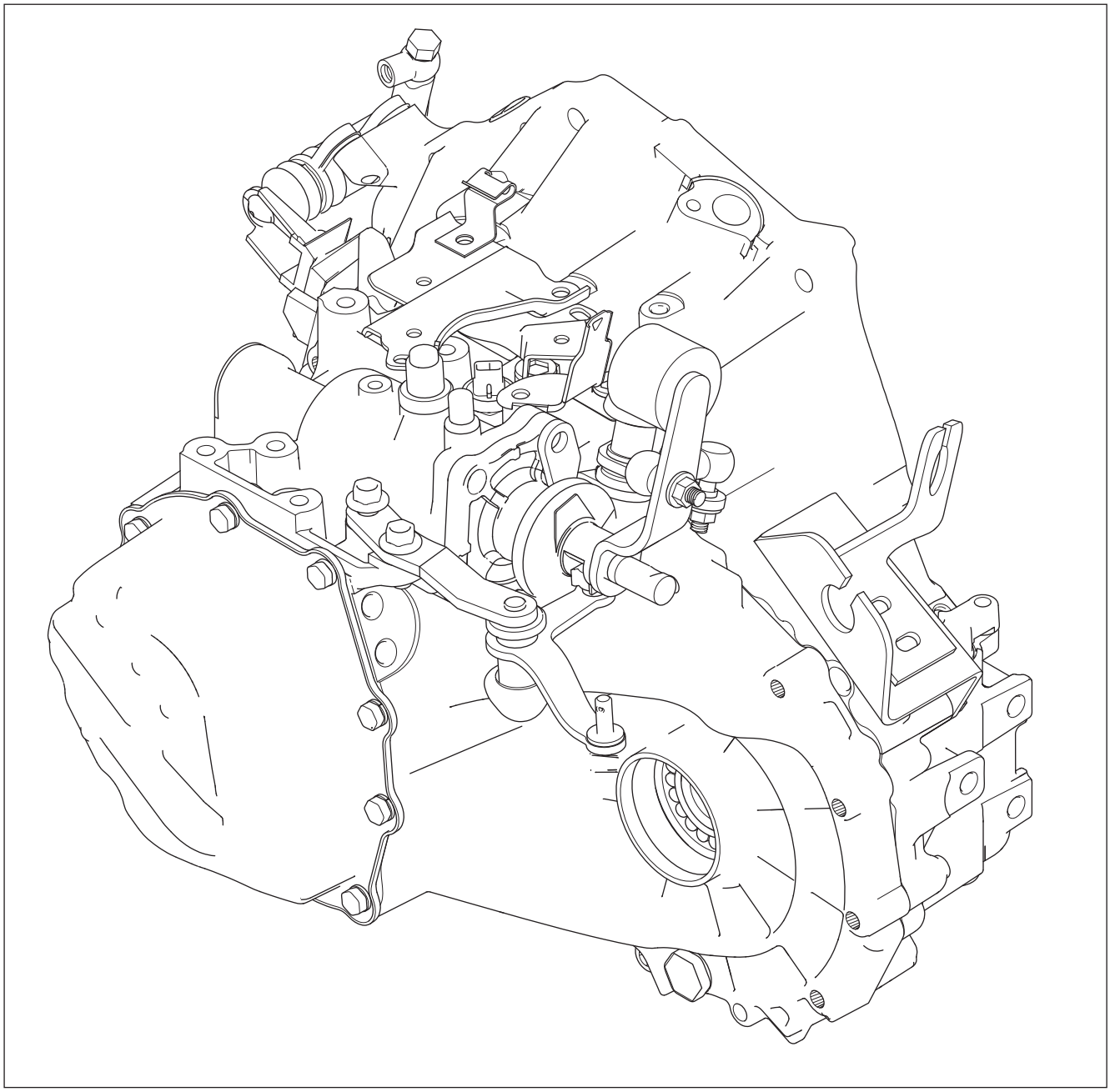
COMPONENTS 94
INLET AND OUTLET PIPE ASSEMBLIES 95

0012E TRANSMISSION

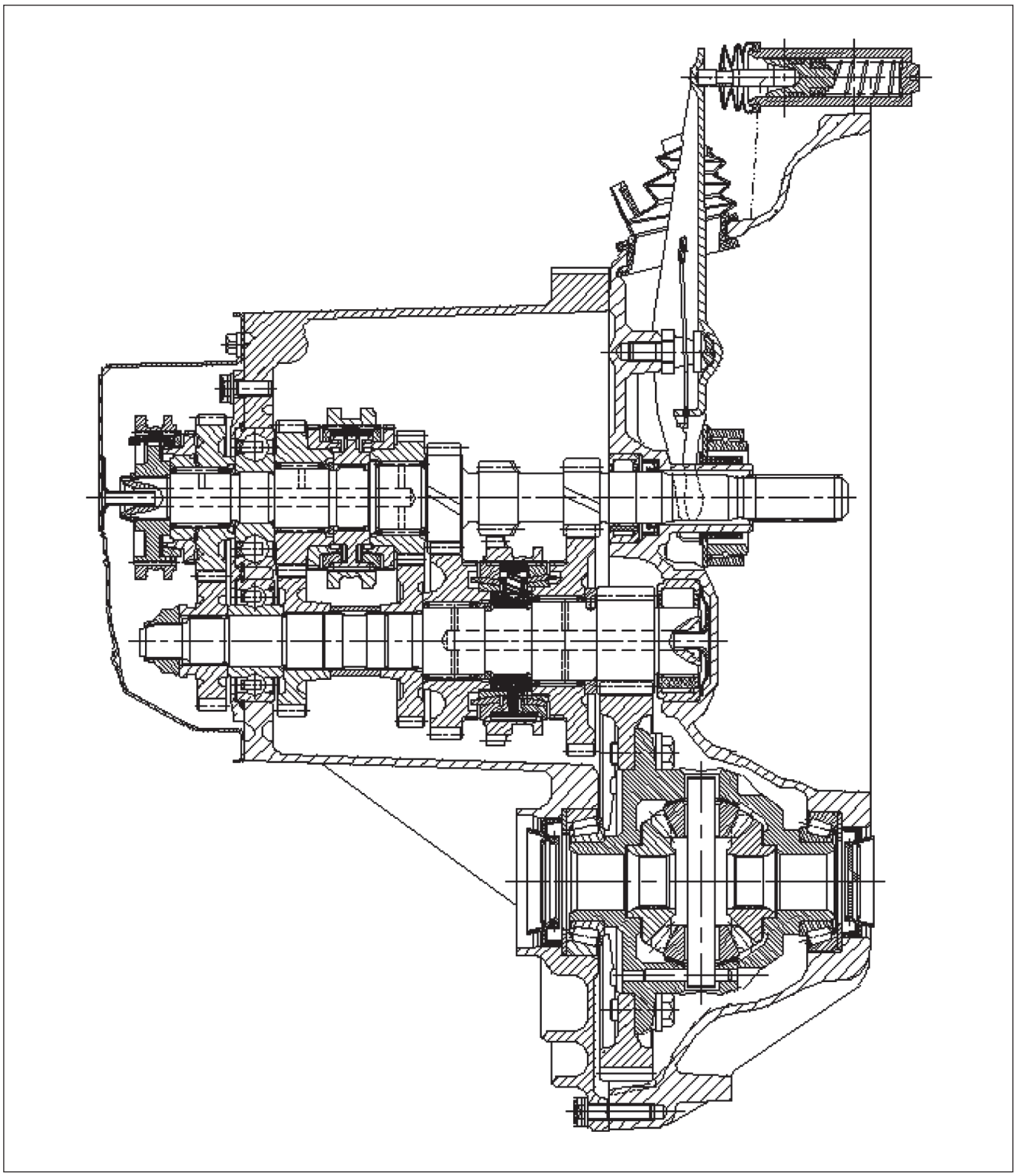
BRIEF INTRODUCTION

This transmission is of front-driving two-axle staged mechanical transmission with differential. Its forward gears employ inertial synchronizer gearshift mechanism which features smooth and easy gearshift, much lower noise, extended gear life and high economical efficiency. Besides the locating steel balls and springs to enable flexible, correct and clear gearshift, its operation mechanism of five-gear transmission is also equipped with interlock mechanism to avoid mistaken engagement of revere gear so as to enhance the driving comfort and reliability.

Overall Outside View



Structure Diagram

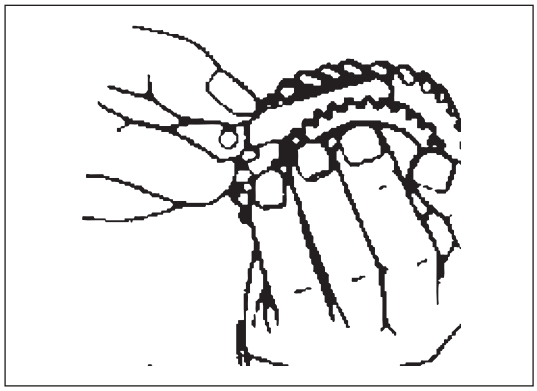


TECHNICAL PARAMETERS

Basic Parameters

Maximum input torque	150N·m/4200rpm					
Speed ratio of each gear	I	II	III	IV	V	R
	3.545	1.905	1.310	0.970	0.816	3.250
Main reduction ratio	4.3125					
Speed ratio of odometer	31/35					
Central distance (mm)	70					
Lubrication oil capacity (L)	1.9±0.15					
Lubrication oil category	SAE80W-90 GL-4					
Net weight(kg)	36.2					

Axial Clearance Between Synchronizer Annulus Ring and Gear (δ)



Gear	I (δ1)	II (δ2)	III (δ3)	IV (δ4)	V (δ5)
Standard clearance (mm)(mm)	1.0~1.6	1.0~1.6	0.8~1.6	0.8~1.6	0.8~1.6

Axial Clearance of Gear Shaft of Each Gear (δ)

Gear	I (δ1)	II (δ2)	III (δ3)	IV (δ4)	V (δ5)
Axial clearance (mm)	0.1~0.3	0.205~0.455	0.125~0.275	0.075~0.325	0.175~0.445

TIGHTENING TORQUE TABLE

Position	Quan. (pcs)	Tightening torque (N•m)
Clutch housing x guy cable support assembly	3	11.3±3.4
Clutch housing x release fork screw	1	36.8±7.4
Clutch housing x oil guide plate/output shaft cylindrical roller bearing pressing plate	2	11.3±3.4
Clutch housing x lock ball screw plug	2	24.5±3.4
Fork shaft x shifting fork (shifting block)	4	15.7±3.1
Clutch housing x lock ball screw plug	1	24.5±3.4
Clutch housing x reverse gear rocker arm support subassembly	2	17.2±3.4
Transmission housing x neutral position locating seat	1	29.4±5.9
Transmission housing x reverse gear lock screw plug	1	12.7±3.4
Transmission housing x input (output) shaft oil guide plate	2	17.2±3.4
Transmission housing x reverse gear locating seat combination	1	39.2±11.7
Transmission housing x reverse lamp switch	1	40.2±12
Transmission housing x oil filling/discharge screw plug	2	39.2±11.7
Transmission housing x clutch housing	13	29.4±5.9
Transmission housing x clutch housing	3	29.4±5.9
Transmission housing x rear body	9	18.1±3.4
Transmission housing x gear selector rocker arm support	1	24.5±3.4
Transmission housing x control cover subassembly	1	19.6±3.4
Transmission housing x control cover subassembly	1	19.6±3.4
Transmission housing x control cover subassembly	1	19.6±3.4
Transmission housing x control cover subassembly	1	19.6±3.4
Transmission housing x bearing pressing plate	5	27.4±5.9
Transmission housing x reverse gear idler shaft	1	29.4±8.8
Output shaft x output shaft lock nut	1	118±7.4
Gear selector rocker arm support x Gear selector rocker arm combination	1	11.8±2.4
Differential housing x differential annulus ring	8	77.4±7.4
Clutch housing x release pump assembly	2	11.8±2.4
Clutch housing x harness support	1	11.3±3.1
Clutch housing x air cleaner support assembly	2	11.3±3.1
Transmission housing x gearshift rocker arm locating bolt	1	24.5±3.4
Transmission housing x left suspension support	4	24.5±3.4
Transmission housing x rear suspension support	4	24.5±3.4

FAILURE DIAGNOSIS TABLE

Common failure	Possible cause	Elimination method
Difficult for gear engagement	Not use the clutch	Use correct driving method
	Incomplete release of clutch	Check and adjust
	Severe wearing of synchronizer annular ring	Replace part and component
	Excessive hard of self-lock spring	Replace part and component
Too large or abnormal noise	Too low oil level	Refill the oil to specified position
	Poor quality of lubrication oil	Replace with specified oil
	Not timely for oil replacement	Replace the oil and damaged part
	Improper gear shaft position and clearance	Check and adjust
	Damage of bearing	Replace part and component
	Blur or knocking of gear	Repair or replace the gear
Oil leakage or seepage	Too oil or too high level	Adjust the level to specified position
	Loose or installation omission of bolt	Re-install and tighten according to specification
	Failure of vent plug	Replace
	Damage of seal	Replace
Damage of synchronizer	Overexerting for gearshift	Replace
	Not use clutch	Use correct driving method
	Damage of synchronizer spring sealing ring	Replace
Out of shift	Failure of operation mechanism	Check and adjust
	Installation omission of spring or steel ball	Install
	Failure of self lock spring	Replace
	Small sleeve back taper angle	Replace
	Excess wearing of gear sleeve fork shaft	Replace
	Excess wearing of shifting fork	Replace
Burning of bearing and gear	Too low oil level	Replace the part and refill the oil
	Poor quality of lubrication oil	Replace the part and lubrication oil
	Not timely oil replacement; too dirty	Replace the part and lubrication oil
	Mixing of different oil products or use of additive	Replace the part and lubrication oil
Difficult for gear disengagement	Failure of synchronizer spring	Replace
	Wearing of internal groove of synchronizer annular ring	Replace
	Synchronizer seized on the taper face	Replace
	Deformation of shifting fork or fork shaft	Replace
	Excessive wearing of shifting fork	Replace

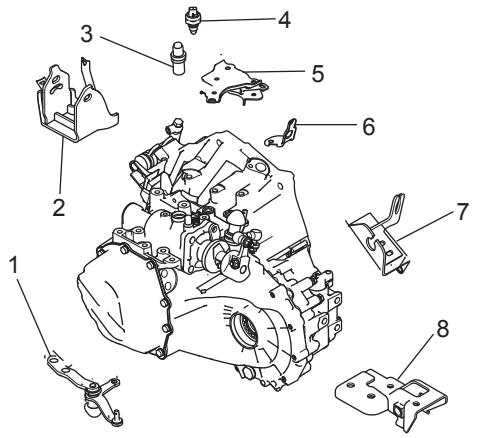
ATTENTISONS

Removal

1. Open the oil drain plug to drain out the oil before removal.
2. Clean the outside of transmission with cleaning agent before removal so as to prevent the foreign materials on gearbox from getting into the gearbox during removal.
3. Prepare a clean container to place the parts removed so as to avoid part loss or confusion, and check the part omission during assembly.
4. It is necessary to carefully check the working conditions, damage, deformation and other failure of each component during removal.

Assembly

1. Clean all parts (except the rubber part and bearing) before assembly. The parts and components shall be completely cleaned with proper methods.
2. When blowing dry the parts with compressed air, notice that the compressed air may lead to flying dust or other dirt, and therefore harm to the eyes.
3. The oil seals, retaining ring for shaft, elastic pin and circlip must not be used again.
4. All the bolts shall be tightened with specified torque.
5. All friction faces shall be applied with lubrication oil; all oil seal lips shall be applied with grease; fully press the oil seal into the transmission housing with special tools; ensure the correct assembly without inclination. Be careful during installation to avoid the oil seal scoring and therefore oil leakage.
6. During installation of bearings, do not pass the pressure with rolling element; do not incline.
7. During assembly of synchronizer subassembly, the openings of spring sealing ring at both sides shall stagger.
8. Special attentions shall be paid to the components with assembly direction requirement.
9. Apply specified sealant onto specified positions; it is necessary to clear the glue on joint face before applying sealant and assemble the parts within 10 minutes after applied the sealant.



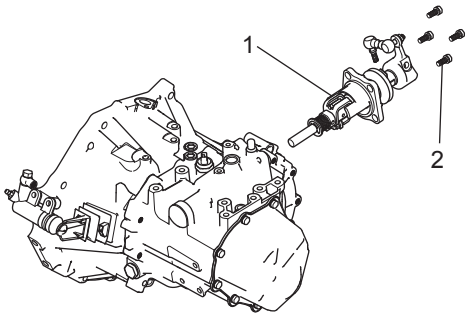
1. Gear selection rocker arm assembly
2. Left suspension support
3. Neutral position locating seat
4. Reverse lamp switch
5. Air cleaner support assembly
6. Harness support 6
7. Guy wire support assembly
8. Rear suspension support

TRANSMISSION ASSEMBLY

Removal

1. Place the transmission with oil drained out onto the working bench.

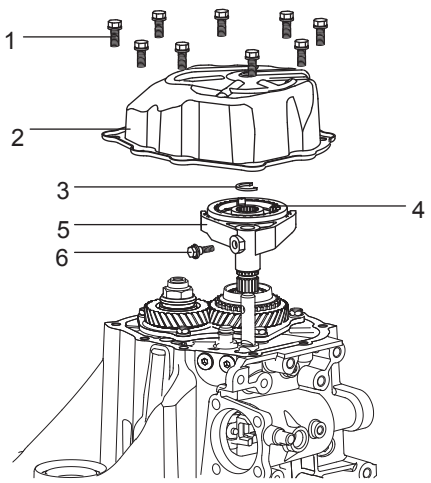
Remove the peripheral parts with tools and screw off the reverse lamp switch and neutral position locating seat.



1. Control cap assembly
2. Control cap bolt and spring washer subassembly

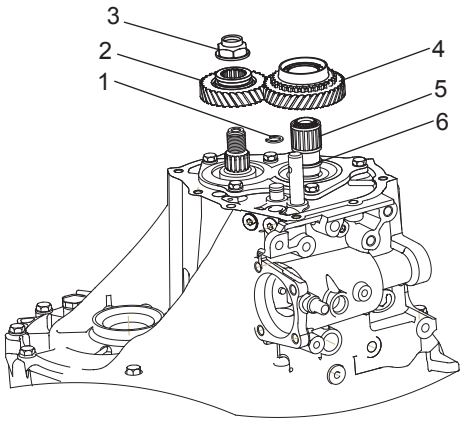
2. Remove the control cap assembly

Screw out the control cap bolt and pull out the control cap assembly.



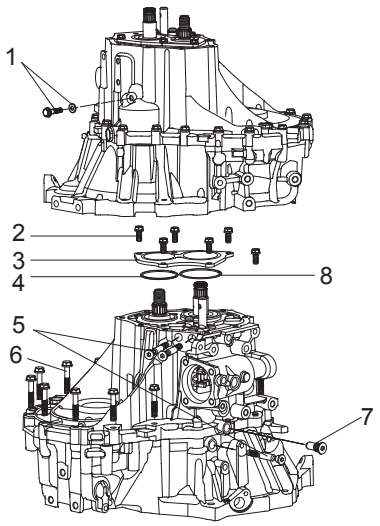
1. Rear cover bolt and spring washer subassembly
2. Rear body subassembly
3. 5th gear hub retaining ring
4. 5th gear synchronizer assembly
5. 5th gear fork
6. Fork set bolt

3. Remove the rear cover and related inside parts with tools.



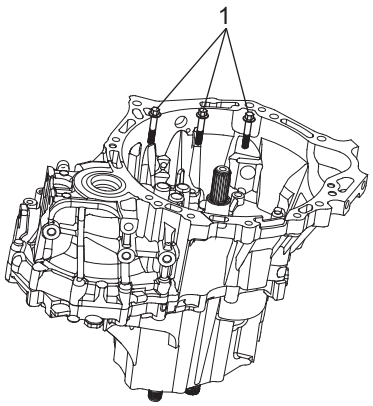
1. Fork shaft limit circlip
2. 5th gear driven gear
3. Output shaft lock nut
4. 5th gear subassembly
5. 5th gear needle roller bearing
6. 5th gear needle roller bearing shock insulator

4. Remove following parts with tools as shown in the figure.



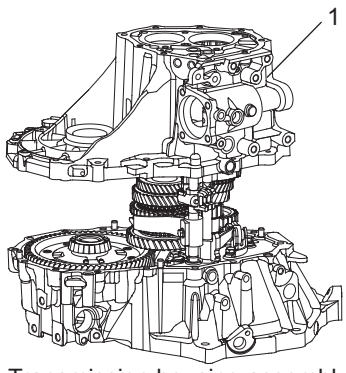
1. Reverse gear idler shaft set bolt and plain washer
2. Pressing plate bolt and plain washer subassembly
3. Bearing pressing plate
4. Output shaft rear ball bearing stop ring
5. Lock ball screw plug, lock ball spring seat, lock ball spring, lock ball
6. Hexagon flanged bolt
7. Reverse gear locating seat
8. Input shaft rear ball bearing stop ring

5. Remove the reverse gear idler set bolt and plain washer, lock ball screw plug, lock ball spring seat, lock ball spring, lock ball, reverse gear locating seat, fork shaft limit circlip, pressing plate bolt and plain washer subassembly, bearing pressing plate, input shaft, output shaft rear ball bearing stop ring and 13 hexagon flanged bolts.



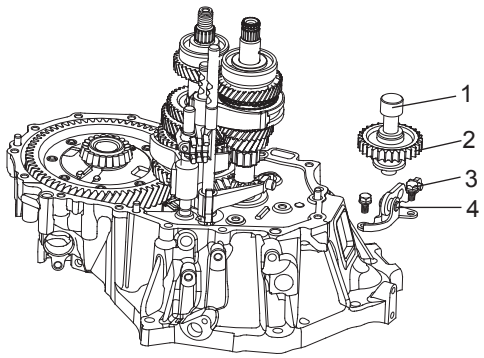
1. Hexagon flanged bolt

6. Turn over the transmission for 90° and screw out the three bolts at one side of the transmission housing.



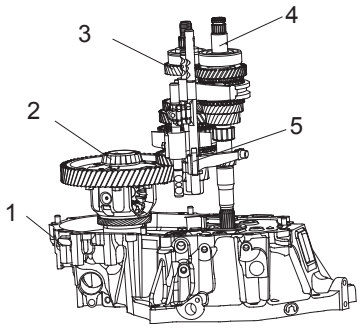
1. Transmission housing assembly

7. Remove the transmission housing assembly.



1. Reverse gear idler shaft
2. Reverse gear idler subassembly
3. Reverse gear rocker arm support set bolt
4. Reverse gear rocker arm support subassembly

8. Remove the set bolt of reverse gear rocker arm support with tools, and take down the reverse gear idler shaft, reverse gear idler subassembly and reverse gear rocker arm support subassembly.



1. Clutch housing assembly
2. Differential assembly
3. Output shaft assembly
4. Input shaft assembly
5. Fork shaft assembly of each gear

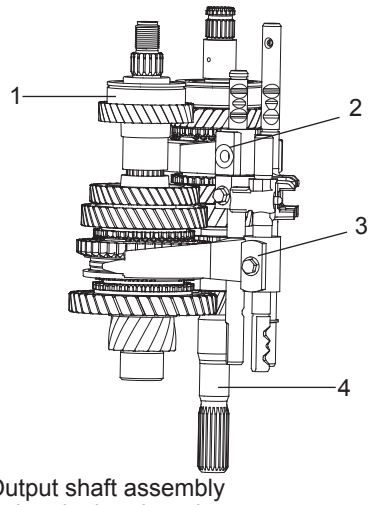
9. Vertically pull out the input shaft assembly, output shaft assembly, 1st and 2nd gear fork shaft assembly, 3rd and 4th, 5th and reverse gear fork shaft assembly, and take out the differential assembly.

Cleaning Description

After disassembly of transmission, clean the input shaft assembly, output shaft assembly, control cap assembly, reverse gear idler subassembly, clutch housing assembly, transmission housing assembly, differential assembly, fork shaft assembly of each gear and the magnets with solvent. Blow dry with compressed air after cleaning.

Inspection Description

1. Check whether there is tooth crack, abnormal wearing or tooth knocking of the gears and replace the gear if any.
2. Check whether there is damage of input/output shaft front/rear bearing and inner ring, destruction of self sealing of bearing, abnormal noise of bearing when rotating; replace the bearing if any.
3. Check whether there is abnormal wearing of 1st and 2nd gear fork, 3rd and 4th, 5th and reverse gear fork, and replace the fork if any.
4. Check whether there is abnormal wearing, crack or deformation on the retaining ring of each fork shaft, and replace the part if any.



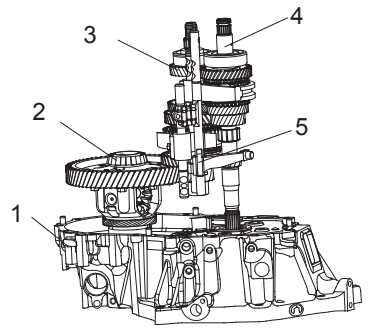
1. Output shaft assembly
2. 3rd and 4th, 5th and reverse gear fork shaft assembly
3. 1st and 2nd gear fork shaft assembly
4. Input shaft assembly

Installation

1. After assembled the 1st and 2nd gear fork shift assembly, 3rd and 4th, 5th and reverse gear fork shaft assembly, place them onto the corresponding synchronizer sleeve.

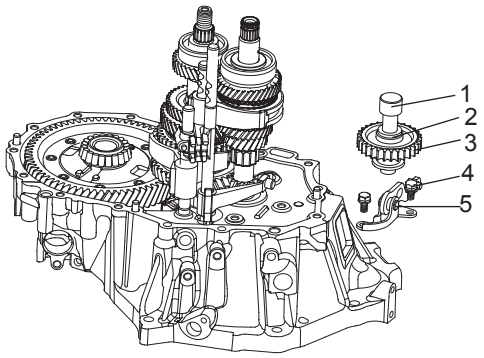
Note:

The two interlock steel ball shall not be omitted.



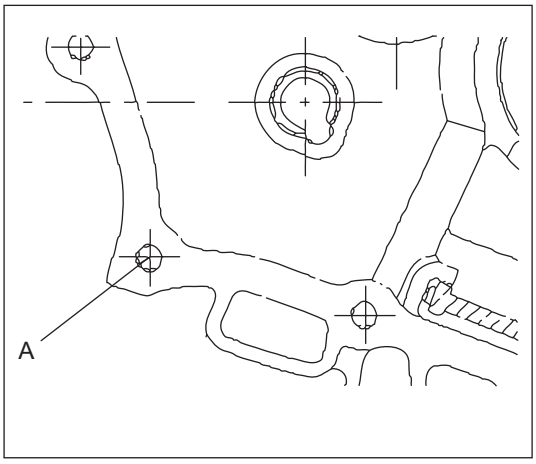
1. Clutch housing assembly
2. Differential assembly
3. Output shaft assembly
4. Input shaft assembly
5. Fork shaft assembly of each gear

2. With the release bearing face of clutch housing assembly facing downward, put into the differential assembly, and then put in the input shaft assembly, output shaft assembly, 1st and 2nd gear fork shaft assembly, 3rd and 4th, 5th and reverse gear fork shaft assembly.



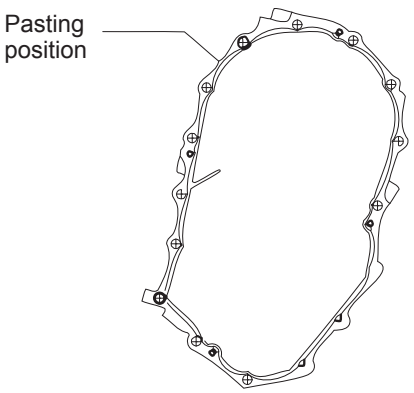
1. Reverse gear idler shaft
2. Reverse gear idler shaft thrust washer
3. Reverse gear idler shaft subassembly
4. Reverse gear rocker arm support set bolt
5. Reverse gear rocker arm support subassembly

3. Put into the reverse gear rocker arm support subassembly and tighten the set bolt of reverse gear rocker arm support with the torque of 17.2Nm; put into the reverse gear idler subassembly, reverse gear idler thrust washer and reverse gear idler shaft.

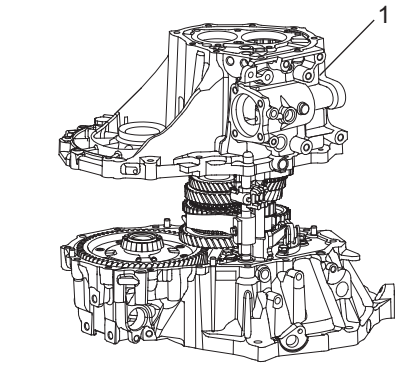


Note:

The direction of mark line at end of reverse gear idler shaft shall align with the bolt hole A on clutch.

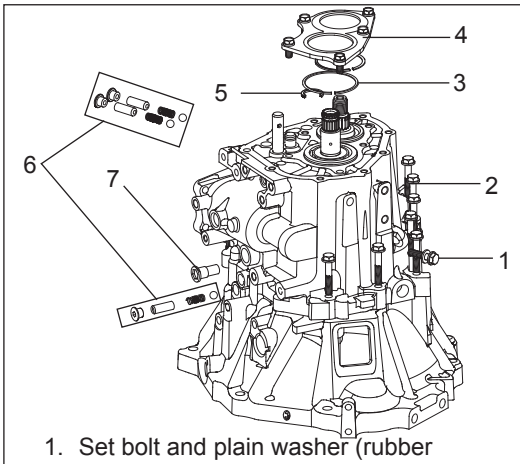


4. Apply sealant on the surface of transmission clutch assembly as shown in the figure.



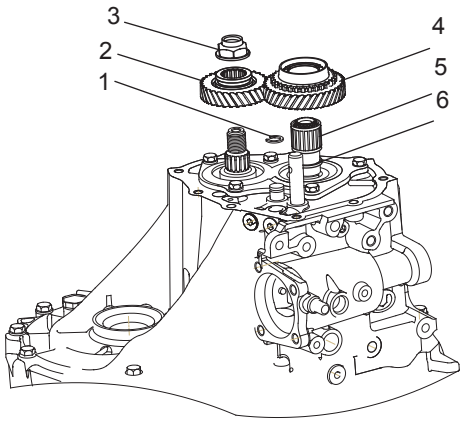
1. Transmission housing assembly

5. Combine the transmission housing assembly and clutch housing assembly.



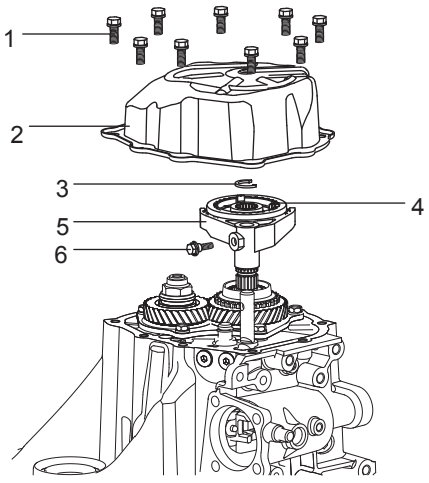
1. Set bolt and plain washer (rubber coating) of idler shaft of reverse gear
2. Hexagon flange bolt
3. Rear ball bearing check ring of input shaft and output shaft
4. Pressing plate bolt and plain washer assembly, bearing pressing plate
5. Shifting fork shaft limiting circlip
6. Lock ball screw plug, lock ball spring seat, lock ball spring, lock ball
7. Reverse gear locating seat

6. Mount 13 box-jointing bolts, set bolt and plain washer of reverse gear idler shaft, lock ball screw plug, lock ball spring seat, lock ball spring, lock ball, reverse gear locating seat, shifting fork shaft limiting circlip, rear ball bearing check ring of input shaft and output shaft, bearing pressing plate, pressing plate bolt and plain washer assembly. Tighten with specified torque.



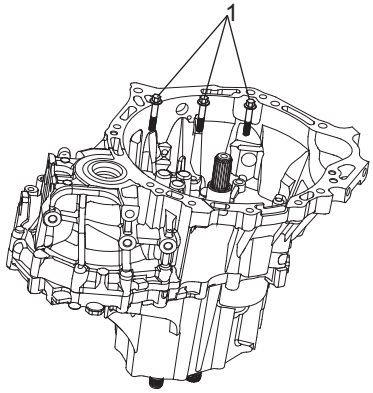
1. Fork shaft limit circlip
2. V gear driven gear
3. Output shaft lock nut
4. V gear subassembly
5. V gear needle roller bearing
6. V gear needle roller being shock insulator

7. Install the gears of V gear and other parts



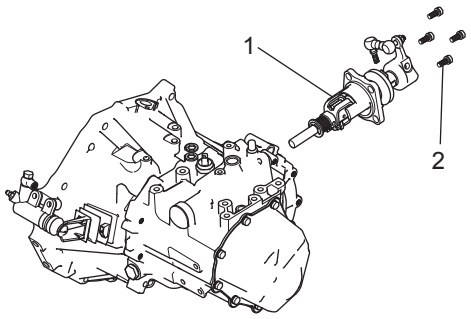
1. Rear cover bolt and spring washer subassembly
2. Rear body subassembly
3. V gear hub shaft retaining ring
4. V gear synchronizer assembly
5. V gear fork
6. Fork set bolt

8. Install the rear cover, V gear synchronizer and other parts



1. Hexagon flanged bolt

9. Turn over the transmission for 90°, and screw in three bolts at one side of clutch housing and tighten with specified torque.

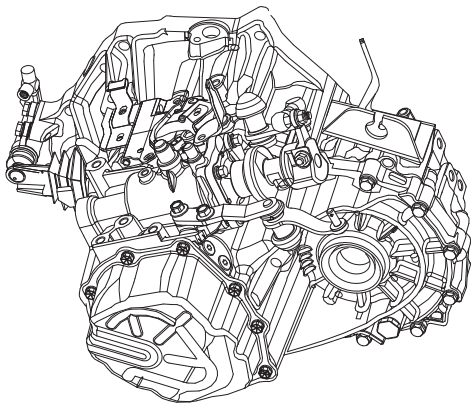


1. Control cover assembly
2. Control cover bolt and spring washer subassembly

10. Mount the control cover assembly.

Note:

The two control cover set bolt at lower part shall be applied with adhesive.



11. Install the release bearing subassembly, release fork subassembly, air cleaner support assembly, left suspension support, right suspension support, neutral position locating seat, reverse lamp switch, gear selection rocker arm assembly, steering support and other gearshift mechanism subassembly, and control cover bolt; then tighten with specified torques. Complete the assembly.

Selection of Bearing Washer of Each Shaft

If the input shaft, output shaft or the gear, hub and bearing on them is replaced during maintenance, it is necessary to measure the axial clearance during assembly and select proper washers and shaft retaining rings to meet the axial clearance requirements. If the transmission housing, clutch housing, differential housing or any part of different front and rear bearing is replaced, the starting torque of differential shall be measured during assembly.

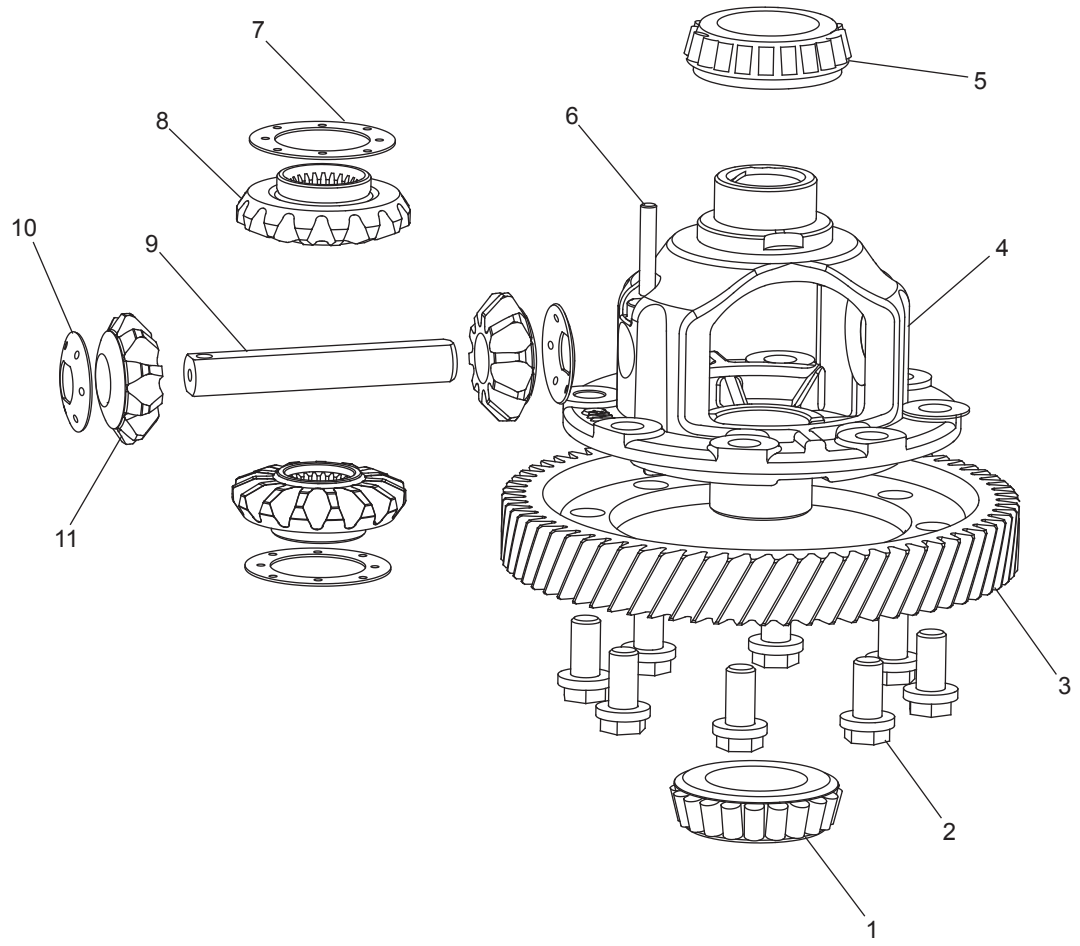
Standard value for starting torque:

New bearing: (0.78 - 1.57)N•m

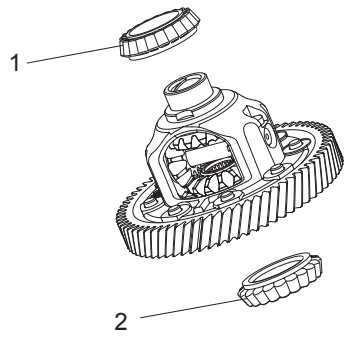
Bearing after running-in: (0.49 - 0.98)N•m

DIFFERENTIAL ASSEMBLY

Structure Diagram



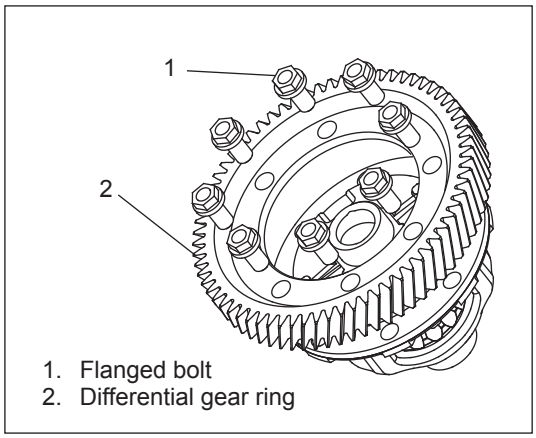
1. Rear tapered roller bearing
2. Flanged bolt (8)
3. Differential gear ring
4. Differential housing
5. Front tapered roller bearing
6. Cylindrical pin Q5220635
7. Axle shaft gear spacer
8. Axle shaft gear
9. Planet gear shaft
10. Planet gear spherical washer
11. Planet gear



1. Front tapered roller bearing
2. Rear tapered roller bearing

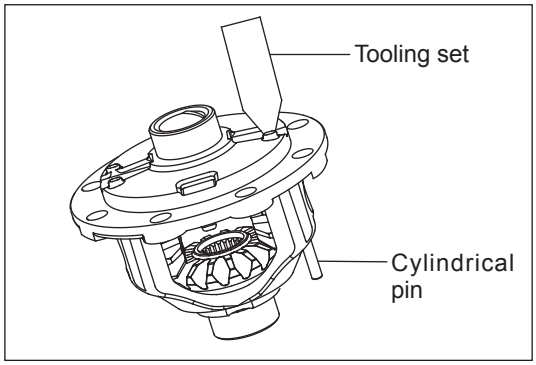
Removal

1. Remove the front/rear tapered roller bearing of differential with special tools, and take down the drive gear of odometer.

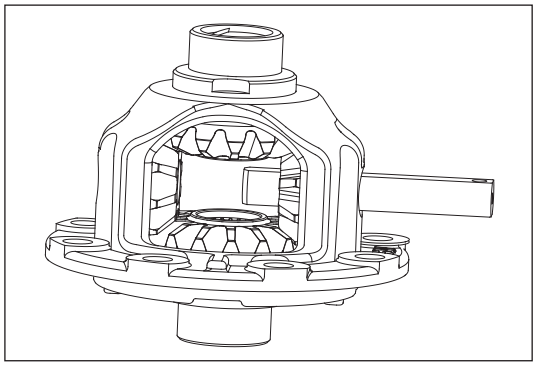


1. Flanged bolt
2. Differential gear ring

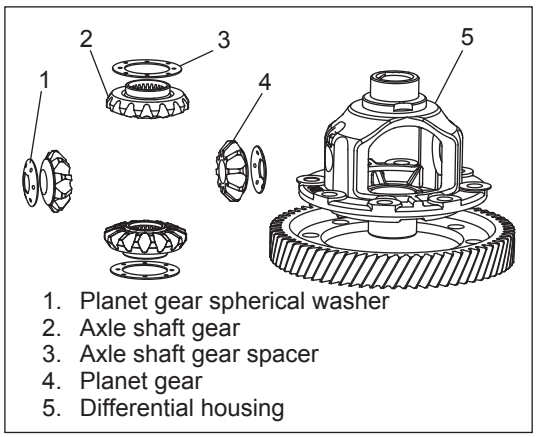
2. Remove 8 flanged bolts and the differential gear ring.



3. Remove the cylindrical pin fixing the planet gear shaft with special tools.



4. Remove the planet gear shaft.



1. Planet gear spherical washer
2. Axle shaft gear
3. Axle shaft gear spacer
4. Planet gear
5. Differential housing

5. Remove the planet gear and axle shaft gear.

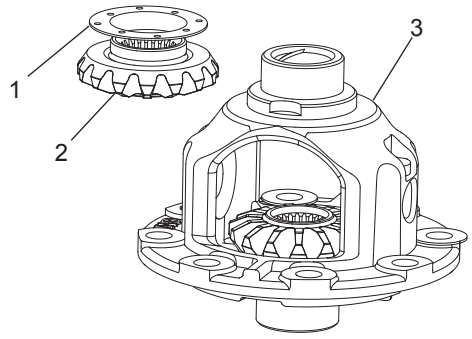
Installation

Note:

1. It shall be replaced with new parts after disassembly of differential front and rear bearing.
2. The bearing outside must be cleaned before assembly, and check and confirm the parts have no abnormal wearing and damage.
3. It must be ensured that there is no knocking on all parts during disassembly.

1. Install the axle shaft gear

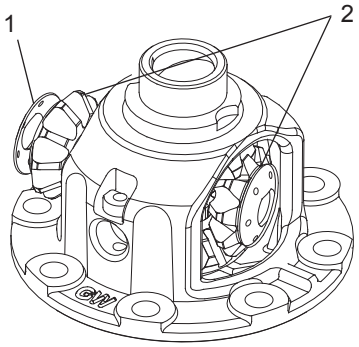
Install two axle shaft gear spacers into the axle shaft gear, and then install into the differential housing.



1. Axle shaft gear spacer
2. Axle shaft gear
3. Differential housing

2. Install the planet gear.

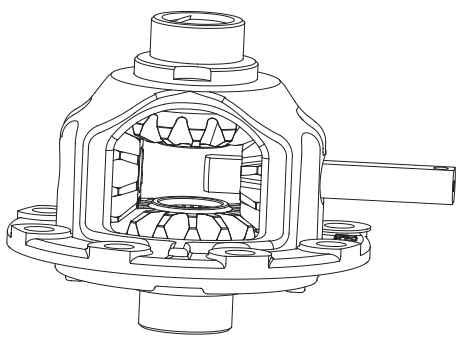
Install the spherical washer onto the planet gear and then put it between two axle shaft gears; simultaneously rotate two planet wheels and align their holes with two holes on differential housing for the installation of planet gear shaft.

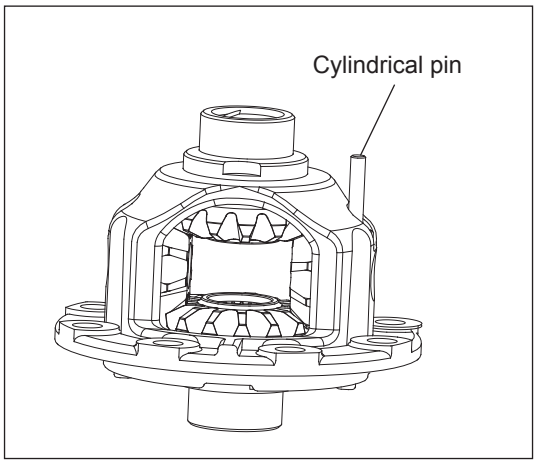


1. Planet gear spherical washer
2. Planet gear

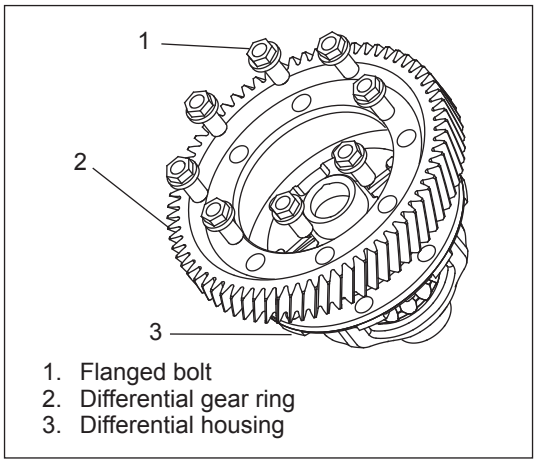
3. Install the planet gear shaft.

Pass the axle gear shaft through two axle shaft gears with the pin hole on shaft aligning with the position of pin hole on differential housing.



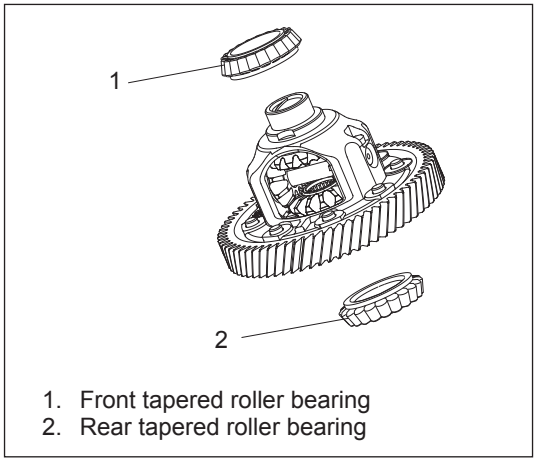


4. Knock in the cylindrical pin with tooling set.
Rivet the differential housing with tooling set to prevent the pin backingout.



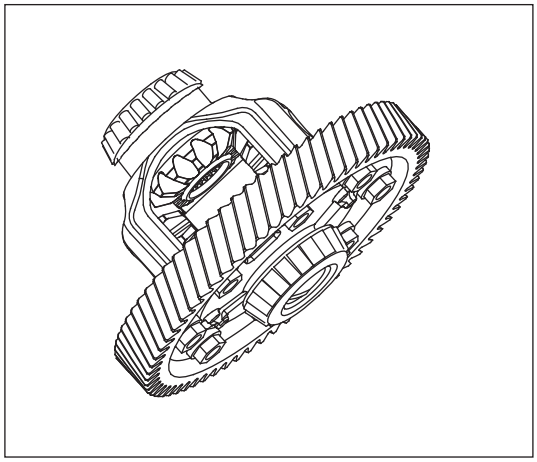
1. Flanged bolt
2. Differential gear ring
3. Differential housing

5. Install the differential gear ring and 8 flanged bolt
Mount the differential gear ring onto the differential housing and then assemble in place after aligning all hole positions. Tighten the flanged bolt with the torque of 77.4N•m.



1. Front tapered roller bearing
2. Rear tapered roller bearing

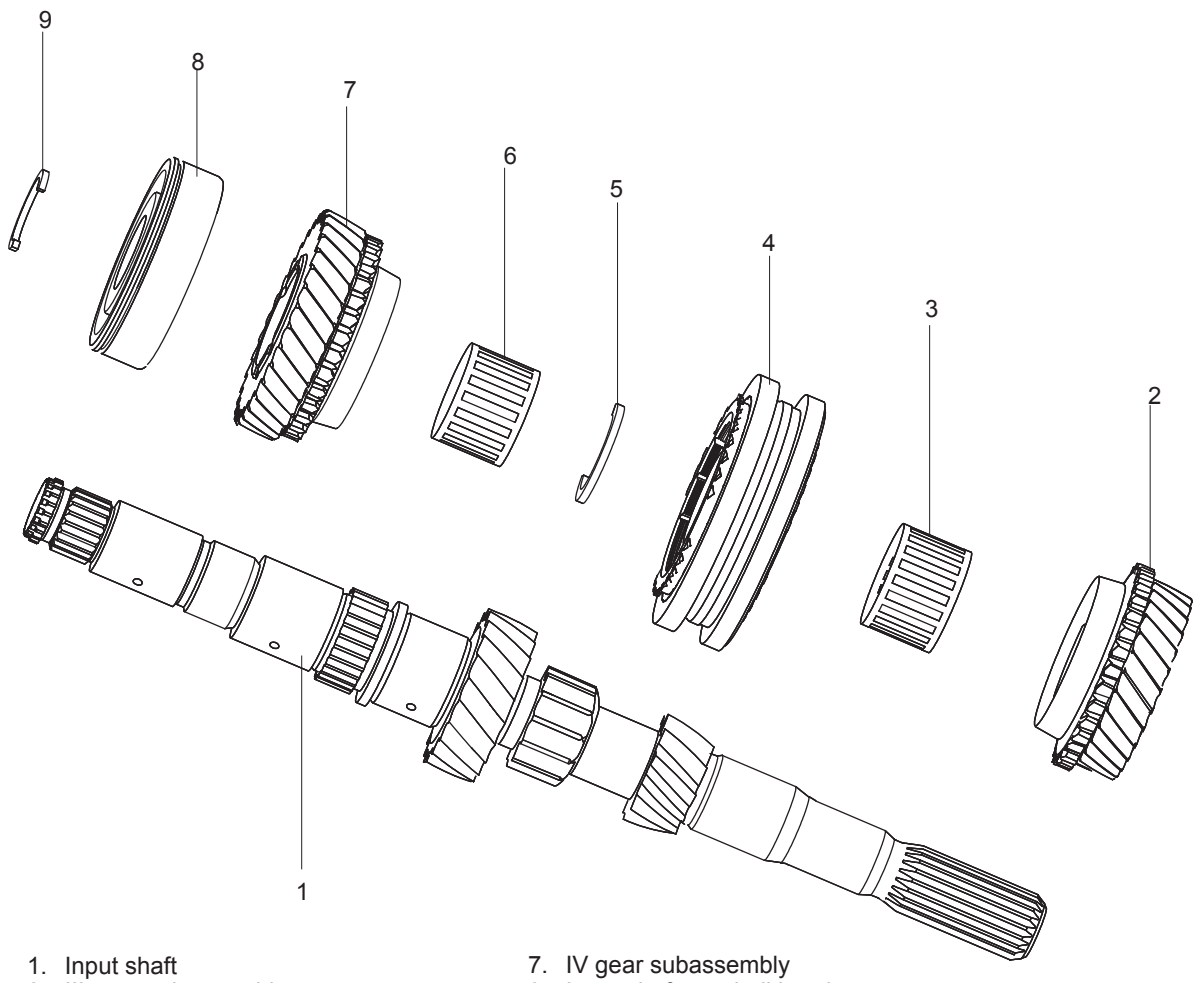
6. Pressing install the front and rear tapered roller bearing with tooling set; put the tapered roller bearing into the odometer drive gear before pressing installation



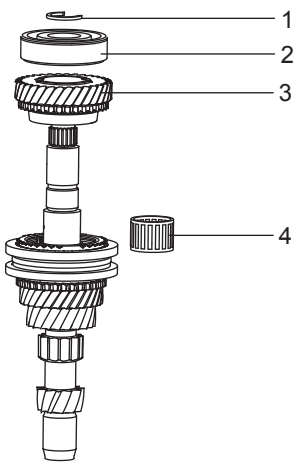
7. Finish the differential assembly.

INPUT SHAFT ASSEMBLY

Structure Diagram



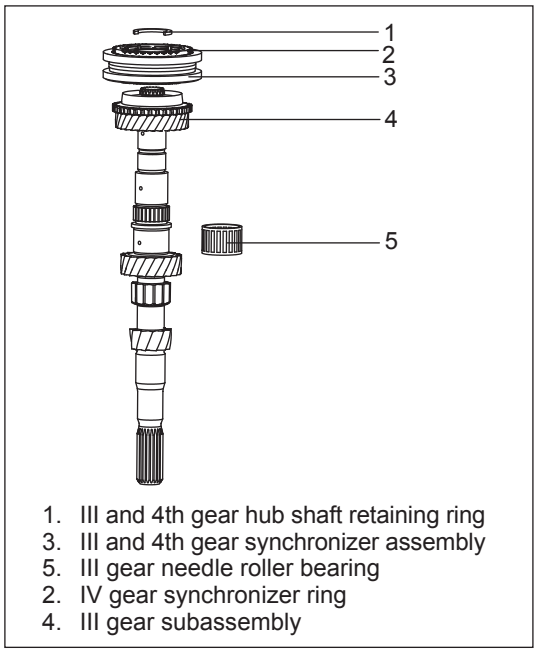
1. Input shaft
2. III gear subassembly
3. III gear needle roller bearing
4. III and IV gear synchronizer assembly
5. III and IV gear hub shaft circlip
6. IV gear needle roller bearing
7. IV gear subassembly
8. Input shaft rear ball bearing
9. Input shaft rear ball bearing shaft retaining ring



1. Shaft retaining ring for input shaft rear ball bearing
2. Input shaft rear ball bearing
3. IV gear subassembly
4. IV gear needle roller bearing

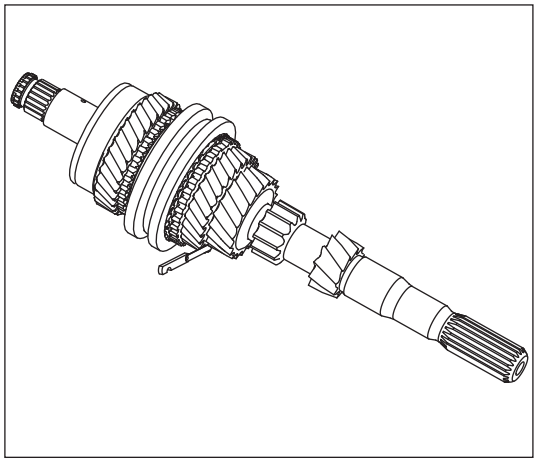
Removal

1. **Remove the shaft retaining ring of input shaft rear ball bearing; press out the IV gear subassembly and input shaft rear ball bearing with special tooling set and take out IV gear needle roller bearing.**



1. III and 4th gear hub shaft retaining ring
3. III and 4th gear synchronizer assembly
5. III gear needle roller bearing
2. IV gear synchronizer ring
4. III gear subassembly

2. Remove the shaft retaining ring of III and 4th gear hub and take out the IV gear synchronizer ring; press out the III gear subassembly and III and IV gear synchronizer assembly with special tooling set and take out III gear needle roller bearing.



Measure The Axial Clearance Of III And IV Gears

1. Control of gear axial clearance

Item	Date (mm)
Reserved amount of synchronizer gear ring	0.8~1.6
Axial clearance of III gear	0.125~0.275
Axial clearance of IV gear	0.075~0.325

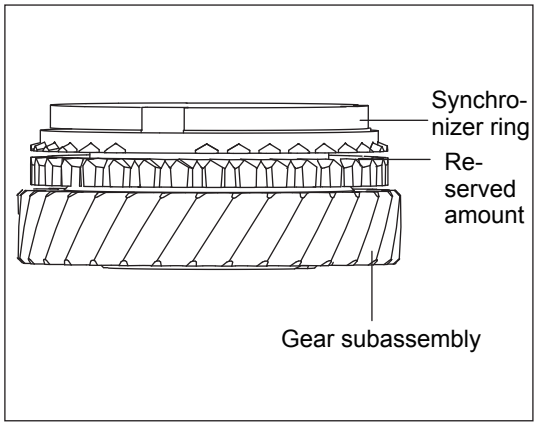
Note:

The metering of following dimensions of all gears and shafts shall be measured only after completely cleaned and blown dry.

2. Control of gear radial clearance

After cleaning and blowing dry, measure the radial clearance of each gear. Compare the measurement results with following tables; if beyond the range, replace with new input shaft gear and needle roller bearing.

Item	Date (mm)
Radial clearance of III gear	0.015~0.058
Radial clearance of IV gear	0.015~0.058



3. Check of reserved amount of III and IV synchronizer ring

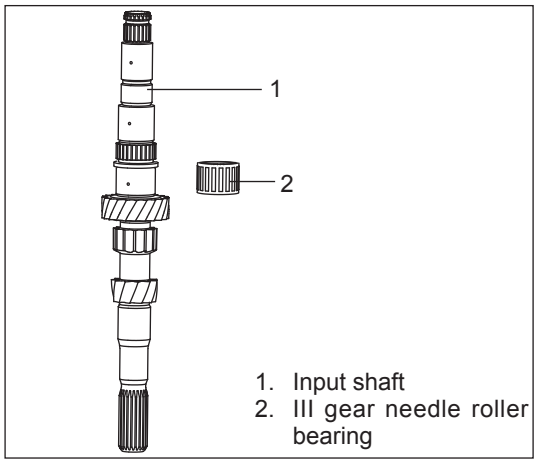
Press the synchronizer ring of each gear onto the gear with hand and then measure the reserved amount between gear and synchronizer ring with feeler.

If the reserved amount is less than 0.8mm or more than 1.6mm, replace the synchronizer ring and re-measure; if the amount of new one is still less than 0.8mm or more than 1.6mm, replace with new gear.

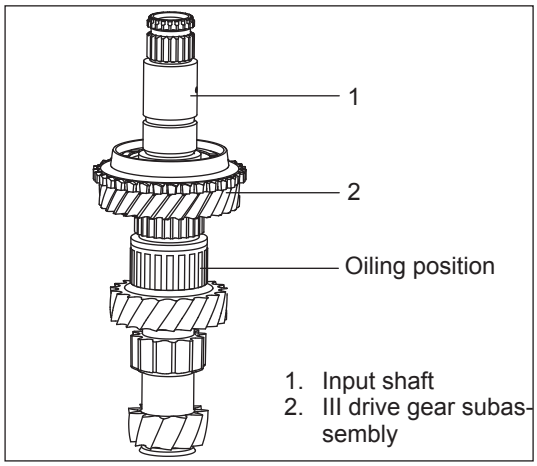
Installation

Note:

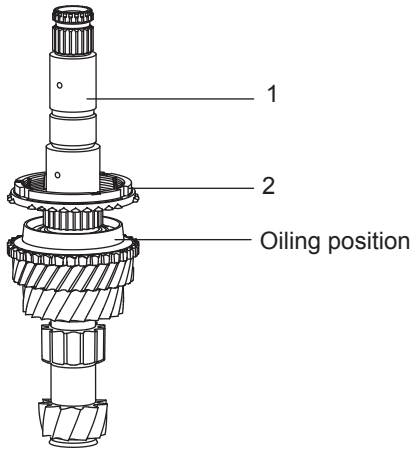
1. **During disassembly, the gear, needle roller bearing and synchronizer ring of each gear shall be placed separately, for example, the main gear, synchronizer ring and needle roller bearing of III gear shall be placed together, and same to the IV and V gears; they can not be confused during assembly.**
2. **Check whether there is damage or crack on gear tapered face of each gear after cleaning, and replace the gear if any.**
3. **After cleaning, check the wearing conditions of synchronizer sleeve and gear lock angle of each gear, and replace the synchronizer and gear in case of severe wearing.**
4. **If the synchronizer falls apart during disassembly (drop-out of slide block and spring or disengagement of sleeve), please refer to "maintenance of synchronizers".**
5. **It is recommended to replace all snap rings used during assembly, and select the ones of proper thickness for assembly.**
6. **During assembly, it is necessary to notice the installation of synchronizer not to damage the boss of synchronizer. And keep in mind the installation direction of gear hub and sleeve.**
7. **The synchronizer gear rings of III and IV gears are different (with figure mark) and not interchangeable; please carefully distinguish.**
8. **The parts removed shall be cleaned before assembly.**



1. Mount the III gear needle roller bearing



2. Install the III gear drive gear subassembly.
Note:
Apply oil on the III gear needle roller bearing before assembly.

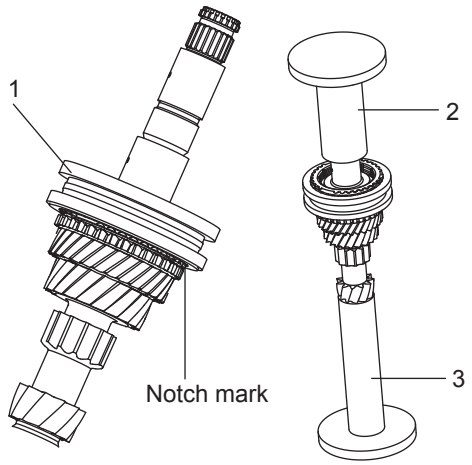


1. Input shaft
2. III gear synchronizer ring

3. Install the III gear synchronizer ring (with figure "3" mark)

Note:

Apply oil on the tapered face of III gear subassembly before assembly.



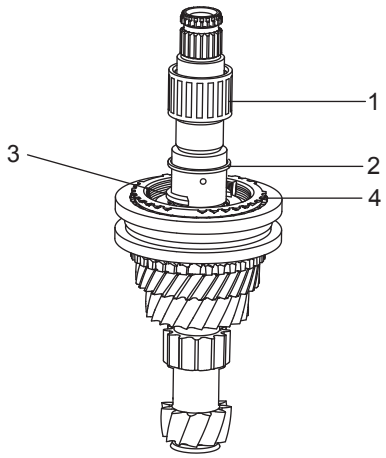
1. Synchronizer assembly of III and 4th gear
2. Tooling set for pressing installation of III and IV gear synchronizers
3. Tooling set for input shaft seat

4. Install the III and IV synchronizer assembly

Press in the synchronizer with tooling set and press.

Note:

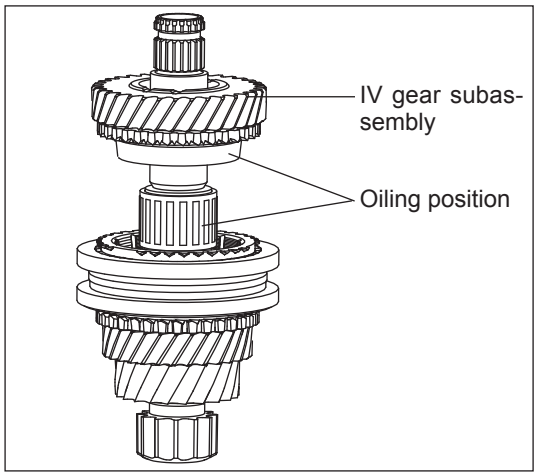
Align the synchronizer notch with the slide block during assembly with the face of sleeve outer ring with notch mark downward (III gear direction).



1. IV gear needle roller bearing
2. IV gear needle roller bearing shock insulator
3. Retaining rings for III and IV gear hub
4. IV gear synchronizer ring

5. Mount the retaining ring for III and IV gear hub with snap ring pliers and put in the shock insulator of IV gear needle roller bearing. Install the synchronizer ring (with figure "4" mark) and IV needle roller bearing.

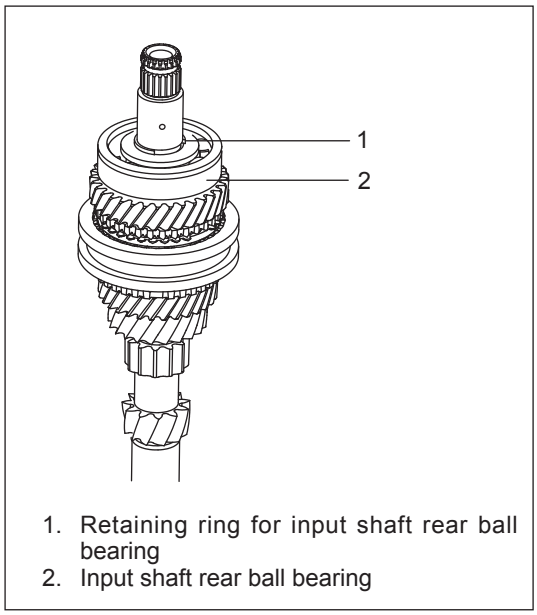
The retaining ring thickness has 6 specs. The installation clearance shall be less than 0.1mm.



6. Install the IV gear subassembly

Note:

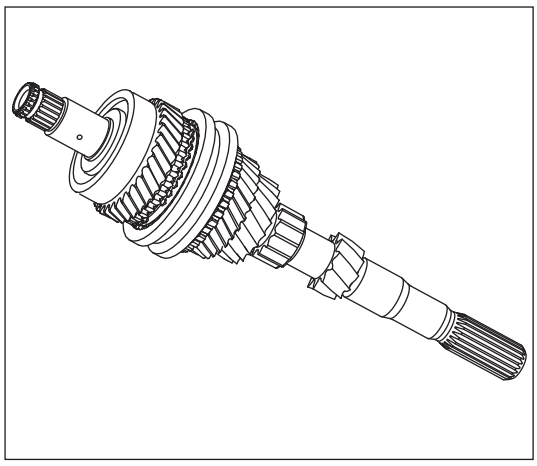
Oil the tapered face and needle roller bearing of IV gear subassembly.



1. Retaining ring for input shaft rear ball bearing
2. Input shaft rear ball bearing

7. Install the input shaft rear bearing and its retaining ring

Pressing install the input shaft rear bearing with special tooling set and then its retaining ring. The retaining ring thickness has 6 specs. The installation clearance shall be less than 0.1mm.



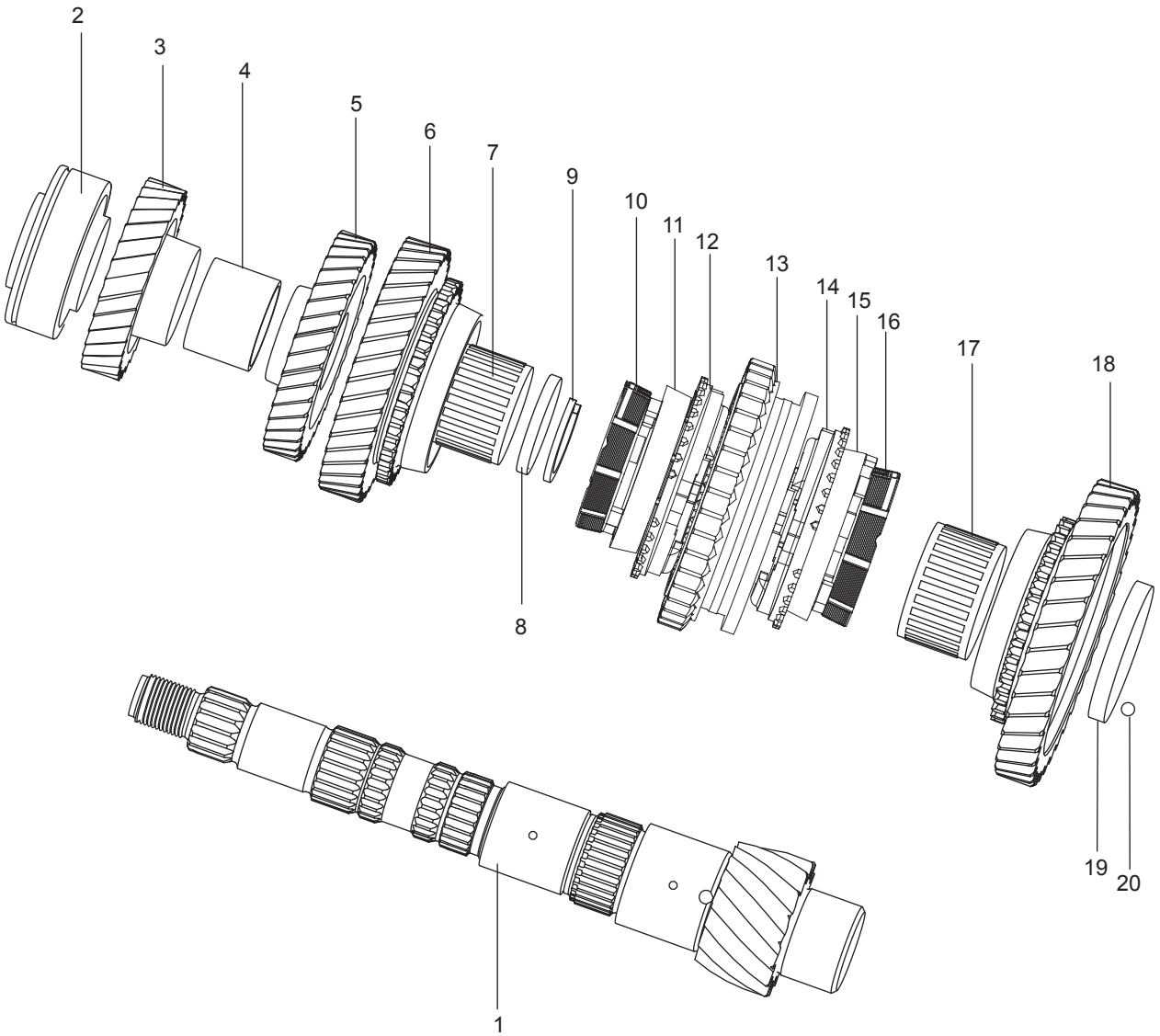
8. Finish the installation of input shaft

Note:

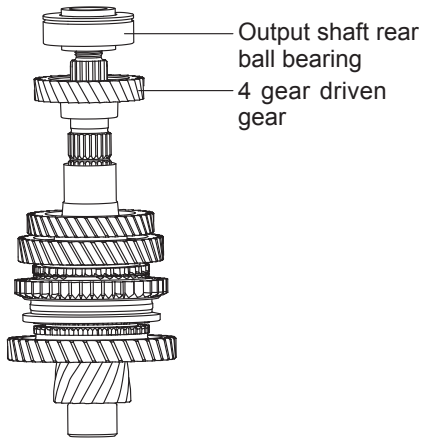
After assembly of input shaft assembly, set the synchronizer sleeve of each gear at neutral position; and then rotate the drive gears of III and IV gear with hand and observe whether it can smoothly rotate. If not, check and re-assemble according to the require-

OUTPUT SHAFT ASSEMBLY

Structure Diagram

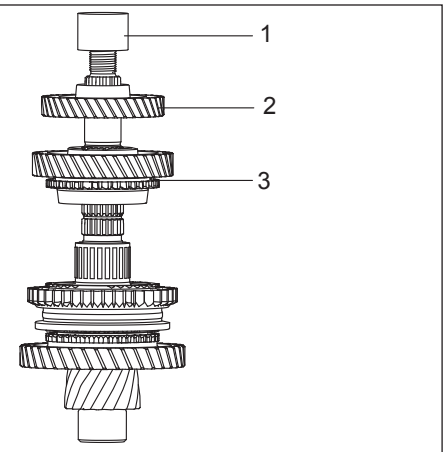


1. Output shaft
2. Output shaft rear ball bearing
3. 4 gear driven gear
4. 3 and 4 gear spacer
5. 3 gear driven gear
6. 2 gear
7. 2 gear needle roller bearing
8. 2 gear needle roller bearing shock insulator
9. 1 and 2 gear hub retaining ring
10. 2 gear synchronizer inner ring
11. 2 gear synchronizer middle ring
12. 2 gear synchronizer outer ring
13. 1 and 2 gear synchronizer assembly
14. 1 gear synchronizer outer ring
15. 1 gear synchronizer middle ring
16. 1 gear synchronizer inner ring
17. 1 gear needle roller bearing
18. 1 gear
19. 1 gear thrust washer
20. Steel ball Sφ4.7625



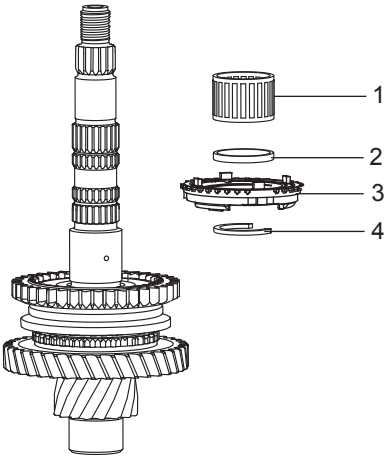
Disassembly

1. **Press out the 4 gear driven gear and output shaft rear ball bearing with special tooling set and press.**
   Remark:
   The two parts shall be pressed out together.



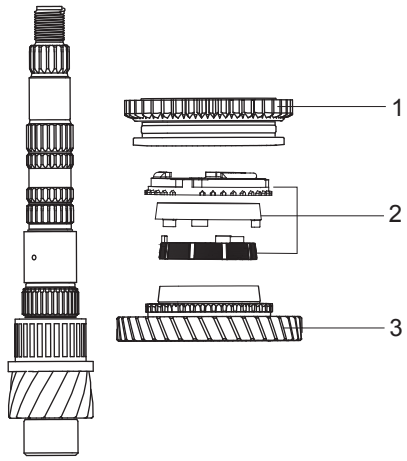
1. 3 and 4 gear spacer
2. 3 gear driven gear
3. 2 gear

2. **Take out the 3 and 4 spacer and press out 2 gear and 3 driven gear with special tooling set and press.**
   Remark:
   The two parts shall be pressed out together.



1. 2 gear needle roller bearing
2. 2 gear needle roller bearing shock insulator
3. 2 gear synchronizer inner ring
4. 1 and 2 gear hub retaining ring

3. **Take out the 2 gear needle roller bearing and its shock insulator, 2 gear synchronizer annulus ring, and remove the retaining ring for 1 and 2 gear hub with snap ring pliers.**

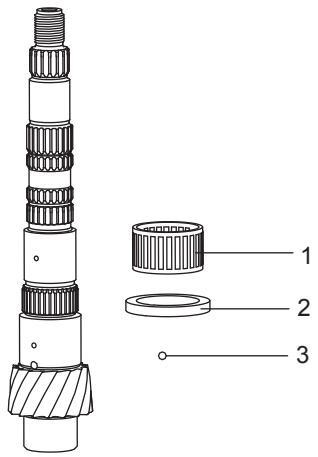


1. 1 and 2 synchronizer assembly
2. 1 synchronizer annulus ring assembly
3. 1 gear subassembly

4. Press out the 1 gear subassembly, 1 synchronizer annulus ring assembly and 1 and 2 gear synchronizer assembly.

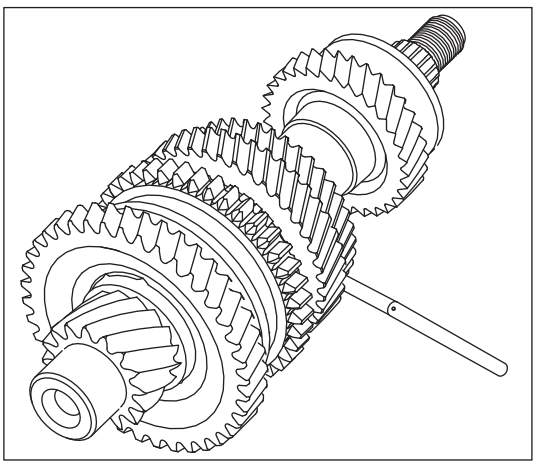
Remark:

The three parts shall be pressed out together.



1. 1 gear needle roller bearing
2. 1 gear thrust washer
3. Steel ball Sφ4.7625

5. Take out the 1 gear needle roller bearing, 1 gear thrust washer and steel ball Sφ4.7625.



Measurement For Clearances Between 1 And 2nd Gear Shaft

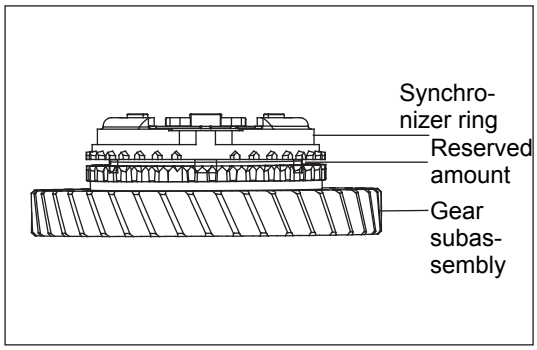
1. Control of gear shaft axial clearance

Gear	I (mm)	II (mm)
Reserved amount for synchronizer annulus ring	0.8~1.6	0.8~1.6
Axial clearance of gear	0.1~0.3	0.205~0.455

2. Control of gear shaft radial clearance

After cleaning and drying out the part, measure the radial clearance of each gear. Compare the measurement results with following table, and replace with new input shaft gear and needle roller bearing if beyond the range.

Gear	Data
Radial clearance of 1st gear	0.015~0.056
Radial clearance of 2nd gear	0.015~0.056

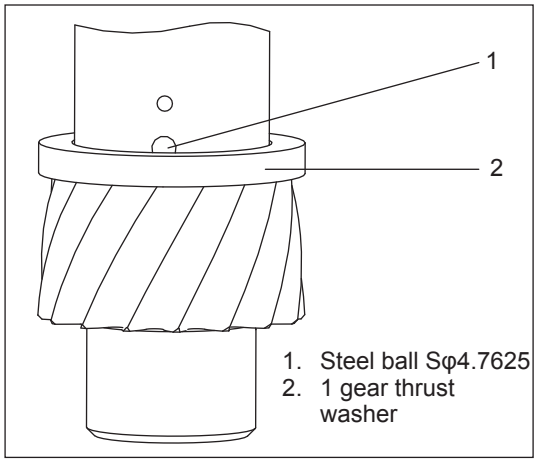


3. **Reserved amount check of 1 and 2 gear synchronizer**
   Press the synchronizer ring flatly onto each gear with hand and measure the reserved amount between gear and synchronizer ring with feeler.
   If the mount is less than 0.8mm or more than 1.6mm, it is necessary to replace the synchronizer ring and re-measure; then if the reserved amount of new synchronizer ring is still less than 0.8mm or more than 1.6mm, the new gear shall be replaced at same time.

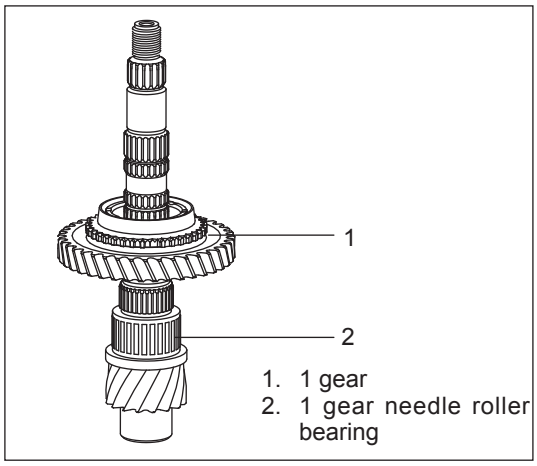
Installation

Note:

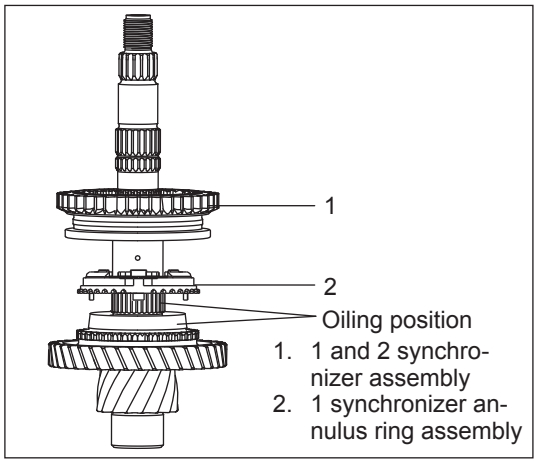
1. **During disassembly, the gear, needle roller bearing and synchronizer ring of each gear shall be placed separately, for example, the gear subassembly, synchronizer ring and needle roller bearing of 1st gear shall be placed together, and same to the 2nd gear; they can not be confused during assembly.**
2. **Check whether there is damage or crack on gear tapered face of each gear after cleaning, and replace the gear if any.**
3. **After cleaning, check the wearing conditions of synchronizer sleeve and gear lock angle of each gear, and replace the synchronizer and gear in case of severe wearing.**
4. **If the synchronizer falls apart during disassembly, please refer to "maintenance of synchronizers".**
5. **It is recommended to replace all snap rings used during assembly, and select the ones of proper thickness for assembly.**
6. **During assembly, it is necessary to notice the installation of synchronizer not to damage the boss of synchronizer. And keep in mind the installation direction of gear hub and sleeve.**
7. **The synchronizer gear rings of 1st and 2nd gears are different (with figure mark) and not interchangeable; please carefully distinguish.**
8. **The parts removed shall be cleaned before assembly.**



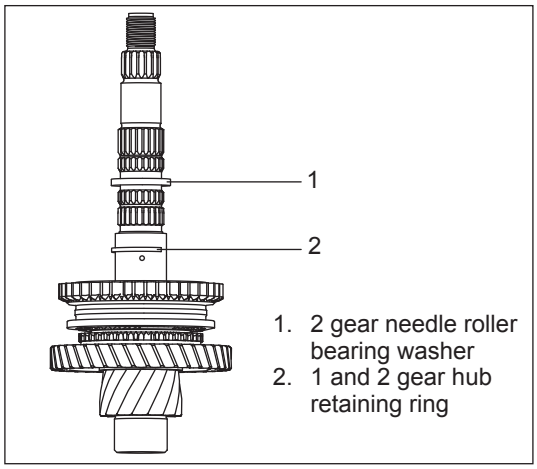
1. **Install the steel ball Sφ4.7625 and 1 gear thrust washer.**



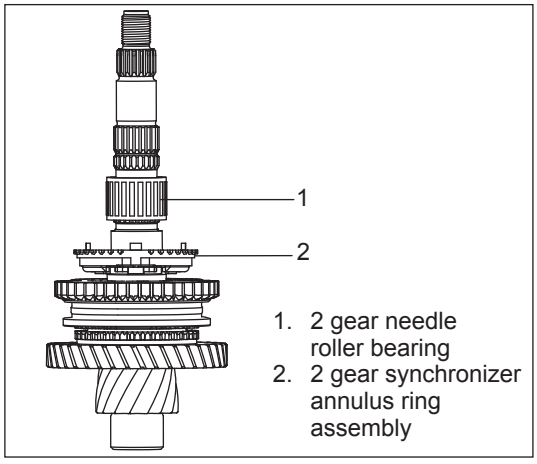
2. Install the 1 gear needle roller bearing and 1 gear.
Note:
Apply oil on the 1 needle roller bearing before assembly of 1 gear subassembly.



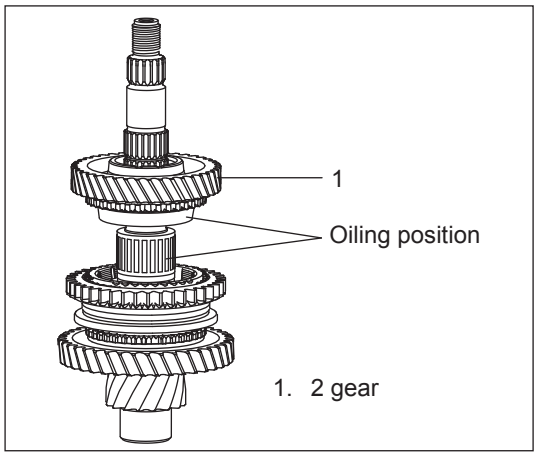
3. Install the 1 gear synchronizer assembly and press in the 1 and 2 gear synchronizer assembly with tooling set and press.
Note:
The three jaws of 1 gear synchronizer annulus ring assembly middle ring shall be inserted into three grooves of gear end face, and the three jaws of annulus inner ring into three grooves of outer ring. for the direction of synchronizer, the boss of annulus ring outer ring shall align with the groove of gear hub during pressing installation.



4. Install the 1 and 2 gear hub retaining ring with snap ring pliers; install the 2 gear needle roller bearing shock insulator. The retaining ring thickness has 6 optional specs. The installation clearance shall be less than 0.1mm.



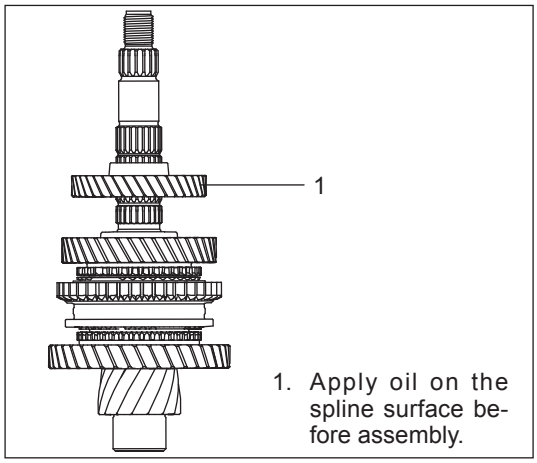
5. Install the 2 gear synchronizer annulus ring assembly and 2 gear needle roller bearing.
Note:
Firstly install the 2 gear synchronizer ring assembly; the inner ring three jaws shall be inserted into the three grooves of outer ring; the boss of outer ring shall be inserted into three grooves of gear hub; the 2 gear needle roller bearing position shall be applied with lubrication oil in advance.



6. Install the 2 gear

Note:

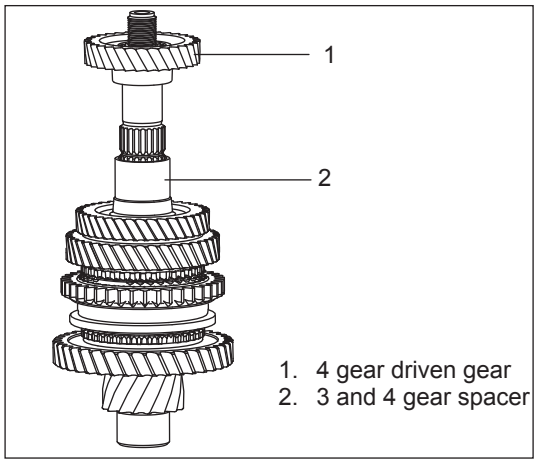
Firstly install the 2 gear synchronizer ring assembly; the inner ring three jaws shall be inserted into the three grooves of outer ring; the boss of outer ring shall be inserted into three grooves of gear hub; the 2 gear needle roller bearing position shall be applied with lubrication oil in advance.



7. Pressing install the 3 driven gear with special tooling set.

Note:

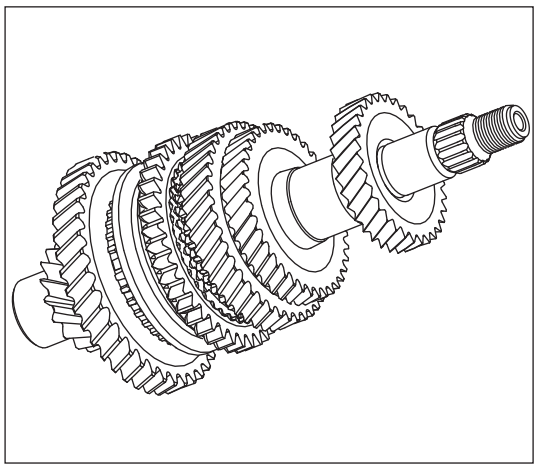
Apply oil on the spline surface before assembly.



8. Put in the 3 and 4 gear spacer and pressing install the 4 gear driven gear with tooling set.

Note:

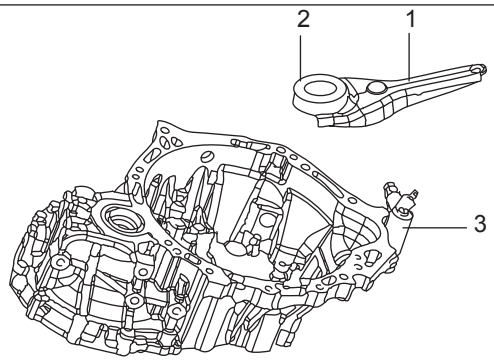
Apply oil on the spline surface before assembly.



9. Finish the assembly of output shaft assembly.

Note:

After assembly of output shaft assembly, set the 1 and 2 synchronizer assembly at neutral position; separately rotate the 1 and 2 gear subassemblies and observe whether they are able to smoothly rotate; if it is not the case, check and re-assemble according to the equipments.

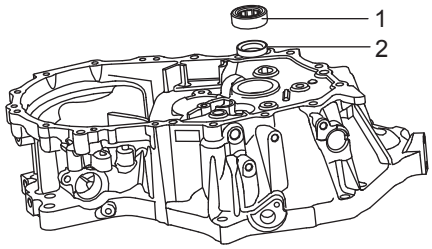


1. Release fork subassembly
2. Release bearing subassembly
3. Clutch release pump subassembly

CLUTCH HOUSING ASSEMBLY

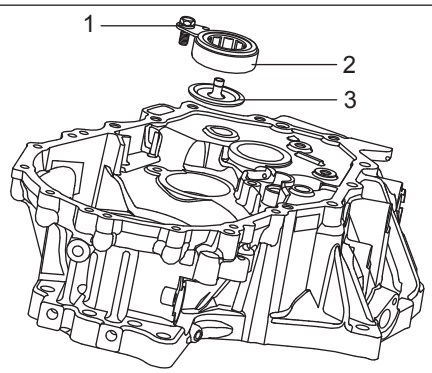
Disassembly

1. Remove the clutch release pump subassembly, release bearing subassembly and release fork subassembly.



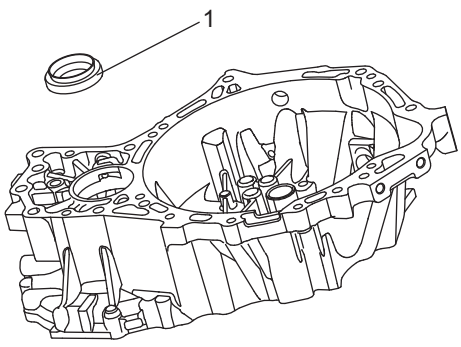
1. Input shaft cylindrical roller bearing
2. Input shaft oil seal

2. Remove the input shaft cylindrical roller bearing and input shaft oil seal with special tools.
Note:
The bearing and oil seal shall be replaced with new ones.



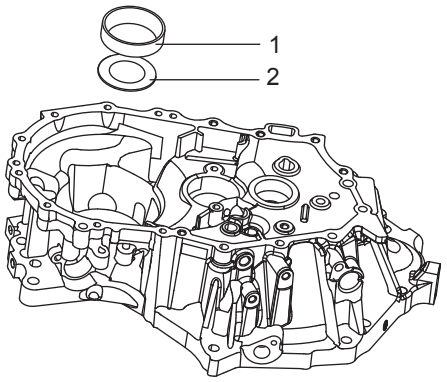
1. Bearing pressing plate, pressing plate bolt and plain washer subassembly
2. Output shaft cylindrical roller bearing
3. Output shaft end nozzle

3. Remove the bearing pressing plate, pressing plate bolt and plain washer subassembly, output shaft cylindrical roller bearing, and take out the output shaft end nozzle.



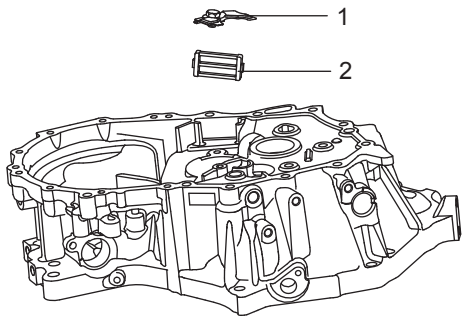
1. Differential front end oil seal

4. Remove the oil seal at front end of differential with special tools.
Note:
It shall be replaced with new oil seal.



1. Front tapered roller bearing outer ring of differentia
2. Differential front end washer

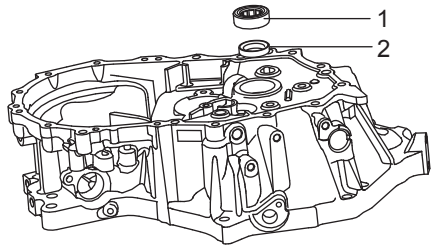
5. Remove the front tapered roller bearing outer ring of differential and differential front end washer.



1. Oil deflector, bolt and spring washer combination
2. Magnet

6. Take out and clean the magnet and remove the oil deflector, bolt and spring washer combination.

Installation

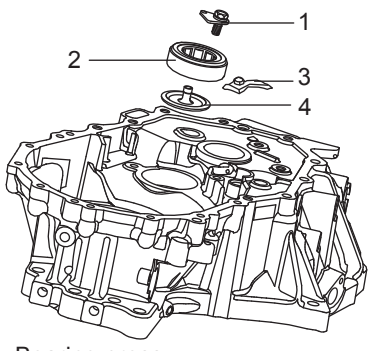


1. Input shaft cylindrical roller bearing
2. Input shaft oil seal

1. Separately press the input shaft oil seal and input shaft cylindrical roller bearing in place with tooling set.

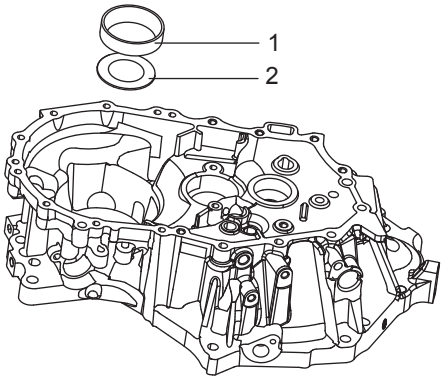
Note:

No skew during pressing installation.



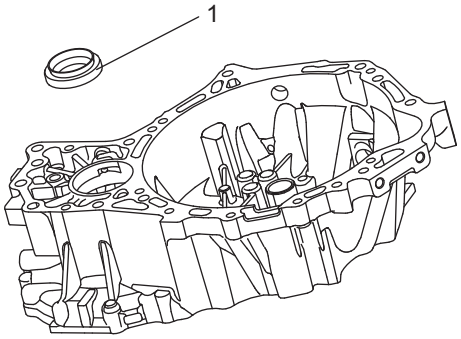
1. Bearing pressing plate, pressing plate bolt and plain washer subassembly
2. Output shaft cylindrical roller bearing
3. Oil deflector, bolt and spring washer combination
4. Oil guiding nozzle

2. Put in the oil guiding nozzle and press the output shaft cylindrical roller bearing in place with tooling set; install the bearing pressing plate, pressing plate bolt and plain washer subassembly; install the oil deflector, bolt and spring washer combination.



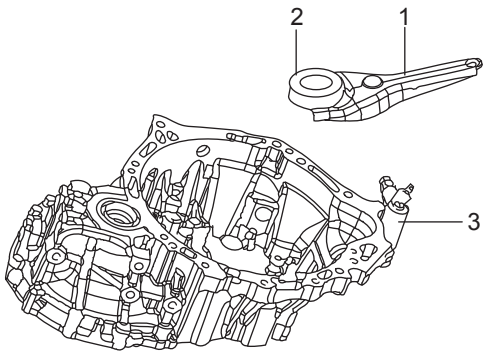
1. Front tapered roller bearing outer ring
2. Differential front end washer

3. Put into the differential front end washer and press the differential front tapered roller bearing outer ring in place with tooling set.



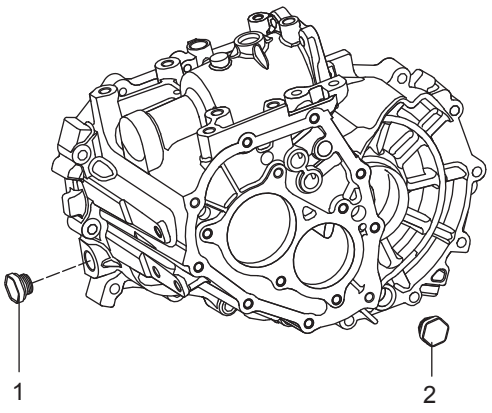
1. Differential front end oil seal

4. Press the differential front oil seal in place with tooling set.



1. Release fork subassembly
2. Release bearing subassembly
3. Clutch release pump subassembly

5. Knock in 4 fixed pins and install the clutch release pump subassembly, release bearing subassembly and release fork subassembly. Complete the assembly.

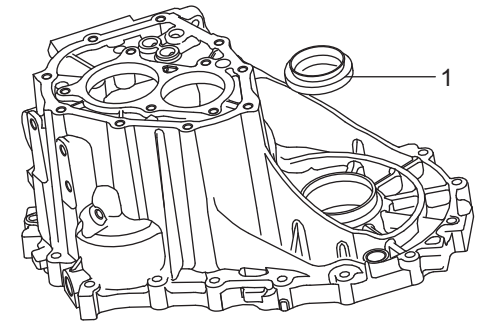


1. Filling screw plug 2. Drain screw plug

TRANSMISSION CLUTCH ASSEMBLY

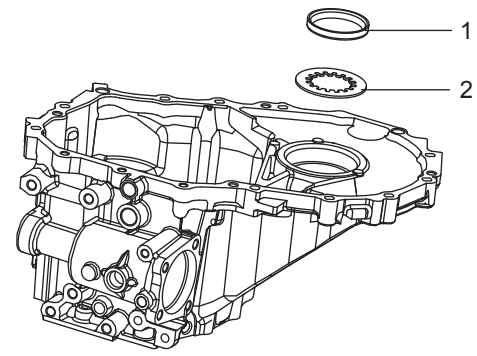
Removal

1. Screw out the filling screw plug, drain screw plug and plain washer.



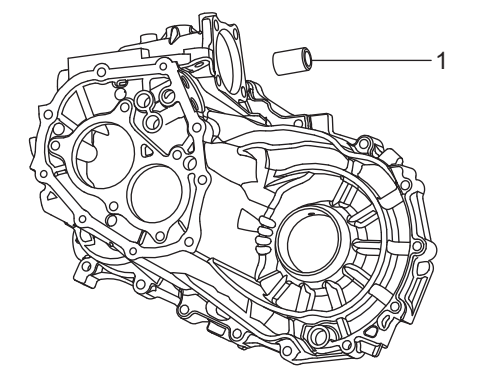
1. Differential rear end oil seal

2. Remove the differential rear end oil seal with special tools.



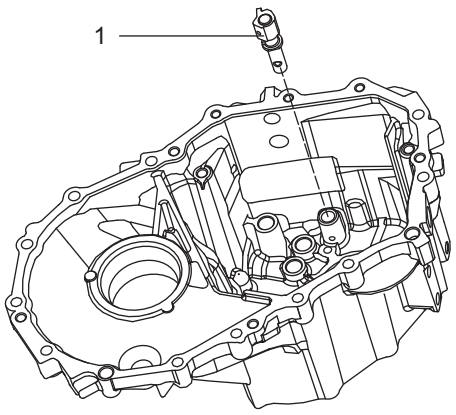
1. Rear tapered roller bearing outer ring
2. Differential rear end spacer

3. Remove the outer ring of differential rear tapered roller bearing and take down the differential rear end spacer.



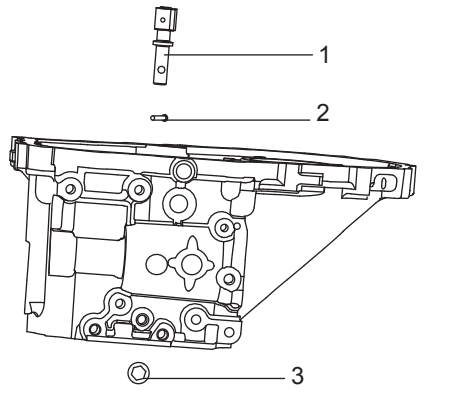
1. Rear linear bearing

4. Remove the rear linear bearing with special tooling set.



1. Reverse gear lock mechanism subassembly

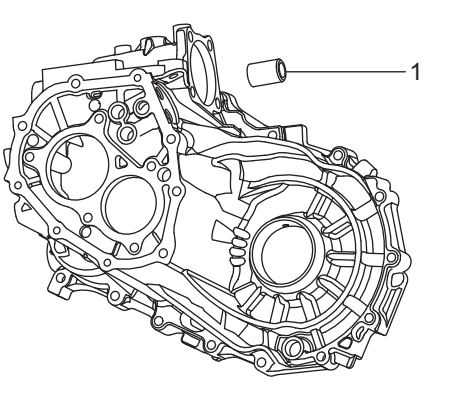
5. Remove the reverse gear lock mechanism subassembly.



1. Reverse gear lock mechanism subassembly
3. Reverse gear lock screw plug
2. Elastic pin

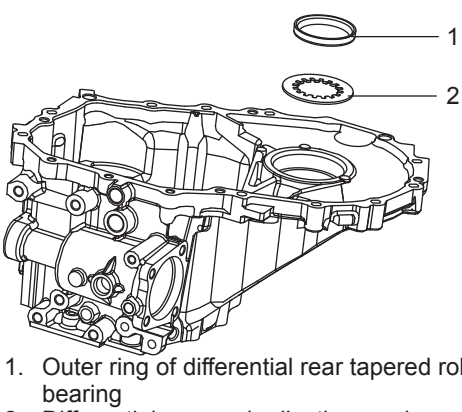
Installation

1. Install the reverse gear lock mechanism subassembly; tighten the reverse gear lock screw plug with specified torque after knocked in the elastic pin.



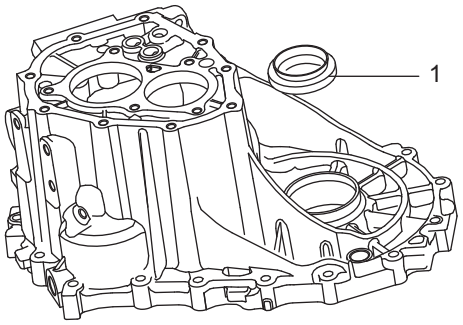
1. Rear linear bearing

2. Press in the linear bearing with tooling set.



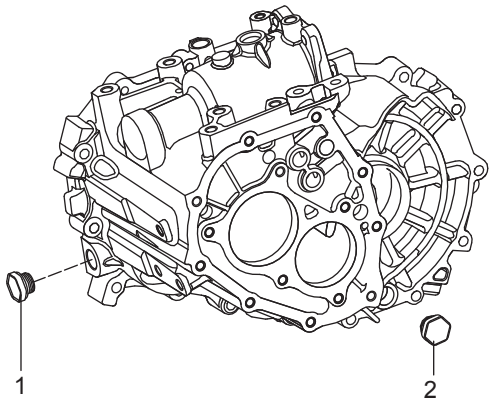
1. Outer ring of differential rear tapered roller bearing
2. Differential rear end adjusting washer

3. Put in the differential rear end adjusting washer and press in the outer ring of differential rear tapered roller bearing.
Note:
Correct adjusting washer shall be selected in ad-



1. Differential rear end oil seal

4. Press in the differential rear end oil seal with tooling set.

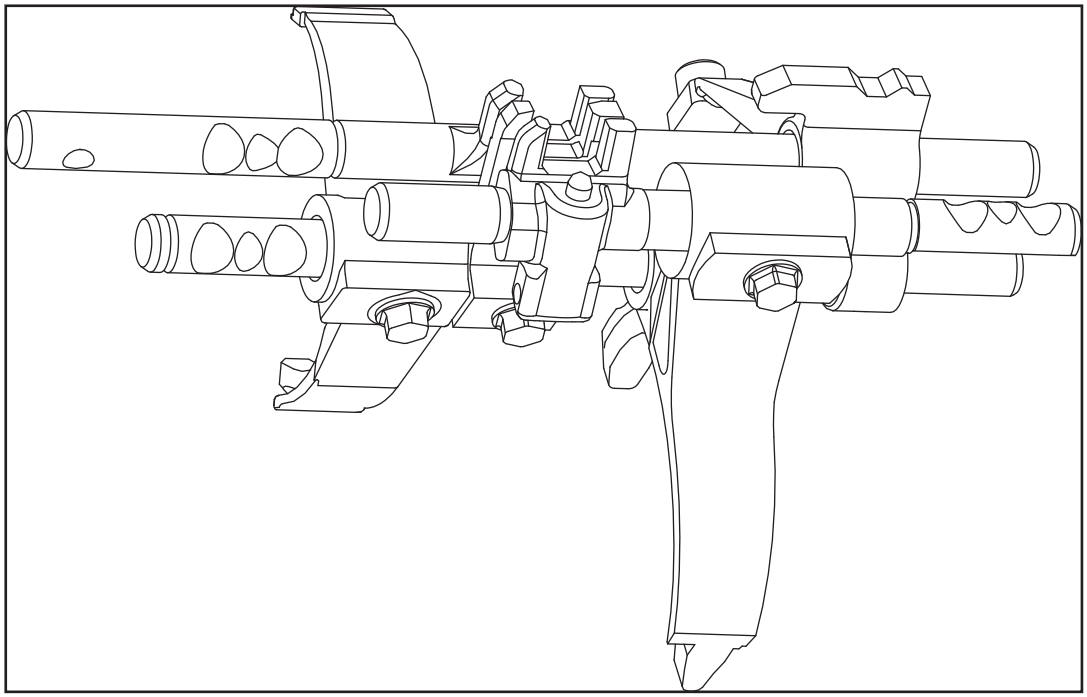


1. Filling screw plug 2. Drain screw plug

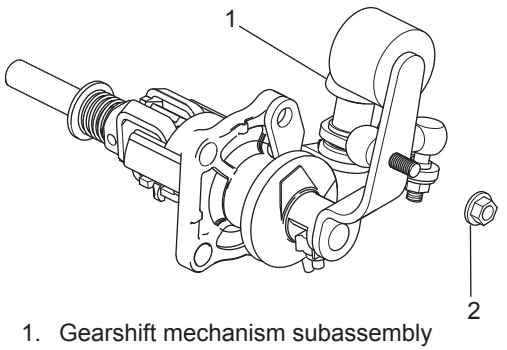
5. Tighten the filling screw plug, drain screw plug and plain washer with specified torque.

OTHER COMMON WEARING PARTS

Fork and Fork Shaft of Each Gear



1. **Removal**
   The maintenance of fork and fork shaft of each gear is simple: remove the limit snap ring of each fork shaft with snap ring pliers and remove the fork set bolt and then the fork.
   Note:
   The snap ring removed can not be used again and it must be replaced with new one; during disassembly, pay attention to protect the working faces of fork and fork shaft from being damaged.
2. **Installation**
   The maintenance and assembly of fork and fork shaft of each gear is also simple: put the parts at proper position; tighten the fork set bolt and install the fork shaft limit snap ring. Notice that the two interlock steel balls shall not be omitted when installing the reverse gear shifter lever.
   Note:
   1. **Pay attention to protect the working faces of fork and fork shaft from being damaged.**
   2. **The fork set bolt shall be applied with threadlocker before installation.**
   3. **Check after assembly and notice the interlock steel ball and other parts shall not be omitted.**

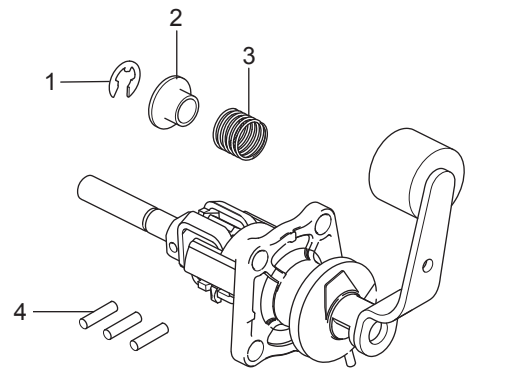


1. Gearshift mechanism subassembly
2. locating bolt of gearshift rocker arm

Manipulation Lid Assembly

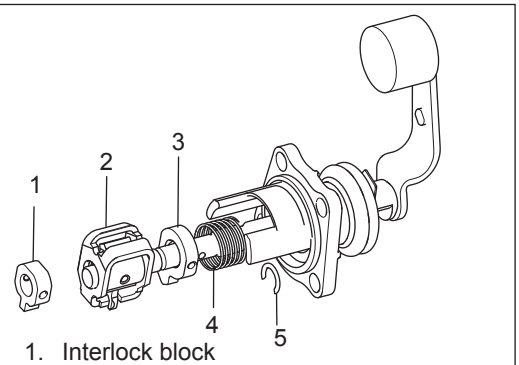
Removal

1. Remove the locating bolt of gearshift rocker arm and take down the gearshift mechanism subassembly.



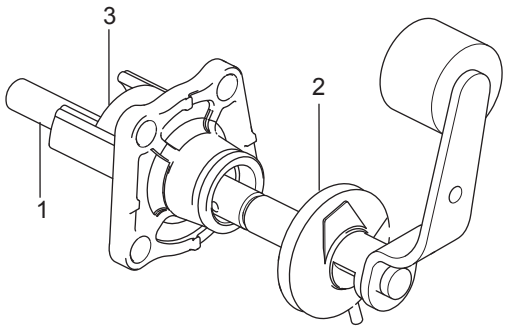
1. Circlip for shaft
2. 5 reverse gear return spring seat
3. 5 reverse gear return spring
4. Elastic pin

2. Remove 3 elastic pins with tooling set; remove the circlip for shaft, 5 reverse gear return spring and its seat.



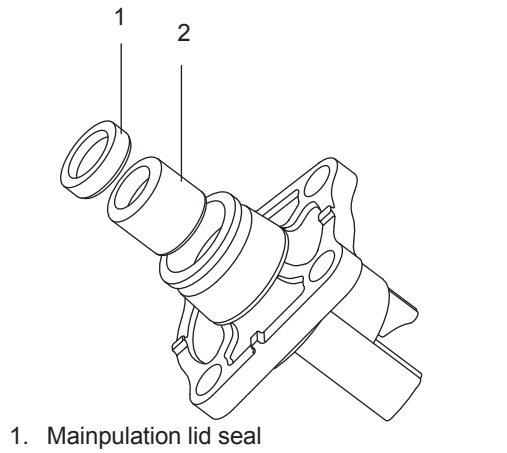
1. Interlock block
2. Gearshift block and gear-shift interlock plate
3. Reverse gear force sensitive block
4. 1 and 2 return spring and its seat
5. Circlip for 1 and 2 gear return spring seat

3. Remove the interlock block, gearshift block and gearshift interlock plate, reverse gear force sensitive block, 1 and 2 gear return spring seat, 1 and 2 gear return spring and the circlip for 1 and 2 gear return spring seat.



1. Gearshift shaft subassembly
2. Gearshift shaft dust cap
3. Mainpulation lid subassembly

4. Draw out the gearshift shaft and dust cap.



1. Mainpulation lid seal
2. Front linear bearing

5. Remove front linear bearing and mainpulation lid oil seal from the mainpulation lid subassembly with tools.

Installation

Install the gearshift shaft assembly, gearshift interlock plate and other parts in reverse sequence to that of disassembly process.

Note:

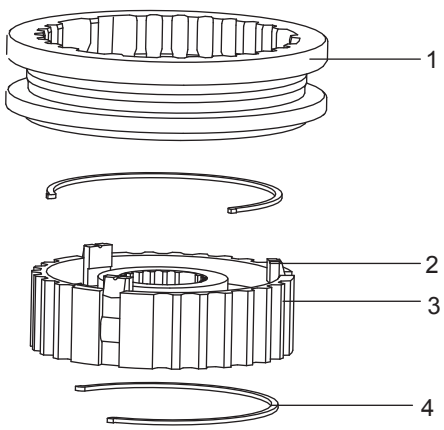
During installation, pay attention to protect the lip of oil seal from damage; the shaft shall be cleanly wiped when installed.

Synchronizer for Each Gear

There are three synchronizer assemblies in transmission: 1 and 2 gear synchronizer assembly, 3 and 4 gear synchronizer assembly, and 5 gear synchronizer assembly. Each synchronizer consists of gear sleeve, gear hub, slide block and spring sealing ring.

Note:

1. **The opening position of spring sealing ring shall stagger.**
2. **During assembly of the 1st and 2 gear synchronizer, the gear hub tapered end shall face upward (2 gear direction) and the gear sleeve end with gear faces upward (2 gear direction).**
3. **During assembly of 3 and 4 gear synchronizer, the gear sleeve end with notch mark faces downward (3 gear direction)**
4. **During assembly of 5 gear, the large end of gear hub inner ring faces downward (5 gear direction) and the gear sleeve end with notch mark faces downward (5 gear direction). The slide block sloped end faces upward.**



1. Gear sleeve
3. Gear hub
2. Slide block
4. Spring sealing ring

Assembly description

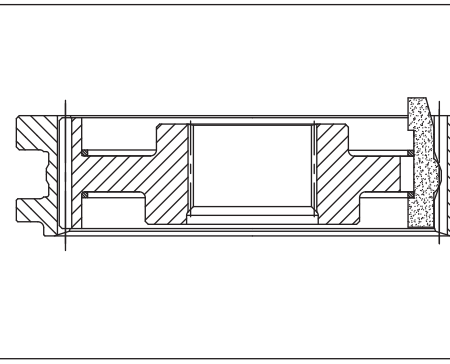
The assembly processes of three synchronizers are similar. Here only the assembly process of 5 gear synchronizer is exemplified in this manual.

1. The assembly process of 5 gear synchronizer.

As shown in the figure: put the slide block into the groove of gear hub; cover the gear sleeve and put on the spring expander

Note:

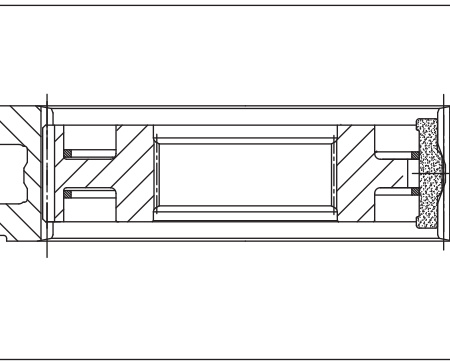
1. **The tooth absence position of sleeve shall align with three grooves of gear hub.**
2. **The opening position of spring sealing ring shall be staggering for 120°.**



2. Assembly features of 5 gear synchronizer.

Note:

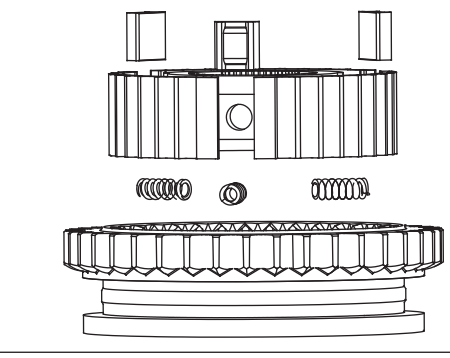
During assembly, the large end of gear hub inner ring faces downward (5 gear direction) and the gear sleeve end with notch mark faces downward (5 gear direction). The slide block sloped end faces upward.



3. Assembly features of 3 and 4 gear synchronizer.

Note:

During assembly of 3 and 4 gear synchronizer, the gear sleeve end with notch mark faces downward (3 gear direction).

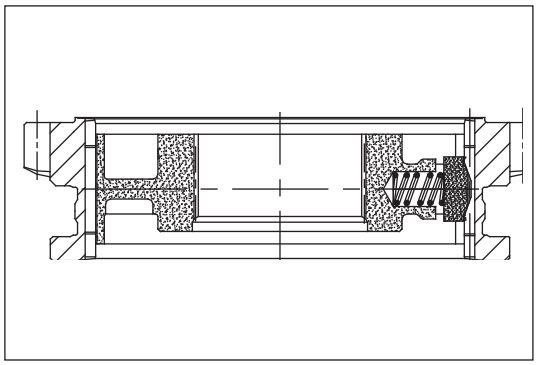


4. Installation process of 1st and 2 gear synchronizer

As shown in the figure, install the spring into the round groove of gear hub; install the slide block into the three groove of hub pushed by the spring, and finally install the gear sleeve onto the gear hub with special guiding tooling set.

Note:

The tooth absence position of sleeve shall align with three grooves of gear hub.



5. Assembly features of 1 and 2 gear synchronizers

Note:

During assembly of 1 and 2 gear synchronizer, the gear hub end with tapered surface faces upward (2 gear direction) and the sleeve end with gear faces upward (2 gear direction).

Reverse Lamp Switch

The reverse lamp switch is of integral type. It is only needed to screw down the reverse lamp switch for maintenance, and then replace with new one and tighten it with specified torque.

VT2-11D TRANSMISSION

OVERVIEW

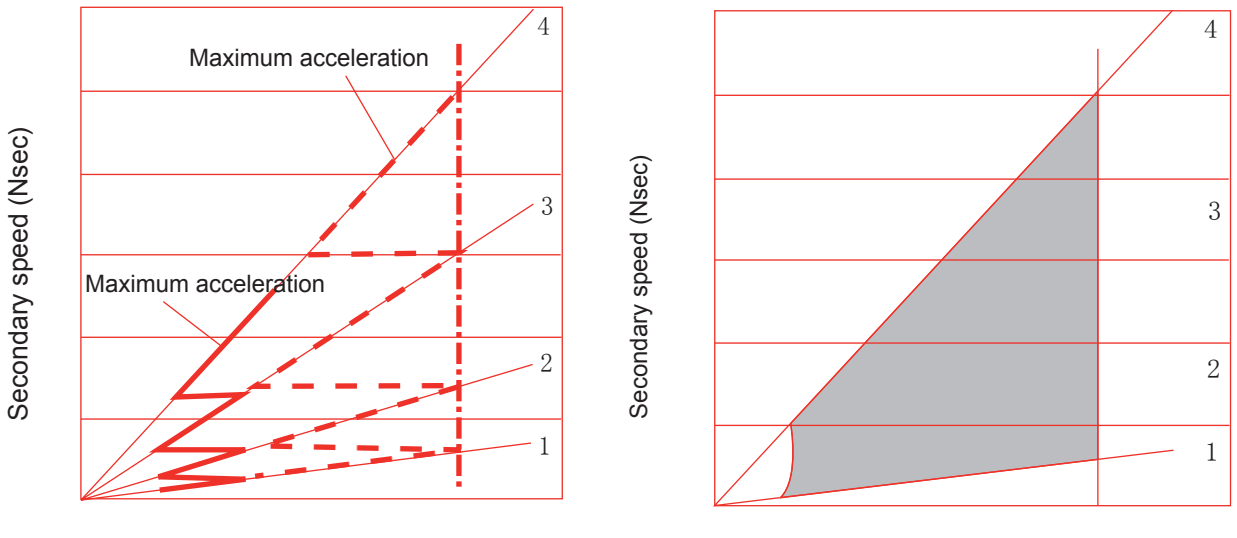
The continuous change of the transmission drive ratio can be implemented by a transmission device, which includes inverted conical wheels on which a V-shaped steel drive belt goes around. The drive ratio of the transmission device is transmitted to the differential in the transmission through an intermediate shaft.

Comparison Between Conventional Automatic Transmission and Stepless Transmission

In the following figure, a comparison of drive ratio change between manual or conventional automatic transmission and stepless transmission is illustrated. Conventional automatic transmission (drive device) has a drive ratio of a series of fixed values.

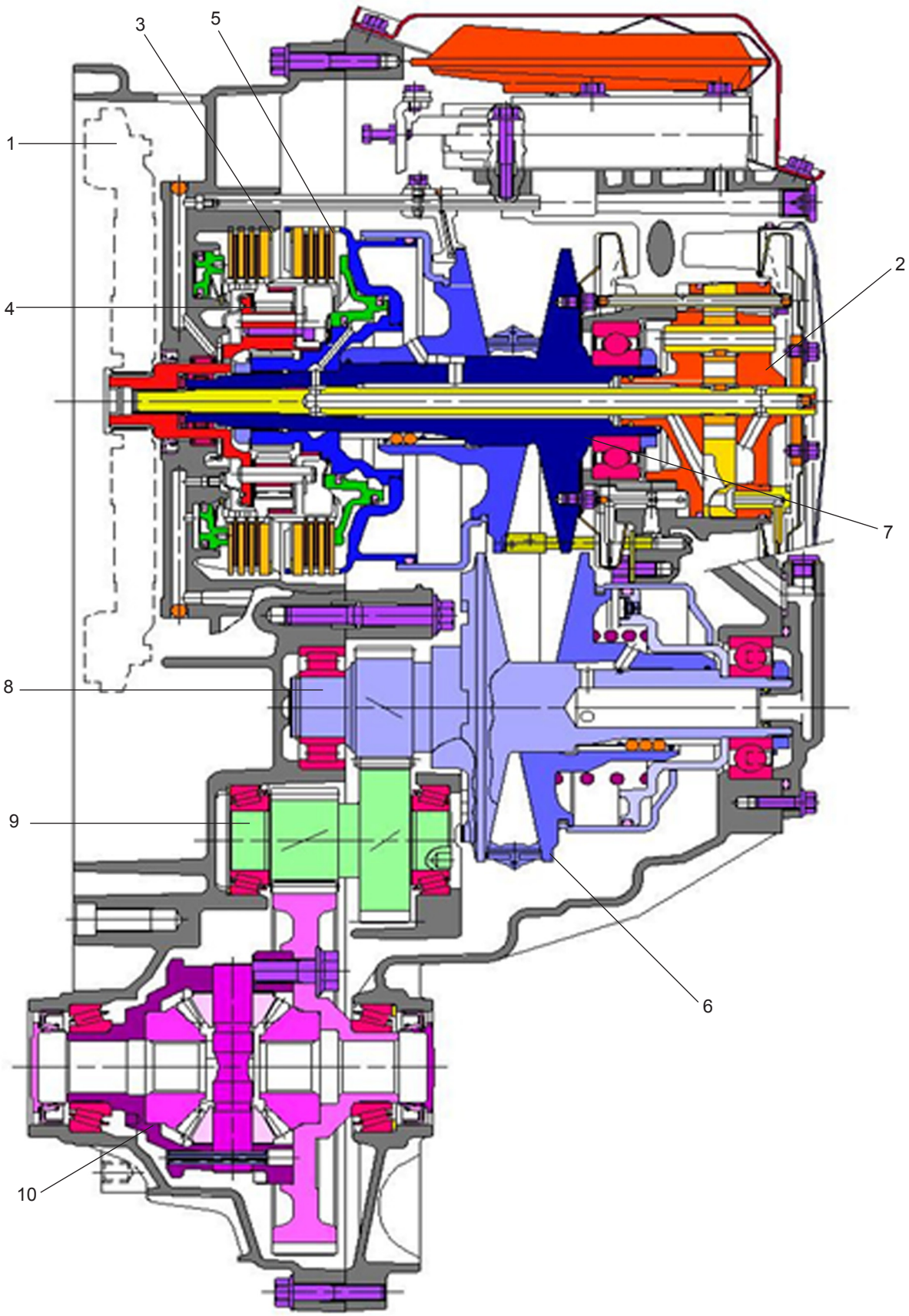
When the transmission is at high gears, the drive ratio changes according to the opening of the throttle along the thick solid or the dotted line as illustrated in the first figure. When using a stepless transmission, the drive ratio change is as shown in the second figure that the shift point of both transmissions is related to the opening of the throttle controlled by the driver.

When the opening of the throttle is enlarged, the engine speeds up and the transmission shifts into higher gears; in the case of conventional transmission, the engine speed is apparently lowered, but in the case of stepless transmission, the engine speed is maintained. The stepless transmission may shift into higher gears by moving the cone pully when the engine speed remains unchanged (see the following explanations). In addition, we can choose other gearing strategies, which is helpful for new users to accept stepless transmission more quickly.



4-gear automatic transmission (L) and stepless transmission (R) drive ratio change

PROFILE



1. Torsional shock absorber/flywheel
2. Oil pump
3. Backward clutch
4. Planetary structure
5. Drive clutch
6. Steel belt
7. Drive cone pully
8. Driven conical wheel
9. Intermediate shaft
10. Differential

THE BASIC PRINCIPLE

VT2 consists of a number of components, which are divided into three groups according to corresponding functions.

Group 1-mechanical drive devices

This component is designed to provide mechanical drive and transmit torque.

Group 2-control system

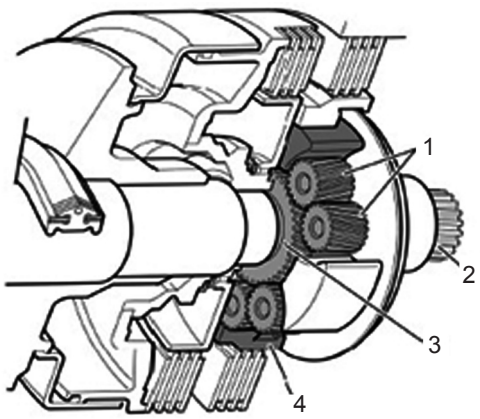
Components related to the control system. According to the load and drive requirement, the control system ensures the power the transmission transmits and changes the drive ratio when applicable.

Group 3-external connections

Components connected to the exterior of the transmission. Some of the components are inside the transmission or connected to the transmission and some are components of the entire system but arranged in other parts of the vehicle.

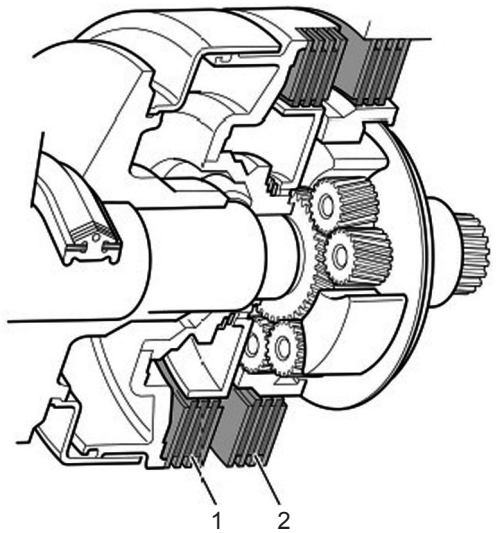
Mechanical Torque Transmission

Planetary Structure



1. Planetary gear
2. Input shaft 3
3. Sun gear
4. Gear ring

Clutch in the Planetary Structure



1. Drive clutch group
2. Reverse clutch group

1. Planetary structure

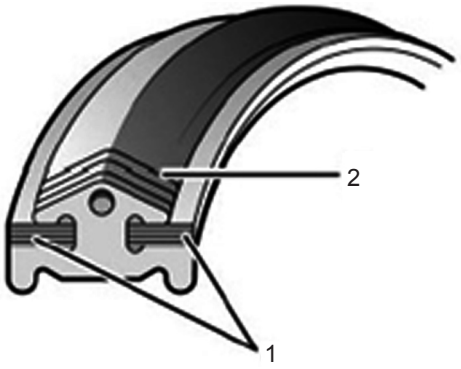
The planetary mechanism enables the transmission to provide the drive torque in both the forward and backward direction. The torque provided by the engine is usually transmitted to the transmission by the input shaft of the planet carrier. By joining the multi-plate clutch in the forward direction, the planet carrier can be directly connected to the sun gear; at this time, the planet carrier and the sun gear form a rotating entity by engagement, and the engine torque is directly transmitted to the drive gear. Because the planet gears do not transmit any torque, there is not mechanical loss in the planetary mechanism, and the direction of rotation of the drive gear will be in keeping with that of the engine. This is the forward mode.

In reverse mode, the joint of reverse multi-plate clutch will keep the gear ring of the planetary structure stationary and the planetary pinion carrier drives the three pairs of planetary gears to rotate sun gear in a reversed direction; now the drive ratio is 1:1.1, which enables a slight torque multiplification by deceleration to compensate the friction loss of planetary structure.

2. Multi-plate clutch

There are two wet multi-plate clutches in total, one forward and one backward. For each clutch there are three friction plates that are 6 friction faces. The clutch is controlled through a hydraulic system to ensure a stable forward movement at any throttle opening, and when the drive gear is completely engaged, control of the amount of the clutch engagement also helps stop the vehicle. The coolant oil cools down the friction plate to prevent friction face overheat.

Drive belt



1. Steel strip 2. Steel plate

3. Conical wheel and steel belt

The major design characteristic of CVT is that a pair of "V"-shaped conical wheels is connected by a steel drive belt. The center distance between the drive wheel and the driven wheel is 155mm. Each conical wheel is divided into two halves: one is fixed, the other slides along the axial direction, both of which have the inclination of 11°. 24 mm-wide "Van Doorne" pushing-type drive belt is used to transmit the torque between pulleys (If you want a larger torque value, 30 mm-wide transmission belt can be used). The transmission belt is lubricated and cooled by oil jet from the nozzle. In order to reduce the angular error of the drive belt when the gear is shifted, put the two moveable pulley halves in the position of the diagonal of both, and then connect each moveable pulley halves to the hydraulic cylinder/piston. The hydraulic pressure is controlled by the control system; see "hydraulic system" section. The spherical spline prevents the moveable pulley hallves from turning relatively to their fixed pulley halves.

Since the sun gear is connected to the drive conical wheel through a spline, the torque is transmitted directly from the planetary gear structure to the drive conical wheel. The steel drive belt transmits the power from the drive conical wheel to the driven cone pully, and the power is then transmitted from the driven conical wheel to the middle gear shaft.

The torque and speed of the driven conical wheel is determined by the position of the drive belt. The sizes of the two pulleys are designed to provide drive ratios of 2.416:1－0.443:1, where the maximum is 5.45 times of the minimum. Fuel consumption is the lowest at speeding drive ratio.

The steel drive belt includes 450 steel plates and 24 steel strips that are 12 on each side fixed together.

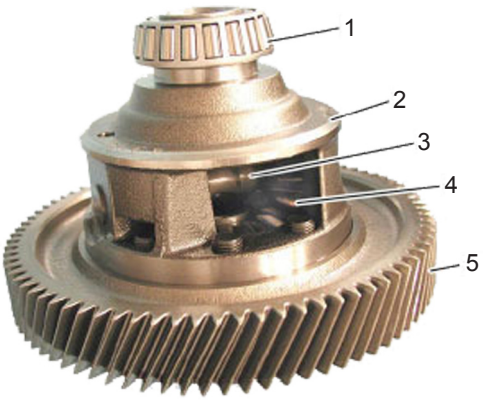
Gear ring and planets

1. Drive conical wheel shaft drive gear
2. Differential crown gear
3. Small drive gear
4. Intermediate transmission gear
5. Driven conical wheel shaft gear

4. Intermediate shaft

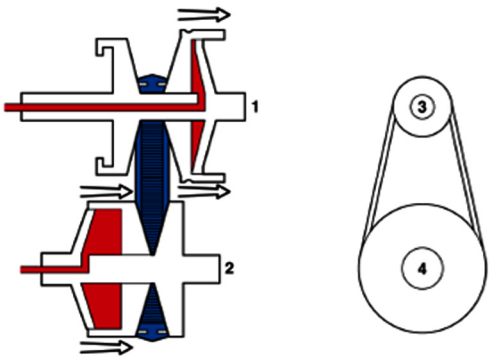
The intermediate shaft (the small gear shaft) decelerates the gear structure of two engaged helical gears between the driven conical wheel and the differential between the two helical gears so that the correct rotation direction of the propeller shaft is ensured. The speed reduction between the driven conical wheel and the drive shaft improves the vehicle performance to a great extent. The intermediate shaft is fixed by the two tapered bearings in the clutch case and the independent bearing seat.

Differential assembly



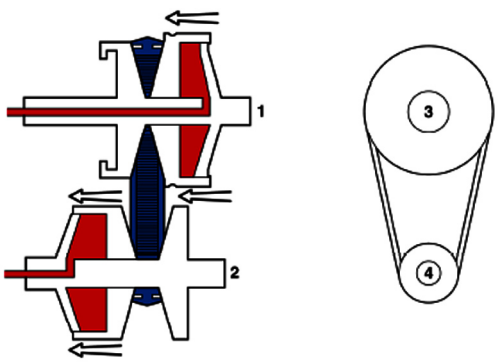
1. Differential bearing 2. Differential case
3. Differential spider
4. Differential planetary gear
5. Differential crown gear

Running gear position at low gears



1.Engine input
2.Output to the wheels
3.Minimum diameter drive gear (low speed)
4.Maximum diameter driven gear (low speed)

Pulley position at high gears (speeding)



1.Engine input
2.Output to the wheels
3.Minimum diameter drive gear (speeding)
4.Maximum diameter driven gear (speeding)

5. Differential

Just as the same as a manual transmission, the torque is transmitted to the wheels through a differential from the crown gear, which is fixed inside the differential by 8 bolts and the propeller shaft is fixed into the differential through a conventional cage-type universal joint and the gasket. The tapered bearing is used to fix the differential.

6. Mechanical manipulation

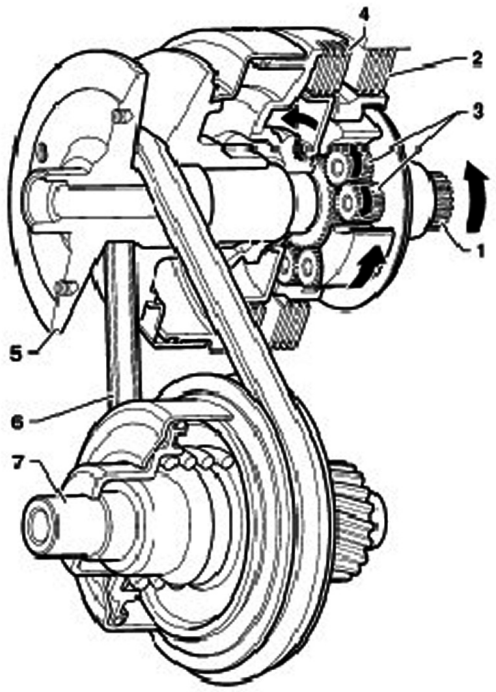
(a) Drive ratio change.

The automatic transmission of a conventional planetary mechanism has a limited number of grades of drive ratio, which is generally four, five, or six grades, but the stepless transmission is different from it-as its name suggests, the transmission ratio of the stepless transmission is continuously variable. The low gear (low drive ratio) makes it easier for a stationary vehicle to start; the diameter of the drive conical wheel is relatively small, while that of the driven conical wheel is relatively large. The drive belt is used to transmit the power and the torque, and the acceleration will be generated if high speed ratio is selected by increasing the diameter of the drive conical wheel and decreasing the diameter of the driven conical wheel. The optimal drive ratio is ensured by controlling the extent of change.

The stepless transmission has two rotating pulleys, i.e. the drive conical wheel and the driven conical wheel, and each of which is composed of two halves, one half is fixed, and the other half can be moved by a hydraulic pressure control. The drive ratio can be determined by the position of the drive belt on the rotating pulleys. If the moveable pulley half approaches its corresponding fixed pulley half, the drive belt will move towards its periphery. When the two pulley halves separate, the circumference will become small, and the moveable pulley half of the drive conical wheel and the driven conical wheel are in the position of their respective diagonal, and at this time the radius of the transmission belt on the drive conical wheel decreases, while the radius of the drive belt on the driven conical wheel increases.

The start of the vehicle needs low drive ratio, and therefore the drive conical wheel separates to make the drive belt adhere to it and makes the transmission belt move around the periphery of the closed driven bevel gear. High drive ratio is needed when the speed increases, so moveable pulley half of the drive conical wheel gradually approaches the corresponding fixed pulley half and the wheel circumference of the conical wheel increases, and simultaneously, the driven conical wheel is forced to separate that the radius decreases and thus producing high drive ratio. The drive ratio of speeding is generated when the drive conical wheel is fully closed and driven conical wheel is fully separated. The drive conical wheel and the driven conical wheel turn at a drive ratio of about 1:2.5.

Transmission Torque Drive Mechanism



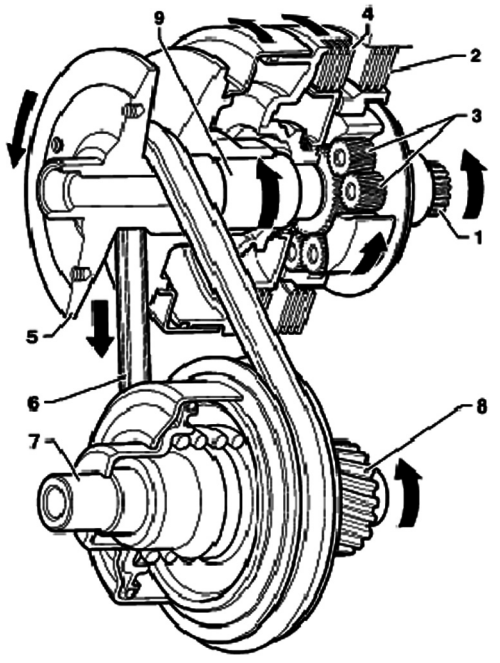
1. Input shaft
2. Backward clutch
3. Planetary gear
4. Drive clutch
5. Drive conical wheel
6. Steel drive belt
7. Driven cone pully

(b) The lever is at the neutral or the parking gear

In this status, reverse clutch (2) and drive clutch (4) separate and the wheels are not able to be driven.

- Transmission input shaft (1) speed is identical to the engine speed.
- Backward clutch (2) separates.
- Drive clutch (4) separates.
- Planets (3) rotate around the sun gear in idle.
- If the sun gear remains stationary, the drive gear (5), driven gear (7), and the vehicle are also stationary.

For any automatic transmission, the engine can only be started at the neutral or the parking gear, and at the parking gear, the mechanical prevents any movement of the vehicle. In order to avoid any damage to the transmission, parking gear can only be shifted when the vehicle is stationary.

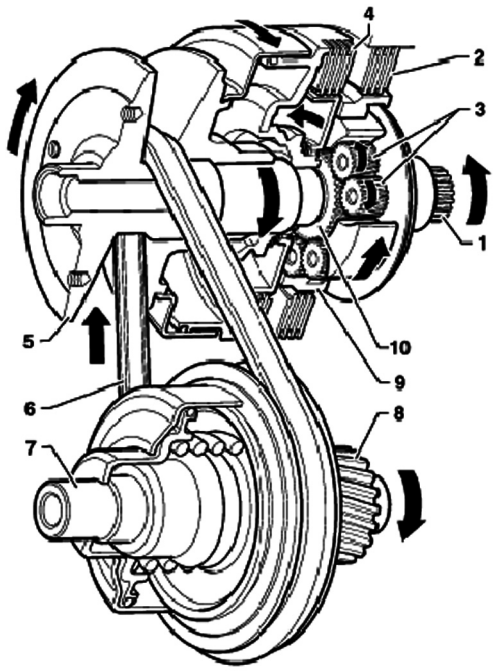


1. Input shaft
2. Reverse clutch
3. Planetary gear
4. Drive clutch
5. Drive conical wheel
6. Steel drive belt
7. Driven conical wheel
8. Driven conical wheel
9. Input shaft

(c) The lever is at drive gear

In this status, the joint of drive clutch (4) send the vehicle into movement.

- Transmission input shaft (1) speed is identical to the engine speed.
- Reverse clutch (2) separates.
- Drive clutch (4) joins.
- The planet gears (3), the sun gear, and the gear ring rotate together.
- Drive gear (5) keeps the same speed with the engine at drive direction.
- The driven gear (7) is at drive direction, and the speed is determined by the drive ratio at running.



1. Input shaft
2. Backward clutch
3. Planetary gear
4. Drive clutch
5. Drive conical wheel
6. Steel drive belt
7. Driven conical wheel
8. Driven conical wheel
9. Gear ring
10. Sun gear

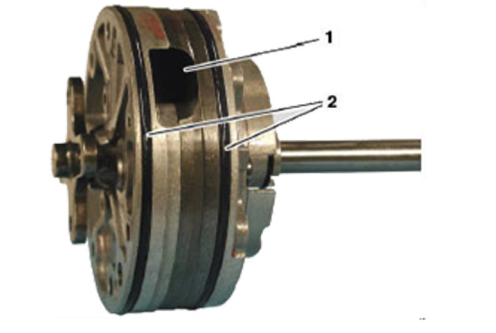
(d) The lever is at the reverse gear

In this status, the reverse clutch (2) joins and the gear ring (9) is locked in the transmission case. The planet gears (3) reverse the direction of the sun gear (10), the drive gear (5), and the driven gear (7) as against the direction of the transmission input shaft (1).

Now reverse gear is shifted

- Transmission input shaft (1) speed is identical to the engine speed.
- Reverse clutch (2) joins.
- Drive clutch (4) separates.
- The gear ring (9) is connected to the transmission case through the reverse clutch (2)
- The planet gears (3) directly driven by the transmission input gear (1) enable it rotate around the gear ring, and then drive the sun gear (10), pulley (5), and the driven conical wheel (7) in a reversed direction.

1. Oil pump drive shaft 2. Oil pump assembly



1. Oil pump inlet 2. Oil pump seal

Control System

Functions of the control system are as follows:

(a) The clamping force of the tension of the steel drive belt is made adapted to the torque of the engine to prevent slipping.
(b) Control the drive and reverse clutch while driving.
(c) Optimal drive ratio is provided for driving.
(d) Provide necessary lubricant and coolant oil for the transmission.

1. Oil pump

The pump within the transmission is an external engagement gear pump, the shaft of which is driven by the engine oil pump shaft and reaches the inside of the pump through the hollow shaft of the drive conical wheel. The pump shaft is connected to the planetary gear rack through a spline, and the pump runs at engine speed at an efficiency of 10cm³/rotation. System pressure depends on the input torque, which is up to 40-50 bar.

Remark:

the oil pressure is used for both hydraulic transmission control and lubrication

2. Transmission control unit

The transmission control unit ensures the drive belt and the pulleys free of slipping at the least tension, and provides drive ratio in accordance with the target set by the driving strategy (calculated by the input (drive) and output (driven) speed). Within the service life, the decline of the control unit will be maintained in a certain range that it does not affect driving comfort and drive belt tension.

3. Tension control unit

(a) The tension control unit can acquire the least tension that ensures the drive belt free of slipping, which brings little affect onto the drive efficiency of the transmission and thus saves fuel consumption.

(b) In addition to normal driving, special circumstances of maximum input and output torque of the transmission are also considered for the tension control device to have the transmission protected to the maximum. The brake of Anti-lock Braking System (ABS), tire locking (without ABS), and other propulsion control systems (such as ESP, and anti-skid control device, etc.) are taken into consideration for the control device. Moreover, special road surfaces and circumstance are also considered for the device, for example, passing the potholed road, road shoulders, transition between high and low adhesion coefficients, and tire slips (e.g. on a low adhesion coefficient road).

(c) The software is able to compare the transmission torque drive performance and estimated input torque of the transmission. When the tension control unit detects insufficient tension, ECU will receive a torque reduction signal and thus adjust the engine torque to an applicable range. This function is also a protection to the transmission.

(d) If the vehicle is not equipped with an electronic drive circuit system, the ECU passes torque signals through CAN bus; if there is no CAN bus, the transmission control unit (TCU) will generate a default torque signal.

4. Speed ratio control unit

(a) The transmission balances the pressure of the drive conical wheel and the driven conical wheel by controlling the input and output pressure, thus controlling the drive ratio. The drive ratio can be calculated according to the speed sensor signal of the drive conical wheel and the driven conical wheel, and the drive ratio needed can be got by changing the output pressure. The minimum pressure can be determined by the tension method. Physical model of the transmission contributes to the rapid adjustment of pressure liquid level to the variable working point. The interference from other components of the transmission is also considered in the control software, so the purpose of developing the software is to reduce delay errors and target speed ratio errors as much as possible (in order to improve the economical efficiency of the fuel).

(b) In order to guarantee that the mechanical requirements and requirements of durability limit state of the transmission, we've made some strategies of driving under the limit state. In addition to the vehicle speed limit, it controls the change rate of the drive ratio (set point) within the allowed range as well. Moreover, the software also avoids the engine speed exceeding certain limit because of the change of the vehicle speed and of the position of shift (POS). In order to realize the limiting condition, the software will require the reduction of the engine torque or make the moving vehicle gear up.

5. Transmission control unit

The transmission controlling software is integrated in the TCU (transmission control unit). TCU is installed in the engine compartment.

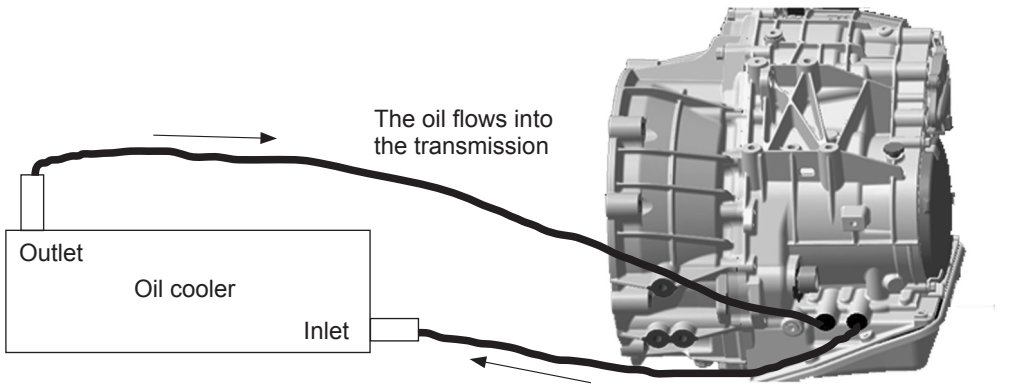
Remark: for the ports, interfaces, circuit, and interface schematic, please see Circuit and Interface.

External connector

1. Oil cooler port

Two oil cooler ports are located on the front of the transmission case. An oil cooler inlet is arranged beside the engine radiator to keep the temperature of lubricating oil at below 120°C.

The oil in the transmission flows out of the port on the right, which is connected to the lower port of the oil cooler. The oil in the cooler flows into the transmission through the port on the left of the transmission, so it is connected to the upper port of the oil cooler.



2. Gearing lever

(a) The gears of VT2 may include Parking (P), Reverse (R), Neutral (N), Drive (D), and Sport (S) or Low (L). These gears are neatly arranged on the transmission shift device.

(b) The vehicle is equipped with electronic gearing lock controlled by TCU (transmission control unit).

(c) The new application may also be related to prompt function, that is, to acquire the prompt signals, TCU needs to be equipped with other ports. In addition, the calibration of maximum rate of engine must be within certain limits.

1. Main connector

3. Main connector

The main connector is on the case of the transmission with 16 pins. Lines are connected through a round connector.

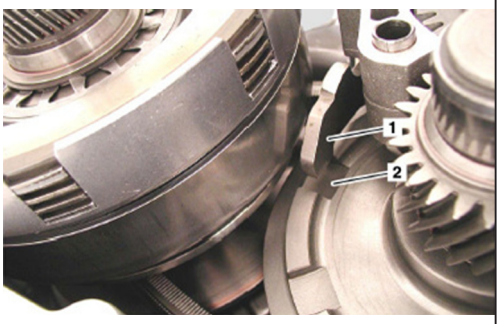
4. Torsion damper

Most of conventional automatic transmissions are connected to the engine and input shaft through a hydraulic torque convertor, but this transmission adopts torsion damper, which is not an integral part of the transmission. Bunge strongly recommends torsion damper, also known as dual-mass fly wheel.

DRIVING MODE

Status under special condition

The context below will explain the status under special condition for vehicles with stepless transmission.



1. Parking lock claw 2. Driven conical wheel

1. Parking and neutral gear funtion feature

The engine can only be started when the shift lever is in parking or neutral position regardless of the transmission type. The mechanical lock in the parking position will prevent the vehicle from moving. Engage the parking gear when the vehicle is stationary, as to prevent damaging to the transmission. If the parking gear is engaged carelessly when the vehicle is driving in high speed, the parking device will not work untill the speed is decelerated to 5 km/h.

TCU will control the starter lock relay when the vehicle starts. This relay can start the engine. The vehicle gear is controlled by internal driving mode sensor which is connected to shift lever directly.

It is necessary to depress the brake pedal when move the shift lever from parking (p) or neutral (N) position to driving (D) or reverse (R) position. If the brake pedal is not depressed, the shift lever will be locked in the starting position.

2. Functions of D and R gear

• Routine operation

The operation of the transmission is totally different from that of the traditional automatic transmission when driving the vehicle, so you should adapt yourself to it. For example: If you step on the accelerator pedal too hard, the engine speed will increase obviously, while the vehicle speed will not change much. This function is normal for stepless transmission; however, it is possible that a driver erroneously thinks there is a transmission failure if he does not understand this transmission. There also might be other circumstances similar to the conventional automatic transmission.

• Adaptive update

Either for drive or reverse, the corresponding clutches are to be re-calibrated to achieve best results in the period of its use. In the following text self-adaptive update will be discussed.

• Crawling

From the performance of the automatic transmission, it can be known that when the shift lever is in Drive (D) or Reverse (R), if the driver releases the brake pedal, the vehicle will begin to crawl (level road). If the road gradient does not exceed 8°, the vehicle can also crawl; if the road gradient is greater than 8°, the vehicle will back up slightly, as in the case with the vehicle equipped with the hydraulic torque converting transmission, the vehicle will not back up if the gradient is not heavy. Whether the road gradient is heavy or not, the maximum vehicle speed will be less than a limit (e.g. 8kph) when the vehicle crawls. Especially when the vehicle goes down a slope, the control system will make the clutch change from separation to “joint” mode, and in this way the engine can be used to brake during sliding.

• Idle stop (drive status only)

VT2 transmission can realize idle stop.Idle stop can occur when both the vehicle (battery status, air conditioner on/off) and the transmission side (without prejudice to the durability of the transmission) meet certain conditions. If all conditions are met, the internal combustion engine is turned off under the stationary state. Only if the brake pedal is released, the engine is restarted, and the transmission works rapidly, can the vehicle move back and forth.

Idle stop function applies in particular to a hybrid drive unit, but for a standard power drive device without any special starter or starting motor, transmission idle stop is of no use.

• Acceleration and Deceleration

In a speed-up process, acceleration is mainly provided based on a driver's requirement and driving conditions, so at this time, the trends of engine speed changes correspond to the initial speed and thus the best driving comfort is achieved.

Clutch controller also provides some methods to compensate for clutch differences (differences among different vehicles) caused by wear and tear so as to ensure driving comfort.

• Acceleration support

To achieve the best driving comfort, most suitable engine speed is to be determined, which is between the minimum traction engine speed and constant cruising speed (economic speed).

The transmission control system provides the functionality satisfying these requirements by using the combination control mode between the speed change device (speed ratio control) and the starting clutch. Therefore, when the vehicle starts, the control target is focusing on controlling the driving performance of higher engine speed related to the vehicle acceleration, whereas when the vehicle cruises or slides, the control target transfers to the economical efficiency of the fuel of the drive system.

• Deceleration

If the driver steps on the accelerator pedal while stepping on the brake pedal, the engine speed will be limited to a certain range (similar to hydraulic torque converting transmission). To this end, the transmission needs to join the engine control system to block torque, so the transmission will be able to respond quickly to control the clutch when the driver suddenly releases the brake pedal.

After long-term use, the clutch high-temperature loss will be caused, and transmission will have the risk of damage, so we use monitoring functions to detect these dangerous situations. Activating internal diagnostic system of transmission can separate the clutch. At this time if the driver has the accelerator pedal being stepped, the engine will accelerate to maximum speed.

But in other cases, the clutch controller can also follow the maximum control objectives to ensure the original degree of safety and improve the driving degree of comfort.

• Driving and braking

When the vehicle decelerates to be stationary, the clutch separates again to prevent the engine from stopping, and as the clutch is gradually separated with a steady decline of pressure under control, torque fluctuations will not be caused.Therefore, the controller provides different patterns according to the speed changes to separate the clutch. The clutch pressure control device also controls the hydraulic control system power in accordance with transmission oil temperature. After the clutch is separated, the vehicle can be quickly prepared to start.

In order to bring optimal driving comfort of the vehicle in braking and starting, the synergism of the transmission software and other drive control devices makes the torque transmission temporarily interrupted, and idling increased.

• The joint/separation of the clutch when driving

If the clutch is not used when driving, transmission controller will impact little on driving comfort because it has nothing to do with the characteristics of the hydraulic system. In this case (low load, parking, low engine speed), in comparison with using the clutch in a static state, using the clutch once again may decline driving comfort.

The default mode of failure

When the software detects a system error, the default rule will be applied; and this will be transferred to the driver through the malfunction display of the instrument cluster. The driver will take a different default-driven state in accordance with the severity of the error. In some cases, main relay will be switched on. All the failure codes will appear on the OBD.

GENERAL DESCRIPTION

Vehicle towing

The vehicle equipped with VT2 transmission cannot be towed directly. Fluid pressure can only be generated in the conical wheel and drives the belt when the engine rotates. Therefore, be sure to raise the front wheels before towing (Hung in the air).

Periodic maintenance

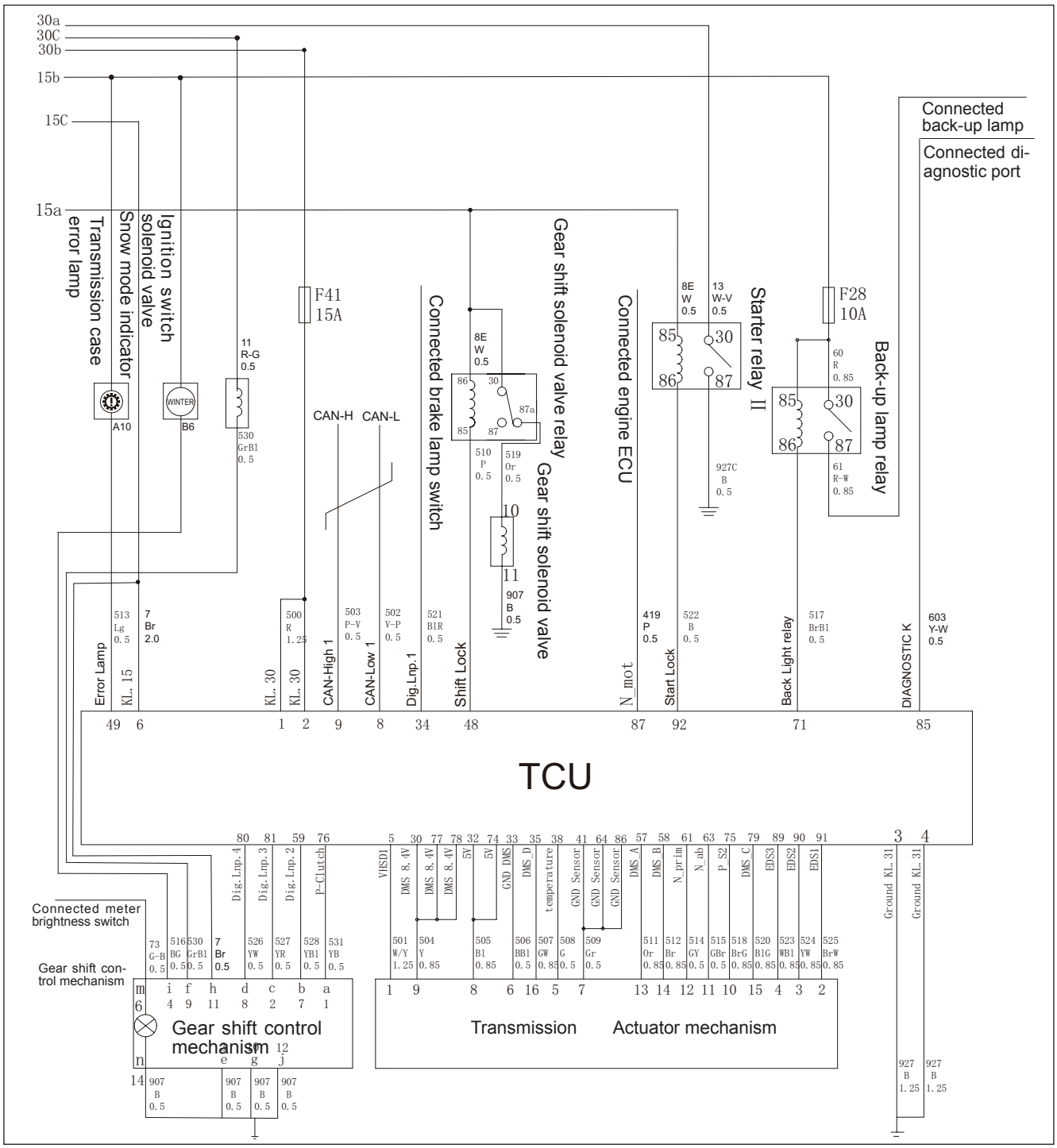
Change the transmission fluid and replace the oil filter every 60,000 km. Therefore, the drain plug and refill plug are fitted on the case.

Lubricant specification

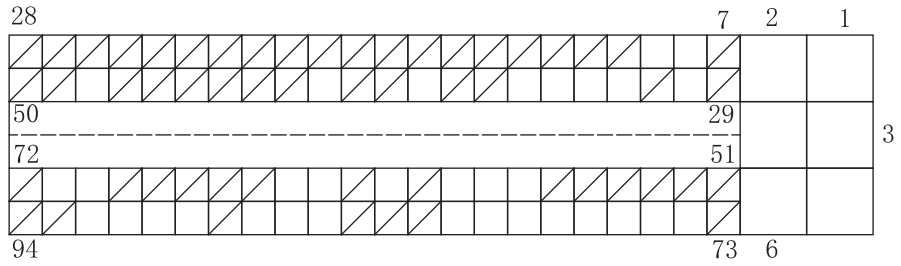
Please use ESSO EZL799(A).

The application of non-specified lubricants maybe damage the transmission, and that may not be covered under warranty.

TCU wire connection diagram



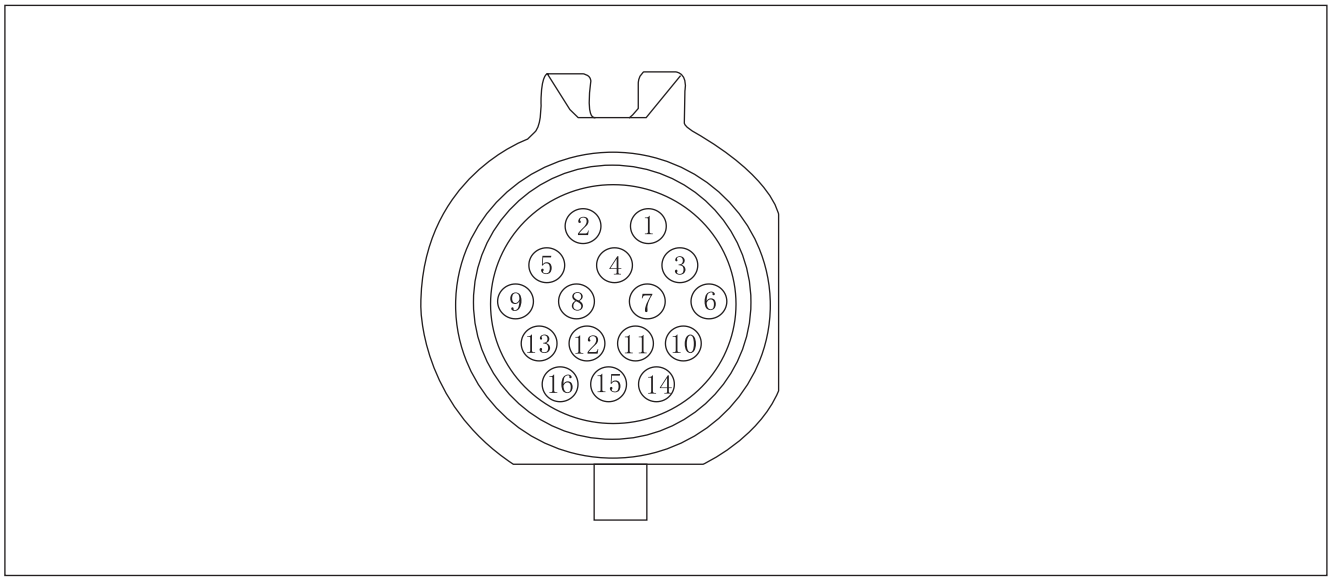
TCU main connector pin



TCU pin configuration

VT2 – signal	Pin
NC power supply Kl.30	1; 2
Ignition power supply Kl.15	6
Ground Kl.31	3; 4
VHSD1 (actuator power supply)	5
Speed and position sensor power supply (8,4 V)	30; 77; 78
Pressure sensor power supply (5 V)	32; 74
GND Driving mode sensor	33
GND: Sensor grounded	41; 64; 86;
Transmission case oil temperature	38
N_Prim (drive conical wheel speed)	61
N_ab (driven conical wheel speed)	63
N_MOT (engine speed signal)	87
DMS_A (driving mode sensor signal)	57
DMS_B (driving mode sensor signal)	58
DMS_C (driving mode sensor signal)	79
DMS_D (driving mode sensor signal)	35
Brake signal	34
Manual mode signal	59
Shift up signal	81
Shift down signal	80
P_S2 (driven conical wheel pressure)	75
Snow mode	76
Gear shifting lock	48
K-Line	85
CAN-high speed	9
CAN-low speed	8
Starter lock	92
EDS1 (driven bevel gear pressure regulator)	91
EDS1 (drive bevel gear pressure regulator)	90
EDS3 (Clutch pressure regulator)	89
Back-up lamp relay	71
Malfunction indicator	49

Transmission case main connector pin



Adaptive update

When the TCU refreshes software or replace transmission case or TCU, the clutch need to finish adaptive update to compensate the tolerance generated in factory.
The process of adaptive update could be completed via Gear shifting operation with the engine idling. If this process isn't over, the transmission case control system warning lamp will blink 1 time at 2 seconds intervals.

You'd better shift gears more times to finish adaptive update process.
Rigid shock will not happen when the adaptive value is 4 or more. So the transmission case control system warning lamp will be off when the adaptive value raises to 4, and the adaptive process keeps updating continously during driving operation.
Read the value of adaptive update using Punch INCA and MLT software, or other testers.The process of adaptive update could be completed successfully though there is no tester to read the value. If the adaptive value cannot be detected for testers lacking, the TCU will make the warning lamp stopped blinking when the adaptive value is 4 or more in D or R position.

For the transmission case at critical (the tolerance generated in factory above the average), an additional function is available in the adaptive update program.That is called swift adaptive update application.Each transmission case has a special value of adaptive update under specified oil temperature, such as -20℃, 0℃, 10℃, 20℃, 40℃, 60℃, 80℃, 100℃, and 120℃. But it's not mean that the process of adaptive update should be done at above temperatures.
When the process of adaptive update is applied under specified oil temperature, the current value will be replicated and changed in accordance with a special temperature automatically. For the difference of clutch tolerances, some clutches of transmission cases may replicate relative data but some may not do. this process is completed automatically when the transmission case warning lamp no longer blinks.

1. **Condition:**
   The main conditions to apply adaptive update is described below.
   The vehicle is stationary.
   Accelerator pedal isn't be depressed.
   steady engine idling
   steady engine torque
   The brake pedal is depressed.

2. Procedure

Perform the adaptive update of clutch under a special temperature according to the following procedures.

1 Start the engine
2 Depress the brake pedal firmly
(Remember to Keep this operation through the process of adaptive update)
3 Engage in the N position
4 Wait for 5 seconds
5 Engage in the D position
6 Wait for 5 seconds
7 Engage in the N position
8 Wait for 5 seconds
9 Engage in the R position
10 Wait for 5 seconds
11 Engage in the N position
12 Wait for 5 seconds
13 Engage in the Forward position
14 Wait for 5 seconds
15 Engage in the N position
16 Wait for 5 seconds
17 Engage in the R position
18 Wait for 5 seconds
19 Back to the 3rd step and repeat the above operations untill the warning lamp stops blinking

When the shift lever is in the forward position or reverse position, the warning lamp should be off if the respective adaptive value is over 4. If the warning lamp still remains illuminating, which means that the adaptive value is not up to 4. To solve this problem, you need to operate shift lever to the forward position and drive the vehicle at 50 km/h, then stop the vehicle. Make sure that the gear shift control mechanism would have been raised to high gear position, and the pressure in the drive conical wheel returns to 0 bar.

Trouble code P0810 will be deactivated after self-learning. TCU will clear the trouble code automatically after 3 driving cycles.

***Note that the engine idling update will influence the transmission case adaptive update directly. The engine idling update will be cleared out automatically after power off.

***The adaptive update process will be performed during the whole transmission case temperature range. However, the fast update only need the transmission case temperature at +20 ℃ to +60 ℃.

***Note that the TCU warning lamp will not flash if only replace the transmission case. The reason is the transmission case clutch self-learning value is stored in the controller unit. Then, it is necessary to perform the self-learn according to the study process mentioned above. However, the malfunction indicator cannot warn the learning process completion, please repeat the proecess above for 10 times.

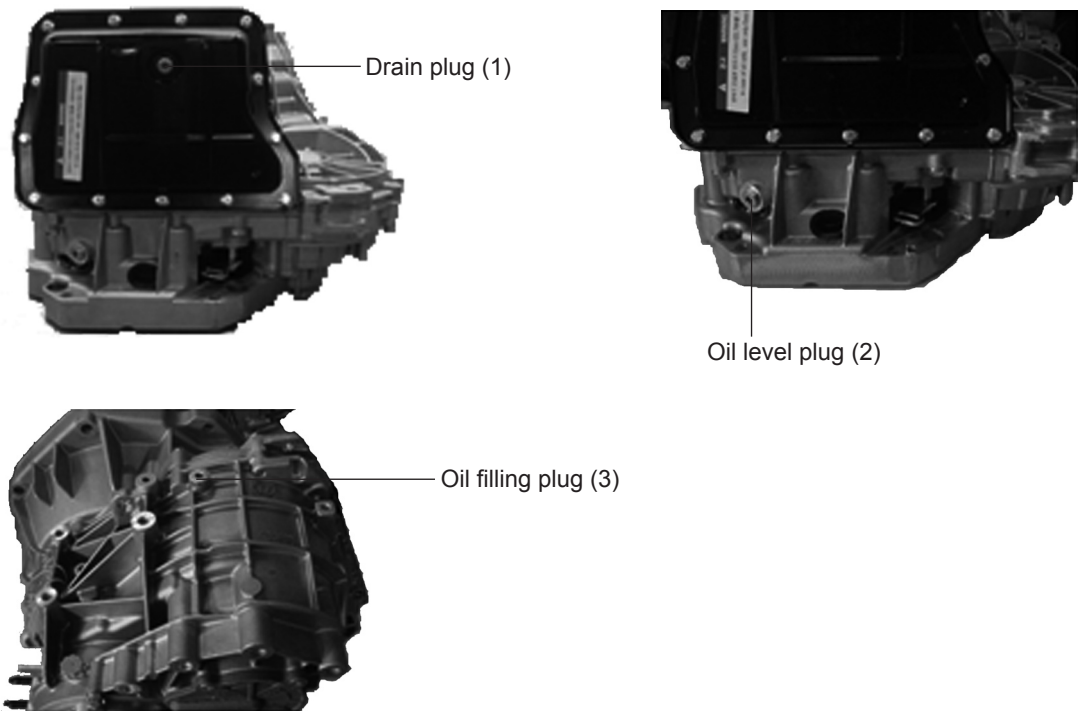
SERVICE INSTRUCTIONS

Oil level inspection

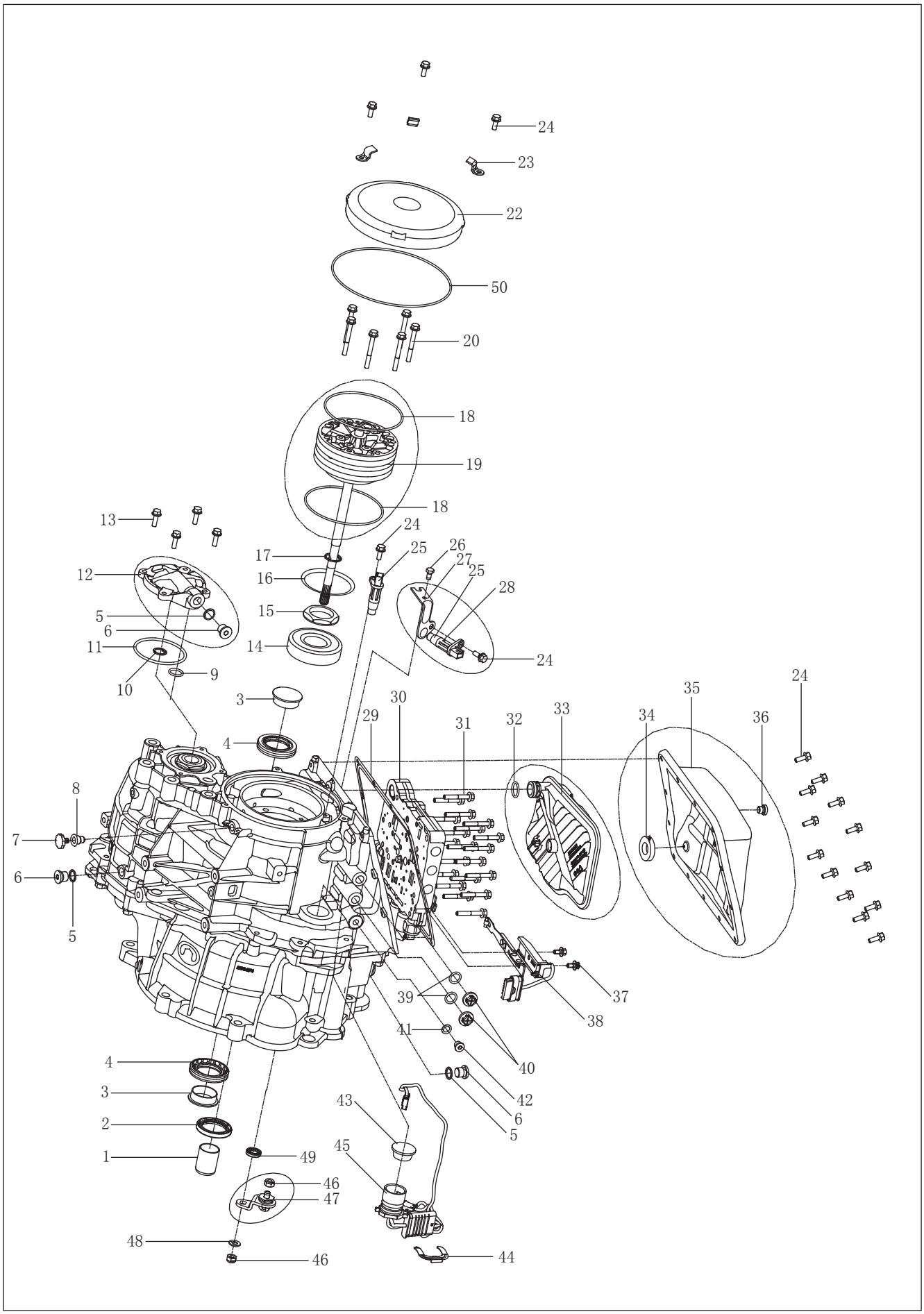
Since the transmission is empty as a service part, it is necessary to add about 4L ESSO EZL799(A) after installing to the vehicle.

Fill oil according to this procedure whenever drain the transmission oil or replace the transmission case. Check the oil level after filling according to the following method:

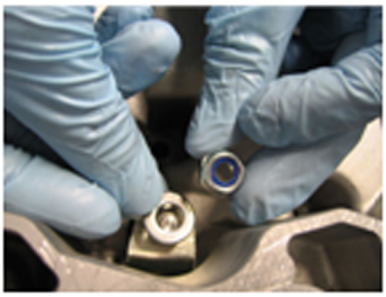
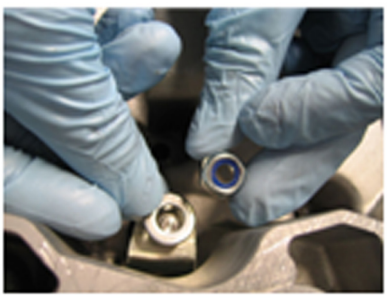
- Start the engine and idle for at least 10 seconds (Caution: It is normal for hearing the cycling sound of the airflow when starting the engine).
- Shift to different position (Parking-Reverse-Neutral-Drive). Wait for 5 seconds before shifting to the next position.
- Shift to "D" (Drive).
- Release the brake pedal.
- Accelerate over 60 km/h (engine speed is less than 2,500 rpm).
- Release the accelerator gently and stop the vehicle (the noise created by airflow will disappear).
- Drive for 5 minutes carefully or wait untill the transmission reaches 60ºc, as to raise the oil temperature.
- Part the vehicle on a flat surface.
- Depress the brake pedal.
- Wait for 2 seconds.
- Shift to "R" (Reverse).
- Wait for 10 seconds.
- Shift to "P" (Parking).
- The engine is idling.
- Loosen the oil level plug.
- Make sure there will be at least 0.2 L oil discharged from the pipe after loosening the oil level plug (If not, it means that the original oil amount is insufficient). If the result is less than 0.2 L, add 0.5 L and repeat above steps again.
- Add untill there is oil dripping from the oil level plug.
- Re-tighten the oil level plug.
- Stop the engine.

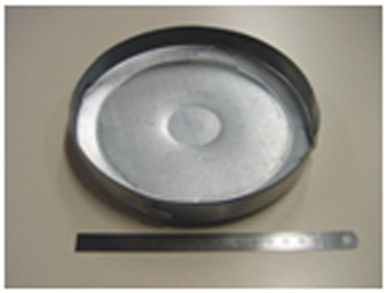
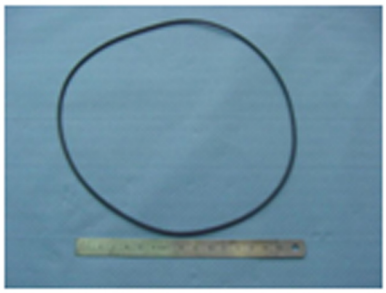
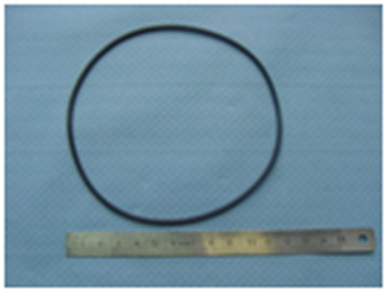


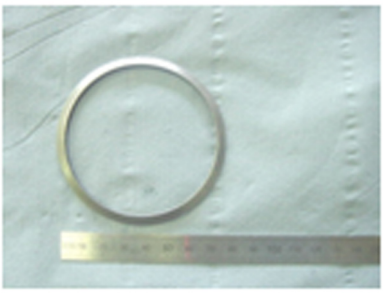
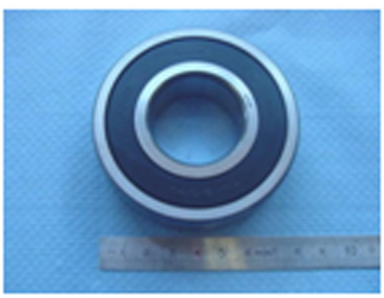
Components

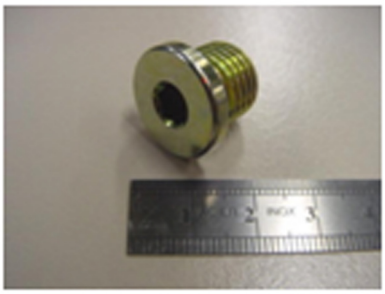
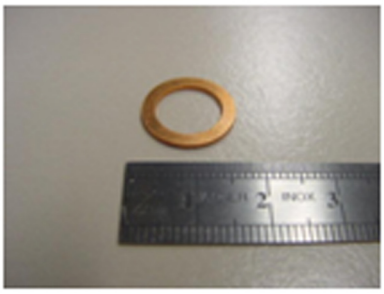
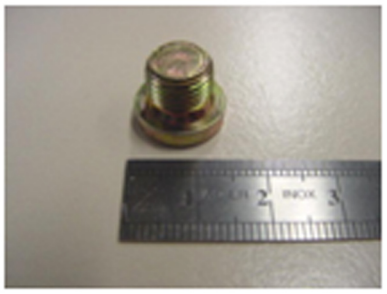

24
23
22
50
20
18
19
18
13
24
17
25
26
27
25
28
12
16
15
14
24
5
6
11
9
10
3
30
29
31
32
33
34
35
36
24
4
8
7
6
5
39
37
38
41
40
42
6
5
4
3
2
1
49
43
45
46
47
48
46
44

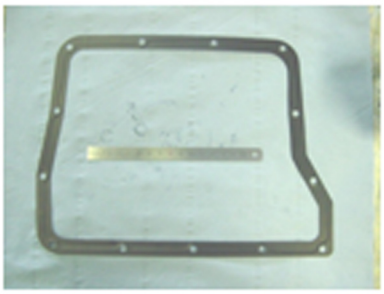
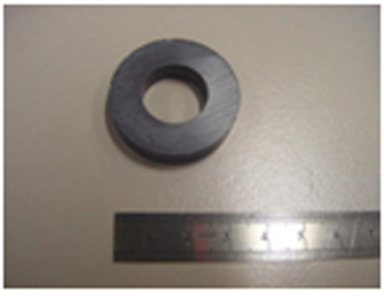
COMPONENT LIST AND TORQUE REQUIREMENT

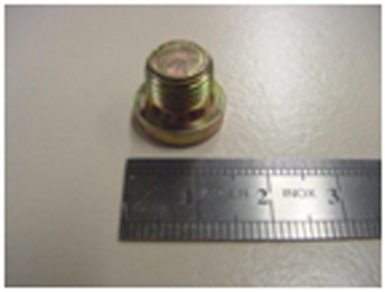
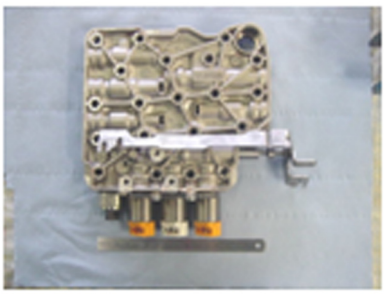
482871 No.4	Differential oil seal	
481274 No.2	Input shaft oil seal	
482584 No.48	Shift lever nut gasket	
481329 No.46	Shift lever nut 14.5±1.5 N·m	
482099 No.49	Oil seal (gear shifting)	
482751 No.47	Shift lever	

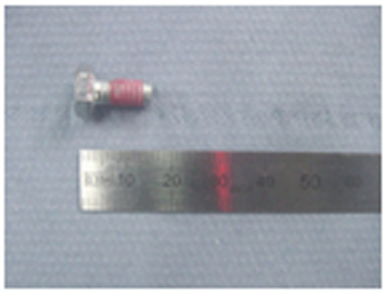
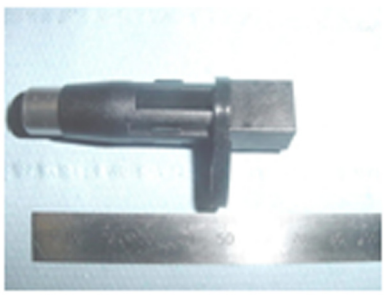
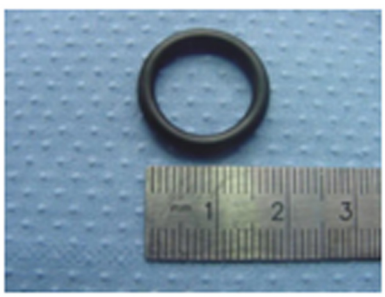
481173 No.22	Drive conical wheel shaft end cover	
481189 No.23	Drive conical wheel shaft end cover buckle	
481253 No.50	Drive conical wheel shaft end cover O-ring 177.47×2.62	
481283 No.24	Drive conical wheel shaft end cover bolt M6×16 9.5±2.5 N·m	
481259 No.18	Oil pump O-ring	
481284 No.20	Oil pump bolt 10±1 N·m	

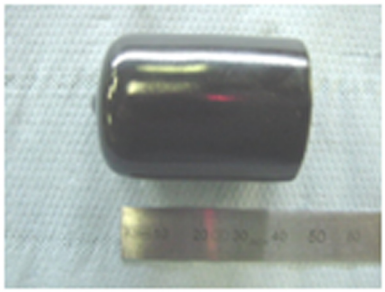
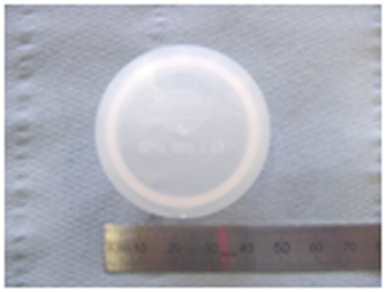
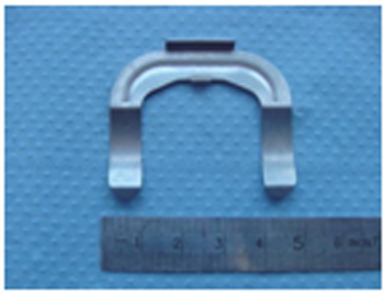
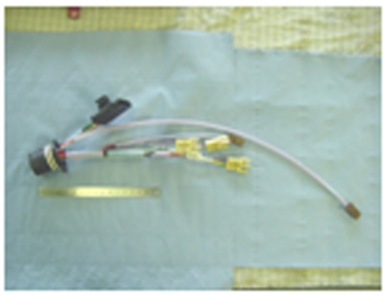
481293 No.15	Drive conical wheel shaft nut 197.5±17.5 N·m	
481826 No.17	Oil pump sealing ring	
481856 No.16	Conical spring gasket	
482773 No.19	Fuel pump	
482294 No.14	Drive conical wheel shaft ball bearing	
481247 No.5	Oil filling plug gasket M14	

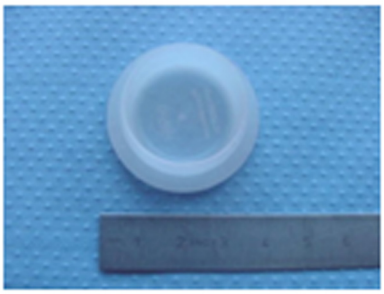
481248 No.6	Oil filling plug M14 21±3 N·m	
481249 No.41	Oil level plug gasket M10	
481250 No.42	Oil level plug M10 15±2.25 N·m	
482982 No.12	Driven conical wheel shaft end cover	
481254 No.9	Driven conical wheel shaft end cover O-ring 17.12×2.62	
481255 No.11	Driven conical wheel shaft end cover O-ring 72.63×3.53	

481877 No.10	Driven conical wheel shaft end cover sealing ring	
482208 No.13	Driven conical wheel shaft end cover countersunk screw 9.5±0.95 N·m	
482456 No.33	Oil filter assembly	
481283 No.24	Oil pan bolt M6×16 9±1 N·m	
482504 No.29	Oil pan gasket	
481870 No.34	Oil pan magnet	

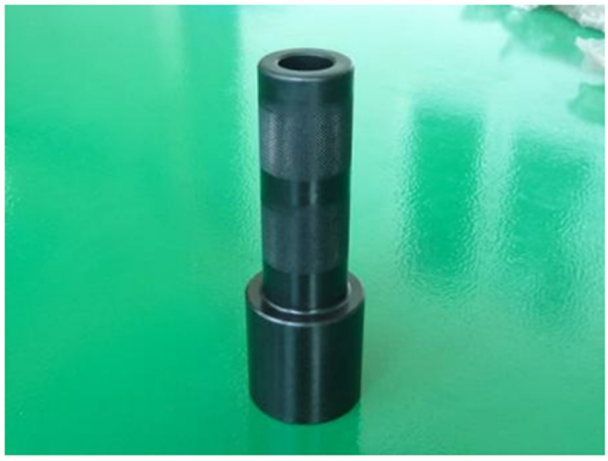
482442 No.2	Oil drain plug 11±1 N•m	
482489 No.35	Oil pan assembly	
482945 483036	TCU (Daisy) TCU (Dahlia)	
482589 No.30	Valve body assembly	
481311 No.31	Valve bolt 11±1 N·m	
482493 No.38	Driving mode sensor	

481090 No.37	Driving mode sensor mounting screw 9.5±0.95 N·m	
482468 No.27	Differential speed sensor bracket	
481289 No.26	Differential speed sensor bracket mounting screw 9.5±0.95 N·m	
482410 No.25	Speed sensor	
481283 No.24	Speed sensor mounting bolt 8.5±2 N·m	
481258 No.39	Oil cooler plug O-ring	

482121 No.40	Oil cooler plug	
482235 No.1	Input shaft rubber sheath	
481296 No.3	Differential oil seal cover	
482105 No.44	Main connector buckle	
482475 No.45	Main connector and internal wire	
482031 No.8	Case breather valve	

482032 No.7	Breather valve cover	
482104 No.43	Main connector sealing cover	
482642 No.32	Oil filter O-ring	

SST

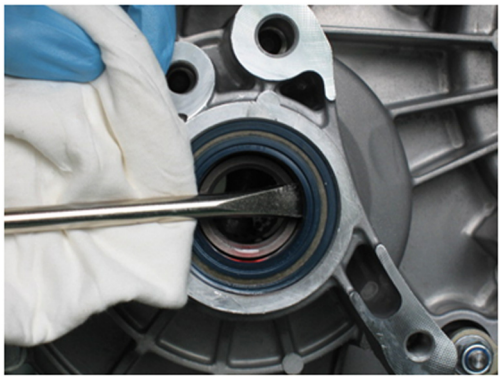
Drive conical wheel bearing plug (Figure T00222)	Gear shifting oil seal punch (Figure 480125)
Drive conical wheel bearing punch (Figure 480137 + 480126)	Drive conical wheel bearing remover (Figure 480136)
	
Input shaft oil seal punch (Figure 480130)	Input shaft oil seal lock bushing (Figure 480129)

Gear shifting oil seal remover (Figure 480127)	Hydraulic pressure control unit lock pin (Figure 23K002-099-84312)
Differential oil seal punch (Figure 23K002-099-84336)	SST for oil pump removal (Figure 23K002-099-84295)

Caution: The figure maybe different from the actual tool or drawings!

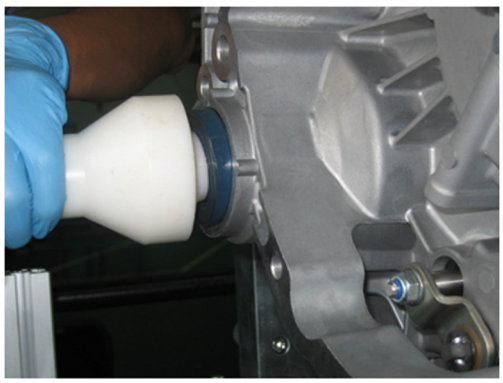
PARTS REPLACEMENT INSTRUCTIONS

1. **Replace the differential oil seal.**
   Malfunction: perform when the oil seal damage or leakage occurs, or the axle shaft damage or leakage occurs.
   Maintenance method:
   (a) Drain the transmission oil (see the oil filter replacement procedure).
   (b) Remove the axle shaft.
   (c) Pry out the oil seal with a big slotted screwdriver. Do not put the slotted screwdriver deeply in order to prevent the case.
   (d) Discard the removed oil seal.



Remove the oil seal.

(e) Put a new oil seal on the case.
(f) Put SST (23K002-099-84336) on the oil seal and tap it into the case with a rubber hammer. Make sure to install into the correct position.
(g) Install the axle shaft.
(h) Refill the transmission case according to the instructions.



Install a new oil seal with SST.

2. **Replace the input shaft oil seal.**
   Malfunction: perform when the input shaft oil seal damage or leakage occurs.
   Maintenance method:
   (a) Drain the transmission oil (see the oil filter replacement procedure).
   (b) Take it off from the vehicle.
   (c) Pry out the oil seal from the case with a big slotted screwdriver along its hollow part. Make sure to be extremely careful. Otherwise, the transmission case input shaft may be damaged.
   (d) Take out and discard the removed oil seal.

Remove the input shaft oil seal

Mount the SST on the input shaft (480129).

(e) Put the oil seal lock bushing (480129) on the input shaft.

Press down the oil seal.

(f) Put a new oil seal on the lock bushing.

Install the oil seal with SST (480130).

(g) Mount the SST (48013) on the input shaft.
(h) Tap the SST with a rubber hammer and pay attention to install into the correct position.
(i) Remove the SST and install the transmission case back.
(j) Refill the transmission case according to the instructions.

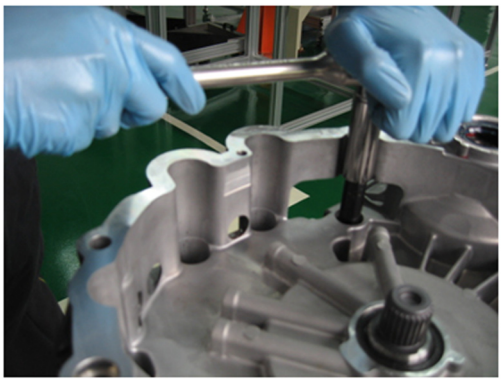
Mount the SST (480127) on the gear shifting.

3. Replace the gear shifting oil seal.

Malfunction: perform when the gear shifting oil seal leakage occurs.

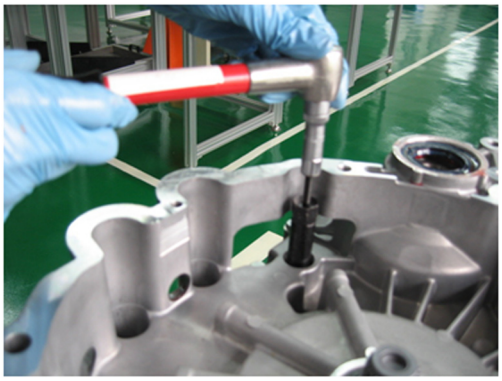
Maintenance method:

(a) Drain the transmission oil (see the oil filter replacement procedure).
(b) Take it off from the vehicle.
(c) Remove the shift lever.
(d) Mount the SST (480127) on the gear shifting.



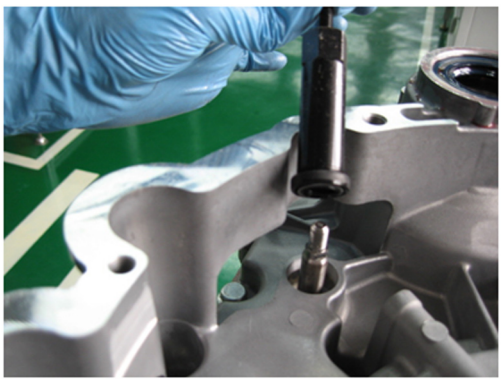
Press and rotate the SST.

(e) Screw SST into the oil seal with wrench. Press the end of the wrench for the convenience of screwing in the oil seal.



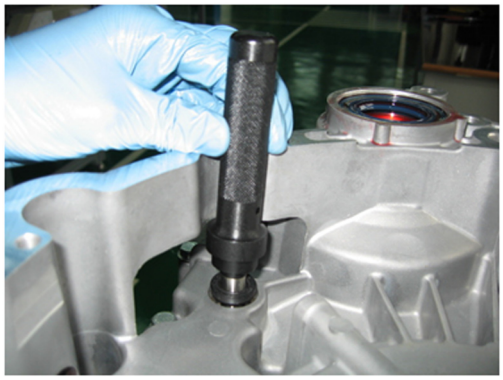
Rotate the small bolt and pull out the oil seal.

(f) Turn the bolt on the SST with a tool and pull out the gear shifting oil seal from the case.



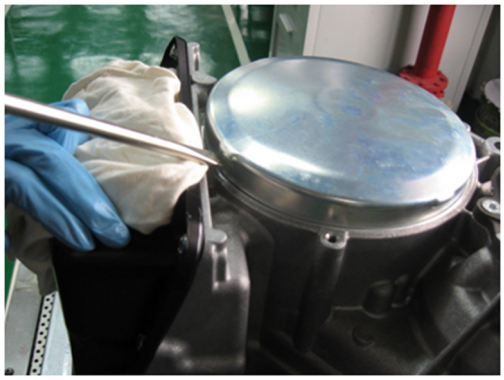
Take out the oil seal.

(g) Discard the oil seal.



Install the oil seal with SST (480125).

(h) Put a new oil seal on the gear shifting.
(i) Put the special punch (480125) on the shaft and tap it with a rubber hammer. Pay attention to install into the correct position.
(j) Install the shift lever and mount the transmission case back.
(k) Refill the transmission case according to the instructions.



Remove the drive conical wheel shaft end cover.

4. Replace the drive conical wheel shaft end cover.

Malfunction: perform when the drive conical wheel shaft end cover leakage occurs.

Maintenance method:

(a) Discharge about 1L transmission oil (see the oil filter replacement).

(b) The transmission case doesn't have to be removed from the vehicle. The replacement will become easy to lower the engine together with the transmission case.

(c) Remove 3 bolts and take off the buckle. Remove the end cover with a big slotted screwdriver. Put a piece of cloth under the cover to prevent transmission case damage.

(d) Remove the end cover with a big slotted screwdriver. Put a piece of cloth under the cover to prevent transmission case damage.

(e) Remove the bigger O-ring and discard it together with the end cover.

(f) Install a new O-ring.

(g) Replace a new end cover and tighten the bolt and buckle.

Torque: 9.5±2.5 N•m

(h) Refill 1L transmission oil.

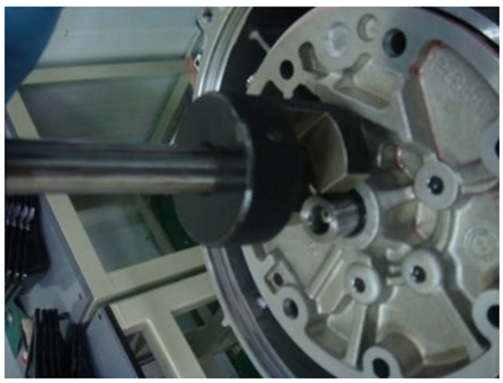
5. Replace the oil pump.

Malfunction: If the transmission case pressure is too low or shocking, abnormal condition occurs during driving, there are two key parts — soil pump and hydraulic pressure control unit, which may cause the above mentioned problems. Then, we need to find the damaged part by trouble codes. In most cases, it is difficult to judge the damaged part, please change one by one to troubleshoot.

Maintenance method:

(a) Remove the end cover following the replacement procedure of the drive conical wheel shaft end cover.

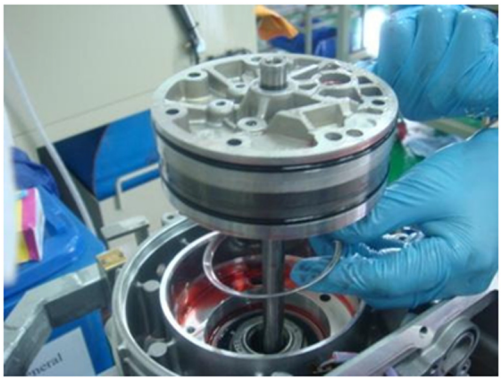
(b) Remove the 6 bolts on the oil pump and put the SST on the oil pump shaft.



Remove the 6 bolts and install the SST.

(c) Pull out the oil pump with SST (23K002-099-84295).

Pull out the oil pump.

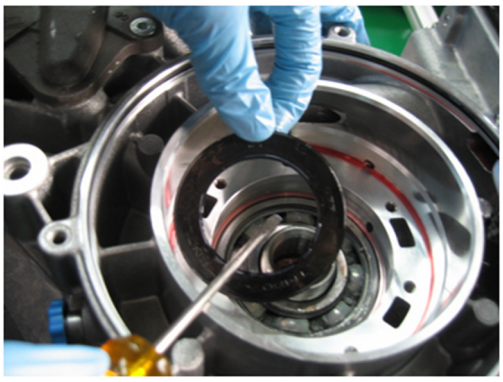


Conical spring gasket

(d) Replace a new oil pump and make sure to put 2 new O-ring on the new oil pump. Pay attetion not to take out the conical return spring. Confirm the end with longer diameter faces the oil pump.
(e) Reinstall the 6 bolts and tighten with 10+1 N•m torque.
(f) Install the end cover according to the procedures. It is unnecessary to replace the O-ring and end cover.

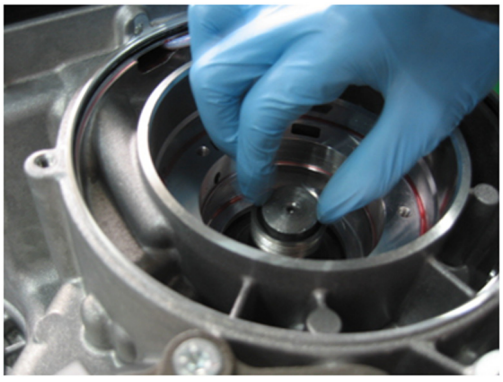
Mark on the shaft and bolt.

6. Replace the drive conical wheel shaft ball bearing.
Malfunction: Replace the drive conical wheel shaft bearing if it is worn. A worn drive conical wheel shaft bearing will sound large noise, which will change according to the engine speed. Then, this bearing may be damaged when there is more and louder noise suddenly under the condition to switch from D gear to manual mode under the constant vehicle speed. For the engine rotation will increase but not the vehicle speed when change to manual mode.
Maintenance method:
(a) Remove the oil pump according to the procedures.
(b) Take out the conical return spring.
(c) Mark on the shaft and nut.
(d) Remove the nut with pneumatic wrench using the torque about 300 N•m.
(e) Remove the dust cover from the bearing with a small slotted screwdriver.

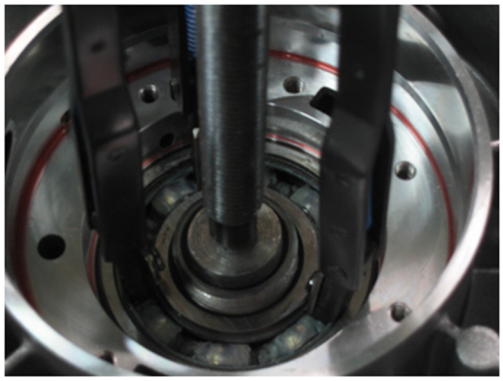


Take out the dust cover on the drive conical wheel shaft bearing.

(f) Put the special plug on the shaft.

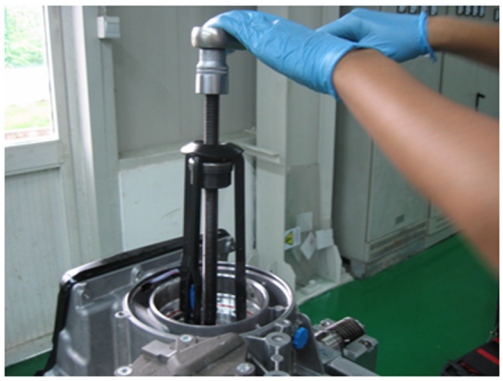


Put the SST on the shaft (Drive conical wheel plug T00222).



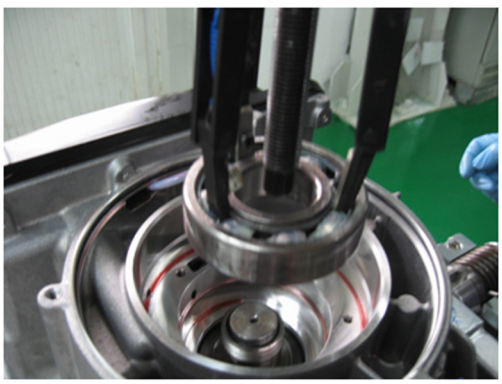
Assemble the bearing remover (480136).

(g) Assemble the bearing remover (480136) and hook the bearing outer ring with it.



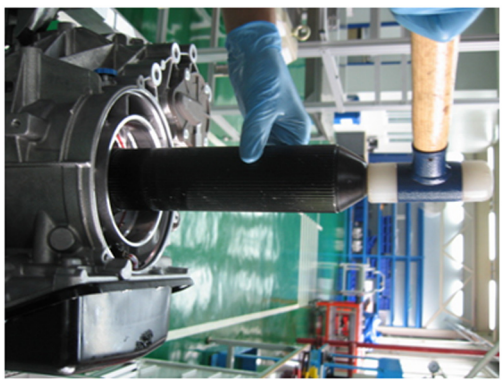
Tighten the central bolt to pull out the bearing.

(h) Tighten the bolt in the centre to pull out the bearing.



Remove the drive conical wheel shaft bearing.

(i) Discard the used bearing, clean the sealant on the drive conical wheel shaft and oil pump drive shaft and clean the oil pump champer.



Install a new bearing.

(j) Put the new bearing in the correct location and install it with special punch (480137+480126). Tap the punch with a rubber hammer and pay attention to install into the correct location.

(k) Tighten the bolt with pneumatic tool untill the marks on the shaft and bolt overlapped ±5°.

(l) Install the conical return spring and make sure the end with longer diameter faces the oil pump.

(m) Install the oil pump into the transmission case according to the procedures.

7. Replace the driven conical wheel shaft end cover

Malfunction: perform when the driven conical wheel shaft end cover damage or leakage occurs.

Maintenance method:

(a) The transmission case doesn't have to be removed from the vehicle. The replacement will become easy to lower the engine together with the transmission case.

(b) Remove 4 countersunk screws.

(c) Remove the 2 O-rings and one gasket on the end cover.

(d) If the end cover is damaged, replace with a new one I.

(e) Reinstall the 2 O-rings and a gasket on the end cover.

(f) Remove the thread adhesive in the 4 screw holes on the case.

(g) Tighten the 4 screws.

Torque: 9.5±0.95N•m

8. Replace the oil pan

Malfunction: perform when the oil pan damage or leakage occurs.

Maintenance method:

(a) Remove the drain plug and drain the oil.

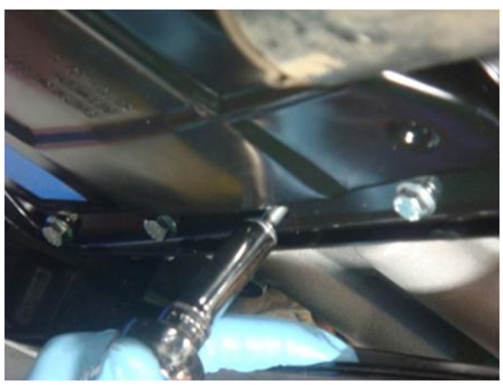
(b) Discard the drain plug when there is no oil dripping.

(c) Remove all of the 13 bolts on the oil pan.

Remove the drain plug

(d) Discard the used oil pan and gasket.

(e) Take a new oil pan and gasket.

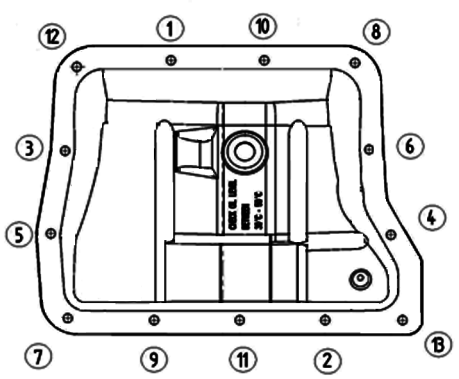


Remove the oil pan

(f) Install the oil pan with new gasket.

Torque: (9.5±1) N•m

(g) Refill the transmission case according to the instructions.



Bolt sequence

Remove the drain plug

9. Replace the oil filter

Malfunction: replace the oil filter every 60,000 km, it depends specific conditions.

Maintenance method:

(a) Open the drain plug and drain the oil.
(b) Discard the drain plug when there is no oil dripping.
(c) Tighten a new drain plug.

Torque: (11±1) N•m

Remove the oil pan

(d) Remove all of the 13 bolts on the oil pan.
(e) Discard the oil pan gasket.
(f) Take out the oil filter gently and discard it.

Lubricate the O-ring.

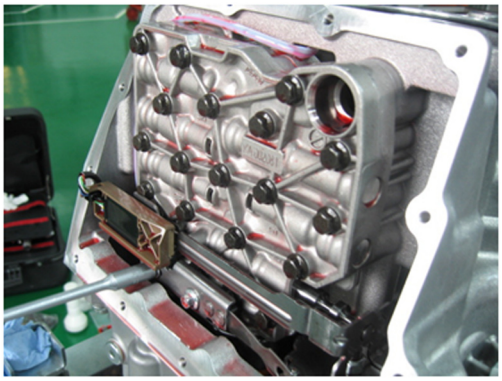
(g) Take a oil filter with O-ring and lubricate it with ESSO EZL799(A).

Install the oil filter into position.

(h) Gently press the oil filter into position (match the oil filter central hole with the hydraulic pressure control unit central bolt).
(i) Clean the magnet and oil pan.
(j) Install the new gasket and oil pan and tighten the 13 bolts.

Torque: (9.5±1) N•m

(k) Refill the transmission case according to the instructions.



Remove the driving mode sensor bolt.

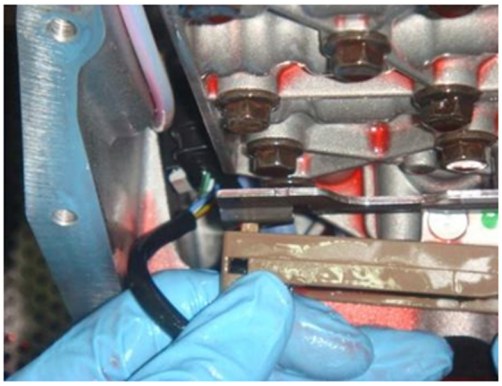
10. Change the driving mode sensor.

Malfunction: perform when the driving mode sensor is at fault. Please change the driving mode sensor, if the trouble code indicates that the driving mode sensor occurs malfunction.

Maintenance method:

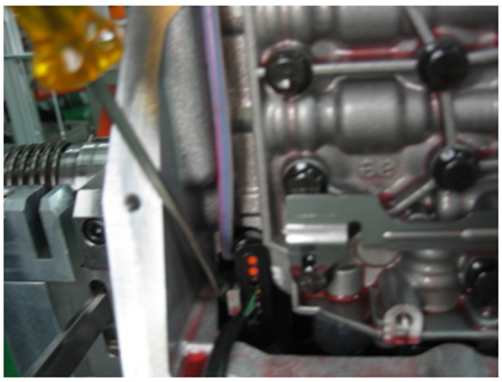
(a) Remove the oil filter according to the procedures.

(b) Remove the 2 screws on the driving mode sensor.



Press down the sensor and take it out.

(c) Since the sensor is fixed with the hydraulic pressure control unit metal slide via a small pin at the back of the sensor, please be careful to remove the driving mode sensor from hydraulic pressure control unit. Press down the sensor to separate the pin from the slide.



Remove the driving mode sensor.

(d) Open the lock on sensor connector with a small slotted screwdriver, press the white buckle and separate the connector.

(e) Connect the new sensor with the connector and press in the white buckle and lock it.

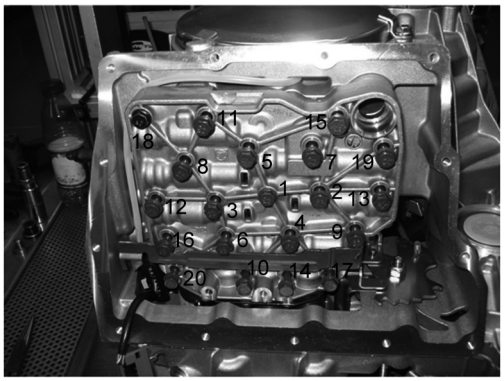
Install the pin on the correct location of the metal slide.

(f) Put the pin which is on the back of the sensor on the metal slide, install in the correct location.

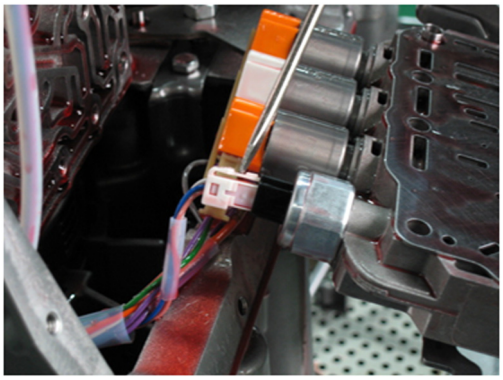
(g) Move the sensor to show up the bolt hole.

(h) Tighten the 2 screws with the torque of (9.5 ± 0.95) N•m.

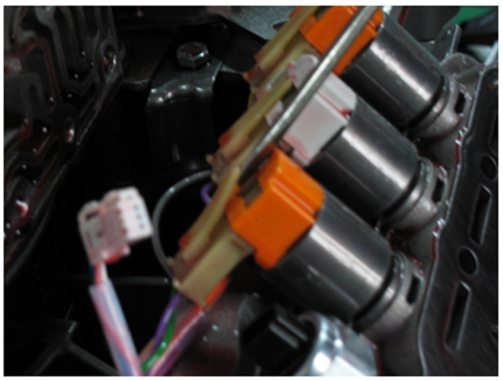
(i) Install the oil filter according to the procedures.



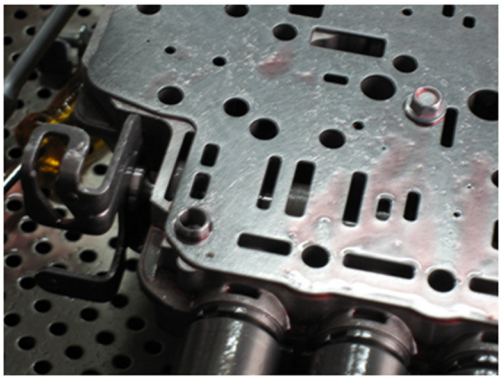
Bolt sequence



Remove the 4 connectors with a small slotted screwdriver.



Remove the 4 connectors with a small slotted screwdriver.



Restrict pin on the back of hydraulic pressure control unit

11. Replace the hydraulic pressure control unit

Malfunction: If the transmission case pressure is too low or shocking, abnormal conditions occur during driving, there are two key parts — soil pump and hydraulic pressure control unit, which may cause the above mentioned problems.Then, we need to find the damaged part by trouble codes. In most cases, it is difficult to judge the damaged part, please change one by one to trouble-shoot.

Maintenance method:

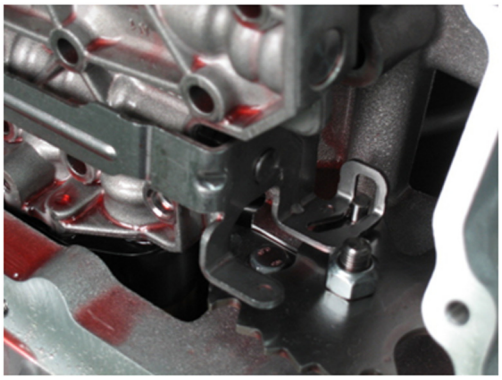
(a) Remove the driving mode sensor according to the procedures.

(b) Remove the bolts following the sequence of 20-19-18-17-16-15-14-13-12-11-10-9-8-7-6-5-4-3-2-1 as shown in the figure.

(c) Take out the hydraulic pressure control unit and separate the 4 connectors carefully with a small slotted screwdriver.

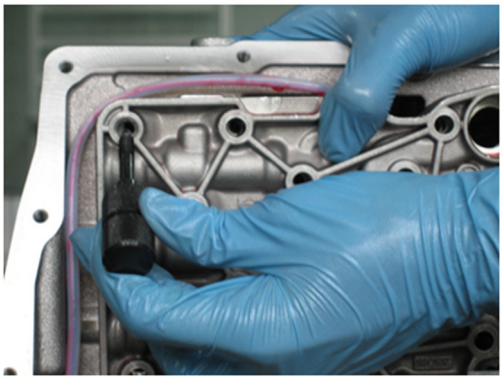
(d) Take a new hydraulic pressure control unit and 4 connectors. Install the 4 connectors on the basis of wire length.

(e) Install the hydraulic pressure control unit into the correct location. There is a pin on the back of hydraulic pressure control unit and be sure to put it to the correct location.



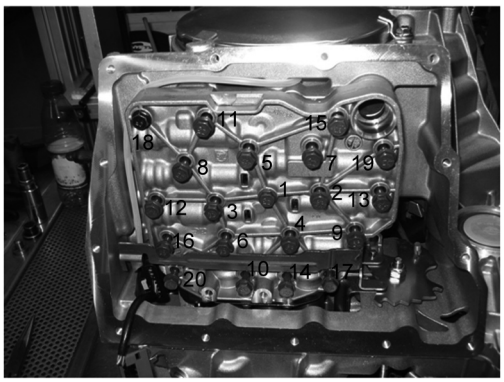
Fix the clutch control valve rod with the shifting camshaft restrict pin.

(f) Make sure to align the metal slide with the shifting camshaft pin.
(g) Install and tighten the central bolt.



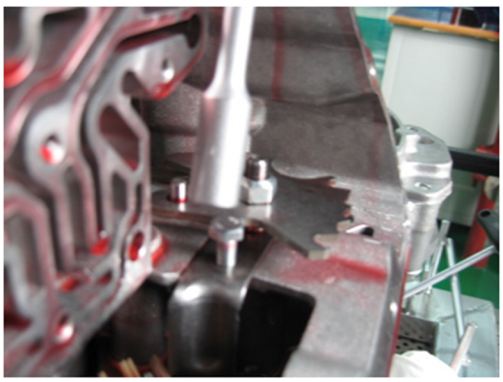
Secure the hydraulic pressure control unit with SST (23K002-099-84312).

(h) Install the SST (23K002-099-84312) on the upper left bolt hole.
(i) Press down the wire of drive conical wheel speed sensor on the hydraulic pressure control unit upper left corner.



Bolt sequence

(j) Install all of the hydraulic pressure control unit bolts.Tighten the bolts with the torque of 11 N•m and following the sequence of 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20 as shown in the figure.
(k) Install the driving mode sensor according to the procedures.



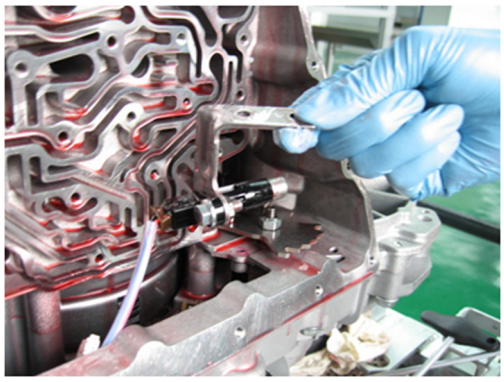
Remove the bolt on the speed sensor bracket

12. Replace the driven conical wheel speed sensor and bracket.

Malfunction: Determine the damaged part via trouble code.

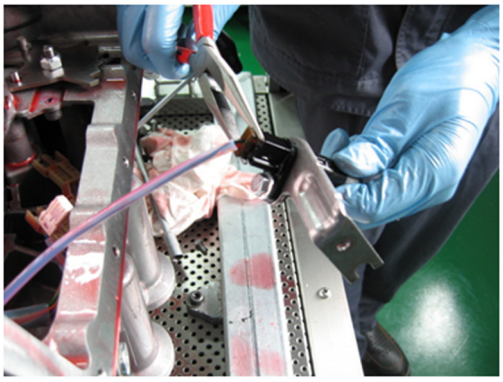
Maintenance method:

(a) Remove the hydraulic pressure control unit according to the procedures.
(b) Loosen and discard the sensor bracket bolt.



Speed sensor bracket

(c) Extract the bracket from the gear shift shaft.



Separate the connector with needle nose pliers.

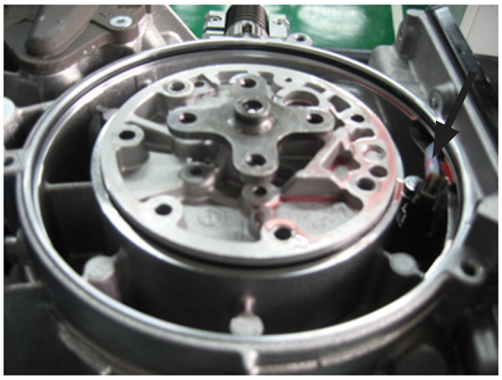
(d) Remove the sensor and connector with needle nose pliers.
(e) Loosen the bolt on the bracket and remove the sensor.
(f) Discard the sensor and bracket.
(g) Secure the new sensor and bracket with bolts.

Torque: (8.5±2)N•m

(h) Connect the wire and seize the bracket on the gear shift shaft, pay attention to install into position.
(i) Fix the bracket with a new bolt.

Torque(9.5±0.95)N•m

(j) Install the hydraulic pressure control unit according to the procedures.



Drive conical wheel speed sensor

13. Replace the drive conical wheel speed sensor.

Malfunction: Determine the damaged part via trouble code.

Maintenance method:

(a) Remove the drive conical wheel end cover according to the procedures.
(b) Loosen the bolt and remove the sensor.
(c) Separate the wires and discard the sensor.
(d) Secure the new sensor with bolt.

Torque: (8.5±2)N•m

(e) Connect wire with the sensor.
(f) Install the drive conical wheel end cover according to the procedures.

Remove buckle from the main connector

14. Replace the main connector and internal wire

Malfunction: Determine the damaged part via trouble code.

Maintenance method:

(a) Remove the hydraulic pressure control unit according to the procedures.
(b) Separate the 2 speed sensor connectors.
(c) Remove the cable connected the main connector with the vehicle.
(d) Remove the main connector buckle and press the main connector into transmission case.

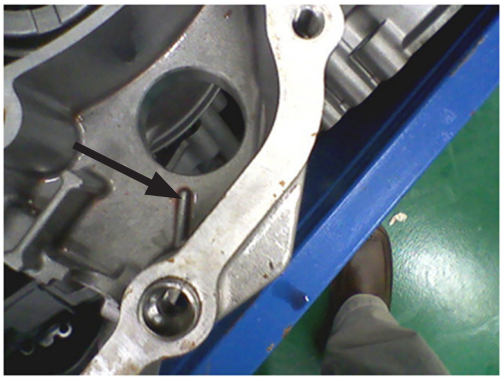
Press the main connector into the transmission case.

Remove the driving mode sensor connector from the transmission case.

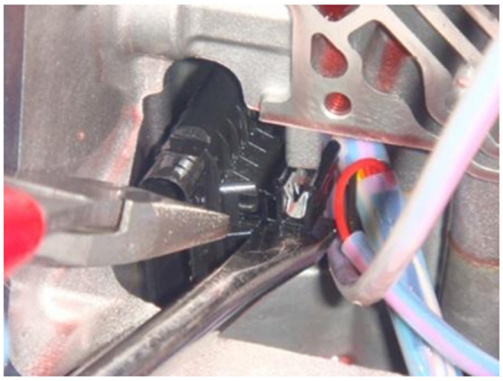
(e) Since the driving mode sensor connector is clamped in the case, please remove it at first.
(f) Take out and discard the whole main connector.
(g) Put a new main connector into the transmission case.

Restrict pin

(h) Connect the main connector to the case with a spline.



Restrict pin



Press and fit the driving mode sensor connector into the case.

(i) It is easier to overdraught with the needle nose pliers at the angle of 45 degree.
(j) Install the buckle back.
(k) Press and fit the driving mode sensor connector into the case.
(l) Connect the speed sensor with connector.
(m) Install the hydraulic pressure control unit into the transmission case according to the procedures.

ELECTRONICS INSPECTION

Transmission case electroics check list:

1. **Driving mode sensor**
   Check the resistances among different pins and determine if the driving mode sensor is normal.
   DMS_GND = 6 pins DMS_A = 13 pins DMS_B = 14 pins
   DMS_C = 15 pins DMS_D = 16 pins DMS_Supply = 9 pins

	DMS_Supply	DMS_A	DMS_B	DMS_C	DMS_D
DMS_Supply	X	17.2 MΩ	17.2 MΩ	17.2 MΩ	17.2 MΩ
DMS_A	17.2 MΩ	X	9 KΩ	9 KΩ	9 KΩ
DMS_B	17.2 MΩ	9 KΩ	X	9 KΩ	9 KΩ
DMS_C	17.2 MΩ	9 KΩ	9 KΩ	X	9 KΩ
DMS_D	17.2 MΩ	9 KΩ	9 KΩ	9 KΩ	X
DMS_GND		4.5 KΩ	4.5 KΩ	4.5 KΩ	4.5 KΩ

2. **Oil temerature sensor**
   Measure the internal resistance of oil temerature sensor.
   Measure the resistance between the pin 5 and pin 7.
   The resistance should be 942 KΩ to 1121 KΩ at 20℃ to 40℃.
3. **Speed sensor**
   This is a complicated two-wire component, so there is no simple method to measure its operating condition.
   The resistance between pin 9 and pin 11 is about 24.3 MΩ.
   The resistance between pin 9 and pin 12 is about 24.3 MΩ.
   Caution:
   It cannot guarantee the speed sensor in good condition via this method.
4. **Oil pressure sensor**
   The resistance between pin 7 and pin 10 is about 44.3 KΩ.
5. **Clutch pressure regulator**
   The resistance between pin 1 and pin 4 is about 5.2 Ω.
6. **Drive conical wheel pressure regulator**
   The resistance between pin 1 and pin 3 is about 5.2 Ω.
7. **Driven conical wheel pressure regulator**
   The resistance between pin 1 and pin 2 is about 5.2 Ω.
8. **TCU cannot be detected**
   Note:
   The measured resistance range will be different depending on the instrument accuracy.

OIL LEAKAGE DIAGNOSIS

Malfunction	Troubleshooting
Transmission oil pan washer leakage	Check that the oil pan bolt is tightened. Replace the oil pan washer. Replace the drain hole. Replace the oil pan assembly.
Transmission drain plug leakage	Check that the plug is tightened. Replace the drain plug. Replace the oil pan assembly.
Drive conical wheel shaft end cover leakage	Check that the sealing cover is tightened firmly. Replace the O-ring. Replace the drive conical wheel shaft end cover.
Driven conical wheel shaft end cover leakage	Check that the sealing cover is tightened firmly. Replace the sealing cover O-ring. Replace the driven conical wheel shaft end cover assembly.
Shift lever leakage	Replace the shift lever grommet.
Input shaft leakage	Replace the input shaft grommet.
Differential oil seal leakage	Replace the oil seal
Cooling pipe connector leakage	Check that the pipe is secured. Replace the cooling pipe connector sealing ring. Replace the pipeline.

TROUBLE CODES AND TROUBLESHOOTING

General instructions:

When the transmission case control system is detected at fault, the malfunction indicator on the dashboard will light or flash. Please check if the trouble code is a history malfunction whenever detected with scanner. Make sure that the malfunction did not occur during the latest driving (it means history malfunction when "H" displayed on the scanner). If that happens, delete the trouble code and check if it will occur again. If it is a current malfunction (the current malfunction occurs when "C" is displayed on the scanner), troubleshoot according to the following trouble codes:

P0710 Oil Temperature Sensor Malfunction

TCU Troubleshooting: Malfunction indicator illuminates and the system sets the transmission oil temperature automatically.

Maintenance Guide:

1. **Measure the transmission oil temperature by scanner. If the signal data is appropriate, clear the trouble code and check if it will occur again.**
2. **Check the wire (open, short or ground).**
3. **Measure the resistance between the two pins of transmission case main connector (it should be 980Ω to 1,000Ω at 20ºC) to check if the oil temperature sensor is damaged. If it is damaged, go to the next step and replace the main connector.**
4. **Replace a normal TCU.**
5. **Replace the transmission case.**

P2765 Drive Conical Wheel Speed Sensor Malfunction

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the transmission oil temperature by scanner. If the signal data is appropriate, clear the trouble code and check if it will occur again.**
2. **Check the wire (open, short or ground).**
3. **Replace a normal TCU.**
4. **Replace the speed sensor.**

P0720 Driven Conical Wheel Speed Sensor Malfunction

TCU Troubleshooting: Malfunction indicator illuminates and the system sets the driven conical wheel speed automatically.

Maintenance Guide:

1. **Measure the transmission oil temperature by scanner. If the signal data is appropriate, clear the trouble code and check if it will occur again.**
2. **Check the wire (open, short or ground).**
3. **Replace a normal TCU.**
4. **Replace the speed sensor.**

P0840 Driven Conical Wheel Pressure Sensor TCU Troubleshooting:

The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the driven conical wheel actual oil pressure by scanner and compare it with the target value. If the signal data is appropriate, clear the trouble code and check if it will occur again.**
2. **Check the circuit according to the value measured in the first step (ground: 0 bar (actual pressure), short: 60 bar, open: 60 bar).**
3. **Replace a normal TCU.**
4. **Replace the valve.**

P0641 Pressure Sensor Power Supply Malfunction

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the input voltage by the scanner to see if the value is 8.4 V. If the signal data is appropriate, clear the trouble code and check if it will occur again.**
2. **Measure the voltage between pressure sensor power cord and ground cable according to the results in the first step.**
3. **Check the wire (open, short or ground).**
4. **Replace a normal TCU.**

P0651 Driving Mode Sensor and Speed Sensor Power Supply Malfunction

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the input voltage by the scanner to see if the value is 5 V. If the signal data is appropriate, clear the trouble code and check if it will occur again.**
2. **Measure the voltage between pressure sensor power cord and ground cable according to the results in the first step.**
3. **Check the wire (open, short or ground).**
4. **Replace a normal TCU.**

P0659 Pressure Regulator Short

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

Measure the HS voltage: Compare with the battery voltage. If the result is the same, check the circuit (if there is short between the battery positive and VHS & transmission case connection) and repair the wire. If not, replace the TCU.

P0658 Pressure Regulator Open or Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

Measure the HS voltage: Compare with the battery voltage. If the result is normal, the high-end voltage is lower than 3.4 V. That means the wire is grounded. If the result is normal, the high-end voltage is higher than 3.4 V. That means there is open. Check the pin wires under those

conditions mentioned above. After the inspection, if the wire is normal, please replace the TCU. If the battery voltage is abnormal, check the battery.

P0702 TCU Internal Detection System Malfunction (During the Ignition)

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

Replace the TCU.

P0962 EDS1 Drive Conical Wheel Pressure Regulator Grounded

TCU Troubleshooting:

The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the drive conical wheel pressure regulator resistance, which should be 5.05±6% Ω.**
2. **Check the wire (ground).**
3. **Replace the hydraulic pressure control unit.**

P0963 EDS1 Drive Conical Wheel Pressure Regulator Short

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the drive conical wheel pressure regulator resistance.**
2. **Check the wire (open, short or ground).**
3. **Replace the hydraulic pressure control unit.**

P0960 EDS1 Drive Conical Wheel Pressure Regulator Open

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the drive conical wheel pressure regulator resistance.**
2. **Check the wire (open).**
3. **Replace the hydraulic pressure control unit.**

P0966 EDS2 Driven Conical Wheel Pressure Regulator Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the driven conical wheel pressure regulator resistance.**
2. **Check the wire (ground).**
3. **Replace the hydraulic pressure control unit.**

P0967 EDS2 Driven Conical Wheel Pressure Regulator Short

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the driven conical wheel pressure regulator resistance.**
2. **Check the wire (short).**
3. **Replace the hydraulic pressure control unit.**

P0964 EDS2 Driven Conical Wheel Pressure Regulator Open

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the driven conical wheel pressure regulator resistance.**
2. **Check the wire (open).**
3. **Replace the hydraulic pressure control unit.**

P0902 EDS3 Clutch Pressure Regulator Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the clutch pressure regulator resistance.**
2. **Check the wire (ground).**
3. **Replace the hydraulic pressure control unit.**

P0903 EDS3 Clutch Pressure Regulator Short

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the clutch pressure regulator resistance.**
2. **Check the wire (short).**
3. **Replace the hydraulic pressure control unit.**

P0900 EDS3 Clutch Pressure Regulator Open

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the clutch pressure regulator resistance.**
2. **Check the wire (open).**
3. **Replace the hydraulic pressure control unit.**

P1763 Actuator Short or Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

P1764 Actuator Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

P0930 Gear Shifting Lock Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

P0931 Gear Shifting Lock Short or Open

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

P1768 Back-up Lamp Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

P1769 Back-up Lamp Short or Open

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

PXXXX Malfunction Indicator Grounded

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

PXXXX Malfunction Indicator Short or Open

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the wire.

P0868 Pressure Preload Adjustment Malfunction

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Check the oil level and quality.**
2. **Replace the oil pump.**
3. **Replace the hydraulic pressure control unit.**
4. **Replace the transmission case.**

P0811 Clutch Slip (Ahead or Backward)

TCU Troubleshooting: Malfunction indicator illuminates and the clutch released

Maintenance Guide:

1. **Measure the clutch pressure and engine & drive conical wheel speed by scanner. If the result is appropriate, clear the trouble code and check if it will occur again.**
2. **If the data is abnormal (for example, the drive conical wheel speed and engine speed is different when the clutch pressure is 10 bar), go to the next step.**
3. **Check the oil level and type.**
4. **Replace the hydraulic pressure control unit.**
5. **Replace the transmission case.**

P0730 Drive Ratio Control Malfunction

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Check the speed sensor signals and the input and feedback current of drive conical wheel pressure regulator by scanner.**
2. **Take measurements according to the malfunctions. For example, check the speed sensor or the pressure sensor based on relative malfunction symptoms.**
3. **Check the oil level and type as well.**
4. **Replace the speed sensor or hydraulic pressure control unit.**
5. **Replace the oil pump.**
6. **Replace the transmission case.**

P1765 Driven Conical Wheel Low Pressure

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the actual pressure during driving (eg. manual shift mode) and compare it with the target value.**
2. **Check the oil level and type.**
3. **Replace the hydraulic pressure control unit.**
4. **Replace the oil pump.**
5. **Replace the transmission case.**

P1766 Driven Conical Wheel High Pressure

TCU Troubleshooting: Malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the actual pressure during driving (eg. manual shift mode) and compare it with the target value.**
2. **Check the oil level and type.**
3. **Replace the hydraulic pressure control unit.**
4. **Replace the oil pump.**
5. **Replace the transmission case.**

P0701 Two Malfunctions Occur Which Needs to Power down the Pressure Regulator

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide: Check the other trouble codes.

P0218 Transmission Case Oil High Temperature

TCU Troubleshooting: Malfunction indicator illuminates

Maintenance Guide:

1. **Check the oil cooler**
2. **Try to have the malfunction to occur again under normal driving conditions. If not happens, consult customer to make sure the malfunction happen condition.**
3. **Measure the transmission case oil temperature by scanner under the driving condition in second step. If the value is higher than 120 ℃ (it is abnormal if the trouble code time is shorter than filter), take measurement to prevent the transmission case temperature is overheated.**

P1767 Transmission Case Oil Temperature out of Range

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Try to have the malfunction to occur again under normal driving conditions. If not happens, consult customer to make sure the malfunction happen condition (driving uphill or high speed).**
2. **Check the oil cooler.**
3. **Check the oil level.**
4. **Transmission case oil temperature is higher than 140 ℃: pressure regulator is powered down and the clutch is released.**
5. **Please be sure to check out the malfunction causes. For the clutch will be released when the malfunctions occur!**

P0219 Power System Speed out of Range

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **It will not happen in principle.**
2. **Check if the engine speed is limited within 6,000 rpm.**

P2766 Indicated Drive Conical Wheel Speed Abnormal with Actual Speed Value

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Detect if the other speed information (engine speed, output shaft speed or vehicle speed) is lost by scanner. If so, troubleshoot these troubles and check if this malfunction occurs again.**
2. **Detect the drive conical wheel speed signal by scanner. Compare it with the engine speed when the clutch is applied and the difference should be within 200 rpm. The comparison should be taken from the low speed to high speed of the engine(up to 6,000 rpm).**
3. **Check the circuit and replace a normal TCU.**
4. **Check the sensor position, angle and trigger wheels. Check if there are objects (steel band fragments) on the front of sensor.**

   Note: This is a mechanical fault. There is other trouble codes for the electrical failure
5. **Replace the drive conical wheel speed sensor.**
6. **Replace a new TCU to determine if TCU is at fault.**
7. **Replace the transmission case.**

P0721 Indicated Driven Conical Wheel Speed Abnormal with Actual Speed Value

TCU Troubleshooting: Malfunction indicator illuminates, enhance the clamp force to 0, the system sets the driven conical wheel speed automatically.

Maintenance Guide:

1. **Detect if the other speed information (engine speed, output shaft speed or vehicle speed) is lost by scanner. If so, troubleshoot these troubles and check if this malfunction occurs again.**
2. **Check the wire.**
3. **Replace a normal TCU, and then there will be another electrical trouble code (other trouble codes).**

4. **Check the sensor position, angle and trigger wheels. Check if there are objects (steel band fragments) on the front of sensor.**
   Note: This is a mechanical fault. There is other trouble codes for the electrical failure.
5. **Replace the driven conical wheel speed sensor.**
6. **Replace a new TCU to determine if TCU is at fault.**
7. **Replace the transmission case.**

P0944 Insufficient Clamp Force (VSM)

TCU Troubleshooting: Malfunction indicator illuminates and the clutch released.
Maintenance Guide: If that happens for several times, then the driven conical wheel pressure is too low (longer than 6 seconds). Check the oil level firstly. If it is still malfunctioning, please replace the transmission case because this malfunction maybe caused by other components (oil pump, hydraulic pressure control unit ect.)

P0810 Linear Adaptive Update not Completed

TCU Troubleshooting: Malfunction indicator flashes.
Maintenance Guide:

1. **Install a new TCU on the vehicle or renew the softwares in the TCU.**
2. **Make the adaptive update again according to the descriptions in the section 2.5. If the operation is correct, malfunction indicator will go out and the trouble code will be cleared automatically after three driving cycles (ignition for 3 times).**

P1762 Current Value is frozen, not Changed

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.
Maintenance Guide:

1. **After checking and repairing the trouble codes P0962 P0963 P0960 P0966 P0967 P0964 P0902 P0903 P0900 P1763 P1764, it is possible that there will be no trouble code any more.**
2. **Replace a normal TCU.**

P0882 Battery or High-end Low Voltage

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.
Maintenance Guide:

1. **There will be a battery voltage record when the malfunction happens (then you can determine whether it is caused by battery or high-end voltage). If it is not a historic record, go to the next step directly.**
2. **Measure the high-en or battery voltage by scanner - temperature is more influential to the value.**
3. **If the problem lies in battery: Check the circuit between battery and TCU (fuses and main relay), or replace/check the battery.**
4. **If the problem lies in pressure regulator: Check the circuit between transmission case and TCU.**
5. **Replace the TCU.**

P0883 Battery or High-end High Voltage

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.
Maintenance Guide:

1. **There will be a battery voltage record when the malfunction happens (then you can determine whether it is caused by battery or high-end voltage). If it is not a historic record, go to the next step directly.**
2. **Measure the high-en or battery voltage by scanner - temperature is more influential to the value.**
3. **Confirm with the customer if he/she uses other battery if the problem lies in battery (at this time the power supply is 24 V). If it is, check the circuit between battery and TCU (fuses and main relay).**
4. **Check and replace the battery.**
5. **If the problem lies in high-end voltage: Check the circuit between transmission case and TCU.**
6. **If the problem lies in high-end voltage but not for the circuit, replace the TCU or check/replace alternator.**

P2787 Clutch High Temperature

TCU Troubleshooting: Malfunction indicator illuminates and the clutch released.

Maintenance Guide:

1. **Check how many times the malfunction happened. If there is only once or a few times, check the TCU internal data and negotiate with the customer for the special driving conditions (for example uphill driving) at that time. Then delete the trouble code.**
2. **It happens only when depress the accelerator pedal and brake pedal at the same time. Delete the trouble code to see if it occurs again.**
3. **Replace the TCU.**
4. **It maybe that the throttle is clogged. Replace the throttle.**

P0727 Indicated Engine Speed Singal Transmission from ECU to TCU Wire Abnormal with Actual Speed Value

TCU Troubleshooting: Malfunction indicator illuminates.

Maintenance Guide:

1. **Check the engine test report to see if the engine is at fault. If it is, repair the engine.**
2. **Check the TCU input signal. It is a frequency signal (the signal will be 30 Hz at the engine speed of 900 rpm, 100 Hz at 3,000 rpm).**
3. **Replace a normal transmission case.**

P1761 Pressure Regulator Current Malfunction

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Measure the pressure regulator internal voltage drop by scanner and compare the value with specified current.**
2. **Measure the pressure regulator internal current by scanner and compare the value with specified current. If it is different with the specified current, check the pressure regulator wire (check the transmission case interior as well).**
3. **Replace a normal transmission case.**
4. **Replace the hydraulic pressure control unit.**

U0301 Vehicle Configuration Incorrect (eg. Inappropriate ECU is equipped)

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Check if the configuration of TCU hardware and sofeware is correct or available.**
2. **If the software is updated by EMS or TCU: The software in the new controller is incorrect (the transmission case controller is incompatible with the engine controller).**

P0706 Driving Mode Sensor Single Wire Malfunction

TCU Troubleshooting: Malfunction indicator illuminates and the system sets the sensor position automatically.

Maintenance Guide:

1. **Check which wire is at fault and the type of fault by scanner. For example, the B wire is short (this malfunction means there is one wire failed) ect.**
2. **Check the wire connected transmission case with TCU.**
3. **Replace a normal TCU.**
4. **Change the driving mode sensor.**

P0705 Driving Mode Sensor Multiple Wires Malfunction

TCU Troubleshooting: The 3 pressure regulators are all powered down and the malfunction indicator illuminates.

Maintenance Guide:

1. **Check which wire is at fault and the type of fault by scanner. For example, the B wire is short (this malfunction means there is one wire failed). Check the wire connected transmission case with TCU.**

2. Replace a normal TCU.
3. Change the driving mode sensor.

P0571 Brake Signal Malfunction

TCU Troubleshooting: Malfunction indicator illuminates and the brake signal is high level.

Maintenance Guide:

1. Check the brake signal.
2. Check the brake signal wire.
3. Replace the TCU.

PO955 Manual Shift Up and Down Signal Malfunction

TCU Troubleshooting: Malfunction indicator illuminates and there is no manual mode.

Maintenance Guide:

1. Check the circuit between gear shift mechanism and TCU.
2. Replace a normal TCU.
3. Replace the gear shift mechanism.

U0415 ABS Function Malfunction

TCU Troubleshooting: Enhance the clamp force to 0, the system sets anti-brake and rotation automatically.

Maintenance Guide: Check the ABS system.

U0001 CAN Bus Malfunction

TCU Troubleshooting: Malfunction indicator illuminates, emergency mode is activated and there is no manual mode.

Enhance the clamp force to 1 (maximum), the system will set anti-brake and rotation automatically. The internal driving mode will be activated, then the system will set the engine speed, torque, coolant temperature, brake signal connecting, accelerator pedal stable data, left front & right front & left rear & right rear wheel speed automatically.

Maintenance Guide:

1. If the malfunction occurs in the other controllers, the wire is at fault (CAN high speed line and low speed line short). Check the vehicle wires.
2. If the malfunction lies in TCU itself, replace a normal TCU.

U0121 ABS CAN Communication Malfunction

TCU Troubleshooting: Enhance the clamp force to 0, the system sets anti-brake and rotation automatically. Then the system will set the left front & right front & left rear & right rear wheel speed automatically.

Maintenance Guide: Check the ABS controller and the communication interface in it (The malfunction maybe occur on other controllers).

U0100 ECU CAN Communication Malfunction

TCU Troubleshooting: Malfunction indicator illuminates, emergency mode is activated and there is no manual mode.

Enhance the clamp force to 0. The internal driving mode will be activated, then the system will set the engine torque, cooling water temperature, accelerator pedal stable data, and stop the CAN data communication.

Maintenance Guide: Check the engine controller and the communication interface in it (The malfunction maybe occur on other controllers).

U1012 Engine Speed Signal on CAN Bus Malfunction

TCU Troubleshooting: Malfunction indicator and warning lamp illuminate.

Maintenance Guide: Check the MCU controller (engine speed sensor and its wires).

U1013 Accelerator Pedal Signal on CAN Bus Malfunction

TCU Troubleshooting: Malfunction indicator illuminates and the accelerator pedal data is frozen.

Maintenance Guide: Check the EMS controller (accelerator pedal sensor and its wires).

U1014 Engine Torque Signal on CAN Bus Incorrect

TCU Troubleshooting: Malfunction indicator illuminates, emergency mode is activated and there is no manual mode. The internal driving mode will be activated, then the system will set the engine torque automatically.

Maintenance Guide: Check the EMS controller.

U1016 Left Front Wheel Speed Signal on CAN Bus Incorrect

TCU Troubleshooting: Enhance the clamp force to 0, the system sets anti-brake, rotation and left rear wheel speed automatically.

Maintenance Guide: Check the ABS controller (wheel speed sensor and its wires).

U1017 Right Front Wheel Speed Signal on CAN Bus Incorrect

TCU Troubleshooting: Enhance the clamp force to 0, the system sets anti-brake, rotation and left front wheel speed automatically.

Maintenance Guide: Check the ABS controller (wheel speed sensor and its wires).

U1018 Left Rear Wheel Speed Signal on CAN Bus Incorrect

TCU Troubleshooting: Enhance the clamp force to 0, the system sets anti-brake, rotation and left rear wheel speed automatically.

Maintenance Guide: Check the ABS controller (wheel speed sensor and its wires).

U1019 Right Rear Wheel Speed Signal on CAN Bus Incorrect

TCU Troubleshooting: Enhance the clamp force to 0, the system sets anti-brake, rotation and left rear wheel speed automatically.

Maintenance Guide: Check the ABS controller (wheel speed sensor and its wires).

Remarks:

The 3 pressure regulators are all powered down:

When there is trouble code and the pressure regulator is powered down, the clutch is released and the vehicle cannot move whatever the gear is engaged or not. In that case, you have to stop the engine,make the ignition key return to its original position and restart the engine, then you could drive the vehicle continously.

Enhance the clamp force to 0: The driven conical wheel pressure is maitained to stable value, which is higher than the normal condition and lower than the highest level.

Enhance the clamp force to 1: The driven conical wheel pressure is kept at the highest level.

EDS1: Drive conical wheel pressure regulator.

EDS2: Driven conical wheel pressure regulator.

EDS3: Clutch pressure regulator.

Emergency mode* : which is called "limp home mode", and it will be activated under the conditions below:

- CAN bus disconnected
- CAN ECU communication malfunction
- CAN engine torque signal incorrect

All of the signals related to engine and ABS will be substituted (troubleshooting):

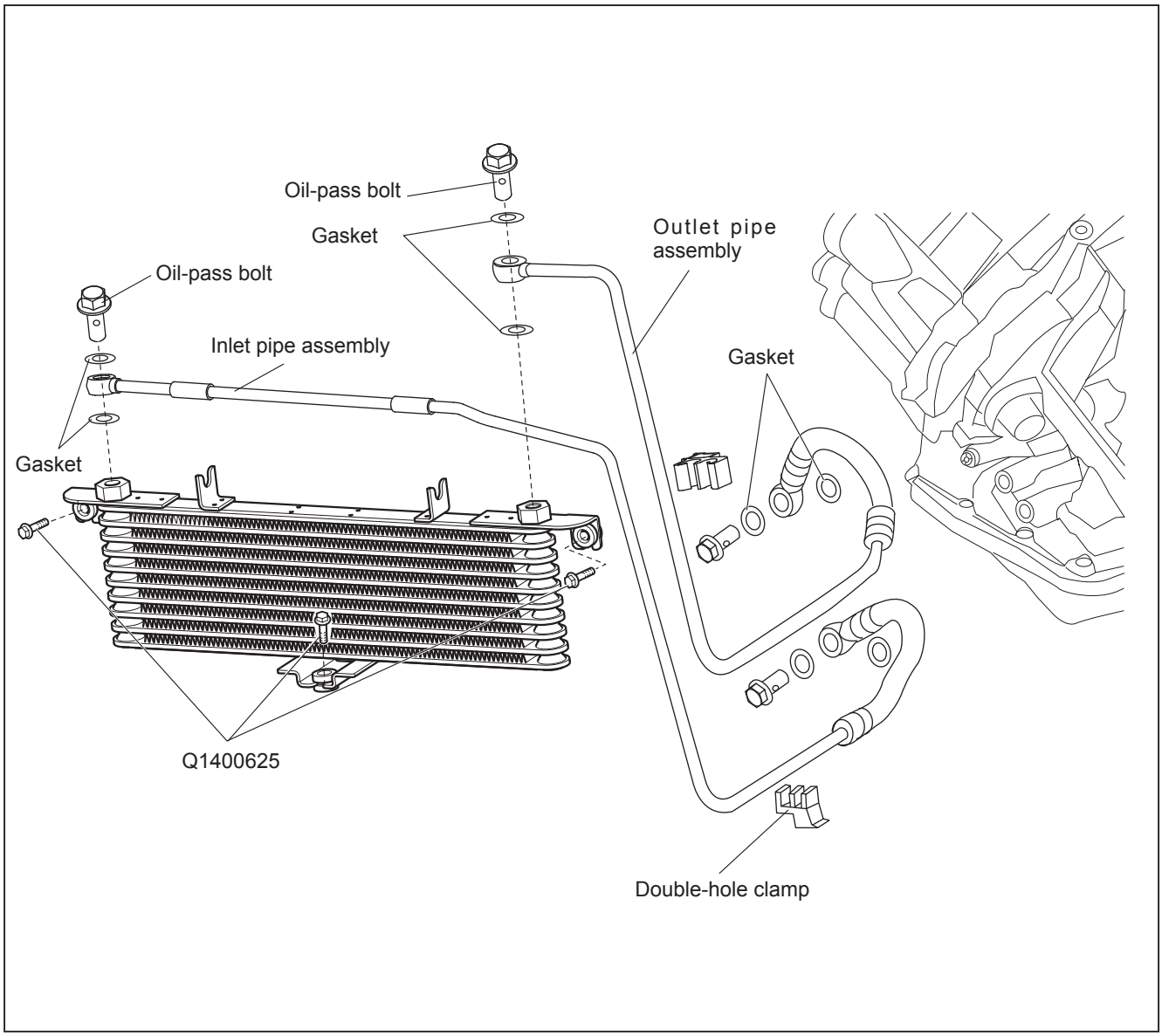
- Throttle opening angle is fixed.
- The engine torque is substituted by engine map drawing.
- Engine coolant temperature is fixed.
- Wheel speed is substituted by transmission case output shaft speed.
- The speed signal from wire is used for engine speed.
- The clutch is released or engaged solidly. It seems not be calibrated according to specified data.
- The highest engine speed is limited within 3,200 rpm.
- The highest vehicle speed is limited within 98 km/h.
- The transmission case gear shift will be done only in a driving mode.

CVT will activate under the most elementary condition and provide enough power for driving to the nearest vehicle service station:

2 seconds later,the manual gear and sport gear will be deactivated and the malfunction indicator will illuminate.

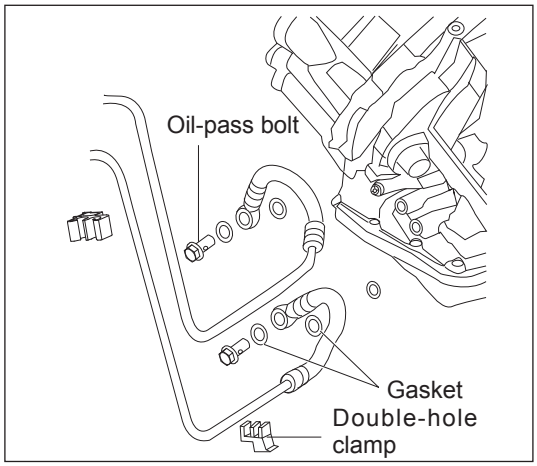
COOLING SYSTEM

COMPONENTS



INLET AND OUTLET PIPE ASSEMBLIES

emoval and installation



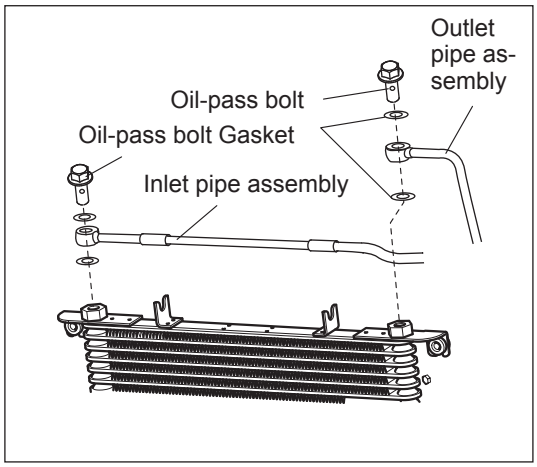
1. Removal and installation of inlet & outlet pipe assemblies and CVT

Caution:

There are two gaskets on each side of the oil pipe, and keep the removed parts clean.

(a) Remove the oil-pass bolt with ratchet and socket.
(b) Take out the oil pipe from the double-hole tube clamp.
(c) Install the oil-pass bolt, oil pipe and gasket.
(d) Install the oil-pass bolt onto CVT.

Torque: (30±3) N•m



2. Removal and installation for inlet & outlet pipe assemblies and cooler assembly

Caution:

There are two gaskets on each side of the oil pipe, and keep the removed parts clean.

(a) Remove the oil-pass bolt with ratchet and socket.
(b) Remove the inlet & oulet pipe from the cooler assembly.
(c) Install the oil-pass bolt, oil pipe and gasket.
(d) Install the oil-pass bolt on cooler assembly.

Torque: (30±3) N•m

DRIVE SYSTEM

DRIVE SHAFT/AXLE

FAILURE SYMPTOM TABLE 2
ON-VEHICLE INSPECTION 2
FRONT AXLE SHAFT 4
LEFT FRONT AXLE HUB SUB-ASSEMBLY 14
BOLTS OF THE LEFT FRONT AXLE WHEEL HUB 18
LEFT REAR AXLE WHEEL HUB AND BEARING ASSEMBLY 19
BOLTS OF THE LEFT REAR AXLE WHEEL HUB.....21

CLUTCH

ATTENTIONS.....22
FAILURE SYMPTOM TABLE 22
CLUTCH FAILURE SYMPTOM TABLE.....23
CLUTCH MASTER CYLINDER AND SLAVE CYLINDER.....28
CLUTCH ASSEMBLY.....35
CLUTCH STARTING SWITCH ASSEMBLY.....39
DISCHARGING GAS IN THE CLUTCH HYDRAULIC SYSTEM.....40

TRANSMISSION SHIFT CONTROL DEVICE (MT)

STRUCTURE DIAGRAM 41
TRANSMISSION DIAGRAM MECHANISM ASSEMBLY 43
TRANSMISSION DIAGRAM CABLE ASSEMBLY.....44

TRANSMISSION SHIFT CONTROL DEVICE (CVT)

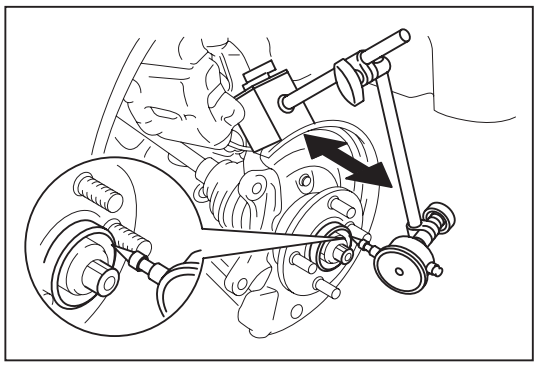
STRUCTURE DIAGRAM 45
TRANSMISSION DIAGRAM MECHANISM ASSEMBLY 45
TRANSMISSION DIAGRAM CABLE ASSEMBLY.....46

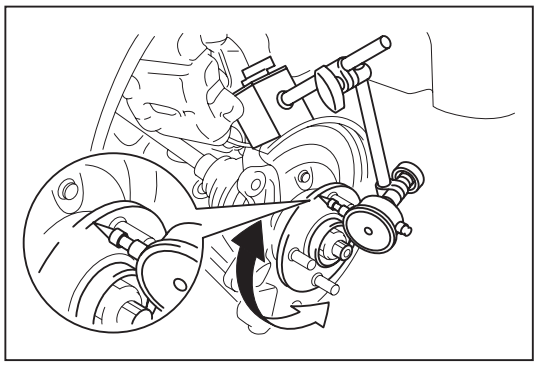
DRIVE SHAFT/AXLE

FAILURE SYMPTOM TABLE

The possible positions are arranged with the coding sequence in following table to determine the failure cause. Check, repair or replace the part according to the steps listed in the sheets below if necessary.

Symptom	Possible positions
Wandering during running	1. Wheel 2. Front wheel alignment 3. Rear wheel alignment 4. Front wheel hub bearing (wearing) 5. Rear wheel hub bearing (wearing) 6. Front absorber and helical spring assembly 7. Steering driving gear (loose or wearing) 8. Stabilizer bar
Front wheel shimmy	1. Wheel balance 2. wheel hub bearing (wearing) 3. Front absorber and helical spring assembly
Noise (drive shaft)	1. Outside universal joint (wearing) 2. Inside universal joint (wearing)





ON-VEHICLE INSPECTION

1. Check the front axle runout and clearance

(a) Remove the front wheel.

(b) Remove the front brake caliper assembly

(c) Remove the front brake disc.

(d) Check the bearing clearance.

Check whether there is clearance near the axle wheel hub center with dial gauge.

Maximum value: 0.05mm.

If the clearance is larger than the maximum value, replace the front axle wheel hub and bearing assembly.

(e) Check the axle wheel hub runout.

Check whether there is runout of axle wheel hub surface out of the hub bolt with dial gauge.

Maximum value: 0.07mm.

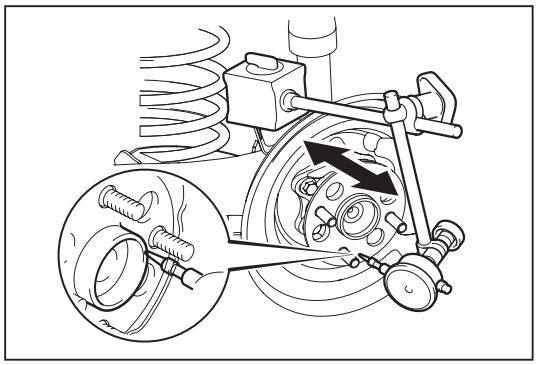
If the runout is larger than the maximum value, replace the front axle wheel hub subassembly.

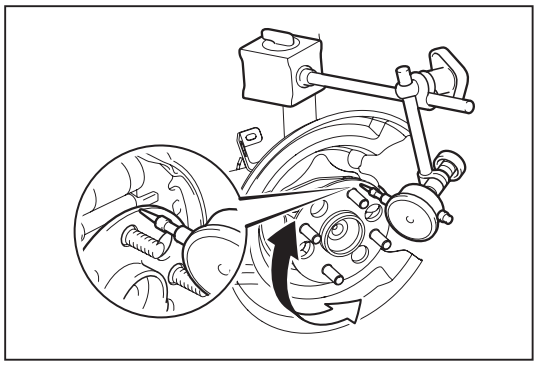
(f) Install the front brake disc.

(g) Install the front brake caliper.

(h) Install the front wheel.

Torque: 110±10 N•m





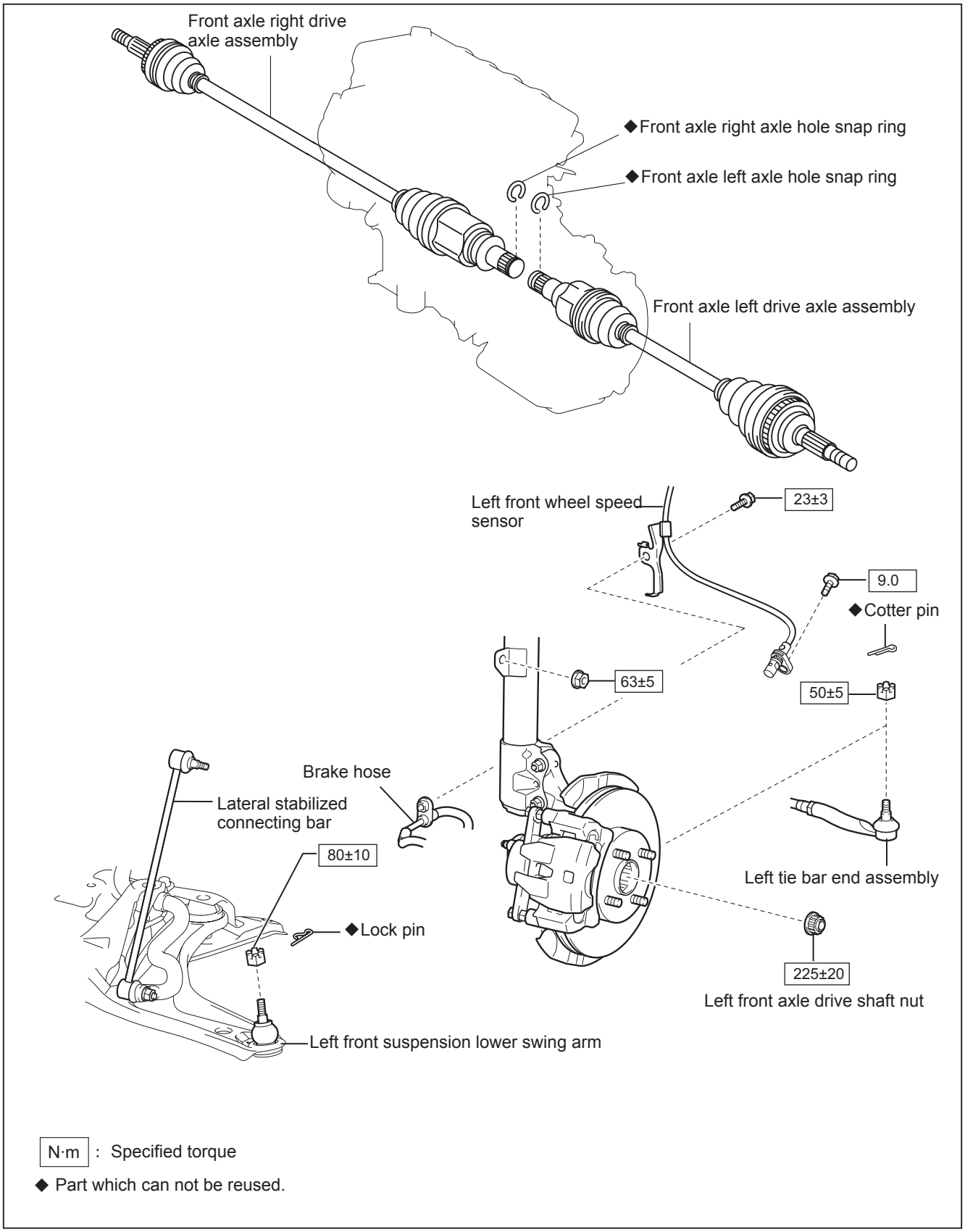
2. Check the rear axle runout and clearance

(a) Remove the rear wheel.
(b) Remove the rear brake caliper.
(c) Remove the rear brake disk.
(d) Check the bearing clearance.
Check whether there is clearance near the axle wheel hub center with dial gauge.
Maximum value: 0.05mm.
If the clearance is larger than the maximum value, replace the rear axle wheel hub and bearing assembly.

(e) Check the axle wheel hub runout.
Check whether there is runout of axle wheel hub surface in hub bolt with dial gauge.
Maximum value: 0.07mm.
If the runout is larger than the maximum value, replace the rear axle wheel hub and bearing assembly.
(f) Install the rear brake disc.
(g) Install the rear brake caliper.
(h) Install the rear wheel.
Torque: 110±10 N•m

FRONT AXLE SHAFT

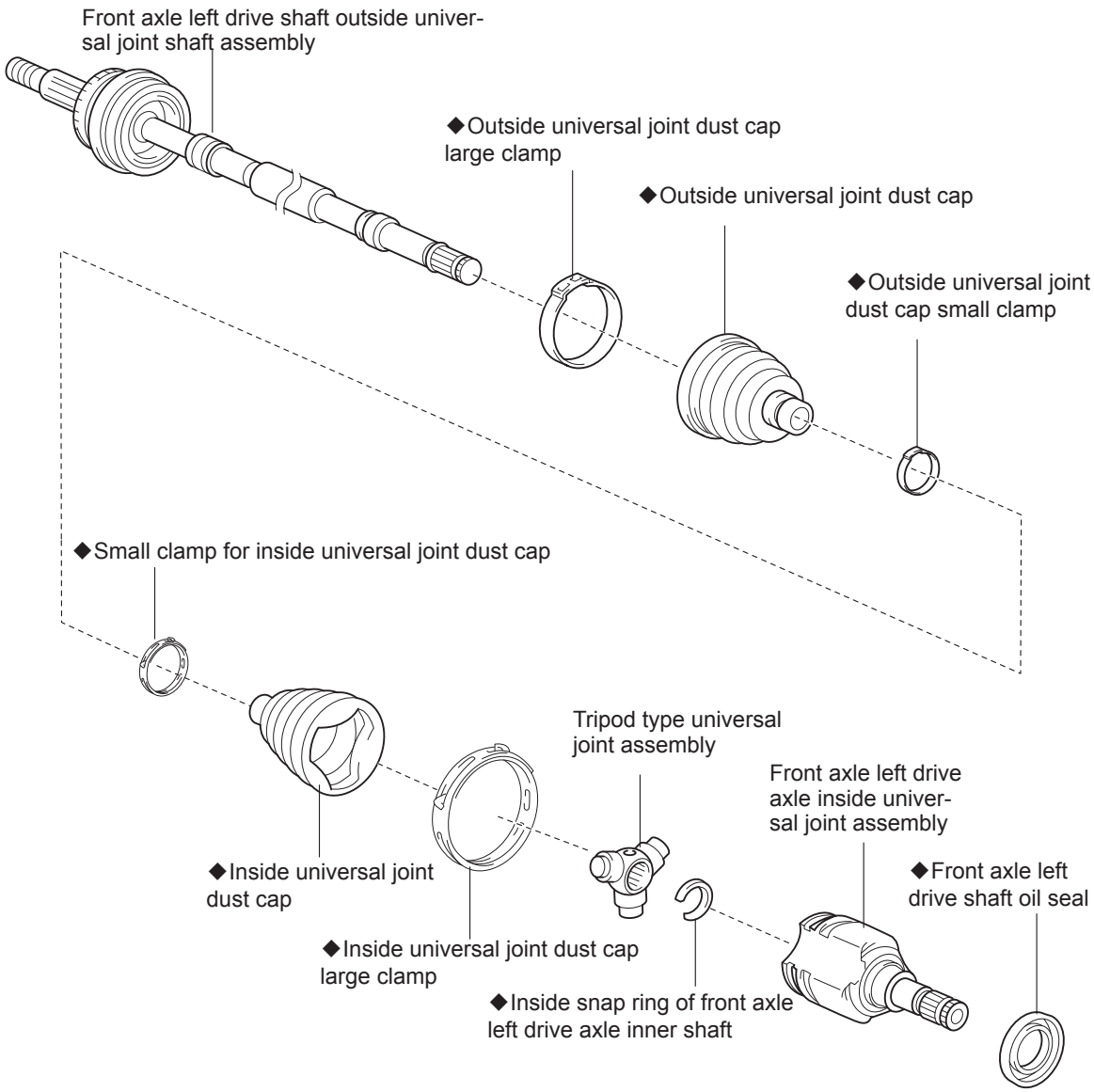
Structure Diagram



N·m : Specified torque

◆ Part which can not be reused.

Structure Diagram



◆ Part which can not be reused.

Overhaul

Tip:

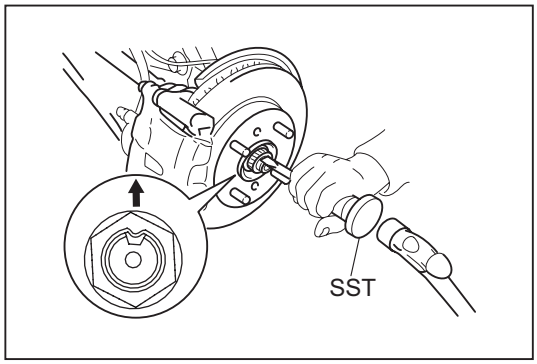
Maintain the right side maintenance process of the left side.

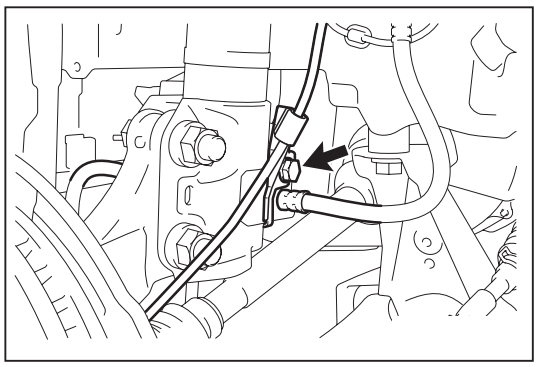
1. **Discharge all the drive axle oil**
   Torque: 39 N•m
2. **Remove the front wheels**
3. **Remove the left bottom hood of the engine**
4. **Remove the nuts of the left front axle drive shaft**
   (a) Prize out the concave part of the left front axle drive shaft nut with SST and hammer.

   Note:

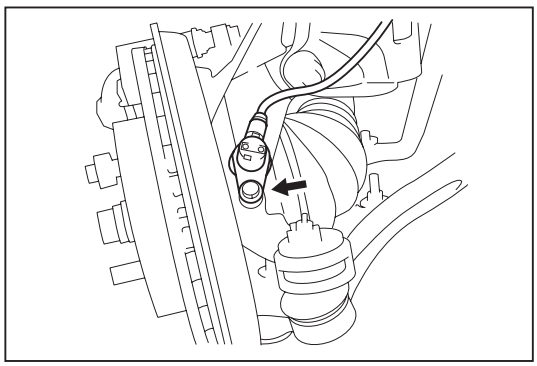
   Completely loosen the locking part of the nut, or the thread of the drive shaft will be damaged.

   (b) Remove the nut of the left front axle drive shaft when applies braking.





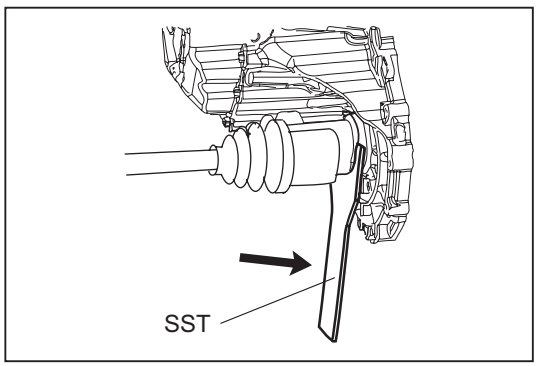
5. **Separate the speed sensor of the left front wheel**
   (a) Remove the bolts and clips, and separate the speed sensor and brake hose of the left front wheel from the left front shock absorber.



   (b) Remove the bolts and take apart the speed sensor of the left front wheel.

   Note:

   - **Do not damage the speed sensor.**
   - **Avoid the foreign matter from attaching to the speed sensor.**



6. **Remove the front axle left drive shaft assembly**
   (a) Remove the front axle left drive shaft assembly with SST.

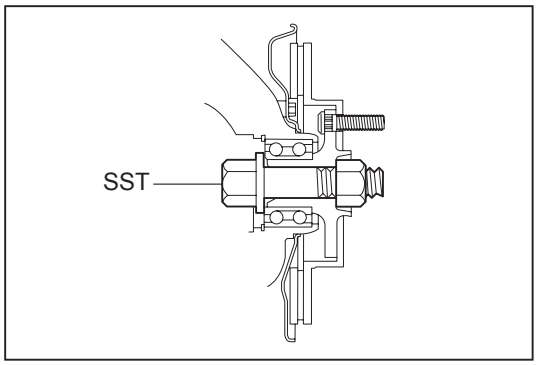
   Note:

   - **Do not damage the oil seal and boot.**
   - **Do not drop the drive shaft assembly.**

7. **Remove the front axle right drive shaft assembly**
   (a) The removal method is the same with the left drive shaft; remove the front axle right drive shaft assembly with SST.

   Note:

   - **Do not damage the oil seal and boot.**
   - **Do not drop the drive shaft assembly.**

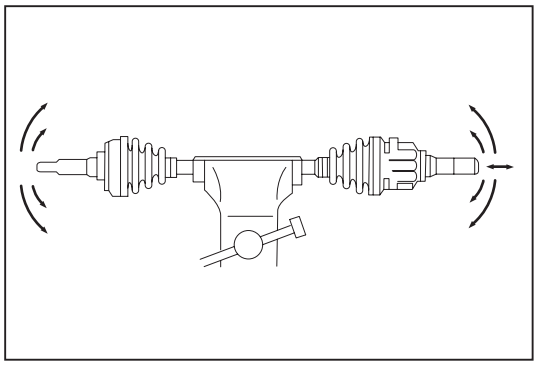


8. Fix the left front axle hub assembly

Note:

If the hub bears the whole weight of the vehicle, then it may be damaged, for example moving the vehicle under such conditions that the drive shaft has been removed.

As a result, if it is necessary to stress the weight of the vehicle to the hub bearing, support it with SST



9. Inspect the front axle left drive shaft assembly

Note:

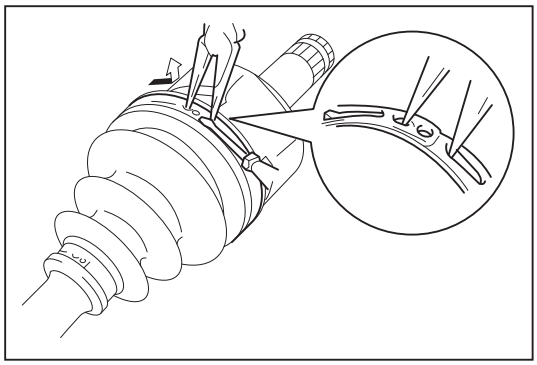
Position the drive shaft assembly horizontally during the inspection.

(a) Inspect and make sure the outer universal joint has no obvious allowance in radical direction.

(b) Inspect and make sure the inner universal joint slides smoothly in axial direction.

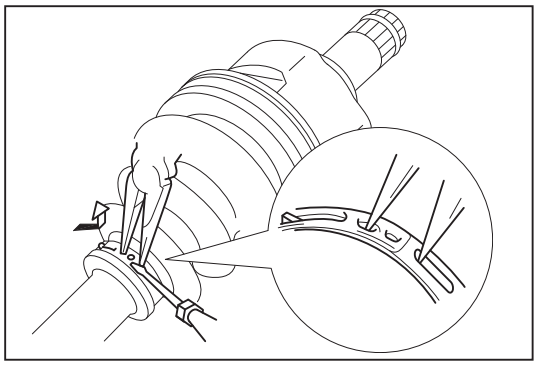
(c) Inspect and make sure the inner universal joint has no obvious allowance in radical direction.

(d) Inspect whether the boot is damaged.



10. Remove the large clip of the left front axle inner universal joint boot

(a) As shown in the figure, remove the large clip of the left front axle inner universal joint boot with sharp-nose pliers.

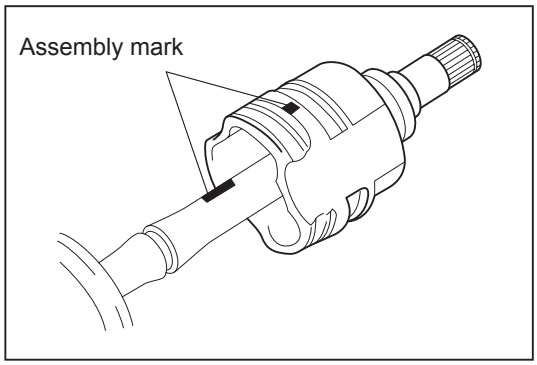


11. Remove the small clip of the left front axle inner universal joint boot

(a) As shown in the figure, remove the clip under the boot of the inner universal joint of the left front axle with sharp-nose pliers.

12. Separate the boot of inner universal joint of the front axle

(a) Separate the inner universal joint boot from the left front axle inner universal joint assembly.



13. Remove the left front axle inner universal joint assembly

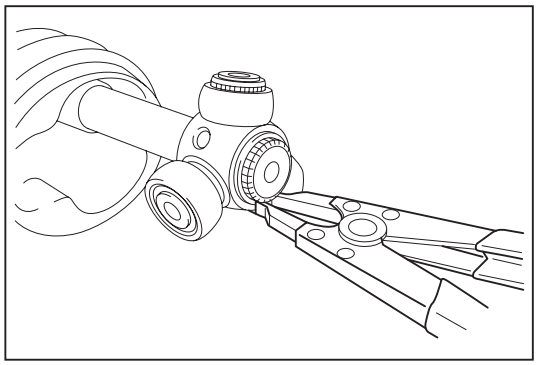
(a) Remove the grease on the left front axle inner universal joint assembly.

(b) Make mark on the left front axle inner universal joint assembly and outer universal joint shaft assembly.

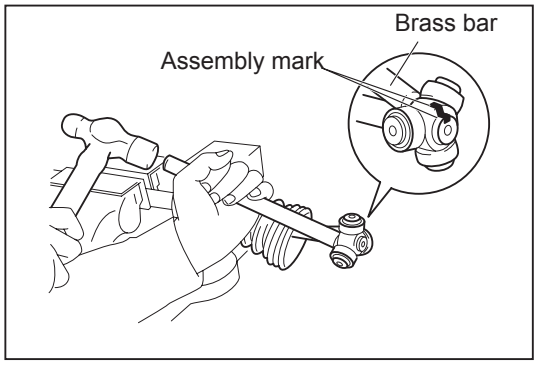
Note:

It is not allowed to make mark with punching head.

(c) Remove the left front axle inner universal joint assembly from the outer universal shaft assembly.



(d) Remove the left drive shaft inner snap ring with snap ring dilator.



(e) Make mark on the outer universal joint shaft assembly and the tripod universal joint assembly.

Note:

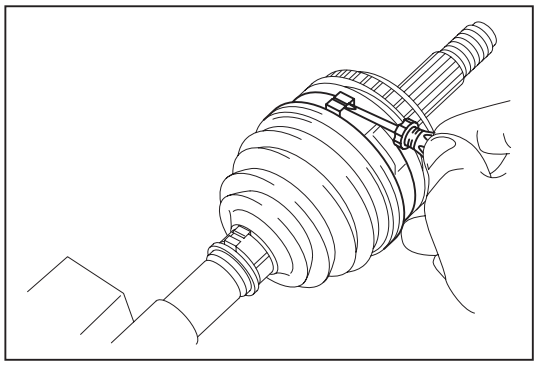
It is not allowed to make mark with punching head.

(f) Remove the tripod universal joint assembly from the outer universal joint assembly with brass bar and hammer.

Note:

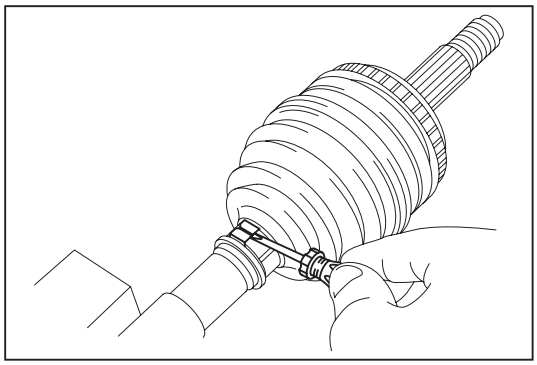
Please do not knock the roller.

(g) Remove the large clip of the left front axle inner universal joint boot, inner universal joint boot and the small clip of the left front axle inner universal joint boot.



14. Remove the large clip of the left front axle inner universal joint boot

(a) Take apart the large clip of the left outer universal joint boot with screw driver.



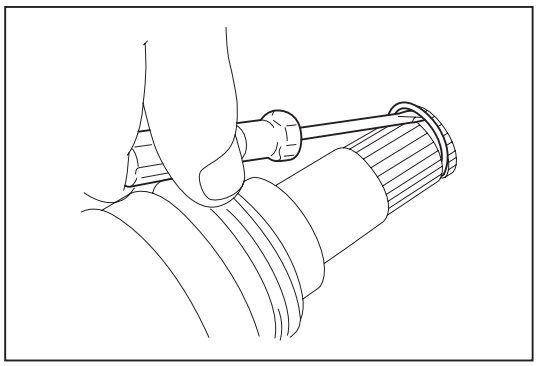
15. Remove the small clip of the left front axle outer universal joint boot

(a) Take apart the small clip of the left front axle inner universal joint boot with screw driver.

16. Remove the outer universal joint boot of the front axle

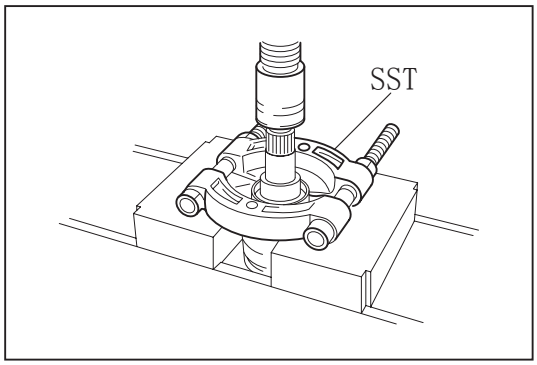
(a) Remove the outer universal joint boot from the outer universal joint boot shaft assembly.

(b) Remove the grease on the outer universal joint.



17. Remove the snap ring of the front axle left drive shaft hole

(a) Take apart the left drive shaft snap ring with screw driver.

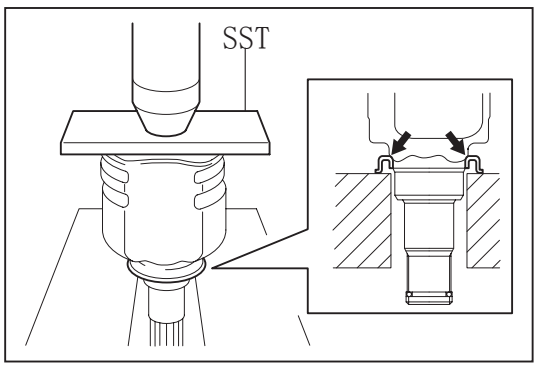


18. Remove the oil seal of the left drive shaft of the front axle

(a) Remove the oil seal of the left drive shaft with SST and press machine.

Note:

Do not drop the inner universal joint assembly.



19. Install the oil seal of the left drive shaft of the front axle

(a) Install the oil seal of the left drive shaft with SST and press machine.

Note:

- **Do not damage the oil seal.**
- **The oil seal should be set at position.**

20. Install the snap ring of the front axle left drive shaft hole

(a) Install a new left drive shaft hole snap ring.

21. Install the front axle outer universal joint boot

(a) Wrap the spline of the outer universal joint with PVC insulated tape to avoid damaging the boot.

(b) Install the new parts onto the inner universal joint shaft assembly according to the following order.

(1) The small clip of the left front axle outer universal joint boot.

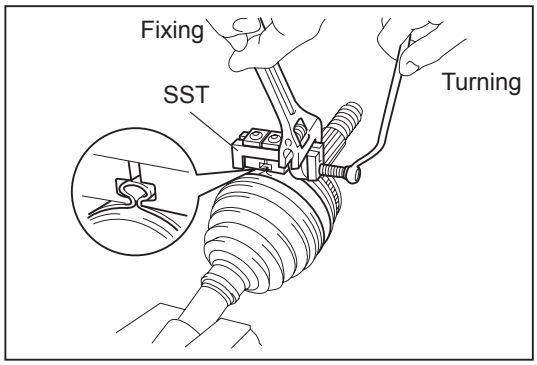
(2) The outer universal joint boot.

(3) The large clip of the left front axle outer universal joint boot.

(c) Seal the outer universal joint assembly of the left front axle with grease.

The grease volume: 155 to 170g

(d) Install the outer universal joint boot on the outer universal joint assembly.



22. Install the large clip of the left front axle outer universal joint boot

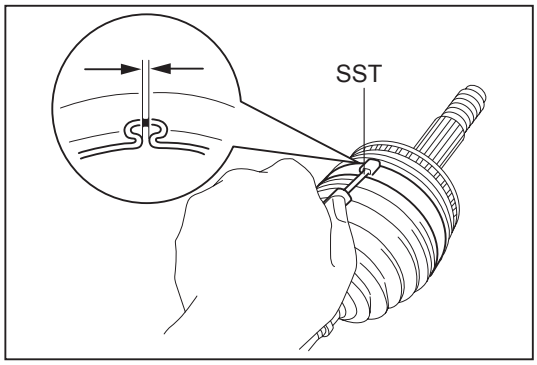
(a) Install the large clip of the left front axle outer universal joint boot on the outer universal joint boot.

(b) Place the SST on the large clip of the left front axle outer universal joint boot.

(c) Tighten the SST to make the large clip of the left front axle outer universal joint boot clamp together.

Note:

Never over tighten the SST.

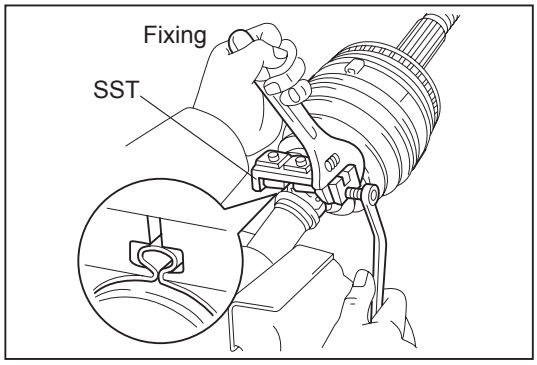


(d) Measure the clearance of the large clip of the left front axle outer universal joint boot with SST.

Clearance: 0.8 mm or less

Note:

Retighten the clip if the measuring value exceeds the specified value.



23. Install the small clip of the left front axle outer universal joint boot

(a) Hold the drive shaft in the vise.

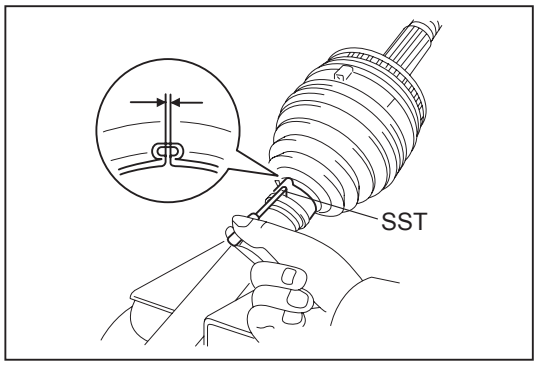
(b) Install the outer universal joint boot of the left front axle on the outer universal joint boot.

(c) Place the SST on the mall clip of the left front axle outer universal joint boot left front axle.

(d) Tighten the SST to make the clip of the left front axle outer universal joint boot clamp together.

Note:

Never over tighten the SST.



(e) Measure the clearance of the mall clip of the left front axle outer universal joint boot left front axle with SST.

Clearance: 0.8 mm or less

Note:

Retighten the clip if the measuring value exceeds the specified value.

24. Install the inner universal joint assembly of the front axle left drive shaft

Tip:

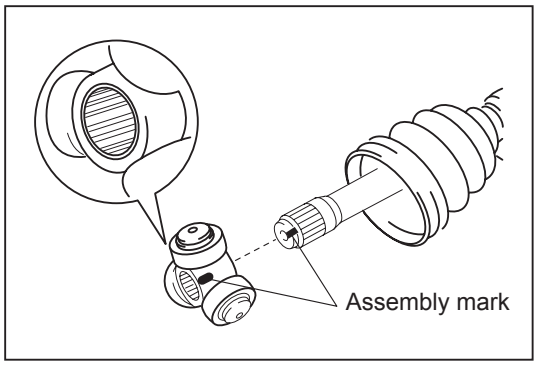
Before install the boot, wrap the drive shaft spline with PVC insulated tape to avoid damaging the boot.

(a) Install the new parts on the outer universal joint shaft assembly according to the following order.

(1) Small clip of left front axle inner universal joint.

(2) Inner universal joint boot.

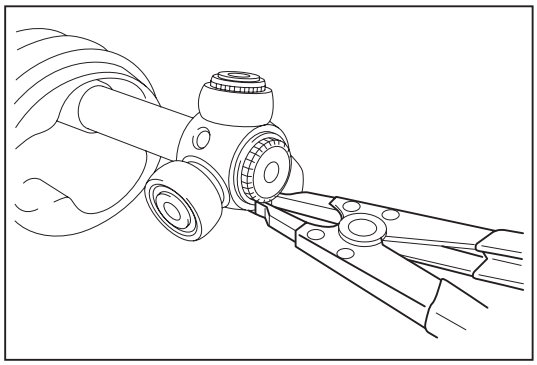
(3) Large clip of the left front axle inner universal joint.



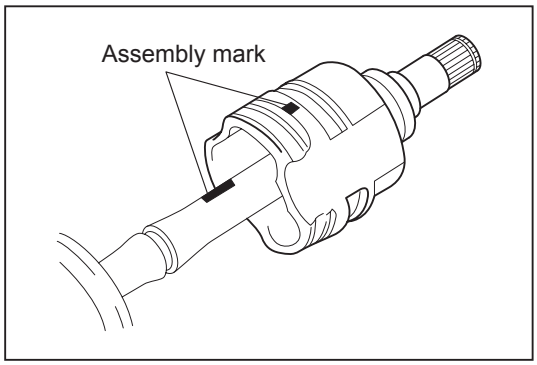
(b) Align to the assembly mark, and install the tripod universal joint assembly on the outer universal joint assembly.
(c) Install the tripod universal joint assembly with brass bar and hammer.

Note:

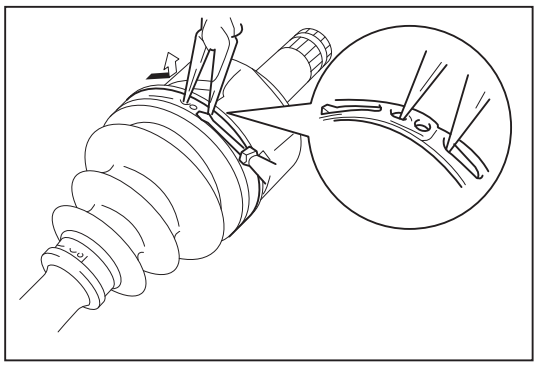
- **Please do not knock the roller.**
- **Make sure to install the tripod universal joint in the correct way.**



(d) Install a new inner snap ring of the left drive shaft inner shaft with snap ring dilator.
(e) Apply grease to the left front axle inner universal joint assembly.
The grease volume: 125 to 135g

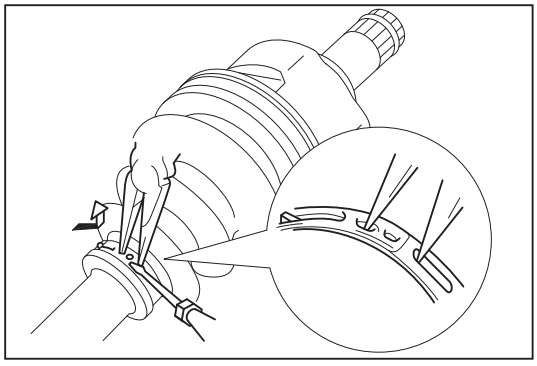


(f) Align to the assembly mark, and install the left front axle inner universal joint assembly on the outer universal joint shaft assembly.

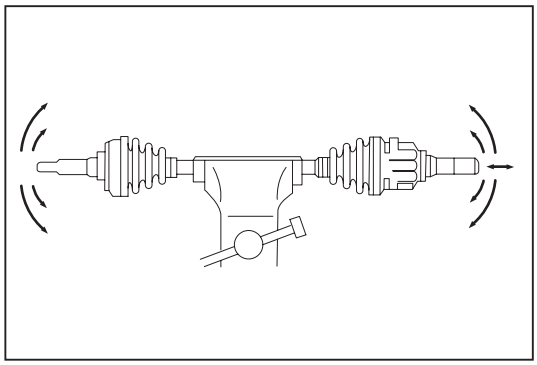


25. Install the inner universal joint boot of the front axle
(a) Install the universal joint boot on the inner universal joint assembly and the outer universal joint shaft assembly.

26. Install the large clip of the left front axle inner universal joint boot
(a) As shown in the figure, install the large clip of the front axle inner universal joint boot with sharp-nose pliers.



27. Install the small clip of the left front axle inner universal joint boot
(a) As shown in the figure, install the small clip of the left front axle inner universal joint boot with sharp-nose pliers.



28. Inspect the front axle drive shaft

Note:

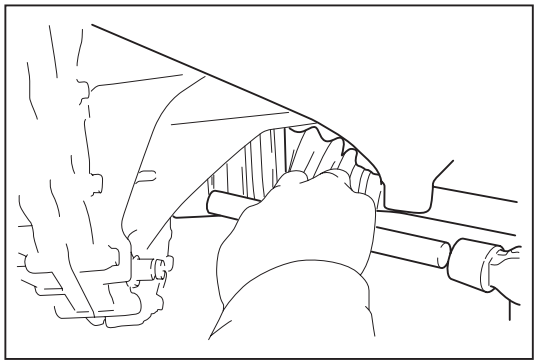
Position the drive shaft assembly horizontally during the inspection.

(a) Inspect whether the universal joint has obvious clearance.

(b) Inspect and make sure the inner universal joint slides smoothly in axial direction.

(c) Inspect and make sure the inner universal joint has no obvious allowance in radical direction.

(d) Inspect whether the boot is damaged.



29. Install left drive shaft assembly of the front axle

(a) Apply gear oil to the spline of the inner universal joint shaft assembly.

(b) Align to the spline of the shaft, and install the left drive shaft assembly of the front axle with brass bar and hammer.

Note:

- **Install the snap ring with its open end facing downward.**
- **Do not damage the dust boot and oil seal.**

Tip:

It can be determined whether the inner universal joint shaft contacts the small gear through the sounds when push the inner universal joint shaft in.

30. Install the front axle drive shaft assembly

Tip:

Carry out the same process to the right side.

Note:

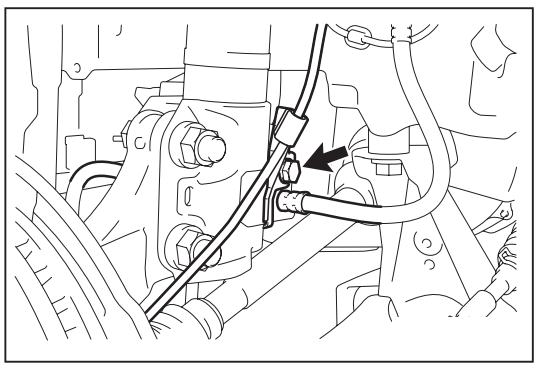
- **Install the snap ring with its open end facing downward.**
- **Do not damage the boot and oil seal.**

31. Install the left front axle hub assembly

(a) Install the left drive shaft assembly on the left front axle hub assembly.

Note:

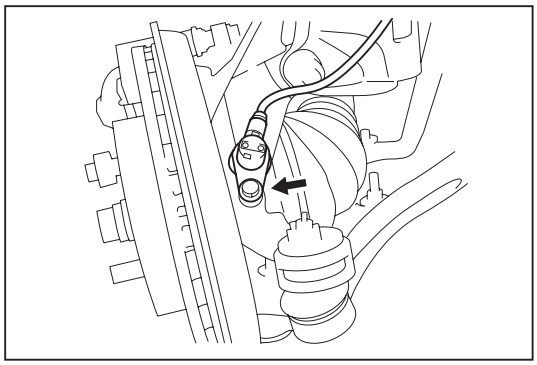
- **Do not damage the outer universal joint boot.**
- **Do not damage the speed sensor.**
- **Do not over push the left front axle assembly.**



32. Install the left front wheel speed sensor

(a) Install the left front wheel speed sensor and the brake hose on the left front wheel shock absorber assembly with bolts and clips.

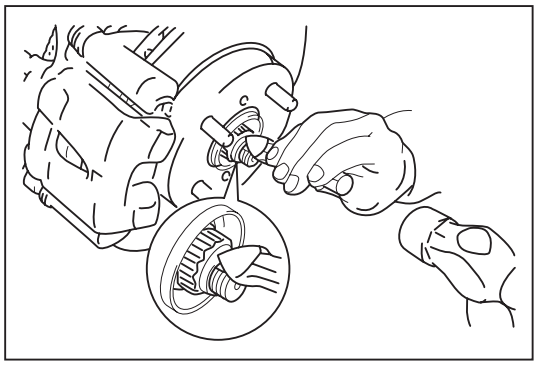
Torque: 23±3 N•m



(b) Install the speed sensor of the left front wheel on the steering knuckle with bolts.
Torque: 9.0 N•m

Note:

- **Do not damage the speed sensor.**
- **Keep the speed sensor clean.**
- **When install the sensor, do not twist the its har-**



33. Install the left front axle drive shaft nut

(a) Install a new left drive shaft nut.
Torque: 225±20 N•m

(b) Tighten the left drive shaft nut with punch and hammer.

34. Install the left bottom hood of the engine

35. Install the front wheel
Torque: 110±10 N•m

36. Fill in drive shaft oil

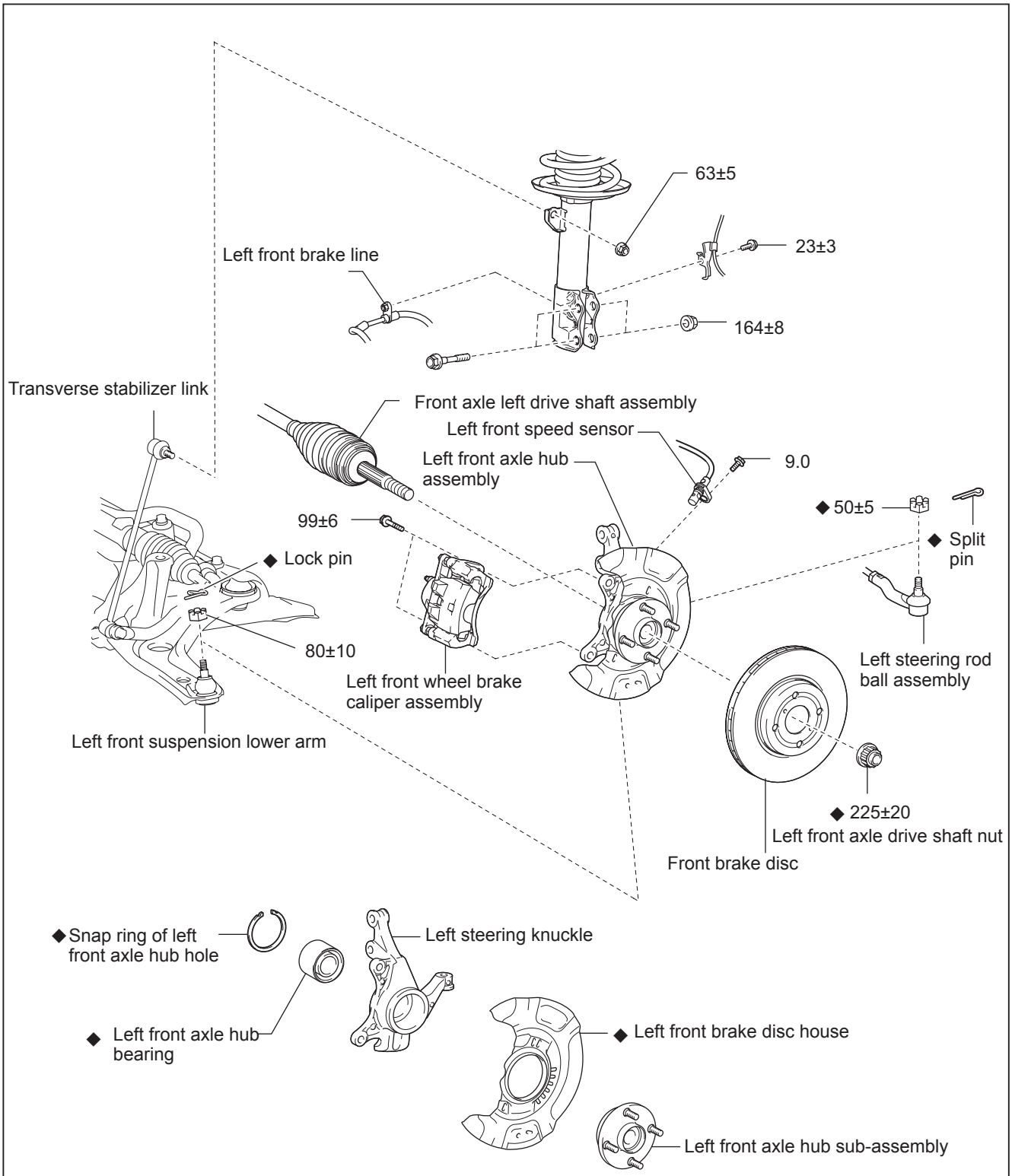
37. Inspect and adjust the drive shaft oil

38. Inspect and adjust the front wheel alignment

39. Inspect the signal of the ABS speed sensor

LEFT FRONT AXLE HUB SUB-ASSEMBLY

Structure Diagram



N•m : Specified torque

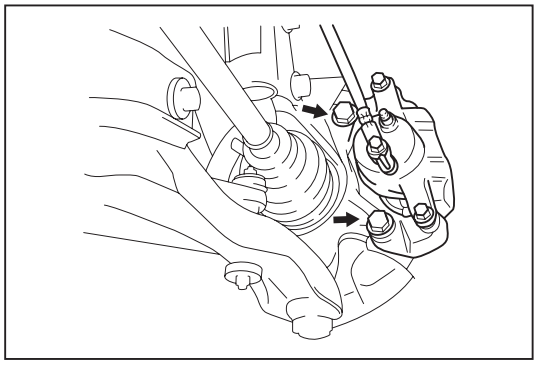
◆ No reusable parts

Replacement

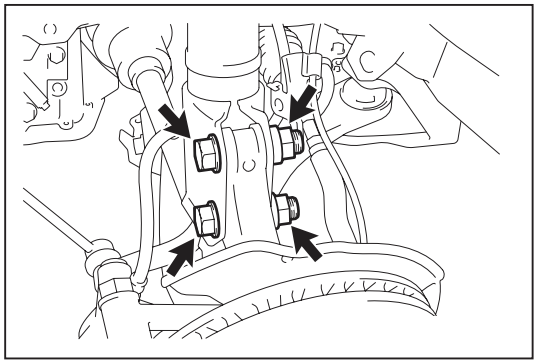
1. **Remove the left front wheel**
2. **Remove the nut of the left front axle hub**
3. **Separate the speed sensor of the left front wheel**
4. **Remove the left front wheel brake caliper assembly**
   (a) Remove 2 bolts, and remove the left front wheel brake caliper assembly from the steering knuckle.

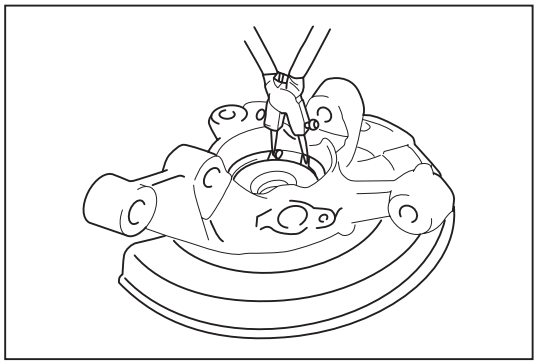
   Note:

   Use string or other tool to avoid the brake caliper from overhanging.

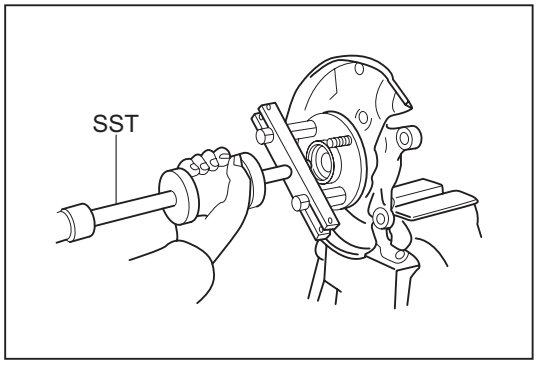


5. **Remove the front brake disc**
6. **Separate the front transverse stabilizer**
7. **Separate the lower arm of the left front suspension**
8. **Separate the left steering rod ball assembly**
9. **Remove the left front axle hub assembly**
10. **Separate the left front shock absorber assembly**
    (a) Remove 2 bolts and 2 nuts, and separate the left front shock absorber assembly from the left steering knuckle assembly.

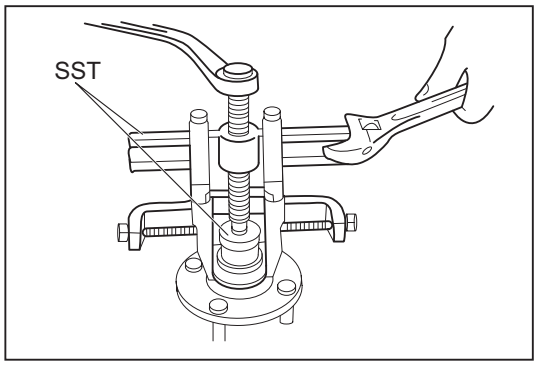




11. **Remove the snap ring of the left front axle hub hole**
    (a) Remove the snap ring of the left front axle hub hole with snap ring caliper.



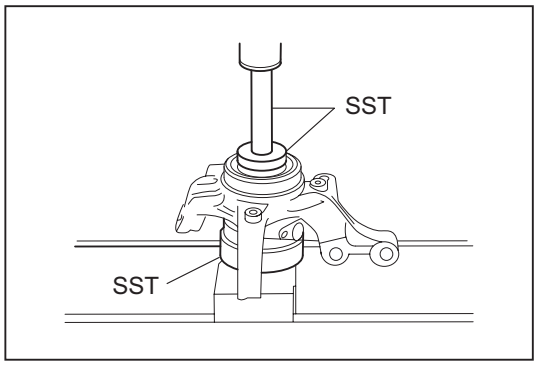
12. **Remove the left front axle hub sub-assembly**
    (a) Remove the left front axle hub sub-assembly with SST.



(b) Remove the inner race of the left hub bearing from the left front axle hub sub-assembly with SST.

13. Remove the left front brake disc hood

(a) Remove 3 bolts and the left front boot.



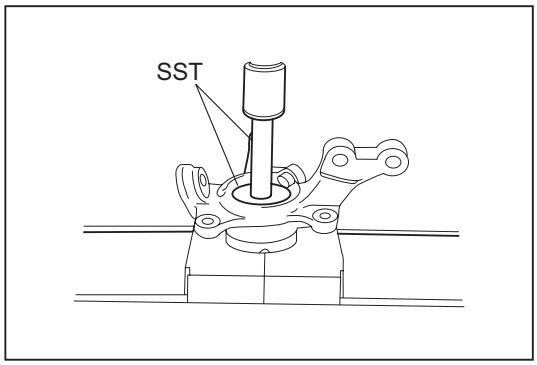
14. Remove the left front axle hub bearing

(a) Place the inner race of the left hub bearing on the outer race of the left hub bearing.

(b) Remove the outer race of the left hub bearing from the steering knuckle with SST and press machine.

Note:

Do not position the steering knuckle horizontally.

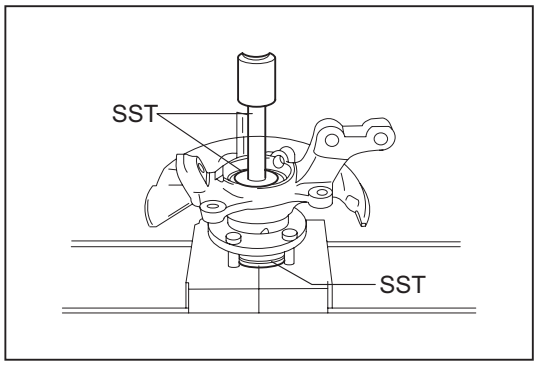


15. Install the left front axle hub bearing

(a) Install the new left front axle hub bearing on the steering knuckle with SST and press machine.

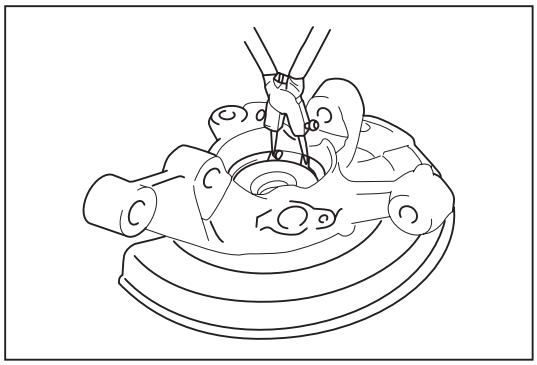
16. Install the left front brake disc hood

(a) Install the left front brake disc hood with 3 bolts.
Torque: 9 N•m



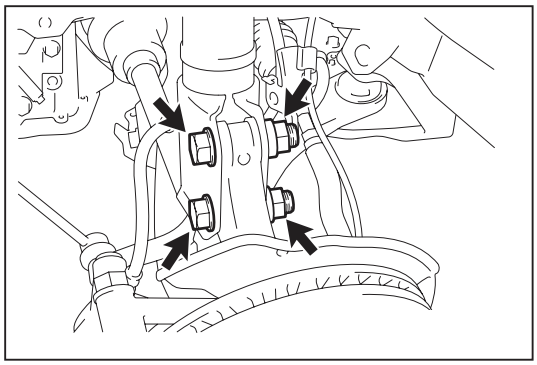
17. Install the left front axle hub sub-assembly

(a) Install the left front axle hub sub-assembly with SST and presses.



18. Install the snap ring for the left front axle hub hole

(a) Install a new snap ring for the left front axle hub hole with snap ring caliper.



19. Install the left front shock absorber assembly

(a) Install 2 bolts, nuts and left front shock absorber assembly.
Torque: 164±8 N•m

Note:

Apply a small quantity of engine oil to the thread of the nuts when use the bolts and nuts again.

20. Install the left front axle hub

21. Install the left steering rod ball assembly

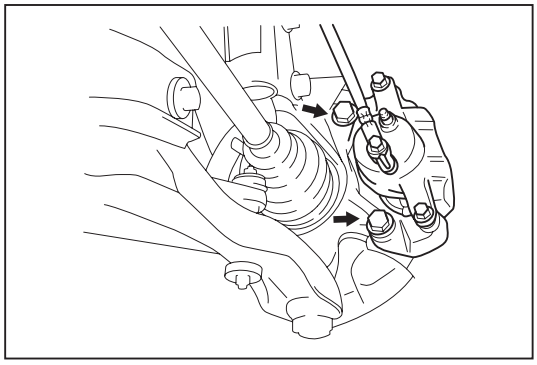
22. Install the left front suspension lower swing arm

23. Install the front transverse stabilizer

24. Install the front brake disc

25. Install the left front wheel brake caliper assembly

(a) Install the brake caliper assembly on the steering knuckle with 2 bolts.
Torque: 99±6 N•m



26. Install the left front axle drive shaft nut

(a) Install a new left drive shaft nut.

27. Remove the left front wheel brake caliper assembly

Note:

Use string or other tools to avoid the brake caliper from overhanging.

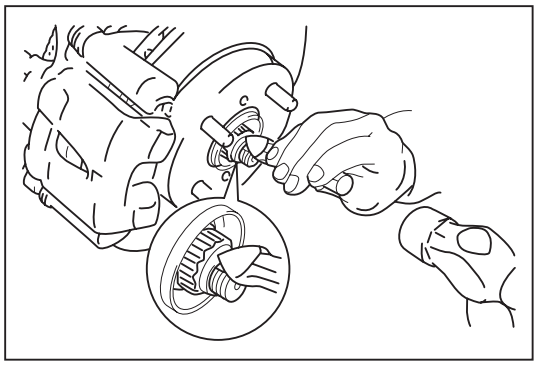
28. Remove the front brake disc

29. Inspect whether the front axle has runout and clearance

30. Install the front brake disc

31. Install the left front wheel brake caliper assembly

32. Install the left front wheel speed sensor



33. Tighten the left front axle drive shaft nut

(a) Tighten the left front drive shaft nut with punch and hammer.
Torque: 225±20 N•m

34. Install the front wheel
Torque: 110±10 N•m

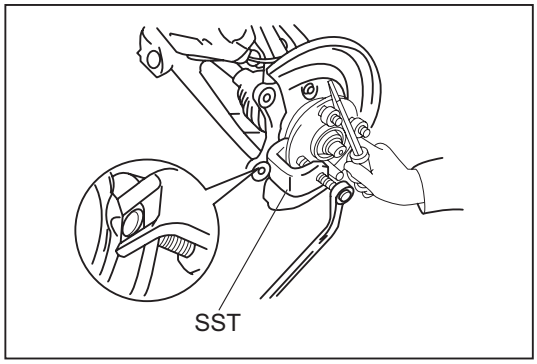
35. Inspect and adjust the front wheel alignment

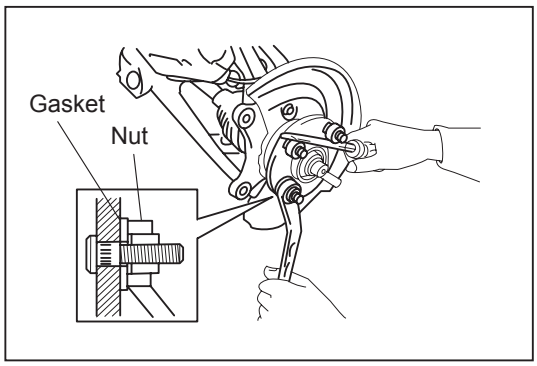
36. Inspect the ABS speed sensor signal

BOLTS OF THE LEFT FRONT AXLE WHEEL HUB

Replacement

1. **Remove the front wheel**
2. **Remove the left front wheel brake caliper assembly**
3. **Remove the front brake disc**
4. **Remove the left front axle hub bolt**
   (a) Fix the left front axle hub sub-assembly with SST and screw driver or other equivalent tools, and remove the bolts of the left front axle hub.

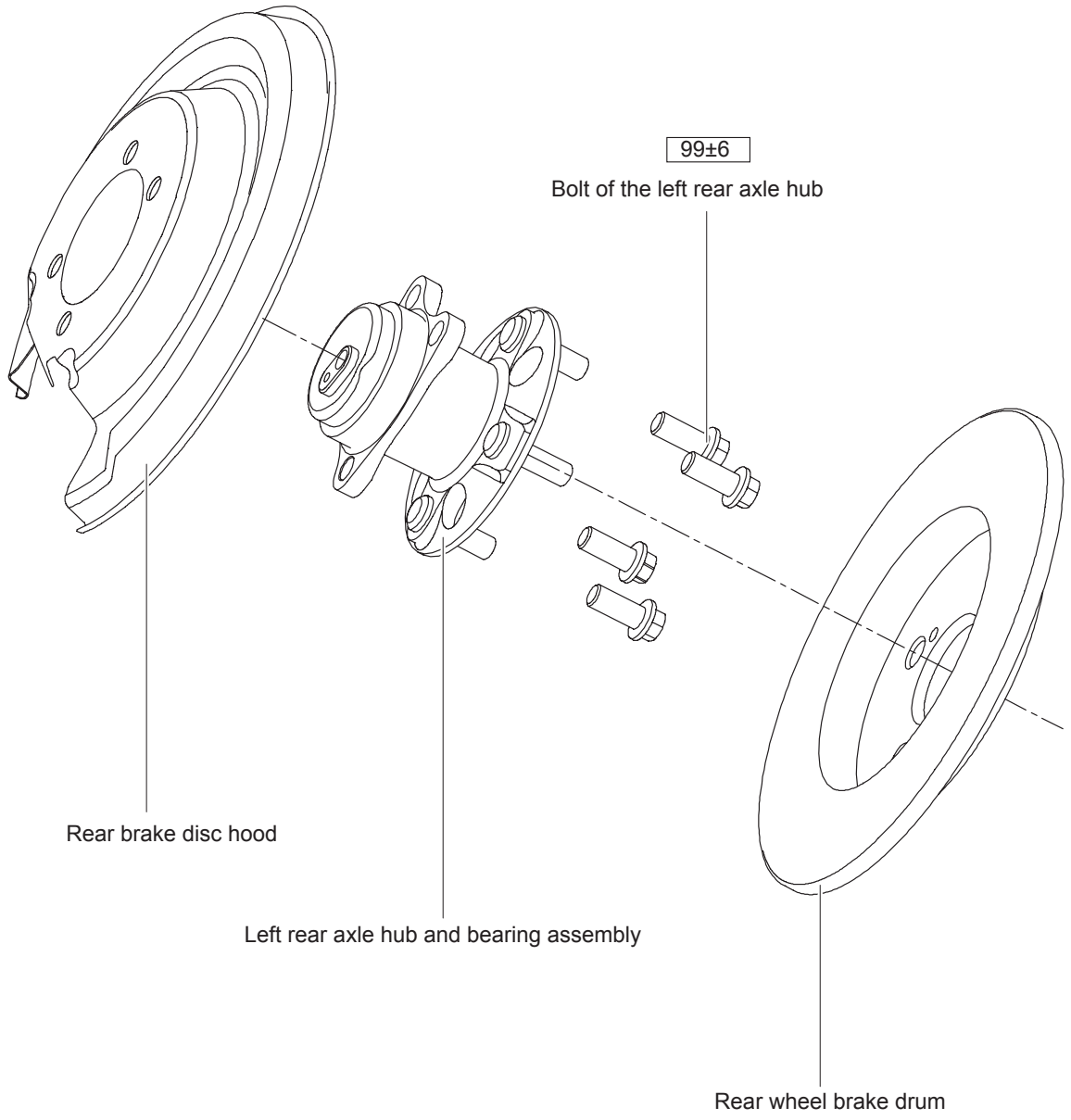




5. **Install the bolts of the left front axle hub**
   (a) As shown in the figure, install the gasket and nut onto the new bolts of the left wheel hub.
   (b) Fix the left front axle hub sub-assembly with screw driver or the equivalent tools, and tighten the nut to install the bolts of the left wheel hub.
6. **Install the front brake disc**
7. **Install the left front wheel brake caliper assembly**
8. **Install the front wheel**
   Torque: 110±10 N•m

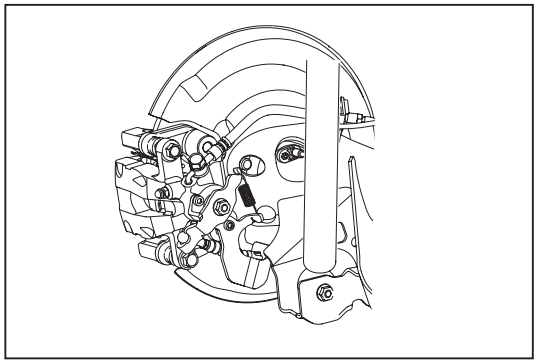
LEFT REAR AXLE WHEEL HUB AND BEARING ASSEMBLY

Structure Diagram

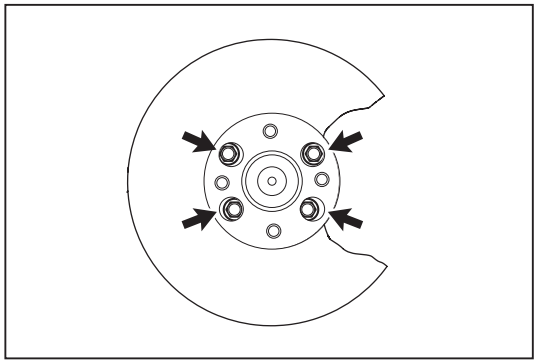


N·m : Specified torque

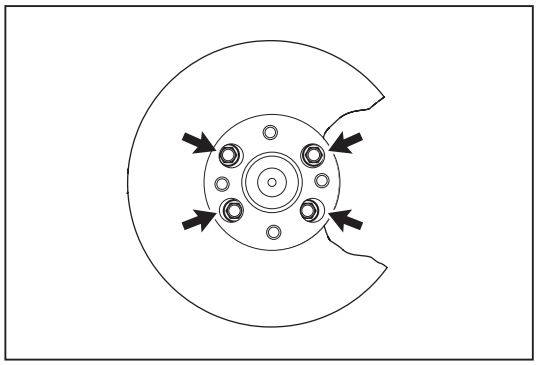
Replacement



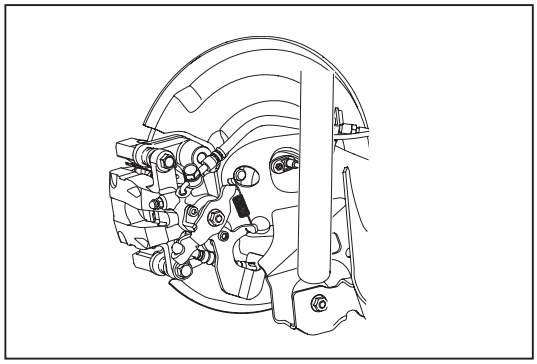
1. **Remove the rear wheel**
2. **Take apart the parking brake cable**
3. **Remove the speed sensor**
   (a) Take mounting bolts of the apart the speed sensor.
4. **Remove the rear brake caliper assembly**
5. **Remove the rear brake disc**



6. **Remove the left rear axle hub and bearing assembly**
   (a) Remove 4 bolts and the left rear axle hub and bearing assembly.



7. **Install the left rear axle hub and bearing assembly**
   (a) Install the left rear axle hub and bearing assembly with 4 bolts.
   Torque: 99±6 N•m
8. **Remove the rear brake disc**
9. **Remove the rear brake caliper assembly**

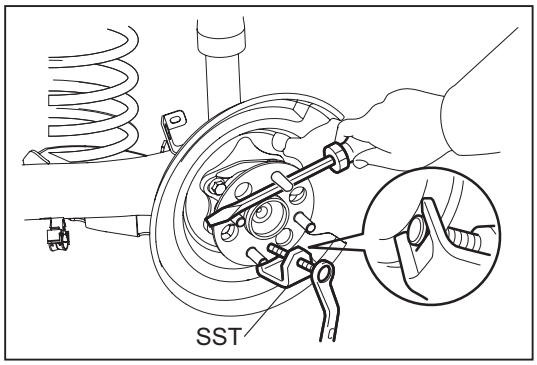


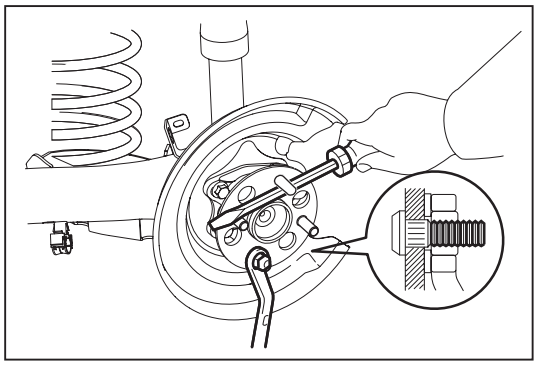
10. **Connect the speed sensor**
    (a) Install the speed sensor with bolts.
    Note:
    Never twist the harness of sensor when connecting.
11. **Inspect whether the rear axle has runout or clearance.**
12. **Install the parking brake cable**
13. **Install the rear wheel**
    Torque: 110±10 N•m
14. **Inspect the signal of ABS speed sensor**

BOLTS OF THE LEFT REAR AXLE WHEEL HUB

Replacement

1. **Remove the rear wheel**
2. **Remove the rear brake caliper assembly**
3. **Remove the rear brake disc**
4. **Remove the bolts of the left rear axle hub**
   (a) Remove the left hub bolts with SST and screw driver or equivalent tools.





5. **Install the left rear axle hub bolts**
   (a) As shown in the figure, install the gaskets and nuts on the new left rear hub bolts.
   (b) Fix the hub and bearing assembly with screw driver or equivalent tools, and tighten the nuts to install the left rear hub bolts.
5. **Install the rear brake disc**
6. **Install the rear brake caliper assembly**
7. **Install the rear wheel**

   Torque: 110±10 N•m

CLUTCH

ATTENTIONS

1. **Apply grease to the clutch pedal and the clutch master cylinder push rod U-shape clip.**
2. **For the pipe connection, it should be tightened in strict accordance with the specified torque.**
   (a) Hard tube and master hylinder: M10 16 ± 2 N•m
   (b) Clutch hard tube and hose: M10 16 ± 2 N•m
3. **Make sure all the air bubbles in the pipe have been exhausted during the exhaustion process. Inspect the level of the brake fluid in the fluid reservoir at this moment, and it should be within MIN and MAX.**

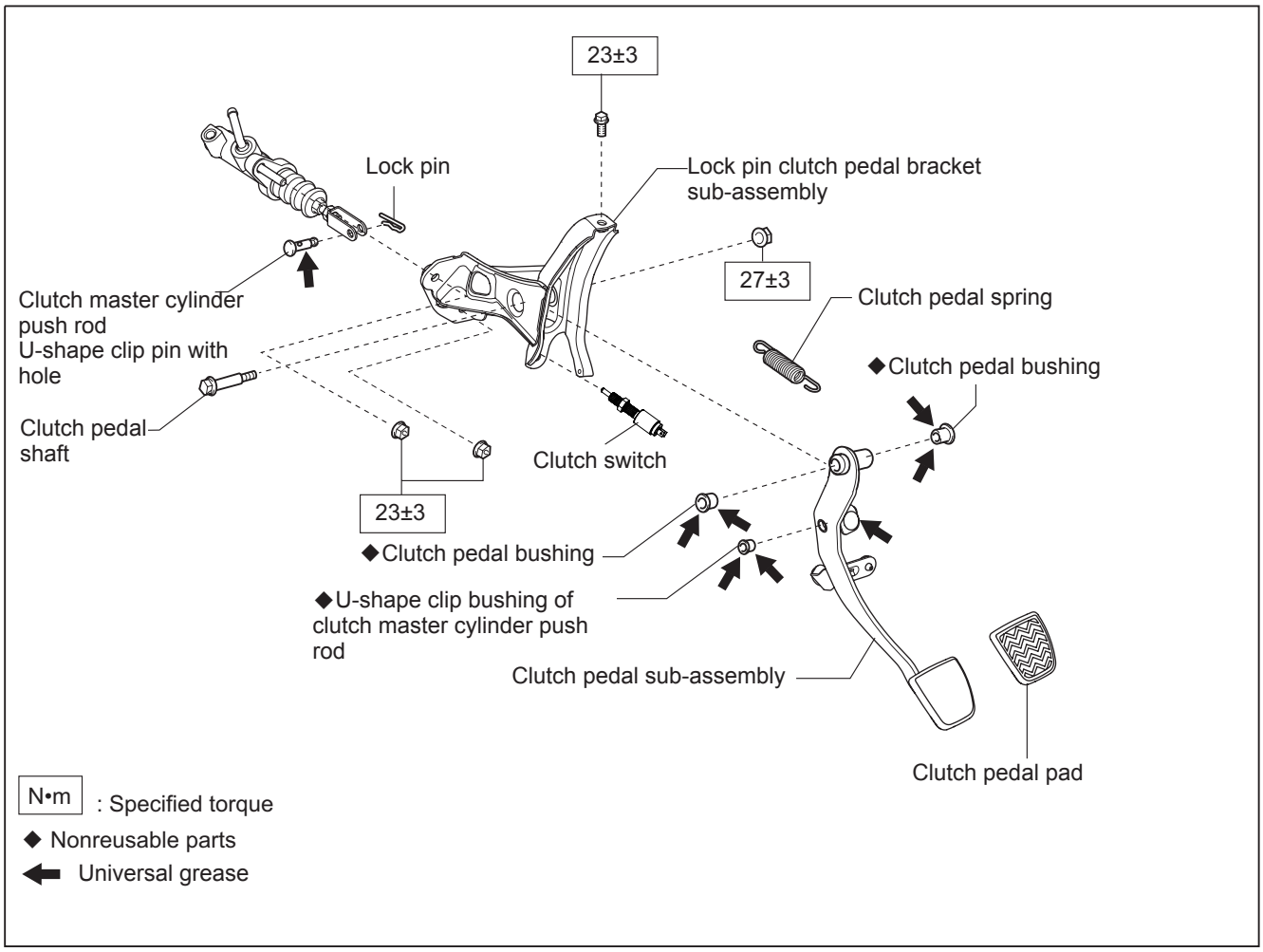
FAILURE SYMPTOM TABLE

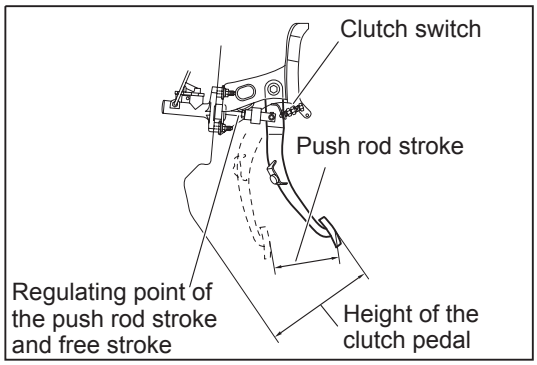
The suspected parts in the following table are ranged in numerical order to determine the fault causes. Inspect, maintain or change parts according to the procedures listed in the following pages when necessary.

Symptom	Suspected Parts
Clutch shaking	1. Engine suspension (looseness) 2. Clutch driven disc assembly (over bouncing) 3. Clutch driven disc assembly (oil strain) 4. Clutch driven disc assembly (wear) 5. Clutch driven disc torsional damper (damage) 6. Clutch driven disc assembly (polishing) 7. Diaphragm spring (incorrect-justified top end)
Loose clutch pedal	1. Clutch pipe (gas in the pipe) 2. Clutch master cylinder rubber cup (damage) 3. Clutch slave cylinder rubber cup (damage)
Abnormal sounds of the clutch	1. Clutch throw-out bearing assembly (wear, dirt or damage) 2. Clutch driven disc torsional damper (damage)
Clutch slipping	1. Clutch pedal (maladjustment of free stroke) 2. Clutch driven disc assembly (oil strain) 3. Clutch driven disc assembly (wear) 4. Diaphragm spring (damage) 5. Pressure plate (deformation) 6. Flywheel sub-assembly (deformation)
Incomplete disengagement of the clutch	1. Clutch pedal (maladjustment of free stroke) 2. Clutch pipe (gas in the pipe) 3. Clutch master cylinder rubber cup (damage) 4. Clutch slave cylinder rubber cup (damage) 5. Clutch driven disc assembly (incorrect installation) 6. Clutch driven disc assembly (over bouncing) 7. Clutch driven disc assembly (fracture) 8. Clutch driven disc assembly (dirt or burn out) 9. Clutch driven disc assembly (oil strain) 10. Clutch driven disc assembly (insufficient grease in the spline part)

CLUTCH FAILURE SYMPTOM TABLE

Structure Diagram





Adjustment

1. Inspect and adjust the clutch pedal sub-assembly

(a) Turn over the carpet.

(b) Inspect and make sure the height of the clutch pedal is correct.

The height of the clutch pedal from the front hoarding: 126 to 132 mm

(c) Adjust the height of the clutch pedal.

Loosen the clutch switch nut until the height of the clutch pedal is correct. Tighten the lock nut.

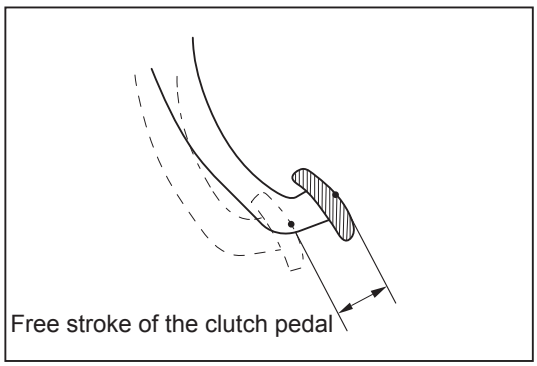
Torque: 12 N•m

(d) Inspect and make sure the clutch pedal free stroke and the push rod stroke are correct. Press down the clutch pedal until feel the resistance of the clutch.

The free stroke of the clutch pedal: 14 mm

Press down the clutch pedal lightly until the resistance starts to increase gradually.

The push rod stroke at the top end of the clutch pedal: 1.0~5.0 mm



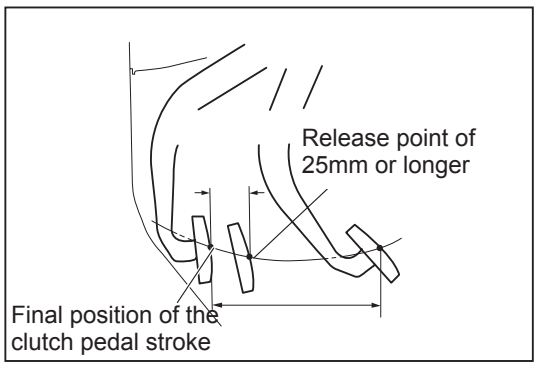
(e) Adjust the clutch pedal free stroke and the push rod stroke.

(1) Loosen the lock nut and turn the push rod until the free stroke and the push rod stroke are correct.

(2) Tighten the lock nut.

Torque: 12 N•m

(3) After adjust the free stroke of the clutch pedal properly, inspect the height of the clutch pedal.



(f) Inspect the clutch release point.

(1) Pull the parking brake handle and install the wheel block.

(2) Start the engine and let it run at idle.

(3) Move the gear shift lever slowly to the reverse position until the gears engage.

(4) Gradually press down the clutch pedal and measure the stroke distance from the where the gear sound stops (release point) to the final position of the clutch pedal stroke.

Standard distance: 25mm or longer

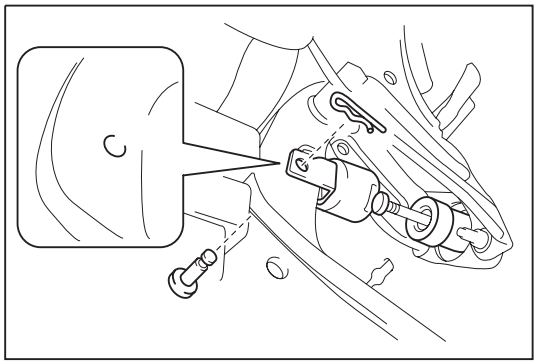
(from the final position of the clutch pedal stroke to the release point)

If the distance does not meet the requirement, carry out the following operations:

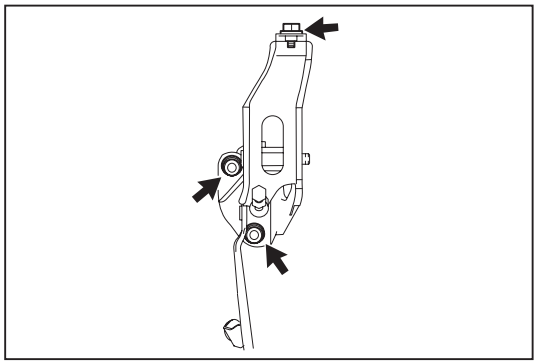
- Inspect the height of the clutch pedal.
- Inspect the push rod stroke and the free stroke of the clutch pedal.
- Discharge the gas in the clutch pipe.
- Inspect the clutch cover assembly and disc assembly.
- Inspect the clutch pedal stroke.

Clutch pedal stroke: 110 mm

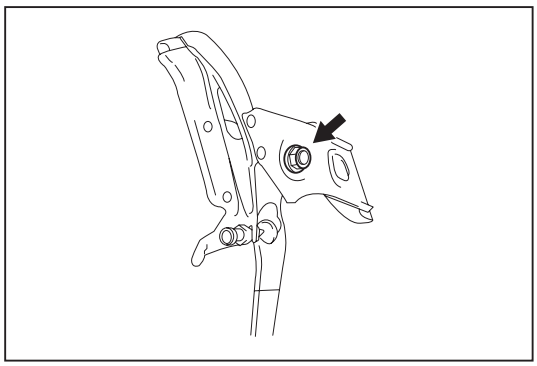
Replacement



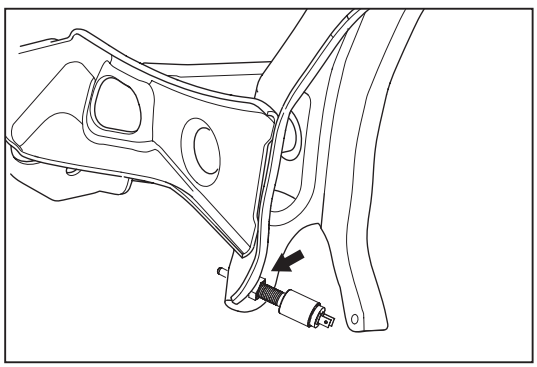
1. **Remove the clutch pedal spring**
2. **Remove the clutch master cylinder push rod U-shape clip pin with hole**
   (a) Remove the lock pin and pin with hole.



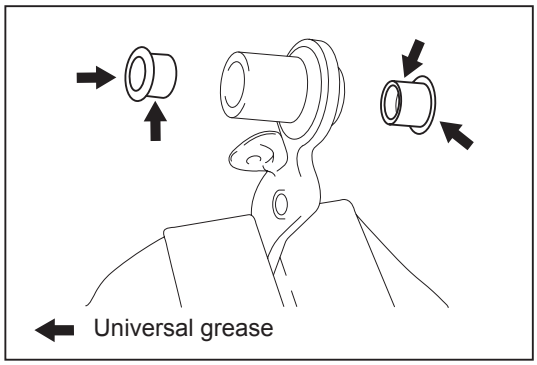
3. **Remove the clutch pedal bracket sub-assembly**
   (a) Remove 3 nuts, bolts and clutch pedal bracket sub-assembly.



4. **Remove the clutch pedal sub-assembly**
   (a) Remove the clutch pedal shaft and nut.
   (b) Remove the clutch spring.
   (c) Remove the clutch pedal from the clutch pedal bracket.

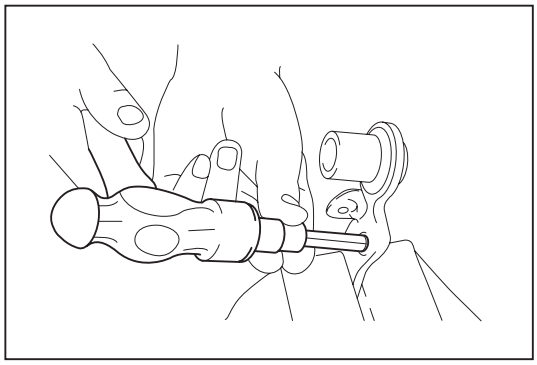


5. **Remove the clutch switch**
   (a) Loosen the lock nut and remove the clutch switch.
   (b) Remove the lock nut from the clutch switch.
6. **Remove the clutch pedal pad**



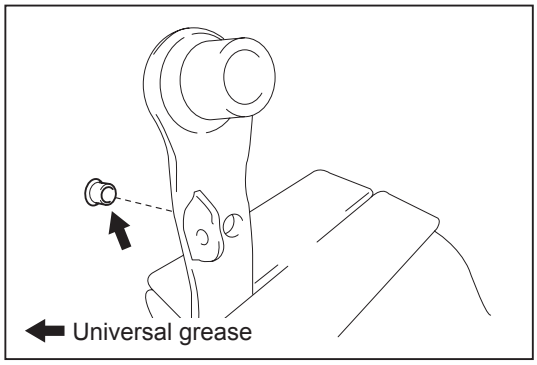
7. Remove the clutch pedal bushing

(a) Remove 2 bushings from the clutch pedal.



8. Remove the clutch master cylinder push rod U-shape clip bushing

(a) Remove the U-shape clip bushing from the clutch pedal with 8mm hexagon spanner and hammer.



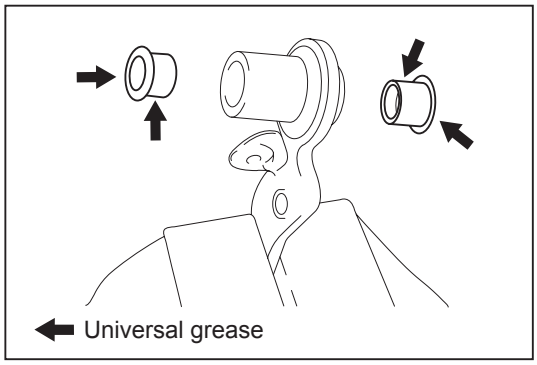
9. Install the clutch master cylinder push rod U-shape clip bushing

(a) Apply universal grease to the internal surface of the new U-shape clip bushing.

(b) Install the U-shape clip bushing on the clutch pedal.

Tip:

Install the U-shape clip bushing from the left side of the vehicle.

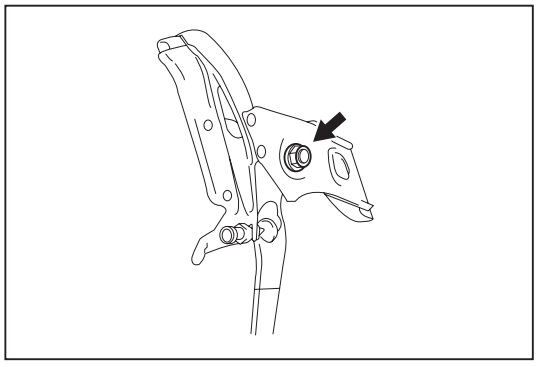


10. Install the clutch pedal bushing

(a) Apply universal grease to both sides of 2 new bushings.

(b) Install 2 bushings on the clutch pedal.

11. Install the clutch pedal pad



12. Install the clutch pedal sub-assembly

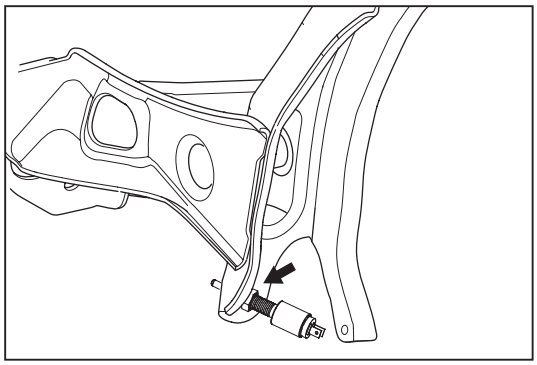
(a) Install the clutch pedal spring.

(b) Install the clutch pedal on the clutch pedal bracket with clutch pedal shaft and nuts.

Torque: 27±3 N•m

Tip:

Install the clutch pedal shaft from the left side of the vehicle.



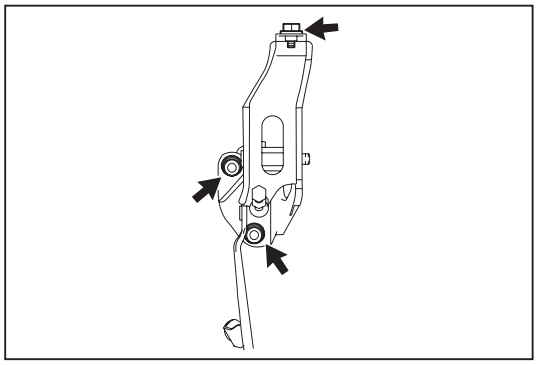
13. Install the clutch switch

(a) Install the lock nut on the clutch switch but do not tighten it.

(b) Install the clutch switch bolt, and contact its end to the clutch pedal pad.

Tip:

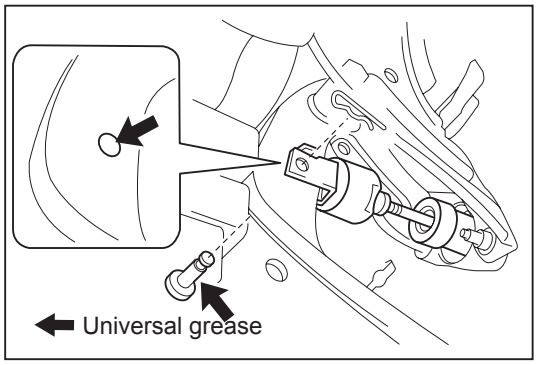
Tighten the nut for the moment.



14. Install the clutch pedal bracket sub-assembly

(a) Install the clutch pedal bracket onto the vehicle with 2 nuts and bolts.

Torque: 23±3 N•m



15. Install the pin with hole of the clutch master cylinder push rod U-shape clip

(a) Apply universal grease on the interface between the pin with hole and the U-shape clip bushing.

(b) Connect the U-shape clip bushing to the clutch pedal using pin with hole.

Tip:

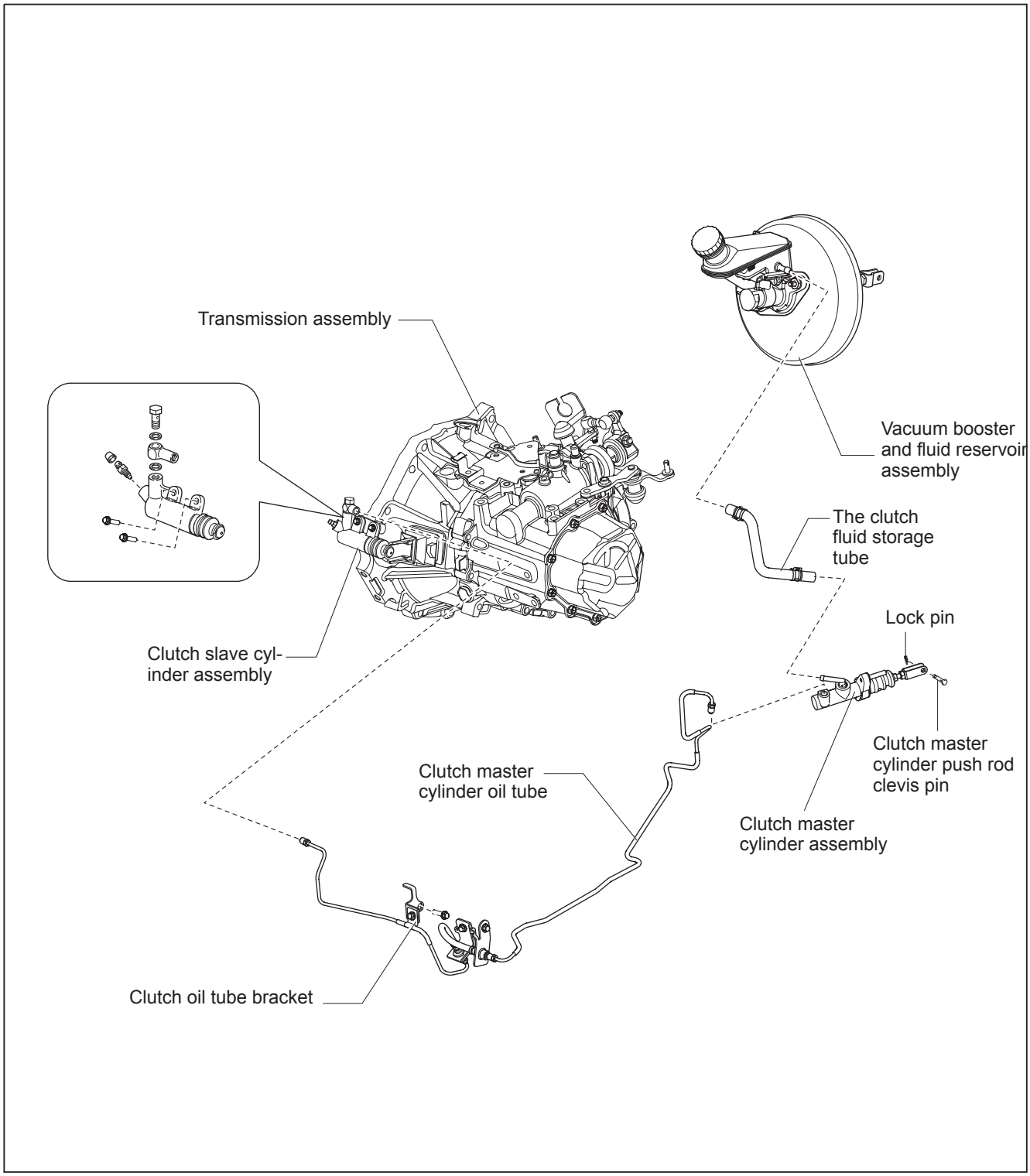
Install the pin with hole from the left side of the vehicle.

16. Inspect and adjust the clutch pedal sub-assembly

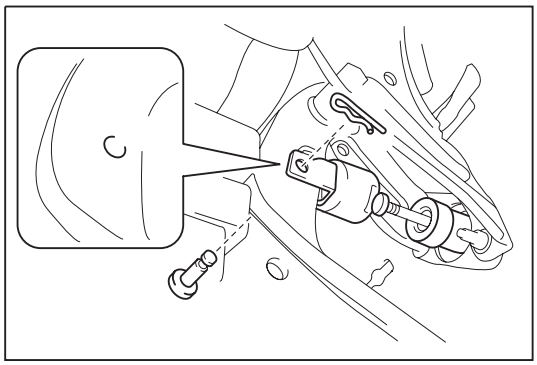
17. Connect the cable of the battery negative electrode

CLUTCH MASTER CYLINDER AND SLAVE CYLINDER

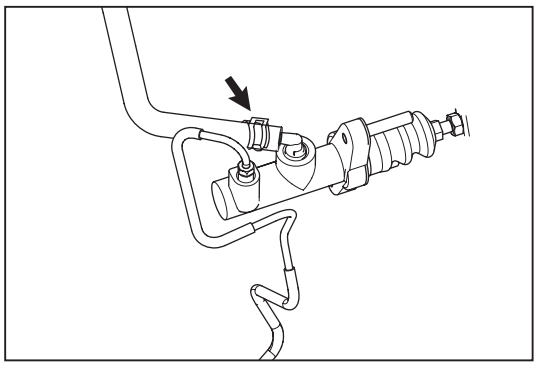
Structure Diagram



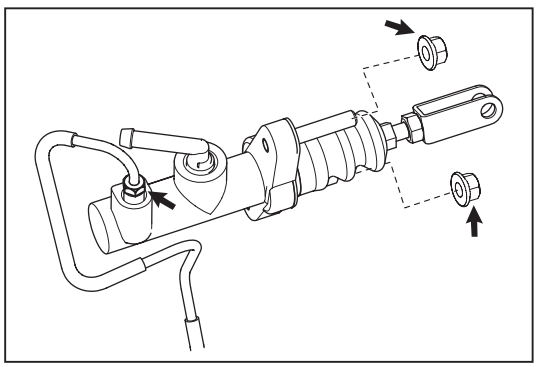
Overhaul of Clutch Master Cylinder



1. **Remove the vacuum booster assembly**
2. **Remove the clutch pedal spring**
3. **Remove the U- shape clip pin with hole of clutch master cylinder**
   (a) Remove the lock pin and pin with hole
4. **Discharge all the brake fluid**



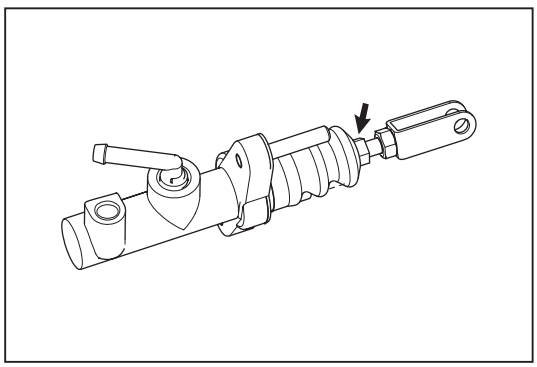
5. **Remove the clutch fluid storage tube**
   (a) Loosen the clip and remove the clutch fluid storage tube from the clutch master cylinder assembly.



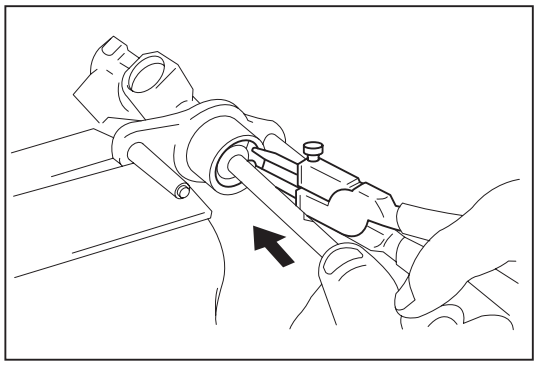
6. **Disconnect the oil pipe connecting the clutch master cylinder**
   (a) Disconnect the oil tube of the clutch master cylinder.

   Tip:

   Collect the brake fluid with container.
7. **Remove the clutch master cylinder assembly**
   (a) Remove 2 bolts and clutch master cylinder assembly.



8. **Remove the clutch master cylinder component**
   (a) Remove the lock nut from the push rod.
   (b) Remove the dust boot from the cylinder body.



(c) Remove the snap ring with snap ring caliper when pushing the push rod.
(d) Remove the push rod from the pump.

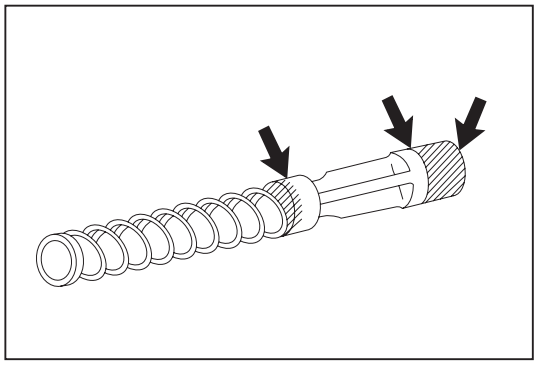
Note:

The piston may bounce out the cylinder, so remove the push rod from the pump slowly.

(e) Remove the stop plate from the push rod.
(f) Remove the piston with spring from the pump.

Note:

Do not damage the inner side of the pump.



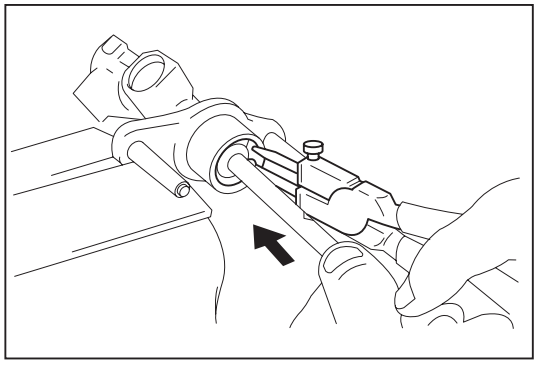
9. Install the clutch master cylinder component

(a) As shown in the figure, coat the component with lubricating grease.
(b) Install the piston with spring into the master cylinder.

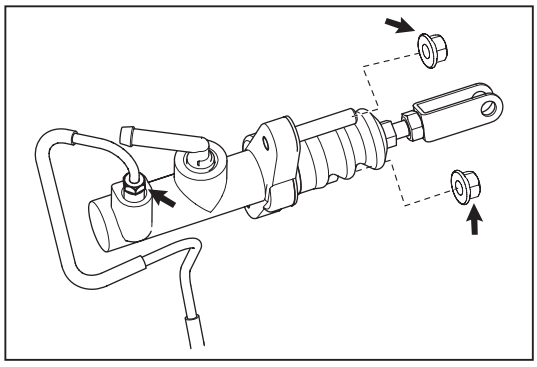
Note:

Do not damage the inner side of the pump.

(c) Install the stop plate to the push rod.
(d) Install the pusher bat to the pump.



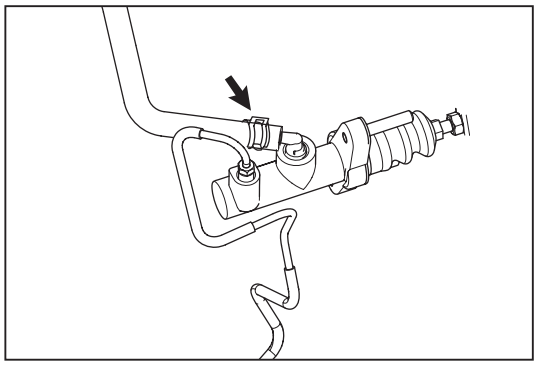
(e) Install the snap ring with snap ring caliper when pushing the push rod.
(f) Install the dust boot onto the pump.
(g) Install the lock nut onto the push rod.
(h) Install the inlet fitting and new gasket.



10. Install the clutch master cylinder assembly

(a) Install the clutch master cylinder assembly with 2 bolts.
Torque: 23±3 N•m

11. Connect the clutch master cylinder oil pipe to the clutch master cylinder
Torque: 16±2 N•m

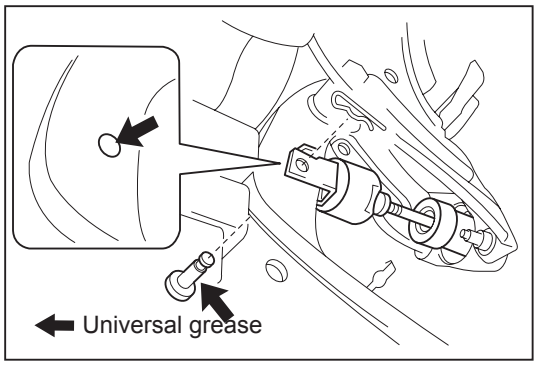


12. Install the clutch fluid storage tube

(a) Install the clutch fluid storage tube onto the clutch master cylinder assembly with clips.

Note:

Be careful not to bend the clutch fluid storage tube when connecting it.



13. Install the U-shape clip pin with hole of the clutch master cylinder push rod

(a) Coat universal lubricating grease on the interface between the pin with hole and the U-shape clip bushing.

(b) Connect the U-shape clip to the clutch pedal assembly with pin with hole.

Tip:

Install the pin with hole from the right side of the vehicle.

(c) Install the lock pin to the pin with hole.

14. Install the clutch pedal spring

15. Install the vacuum booster assembly

16. Discharge the gas in the clutch pipe

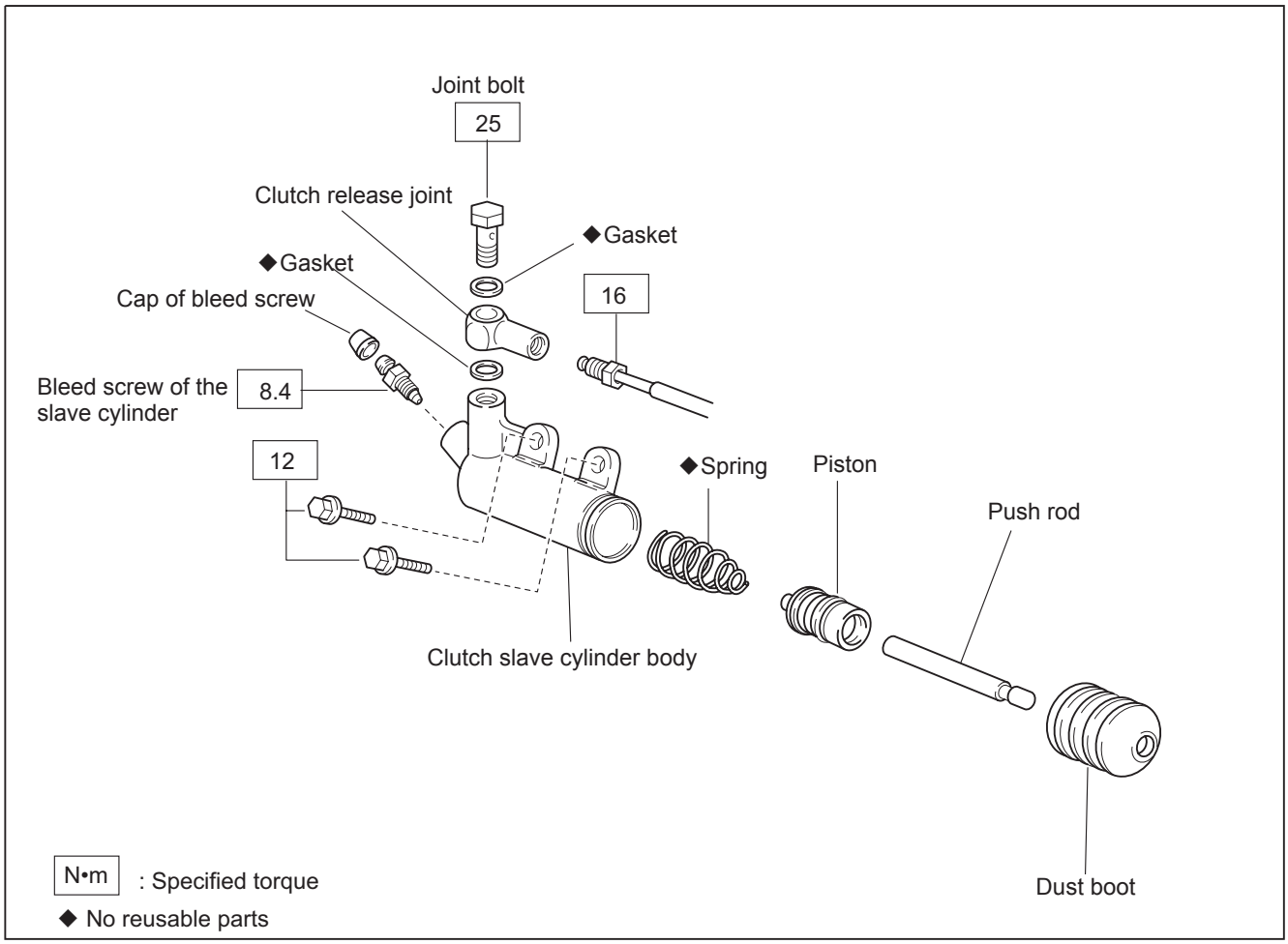
(a) Fill brake fluid into the fluid tank and discharge the gas in the clutch system.

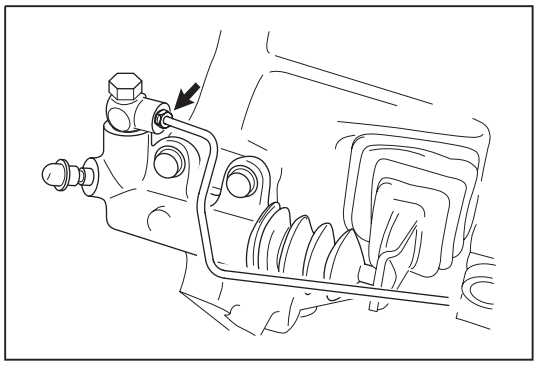
Torque: 8.4 N•m

17. Inspect the fluid level in the fluid reservoir

18. Inspect and adjust the clutch pedal sub assembly

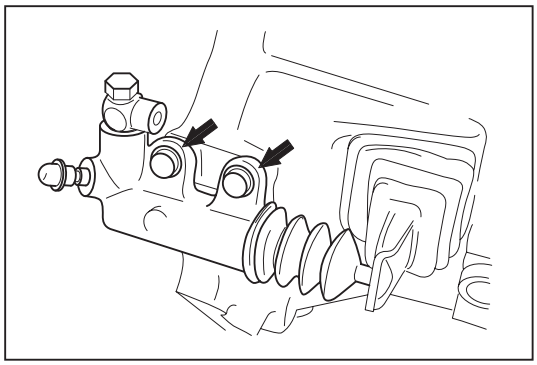
Clutch Slave Cylinder Assembly
Structure Diagram



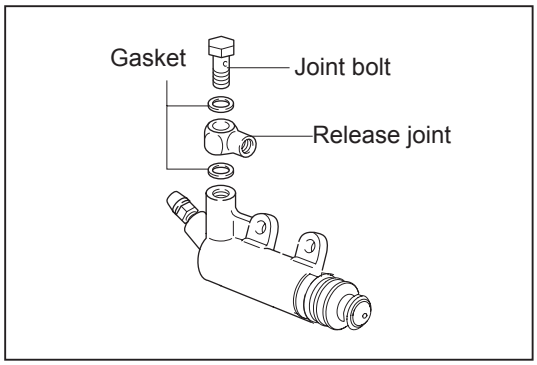


Removal

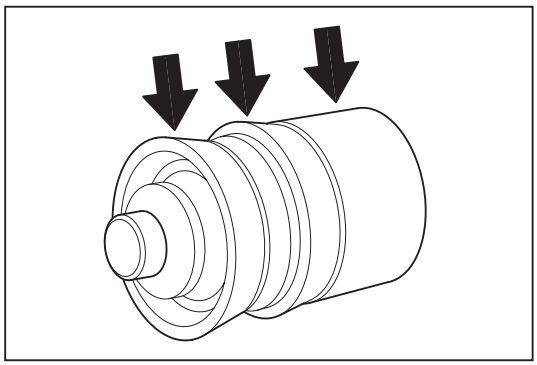
1. **Disconnect the clutch oil tube from the clutch slave cylinder**
   (a) Remove the clutch oil tube with tools.
   Tip:
   Collect the brake fluid with container.

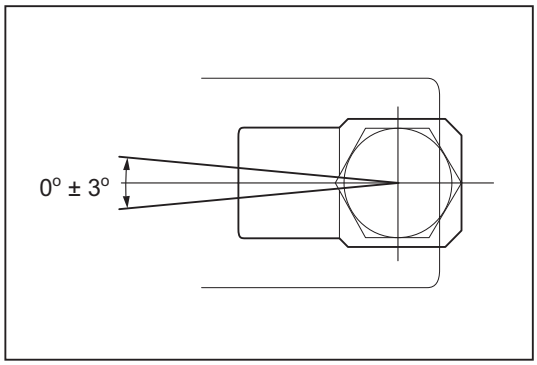


2. **Remove the clutch slave cylinder assembly**
   (a) Remove 2 bolts and clutch slave cylinder assembly.



3. **Remove the clutch release joint**
   (a) Remove the joint bolt.
   (b) Remove the clutch release joint and 2 gaskets.
4. **Remove the clutch slave cylinder component**
   (a) Remove the dust boot from the cylinder body.
   (b) Remove the push rod from the cylinder body.
   (c) Remove the piston from the cylinder body. Note: Do not damage the inner side of the cylinder.
   Note:
   Do not damage the inner side of the cylinder.
   (d) Remove the spring from the cylinder body.
   (e) Remove the cap of bleed screw.
5. **Remove the clutch slave cylinder bleed screw.**
6. **Install the clutch slave cylinder bleed screw**
7. **Install the clutch slave cylinder component**
   (a) Install the cap of bleed screw onto the bleed screw.
   (b) Install a new spring onto the cylinder body.
   (c) As shown in the figure, apply lubricating grease to the new piston.
   (d) Install the piston to the cylinder body.
   Note:
   Do not damage the inner side of the cylinder.
   (e) Install the push rod to the cylinder.
   (f) Install the dust boot to the cylinder.



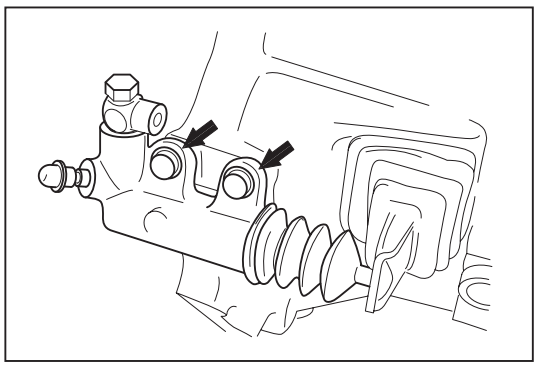


8. Install the clutch slave cylinder joint

(a) As shown in the figure, install the clutch release joint with joint bolts and 2 new gaskets.
Torque: 25 N•m

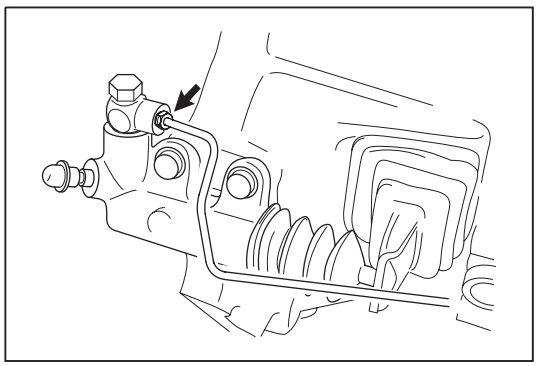
Note:

The setting angle of the clutch release joint should be 0°± 3° from the main body.



9. Install the clutch slave cylinder assembly

(a) Install the clutch slave cylinder assembly with 2 bolts.
Torque: 12 N•m



10. Connect the clutch oil tube to the clutch slave cylinder

(a) Connect the clutch oil tube.
Torque: 16 N•m

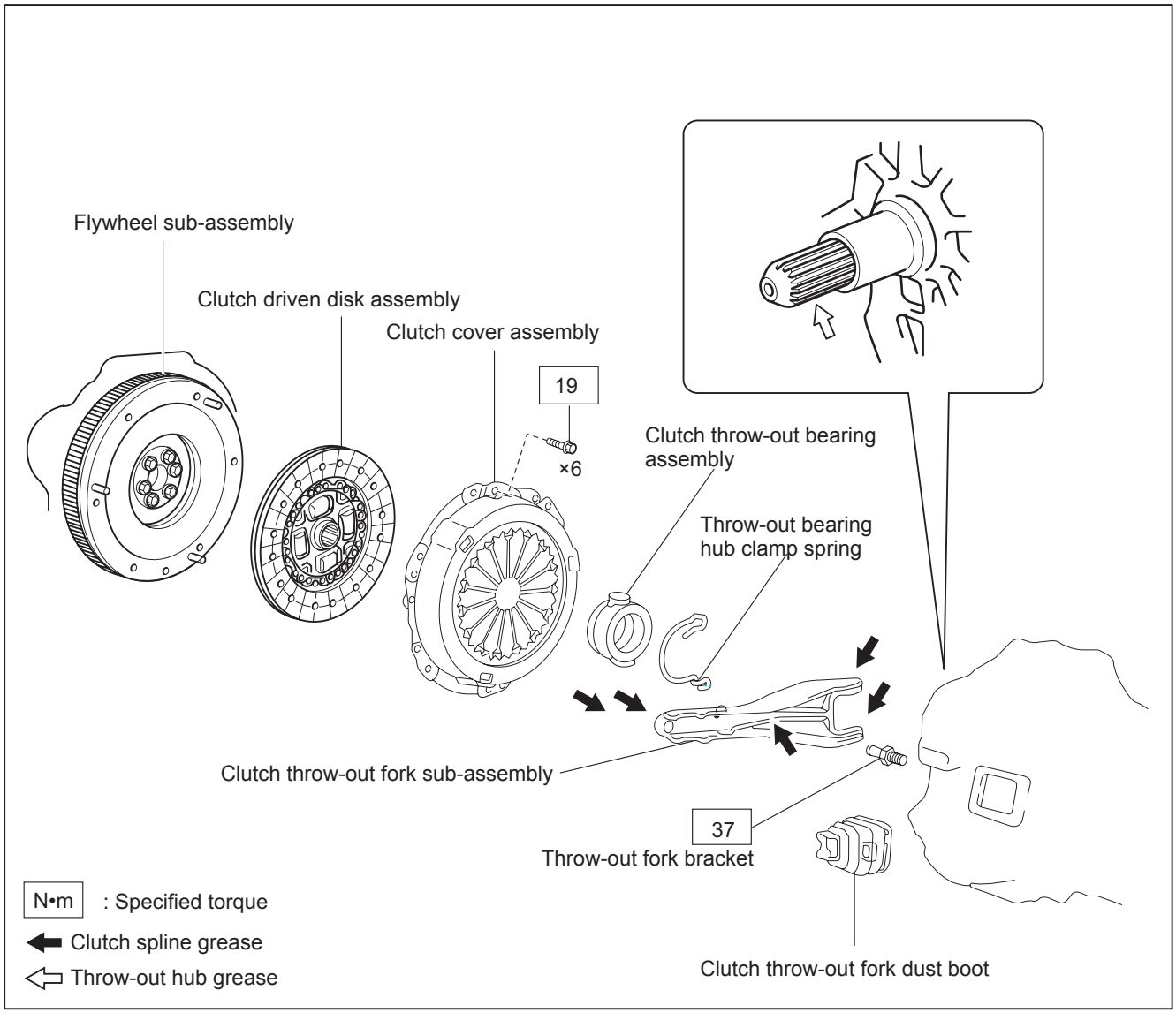
11. Discharge the gas in the clutch pipe

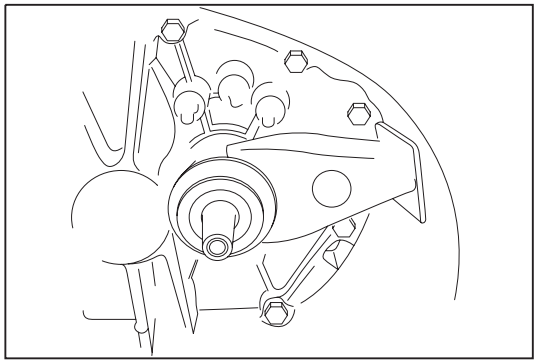
(a) Fill the brake fluid into the brake fluid reservoir and discharge the gas in the clutch system.
Torque: 8.4 N•m

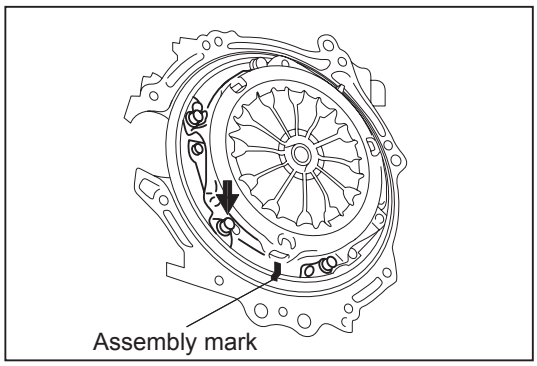
12. Inspect whether the clutch leaks fluid

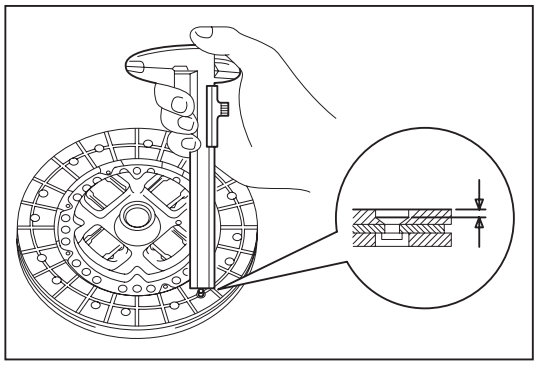
CLUTCH ASSEMBLY

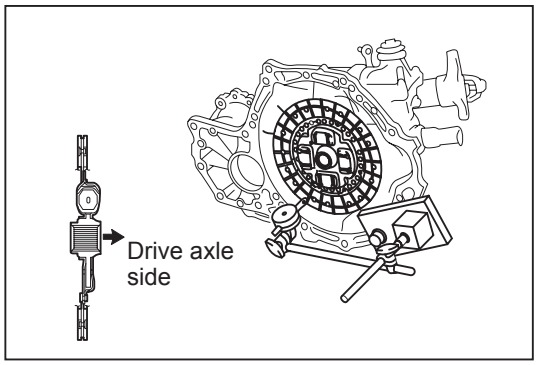
Structure Diagram











Overhaul

1. **Remove the drive shaft assembly**
2. **Remove the clutch throw-out fork sub-assembly**
   (a) Remove the clutch throw-out fork from the drive axle assembly.
3. **Remove the clutch throw-out fork boot**
4. **Remove the clutch throw-out bearing assembly**
   (a) Remove the clutch throw-out bearing assembly from the clutch throw-out fork.
5. **Remove the throw-out bearing hub clamp spring**
6. **Remove the throw-out fork bracket**
   (a) Remove the bracket and throw-out fork from the drive axle.
7. **Remove the clutch cover assembly**
   (a) Direct the assembly mark on the clutch cover assembly to the assembly mark on the flywheel sub-assembly.
   (b) Unscrew the fixing bolts for a cycle every time, until the spring tension is fully released.
   (c) Remove the fixing bolts and pull down the clutch cover assembly.

   Note:

   Don not let the clutch drop from the driven disk assembly.
8. **Remove the clutch driven disk assembly**
9. **Inspect the clutch driven disk assembly**
   (a) Measure the depth of the rivet head with sliding callipers.

   The minimum rivet head depth: 0.3 mm

   Change the clutch driven disk assembly if necessary.
   (b) Install the clutch driven disk assembly onto the drive shaft assembly.

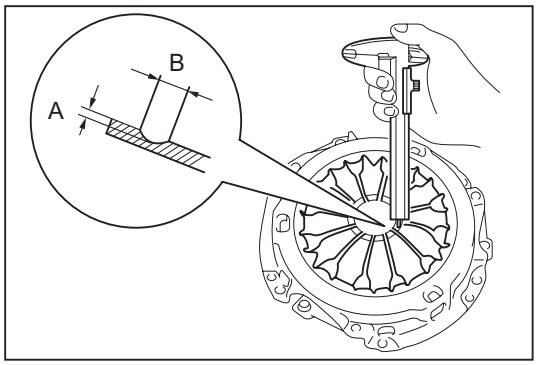
   Note:

   Do not install the clutch driven disk assembly in the wrong direction.

   (c) Inspect the jouncing of clutch driven disk assembly with dial gauge.

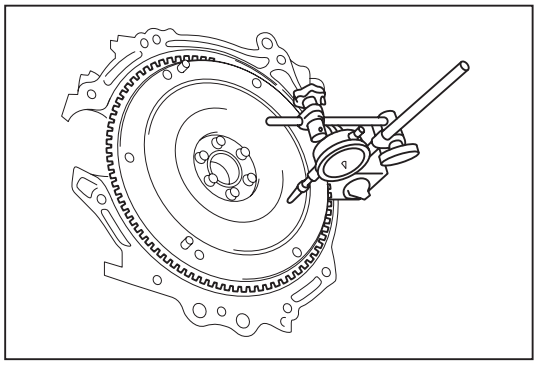
   The maximum jouncing: 0.8 mm

   Change the clutch driven disk assembly if necessary.



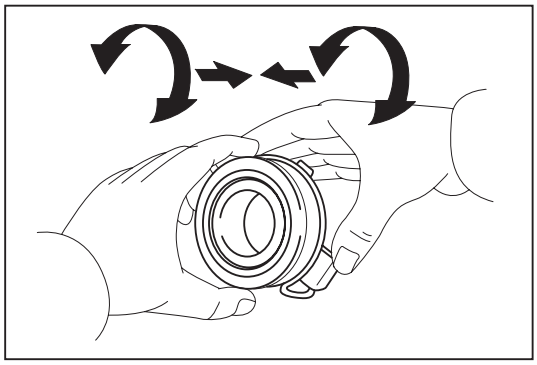
10. Inspect the clutch cover assembly

(a) Inspect the worn depth and width of the diaphragm spring with sliding callipers.
Maximum value:
A (Depth): 0.5 mm
B (Width): 6.0 mm
Change the clutch cover assembly if necessary.



11. Inspect the flywheel sub assembly

(a) Inspect whether the flywheel sub assembly jounces with dial gauge.
The maximum jouncing: 0.1mm
Change the flywheel if necessary.

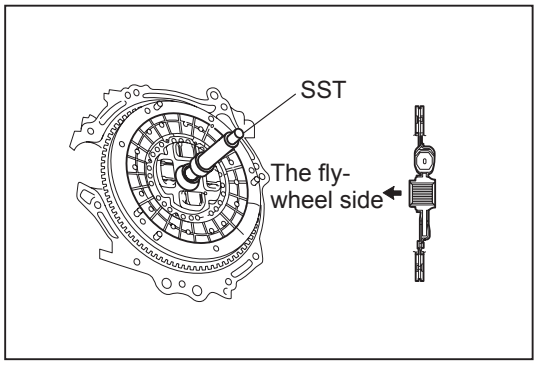


12. Inspect the clutch throw-out bearing assembly

(a) Turn the throw-out bearing with hand when apply axial force.

Tip:

- This bearing has permanent lubrication and does not need cleaning or lubricating.
- Change the throw-out bearing assembly if necessary.

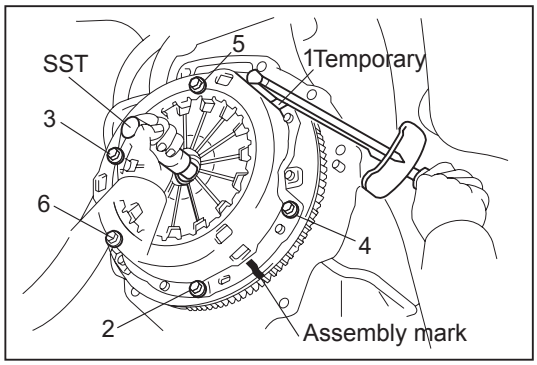


13. Install the clutch driven disk assembly

(a) Insert the SST into the clutch driven disk assembly, and then insert them into the flywheel sub-assembly.

Note:

Do not install the clutch driven disk assembly in the wrong direction.



14. Install the clutch cover assembly

(a) Direct the assembly mark on the clutch assembly to the assembly mark on the flywheel sub-assembly.

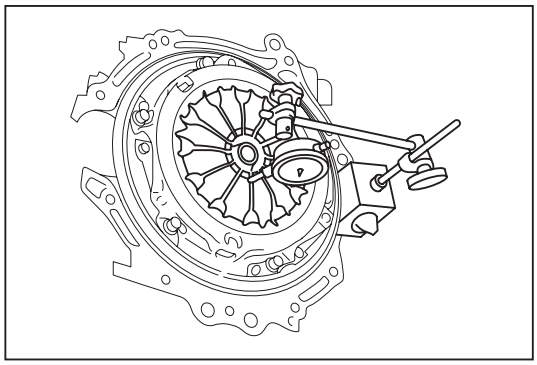
(b) As shown in the figure, start from the bolt which is located near the top aligning pin, tighten the 6 bolts one by one.

Torque: 19N•m

Tip:

Following the order shown in the figure, tighten the bolt a bit every time.

After inspect and insure the driven disk is located in the center, move the SST slightly in all direction to tighten the bolt.

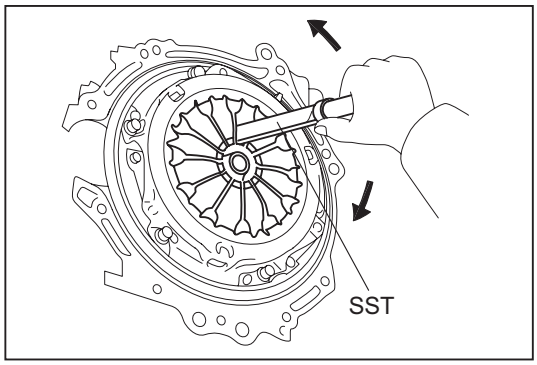


15. Inspect an adjust the clutch cover assembly

(a) Measure the height deviation of the top of diaphragm spring using dial gauge witch roller instrument.

The maximum deviation: 0.5mm

(b) If the deviation is out of the specified range, then adjust it with SST.



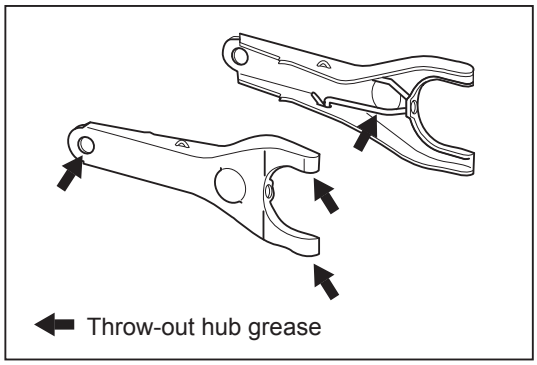
16. Install the throw-out fork bracket

(a) Install the throw-out fork bracket onto the drive axle assembly.

Torque: 37 N•m

17. Install the clutch throw-out dust boot

18. Install the throw-out bearing hub clamp spring



19. Install the clutch throw-out fork sub-assembly

(a) Apply throw-out hub lubricating grease on the contact surface between the throw-out fork and throw-out bearing assembly, the contact surface between the throw-out fork and push rod and the throw-out fork supporting point.

(b) Install the throw-out fork to the throw-out bearing assembly.

20. Install the clutch throw-out bearing assembly

(a) Apply clutch spline grease to the input shaft spline.

(b) Install the bearing to the throw-out fork, and then install them to the drive axle assembly.

Note:

Move the throw-out fork to and from after installation to inspect and make sure whether the clutch throw-out bearing slides smoothly.

21. Install the drive axle assembly

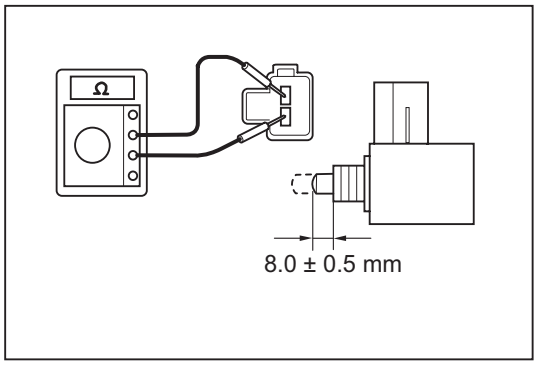
CLUTCH STARTING SWITCH ASSEMBLY

Vehicle Inspection

1. **Inspect the clutch starting system**
   (a) Inspect and make sure the engine can not start when the clutch pedal is released.
   (b) Inspect and make sure the engine starts when the clutch pedal is fully engaged.

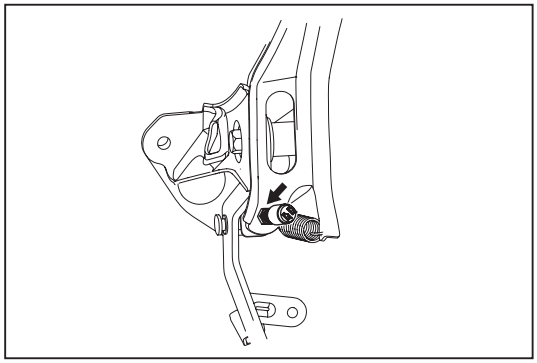
   Change the clutch starting switch assembly if necessary.

Inspection



1. **Inspect the clutch starting switch assembly**
   (a) Inspect whether the terminals are conducting when the switch is in the ON and OFF position.

Position of the Switch	Condition
ON (Press)	Conducting
OFF (Release)	Non- Conducting



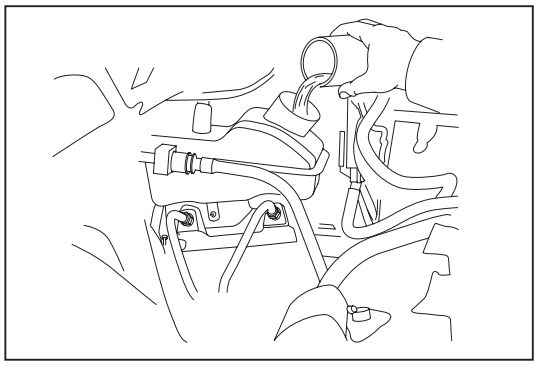
Replacement

1. **Remove the clutch starting switch assembly**
   (a) Disconnect the connector of the clutch starting switch assembly.
   (b) Unscrew the lock nuts, and remove the clutch starting switch.
   (c) Remove lock nuts from the clutch starting switch.
2. **Install the clutch starting switch assembly**
   (a) Install the clutch starting switch assembly with nuts.
   Torque: 6.2 N•m
   (b) Connect the connector of the clutch starting switch assembly.
3. **Inspect the clutch starting switch assembly**

DISCHARGING GAS IN THE CLUTCH HYDRAULIC SYSTEM

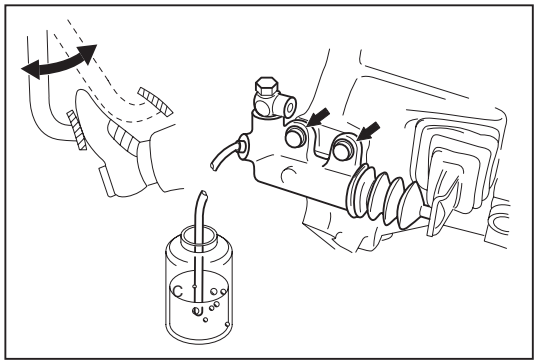
Tip:

After overhaul, there may be air in the pipe of clutch hydraulic control system; and air may come into the hydraulic system when adding brake fluid. Entrance of the air will shorten the master cylinder push rod stroke, namely pedal working stroke, thus make the clutch separate incompletely.



1. **Fill brake fluid to the fluid reservoir.**
   Brake fluid: DOT4 synthetic brake fluid
   Tip:
   The level of the brake fluid in the fluid reservoir should be between MIN and MAX.

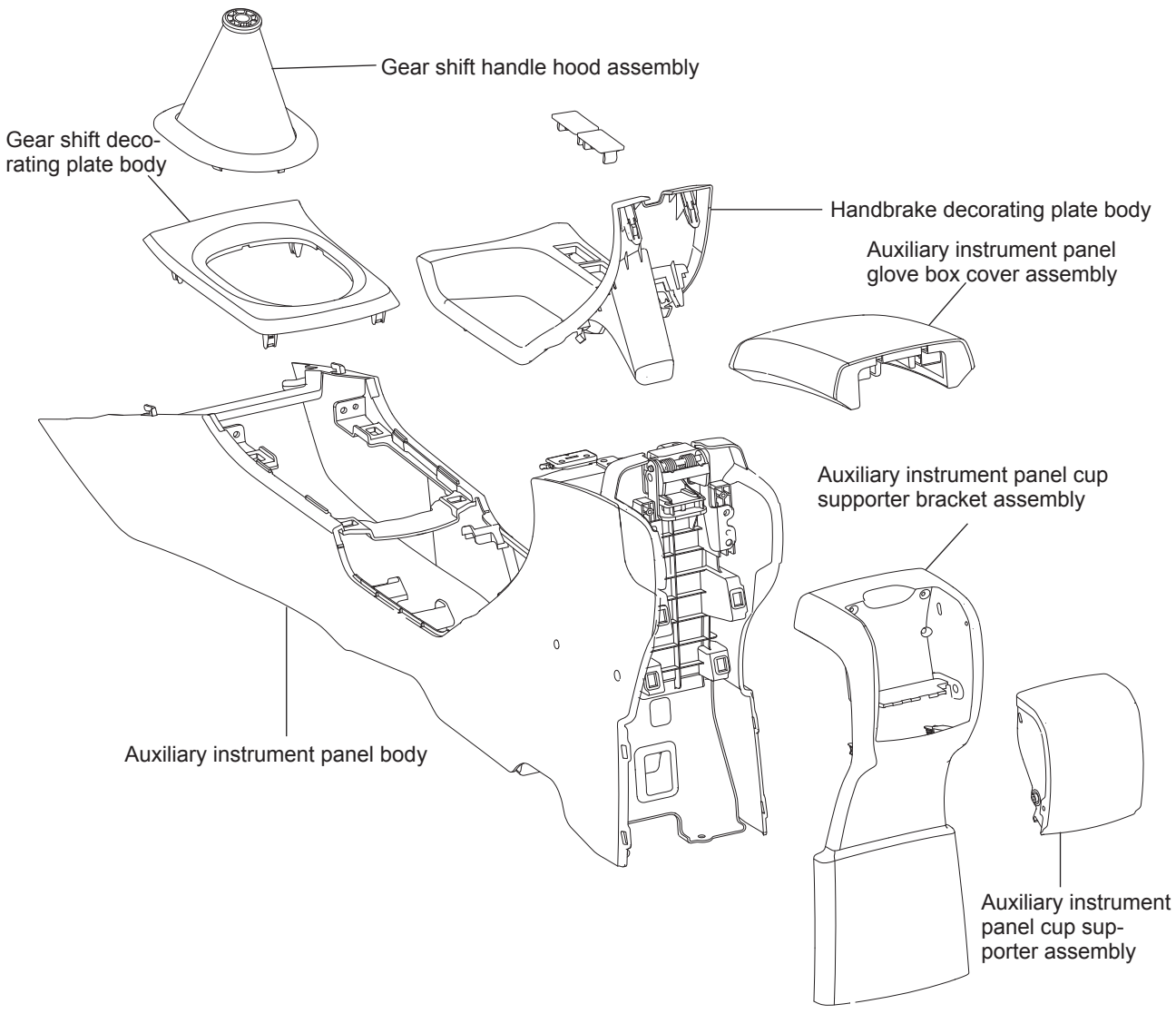
2. **Lift the vehicle.**
   (a) Lift the vehicle up to the proper height with lifter.

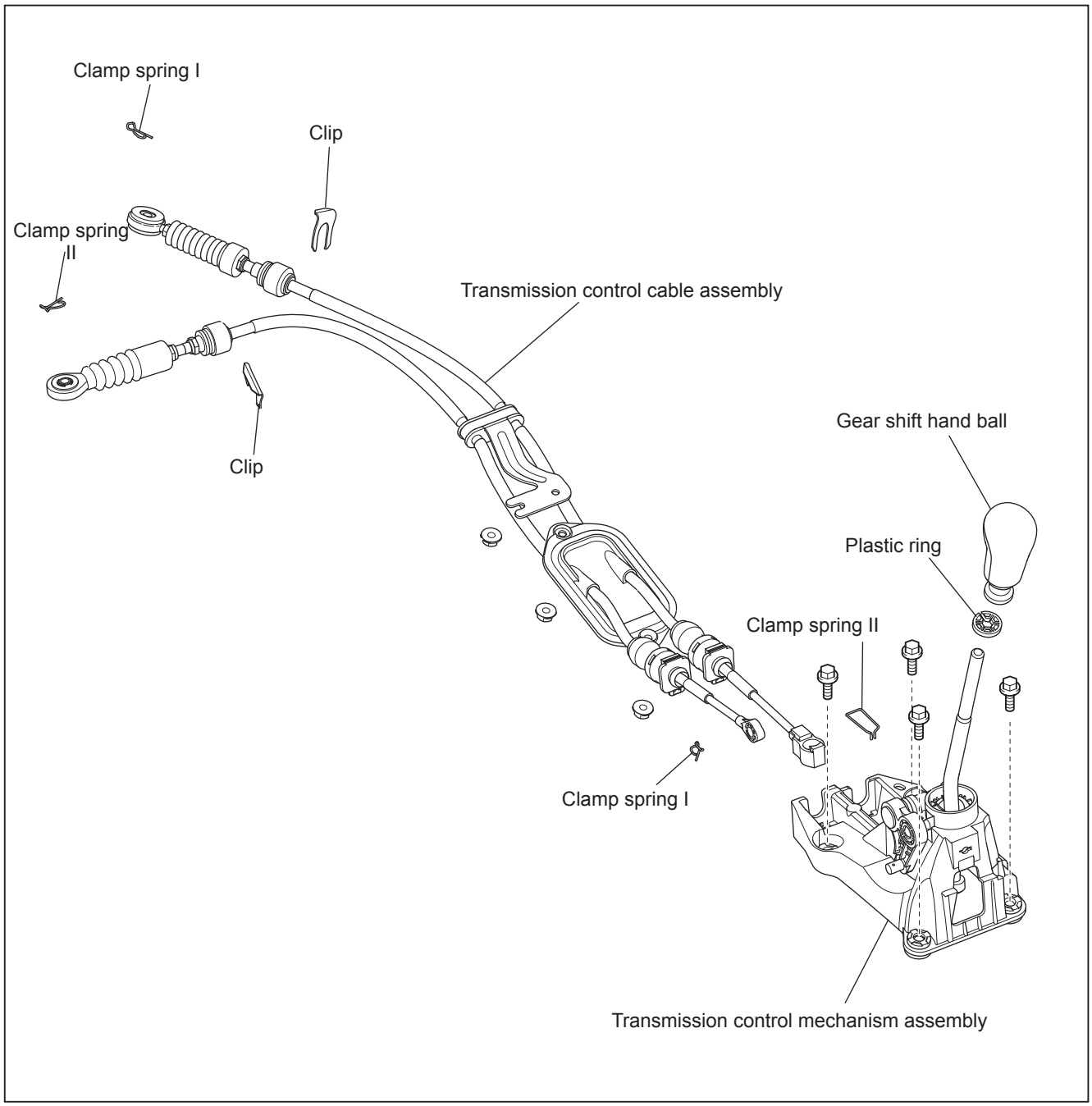


3. **Discharge the gas in the clutch hydraulic system.**
   (a) Connect the plastic tube to the bleed screw.
   (b) Press the clutch pedal several times, and unscrew the bleed screw when pressing down the clutch pedal.
   (c) When the brake fluid stops emitting, tighten the bleed screw and then release the clutch pedal.
   (d) Repeat (b) and (c) until all the air in the brake fluid has been exhausted.
   Tip:
   It takes two people to cooperate when discharging the air.
4. **After the air has been fully discharged, re-inspect and adjust the free stroke of the clutch pedal and add brake fluid.**

TRANSMISSION SHIFT CONTROL DEVICE (MT)

STRUCTURE DIAGRAM




Clamp spring I
Clip
Clamp spring II
Transmission control cable assembly
Clip
Gear shift hand ball
Plastic ring
Clamp spring II
Clamp spring I
Transmission control mechanism assembly

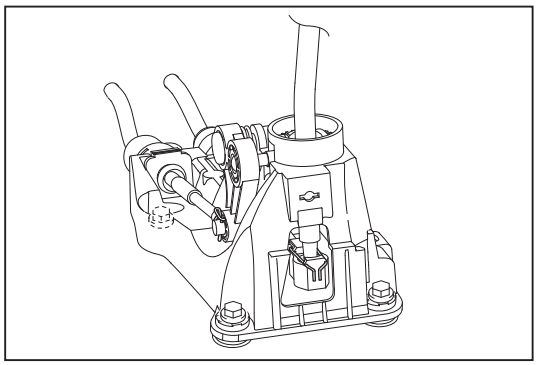
TRANSMISSION DIAGRAM MECHANISM ASSEMBLY

Removal

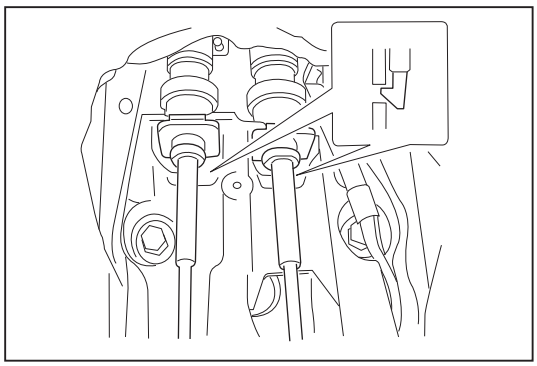
1.Remove the gear shift hand ball, hand ball hood and plastic ring

2. Remove the auxiliary instrument panel assembly

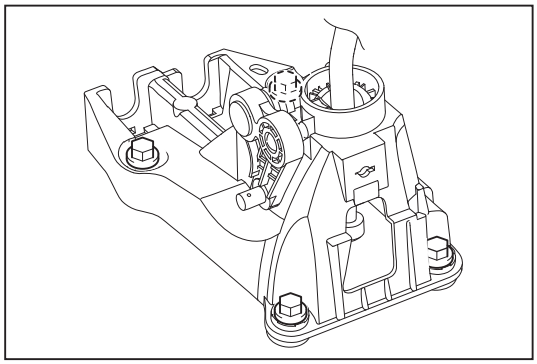
3. Remove the transmission control mechanism assembly



(a) Remove the clamp spring I and clamp spring II, and disconnect the joint between the transmission control mechanism and the gear shift cable.



(b) Disconnect the gear shift cable and the transmission control mechanism “U” shape groove coordinately with straight screwdriver.



4. Remove the transmission control mechanism
Remove 4 fastening bolts.

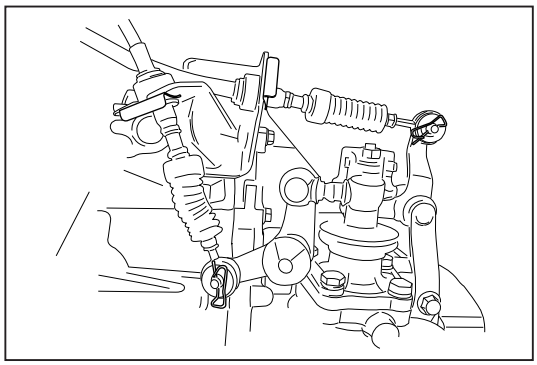
Installation

The installation order is contrary to the removal order.

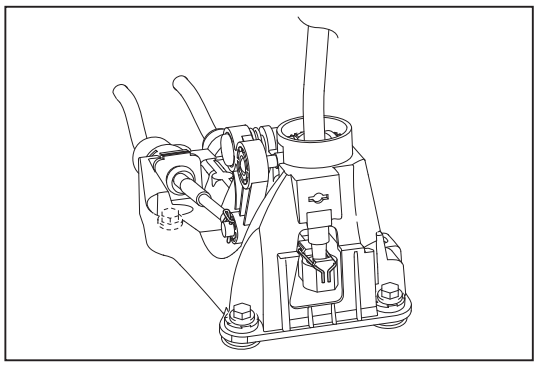
TRANSMISSION DIAGRAM CABLE ASSEMBLY

Removal

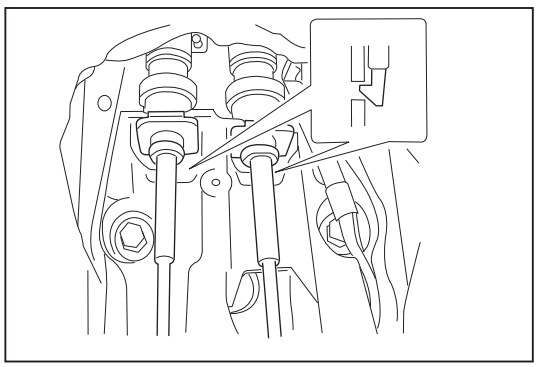
1. **Remove the gear shift hand ball, hand ball hood and plastic ring**
2. **Remove the auxiliary instrument panel assembly**
3. **Remove the air cleaner assembly**
4. **Remove the exhaust gas catalyst and insulation board**
5. **Remove the transmission control cable assembly**



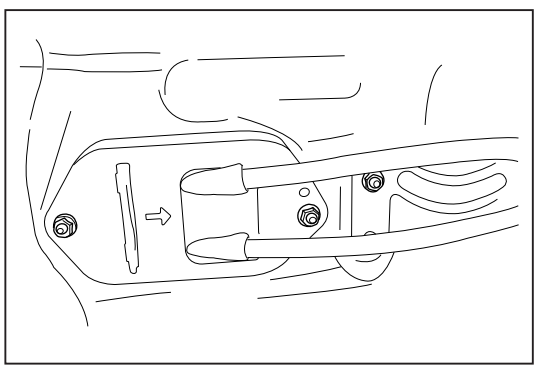
(a) Remove the clamp spring I and clip at the joint where the control cable meets the transmission, and remove the transmission control cable from the transmission mounting bracket.



(b) Remove clamp spring I and clamp spring II, and disconnect the joint between the transmission control mechanism and the gear shift cable.



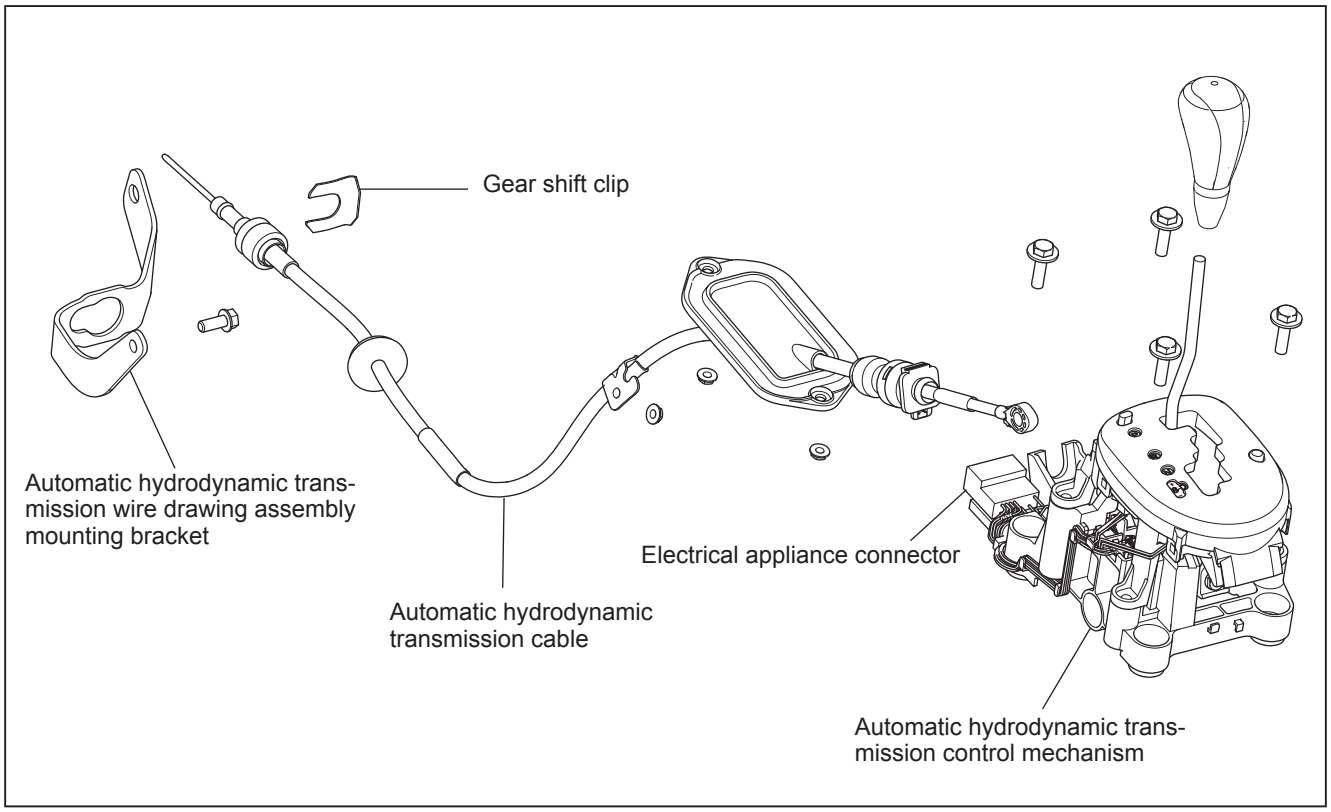
(c) Disconnect the gear shift cable and the transmission control mechanism “U” shape groove coordinately with straight screwdriver.



(d) Remove 3 nuts.

TRANSMISSION SHIFT CONTROL DEVICE (CVT)

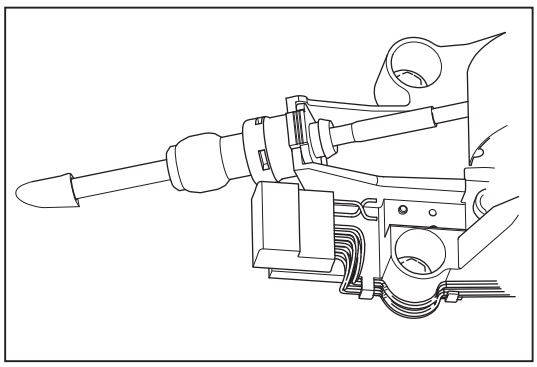
STRUCTURE DIAGRAM

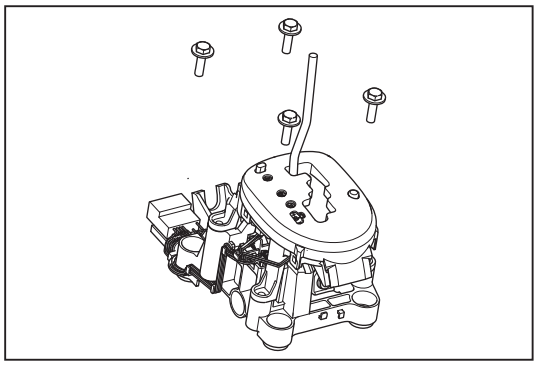


TRANSMISSION DIAGRAM MECHANISM ASSEMBLY

Removal

1. **Remove the auxiliary instrument panel assembly**
2. **Remove the transmission control mechanism assembly**
   (a) Pull out the electrical appliance connector
   (b) Remove the automatic hydrodynamic transmission wire drawing from the shifter.



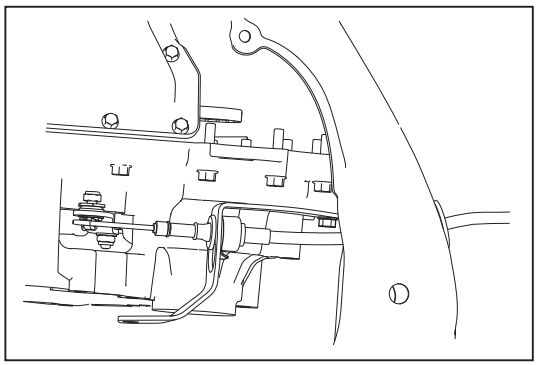


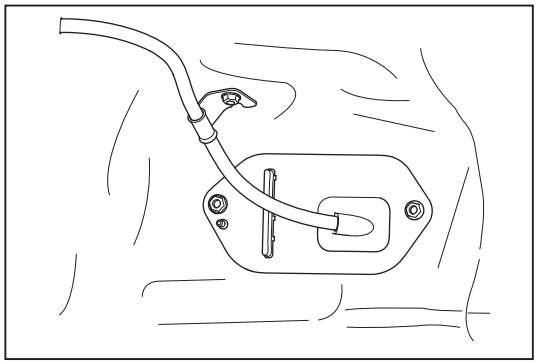
(c) Remove 4 bolts.

TRANSMISSION DIAGRAM CABLE ASSEMBLY

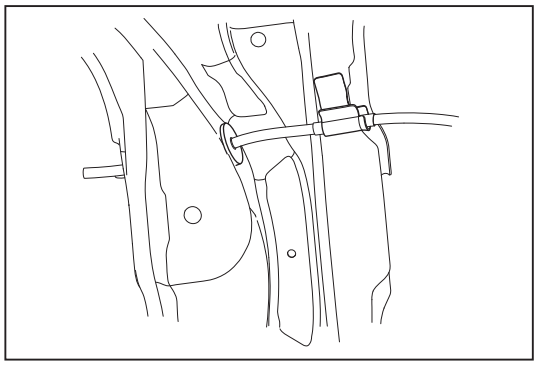
Removal

1. **Remove the auxiliary instrument panel assembly**
2. **Separate the cable and the shifter**
3. **Remove the air cleaner assembly**
4. **Remove the exhaust gas catalyst and insulation board**
5. **Remove the transmission control cable assembly**
   (a) Loosen the gear shift rocker nuts.
   (b) Change the gear shift clip.





(c) Remove the fastening nuts which fix the automatic hydrodynamic transmission wire drawing to the vehicle body.



(d) Remove the rubber plug of the automatic hydrodynamic transmission wire drawing.
(e) Remove the gear shift wire drawing from the complete vehicle.

SUSPENSION SYSTEM

SUSPENSION SYSTEM

FAULT DIAGNOSIS TABLE 2

WHEEL ALIGNMENT

BRIEF INTRODUCTION 3
PARAMETER DESCRIPTION.....3
PRELIMINARY INSPECTION 5
FRONT WHEEL ALIGNMENT.....5
REAR WHEEL ALIGNMENT 7

FRONT SUSPENSION

STRUCTURE DRAWING.....8
FRONT SHOCK ABSORBER 11
AUXILIARY FRAME 13
THE LOWER SWING ARM ASSEMBLY 16
FRONT TRANSVERSE STABILIZER ASSEMBLY.....19

REAR SUSPENSION

STRUCTURE DIAGRAM 20
REAR SHOCK ABSORBER.....21
REAR COIL SPRING 23
REAR TORSION BEAM ASSEMBLY 24

TIRES AND WHEELS

TIRES.....27
WHEELS 32

SUSPENSION SYSTEM

FAULT DIAGNOSIS TABLE

Front Suspension

Fault Symptom	Fault Causes	Troubleshooting
Front suspension noise	The connecting bolts of the front shock absorber, steering knuckle and lower arm (tie rod arm) are loose.	Retighten each loose bolt
	The front shock absorber leaks oil seriously or the piston rod and cylinder tube of the front shock absorber are badly worn.	Change the front shock absorber
	The front or rear bushing of lower swing arm (tie rod arm) is worn, aged or damaged	Change the bushing
	The coil spring is invalid or snapped.	Change the coil spring
Front wheel deviation	The pressure of two front wheels is inconsistent.	Charge air into both front wheels to the normal pressure
	The tires of two front wheels are worn, which makes the adhesive power with the road smaller.	Change the tire
	The left or right coil spring is damaged or has permanent deformation.	Change the coil spring
	The left or right front absorber is damaged or deformed.	Change the front shock absorber
	The front wheel alignment angle is incorrect.	Re-inspect and adjust the front wheel alignment angle
	The bushing of the transverse stabilizer is damaged or the fixing bolts are loose.	Change the rubber boots and retighten the bolts
Front wheel wobble	The steel ring bolts of the wheel rim is loose.	Tighten the steel ring bolts according to specified moment
	The bolts (nuts) of the front suspension are loose.	Tighten the bolts (nuts) of steering knuckle, front shock absorber and lower swing arm
	The front hub bearing is worn, which makes the clearance larger.	Change the bearing
	The wheel hub wobbles.	Change the wheel hub
	The wheel is unbalanced.	Balance the wheel
	The ball stud (ball joint)of lower swing arm (tie rod arm) is worn or loose.	Change the ball stud (ball joint)
	The ball stud of steering tie rod is worn or loose.	Change the ball stud
	The alignment angle of front wheel is incorrect.	Correct the toe-in and camber of the front wheel
Abnormal wear of front wheel tire	The pressure of front wheel is abnormal.	Charge air correctly, neither too high or too low pressure
	The alignment angle of front wheel is incorrect.	Correct the toe-in and camber of the front wheel
	Front wheel wobble.	Overcome various front wheel wobble faults

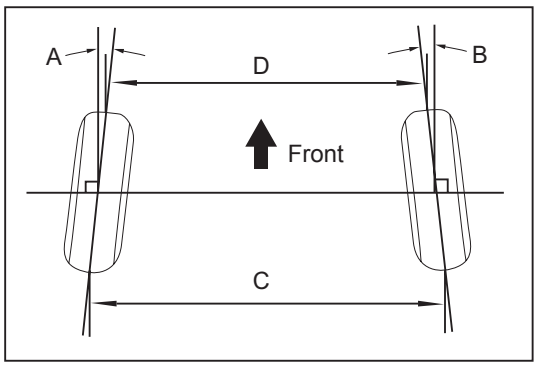
Rear Suspension

Fault Phenomenon	Fault Causes	Troubleshooting
Rear wheel wobble	The rim of rear wheel wobbles.	Change the rear wheel rim
	The rear wheel is unbalanced.	Balance the rear wheel
	The clearance of the rear wheel hub is too large.	Adjustment
	The rear hub bearing is damaged.	Change the bearing
	The air pressure of the rear wheel tire is abnormal.	Charge air correctly
	The rear axle has deformation.	Change the rear axle
	The shock absorber is invalid.	Change the rear shock absorber
	The needle bearing between the trailing arm and the rear stern tube bracket assembly is damaged.	Change the needle bearing
Rear suspension noise	The rear shock absorber leaks oil or is damaged.	Change the rear shock absorber
	The cushion collar at the rear shock absorber side is damaged.	Change the cushion collar
	The rear hub bearing is damaged.	Change the bearing
	The bolts (nuts) of rear suspension are loose.	Retighten the bolts (nuts)
	The rubber supporter of the rear axle is damaged.	Change the rubber supporter of the rear axle
	The spline between the torsion bar and trailing arm, rear stern tube bracket assembly is worn or loose.	Change the torsion bar
	The needle bearing between the trailing arm and the rear stern tube bracket assembly is damaged.	Change the needle bearing

WHEEL ALIGNMENT

BRIEF INTRODUCTION

The wheel alignment means the installation of each wheel, steering knuckle and axle to the vehicle frame should keep a certain relative position. Generally, wheel alignment means the front wheel alignment, and there are 4 parameters of front wheel alignment: king pin caster, king pin inclination, camber of front wheel and toe-in of front wheel. The major function of wheel alignment is to keep the stability of vehicle during straight running, ensure the smooth steering of vehicle when turning and make the steering wheel return automatically to reduce tire wearing.



PARAMETER DESCRIPTION

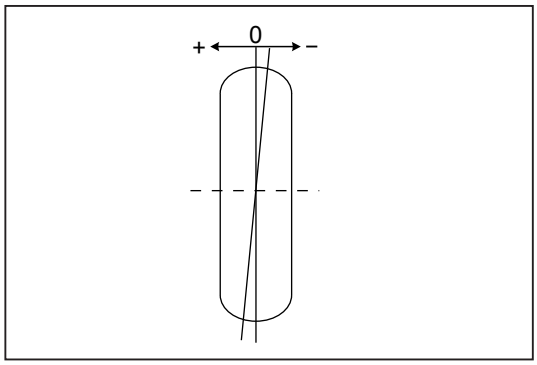
Toe-in

Toe-in means the measured value of inclination or camber amount when the front wheel and/or rear wheel are in the direct forward position. The function of toe-in is to make sure the wheel of both sides roll in parallel. The toe-in can also compensate the small deviation of the wheel supporting system when the wheel rolling forward. In other words, if change the wheel to toe-in mode when the vehicle is at rest, the wheels will roll in parallel when the vehicle is in motion.

Improper toe-in adjustment will lead to early tire wearing and unsteady steering.

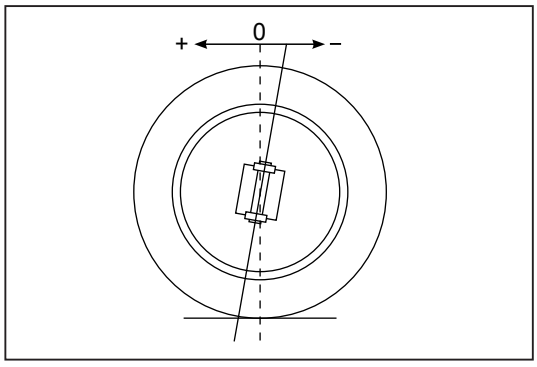
When the wheel inclines inward, the toe-in is positive (+).

When the wheel inclines outward, the toe-in is negative (-).



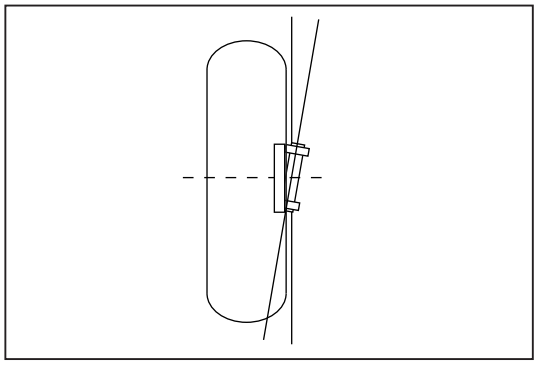
Camber

Camber means the angle of wheel inclination away from the vertical when observed directly ahead of the vehicle.
Amount of inclination is the degree of inclination away from the vertical. The set value of camber affects the direction control and wearing of tire.
When the top of the wheel inclines outward, the camber is positive (+).
When the top of the wheel inclines inward, the camber is negative (-).
Overlarge positive camber will lead to early wear of tire and excessive wear of the suspension part. Overlarge negative camber will lead to early wear of the inner tire and excessive wear of the suspension part.
If the difference between camber of both sides is 1°or more, it will lead to the deviation of the vehicle to the side with larger camber.
The adjustment of camber can be used on front and rear wheel of the vehicle.



King Pin Caster

The king pin caster means the front and back inclination of the highest point of the steering wheel in the vertical direction when viewing from the side of the vehicle. The king pin caster affects the direction control of the steering mechanism but not wear of the tire. If the positive king pin longitudinal inclination of a wheel is larger than those of other wheels, it will lead to the wheel declining to the vehicle center. When the positive king pin longitudinal inclination is too small, it is hard for the wheel to turn, and the return performance of the vehicle will decrease when the turning is finished.
Backward inclination of the top is positive (+) and frontward inclination is negative (-).



King pin inclination

King pin inclination means the front and back inclination of the highest point of the steering wheel in the vertical direction when the vehicle is seen from the longitudinal. The function of king pin inclination is to make the wheel return automatically after steering, and make the steering operation convenient. The larger the king pin inclination or the steering wheel deflection angle is, the higher the front of vehicle will be lifted, and the larger the return function of steering wheel is.

PRELIMINARY INSPECTION

When any operation which has influence to the wheel alignment is carried out, the following inspection and adjustment should be carried out to make sure the alignment indication is correct:

Inspection	Operation
Inspect whether the gas pressure is proper, and whether the wear of tire tread is normal.	Charge air into the tire to proper pressure. Change the tire if necessary.
Inspect runout of the wheel and tire.	Measure and correct the tire runout.
Inspect the vehicle head raising height.	Correct the head raising height. Make correction before adjusting the toe-in.
Inspect whether the wheel bearing is loose, and whether the play or clearance is too large.	Tighten the axle nuts to the proper specification. Change the wheel bearing if necessary.
Check whether the end of the ball joint and steering tie rod are loose	Tighten the connecting bolts of ball joint and steering tie rod.
Inspect whether the steering engine of the auxiliary frame is loose.	Tighten the steering engine fixing bolts.
Inspect whether the shock absorber has wear, leakage or any obvious noise.	Chang the pillar assembly.
Inspect whether the control arm and transverse stabilizer is loose or worn.	Tighten the connecting bolts. Change the bushing if necessary.

Attentions

Shake the vehicle for 3 times before inspecting the wheel alignment to keep the vehicle height stable, thus avoid incorrect reading.

The toe-in must be inspected after the camber is changed.

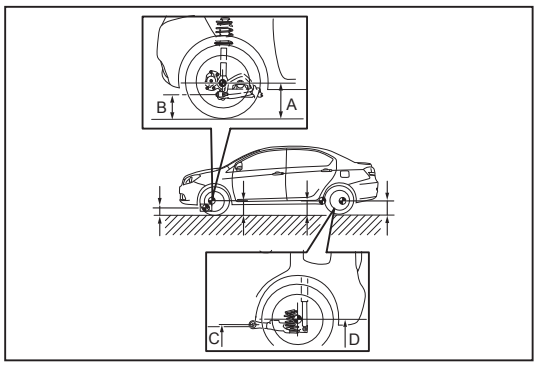
Carry out adjustment of four wheel alignment according to the following order:

1. Rear wheel camber
2. Toe-out
3. Front wheel camber
4. Toe-in and steering wheel turn angle

FRONT WHEEL ALIGNMENT

Adjustment

The rear wheel alignment should be adjusted well before adjusting the front wheel alignment.



1. Measure the height of the vehicle

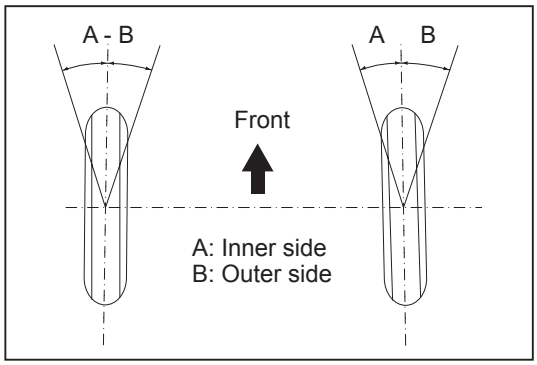
Measuring point:

A: Distance between the center of front wheel and the ground

B: Distance between the center of front bolt of the front suspension lower swing arm and the ground

C: Distance between the center of fixing bolt of rear torsion beam and the ground

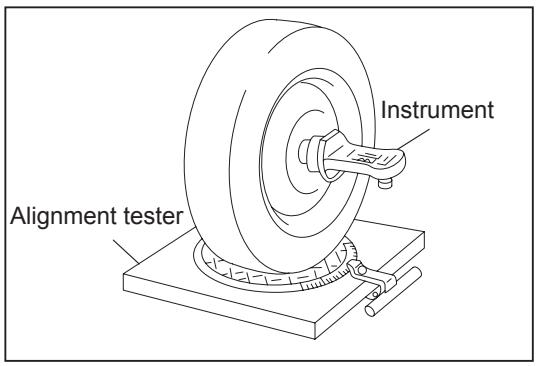
D: Distance between the center of rear wheel and the ground



2. Inspect the wheel turn angle

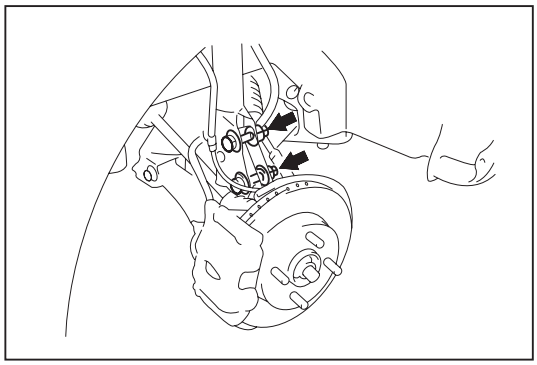
Turn the steering wheel to the end, and measure the turn angle. If the inner turn angle of left or right wheel is inconsistent with the specified value, then inspect the left and right length.

Remark: First adjust the distance between the chassis and the ground to the specified value before inspect the center alignment of the wheel.



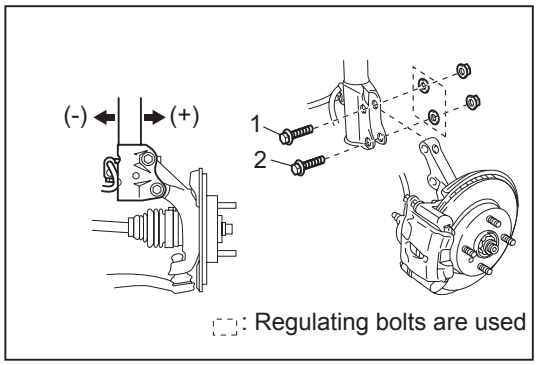
3. Inspect the front wheel camber, front wheel king pin caster angle and front wheel king pin inclination:

If the king pin caster and inclination of the front wheel is out of the specified range, first correct the camber, and then re-inspect whether the suspension parts are damaged and/or worn.

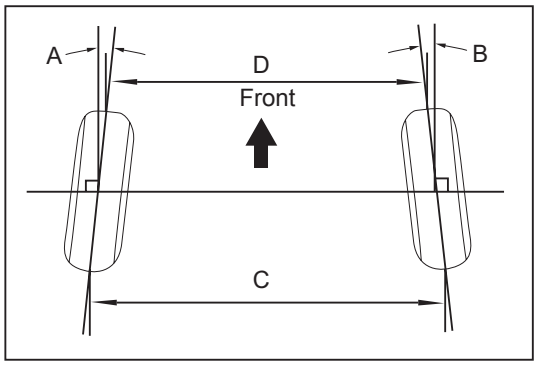


4. Adjust the camber

(a) Remove the front wheel.
(b) Remove the 2 nuts under the shock absorber.
(c) Clean the shock absorber mounting surface and the steering knuckle.

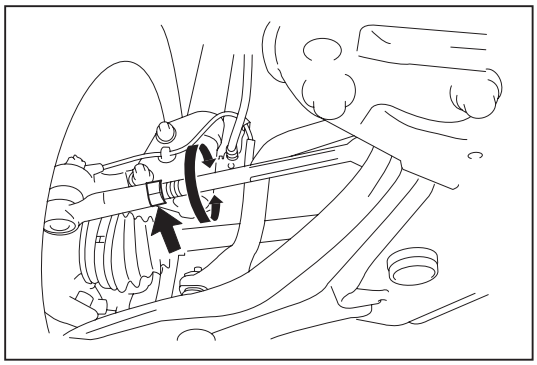


(d) Install 2 nuts for the moment.
(e) Pull and push the bottom side of the shock absorber along the direction needed for adjusting the camber to adjust the camber.
(f) Tighten the nuts.
Torque: 164±20 N•m
(g) Install the front wheel.
Torque: 110 N•m
(h) Inspect the camber.



5. Inspect the toe-in

The toe-in need adjustment if it is out of the specified range.



6. Adjust the toe-in

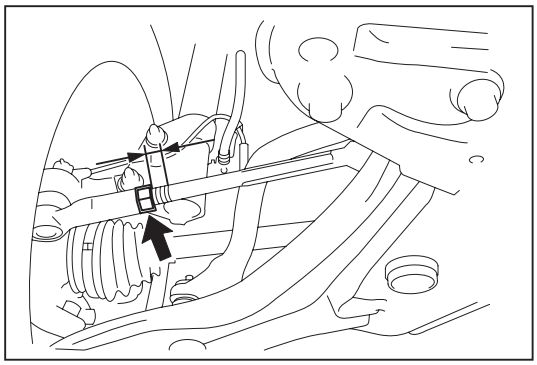
Remark:

The camber should be adjusted well before inspect the toe-in.

(a) Remove the retaining clip of the gear rack dust boot.

(b) Loosen the lock nuts on the tie rod joint.

(c) Turn the left and right gear rack with equal quantity to adjust the toe-in.



(d) Make sure the length of the left and right gear rack joint is the same.

(e) Tighten the lock nuts on the tie rod joint.
Torque: 37 N•m

(f) Put the boot on the base and install clips.

Remark:

Make sure the boot does not distort.

REAR WHEEL ALIGNMENT

Inspection

1. Inspect the tire

2. Measure the height of the vehicle

Note:

Adjust the vehicle height to the specified value before inspecting the wheel alignment.

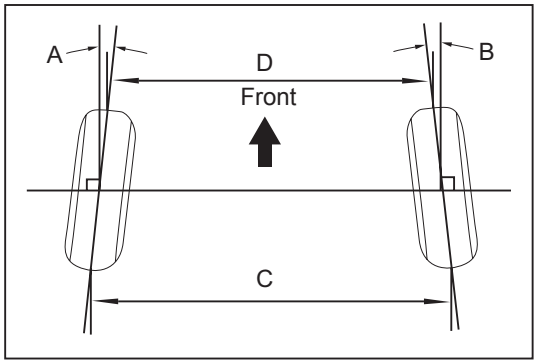
3. Inspect the camber

(a) Install front wheel alignment tester or put the vehicle on the wheel alignment tester.

(b) Inspect the camber.

Camber:

If the measuring value is out of the specified range, then inspect whether the suspension parts are damaged and/or worn. Since the camber can not be adjusted, change the parts if necessary.

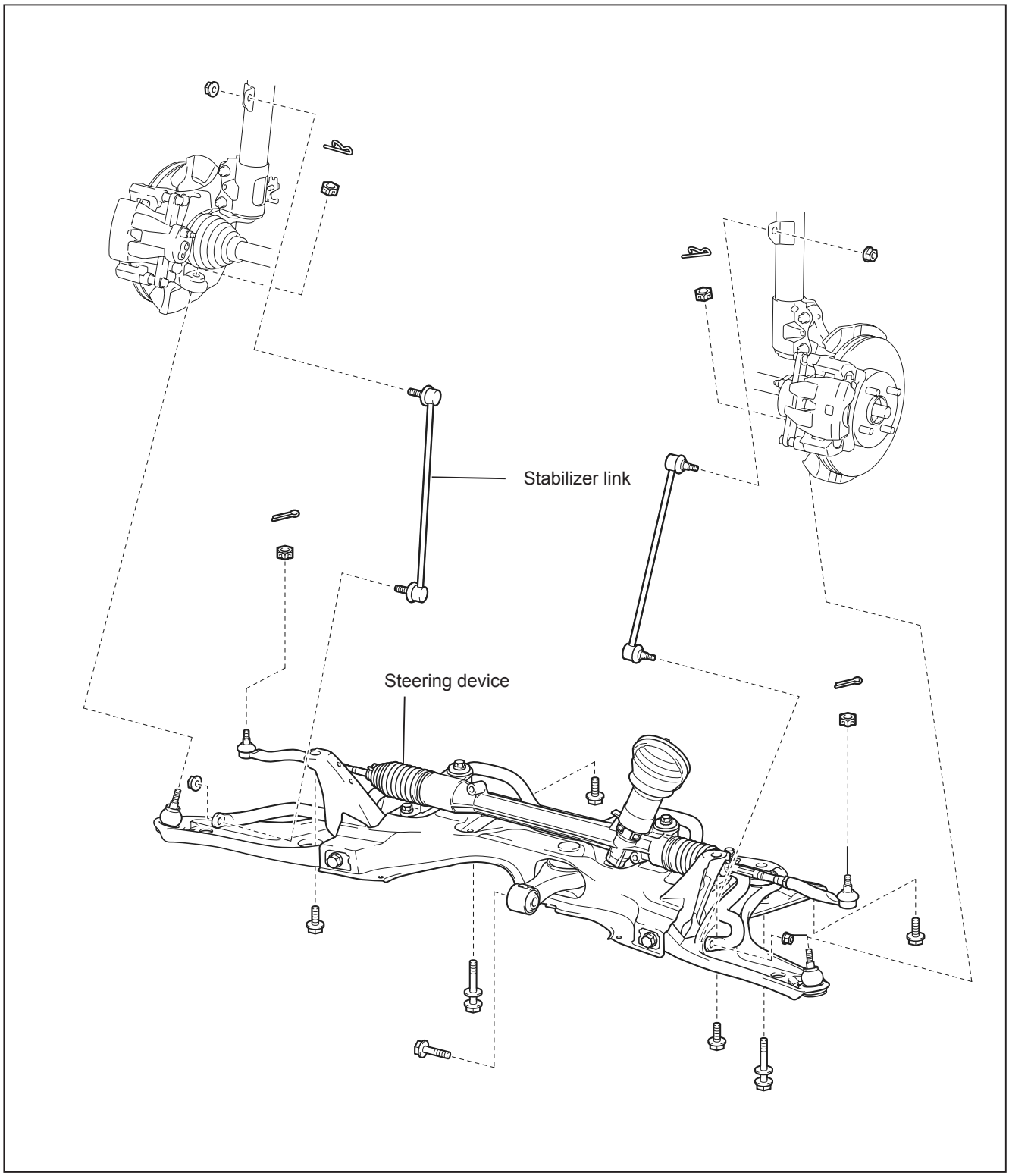


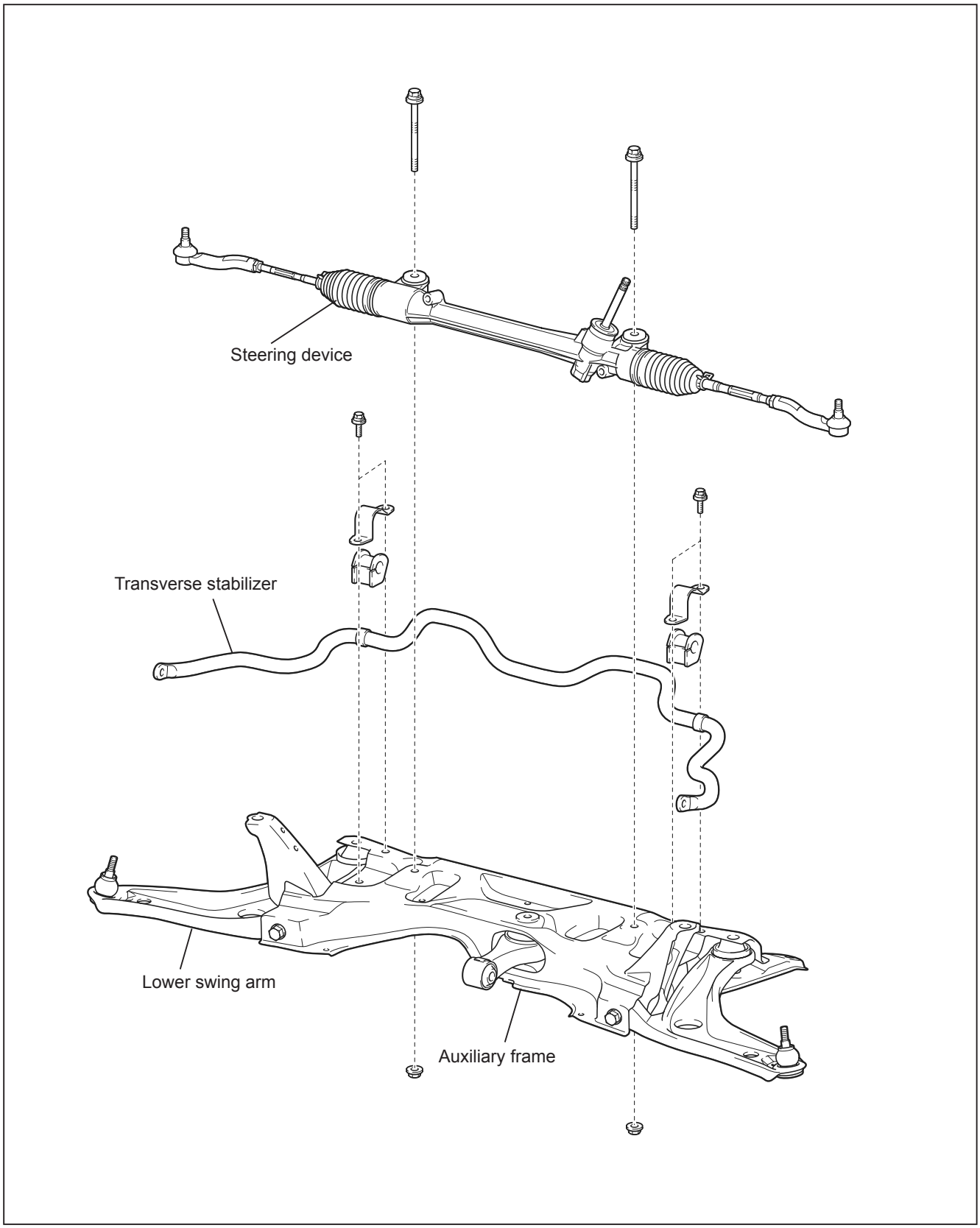
4. Inspect the rear wheel toe-in

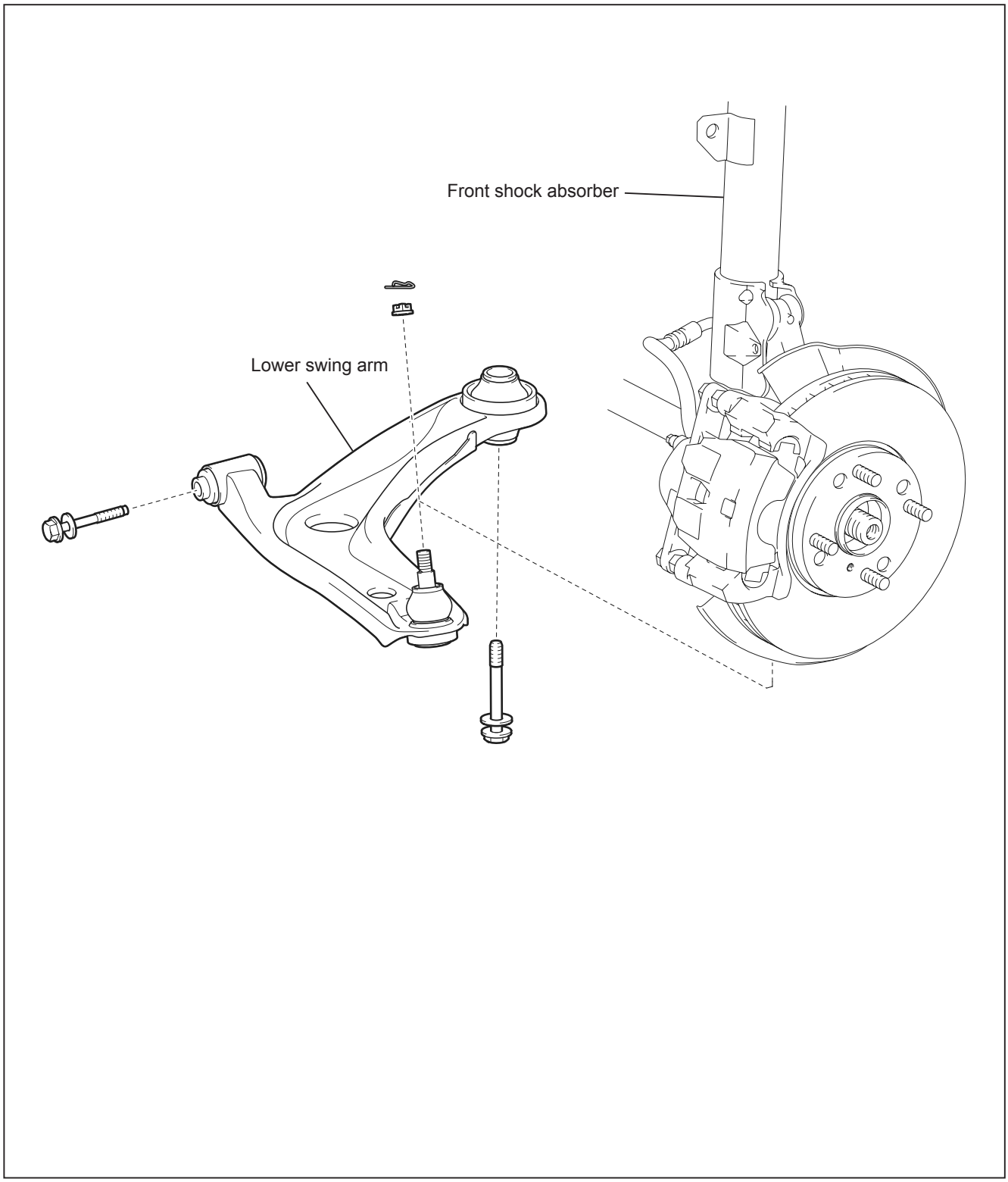
If the toe-in is out of the specified range, then inspect the suspension parts and change them if necessary.

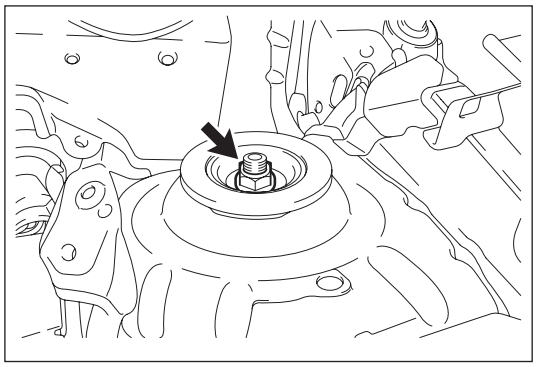
FRONT SUSPENSION

STRUCTURE DRAWING




Steering device
Transverse stabilizer
Lower swing arm
Auxiliary frame

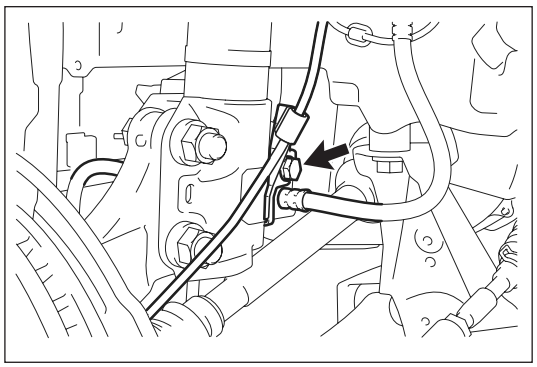

Front shock absorber
Lower swing arm



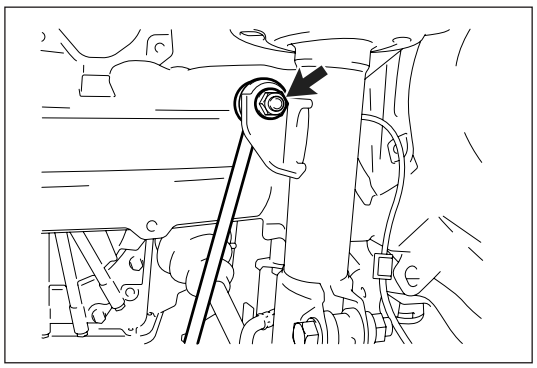
FRONT SHOCK ABSORBER

Removal

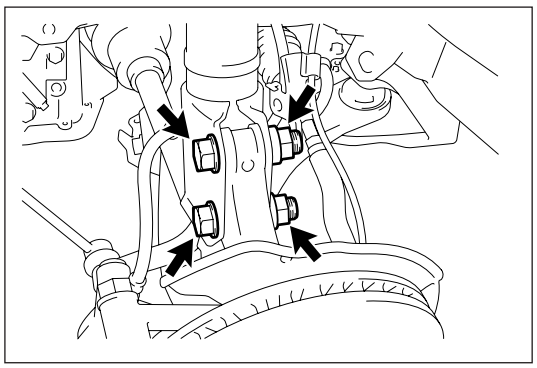
1. Open the engine hood
2. Take down the dust boot of nuts
3. Lift the whole vehicle with a lifter
4. Remove the tire assembly



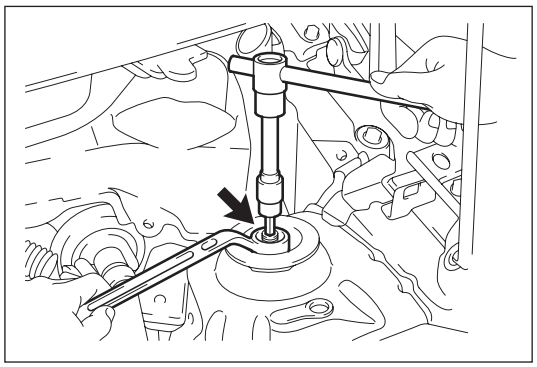
5. Remove the braking hose



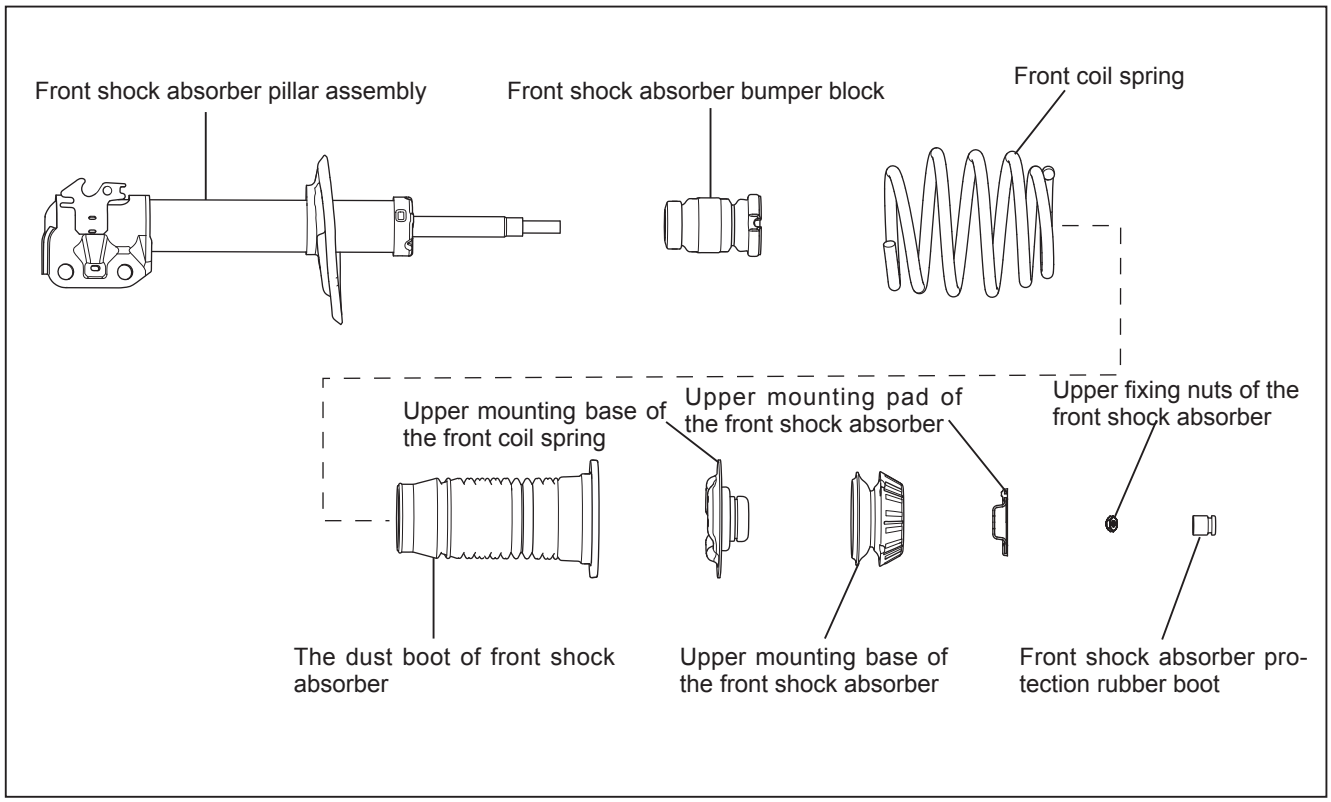
6. Remove the stabilizer link



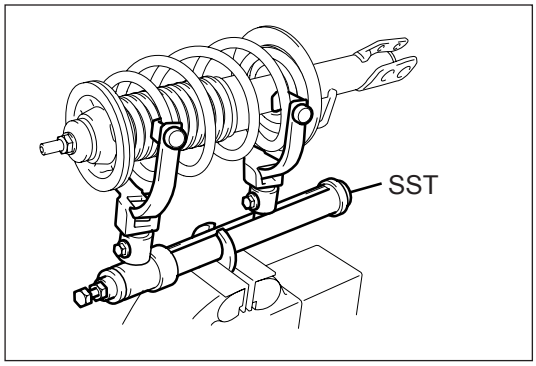
7. Remove the shock absorber and steering knuckle mounting bolts



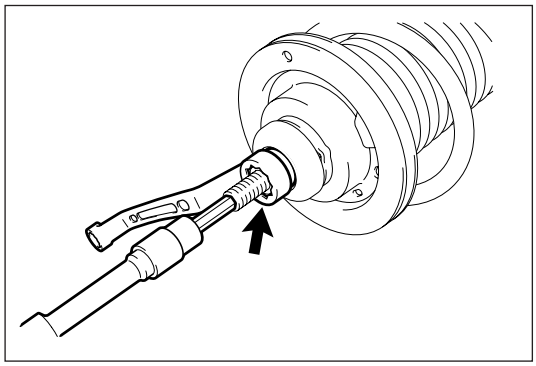
8. Remove the upper mounting point of the shock absorber



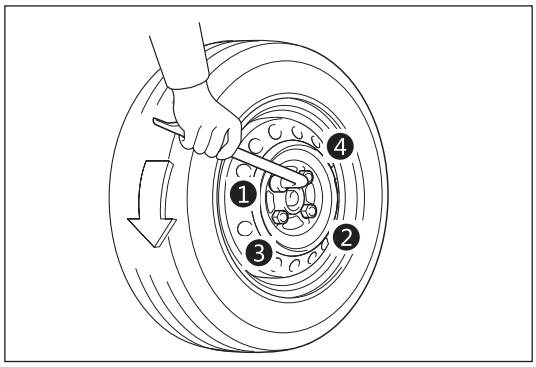
Disassemble



1. **Fix the coil spring assembly of the shock absorber with special tool**



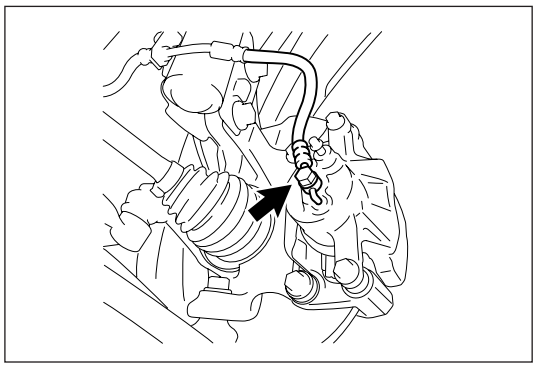
2. **Remove the upper fixing nuts of the front shock absorber**
3. **Remove the upper mounting pad of the front shock absorber**
4. **Remove the upper mounting base of the front shock absorber**
5. **Remove the upper mounting base of the front coil spring**
6. **Remove the front coil spring**
7. **Remove the front shock absorber boot**
8. **Remove the front shock absorber bumper block**



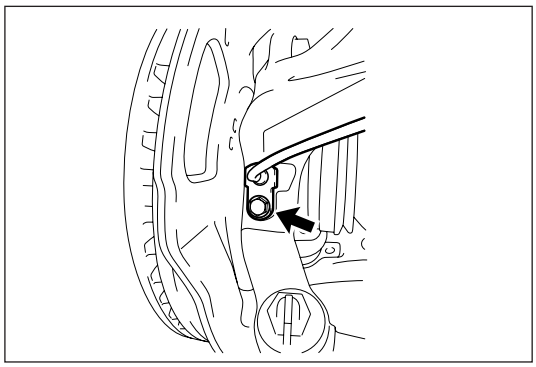
AUXILIARY FRAME

Removal

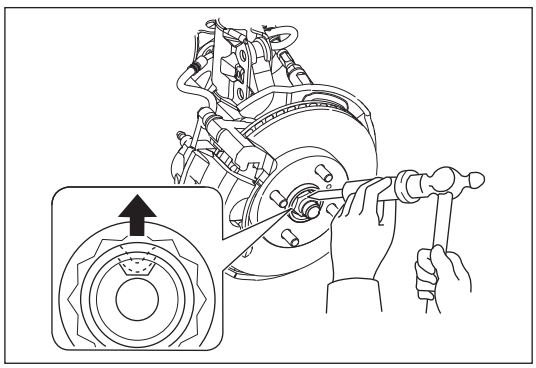
1. **Lift the vehicle with lifter, and remove wheels of both sides**



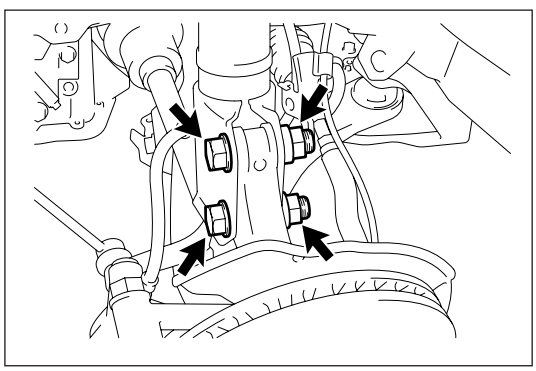
2. **Remove the braking hose**
   (a) Remove the eye bolts of the left and right braking hose.
   (b) Pull out the braking hose
   Note:
   Fill the brake fluid in a special container.



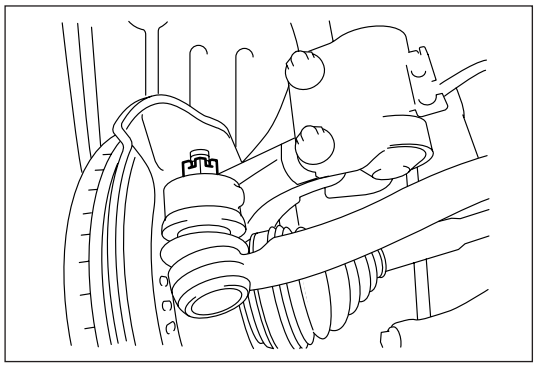
3. **Remove the speed sensors of the left and right front wheels**



4. **Remove the drive shaft**
   (a) Remove the drive shaft nuts.



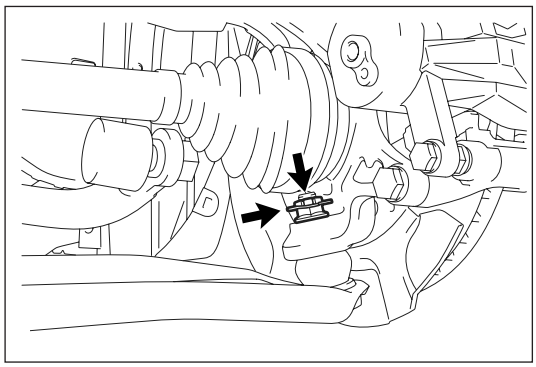
   (b) Remove the fixing bolts connecting the front shock absorber and steering knuckle, and pull out the drive shaft.



5. Remove the steering knuckle

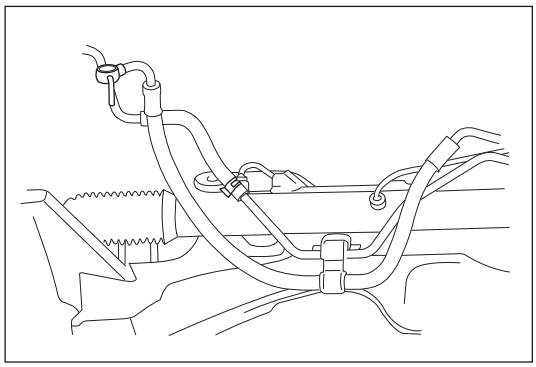
(a) Remove the steering tie rod ball split pin and steering ball nuts.

(b) Knock the male cone of the steering device with hammer, and take out the steering device ball making use of vibration.

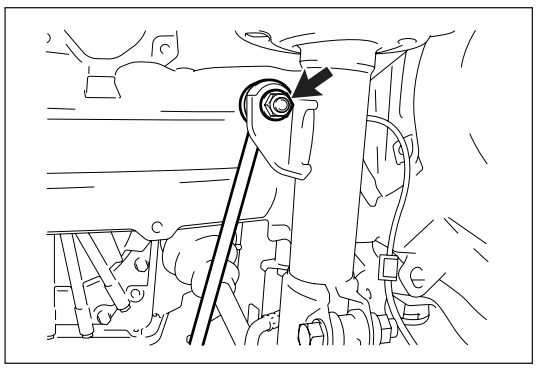


(c) Remove the lower swing arm ball split pin and the lower swing arm ball nuts.

(d) Take out the arm ball from the steering knuckle hole in the same knocking method.

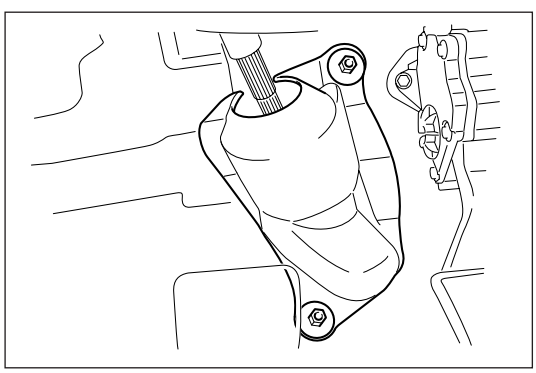


6. Disconnect the steering oil inlet and outlet tube, and let out the steering fluid



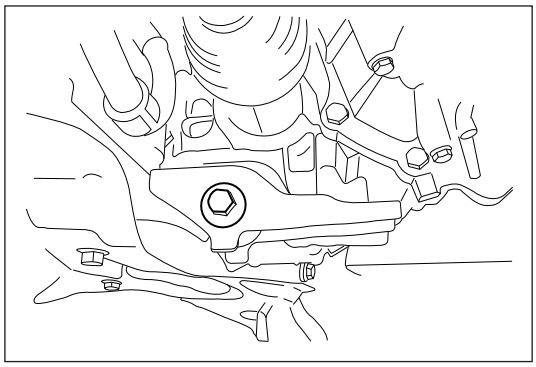
7. Take apart the stabilizer link assembly

Remove the nuts connecting the stabilize link and shock absorber, and remove the link assembly from the shock absorber.



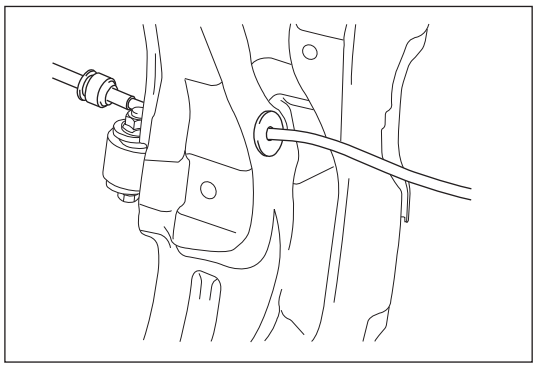
8. Take apart the steering drive shaft

Unscrew the bolts connecting the steering engine and the steering drive shaft assembly, and unplug the steering drive shaft.

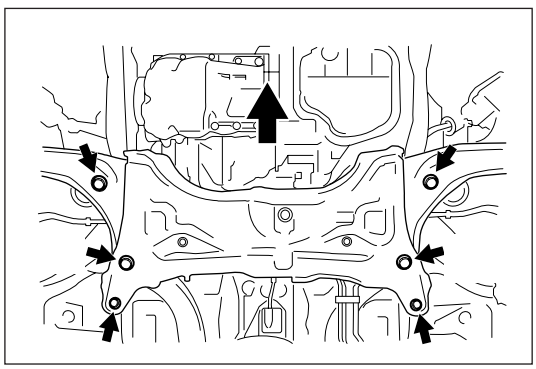


9. Take apart the engine rear suspension and engine bracket

Unscrew the fixing bolts of the engine rear suspension and engine bracket.

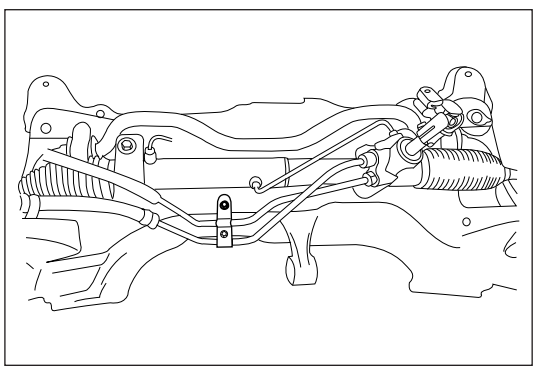


10. For CVT model, remove the shift stay wire from the shifter, and pull it out from the central hole of the auxiliary frame.



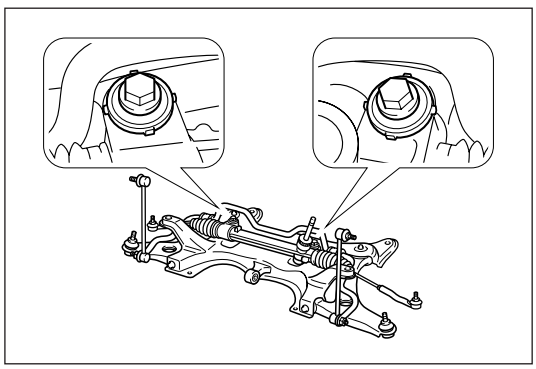
11. Remove the auxiliary frame assembly

(a) Support the auxiliary frame with tool vehicle.
(b) Remove the 6 fixed bolts on the vehicle body.
(c) Remove the auxiliary frame assembly.

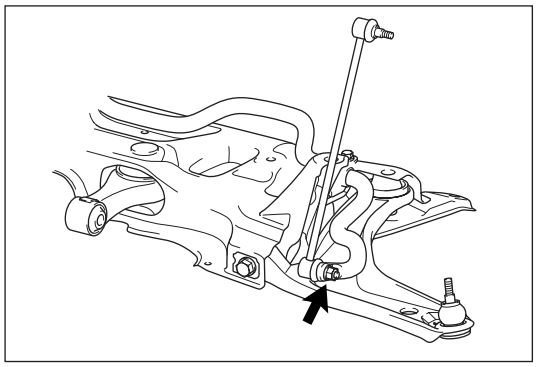


12. Remove the steering engine

(a) Remove the fixing bolts connecting the steering oil tube and auxiliary frame.

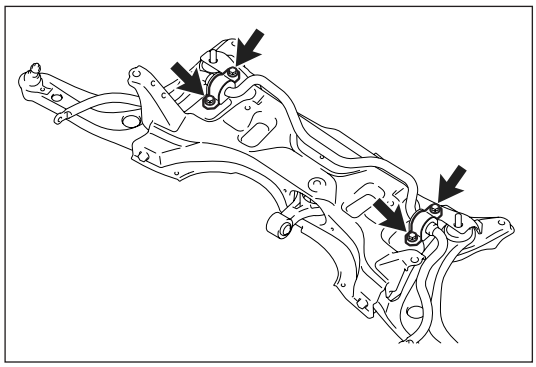


(b) Remove the fixing bolts connecting the steering engine and the auxiliary frame.
(c) Remove the steering engine.



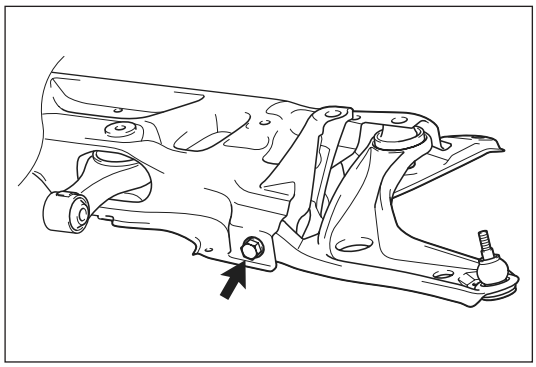
13. Remove the link

Remove the fixing nuts connecting the stabilizer and the link, and remove the link.



14. Remove the stabilizer

(a) Remove the bolts at the place where the stabilizer and the auxiliary frame are fixed.
(b) Take down the stabilizer bracket and bushing.
(c) Remove the stabilizer.



15. Remove the the lower swing arm assembly

Remove the bolts connecting the auxiliary frame and the arm.

Installation

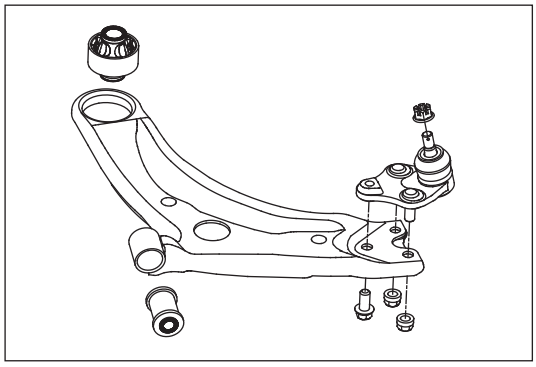
Remark:

The installation order is contrary to the removal order.

1. Let out the air in the braking pipe.
2. Inspect the rear wheel alignment.
3. Inspect the signal of the ABS wheel speed sensor.

THE LOWER SWING ARM ASSEMBLY

The Lower Swing Arm Ball Pin

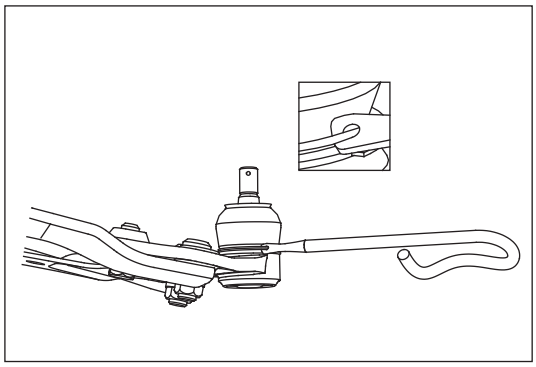


1. Inspect the ball pin of the lower arm

(a) Inspect whether it can turn flexibly.
(b) Inspect whether it is damaged.
(c) Inspect whether the ball pin boot is damaged, and change it if so.

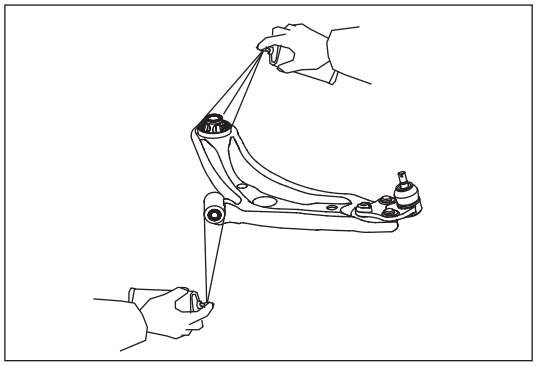
Note:

Do not disconnect the lower arm welding assembly and the lower arm ball pin, if it cannot turn flexibly or the ball pin is damaged, the whole lower arm and ball pin assembly should be changed.



2. Change the ball pin boot

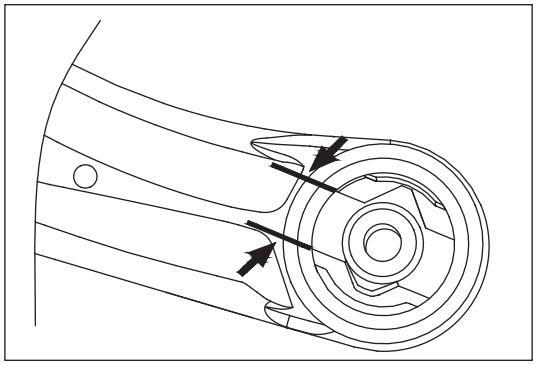
Remove the snap ring which fixing the ball pin boot by turning it with special tool, change the ball pin boot, and the snap ring can be installed with the same special tool.



Shaft Sleeve of the Lower Swing Arm

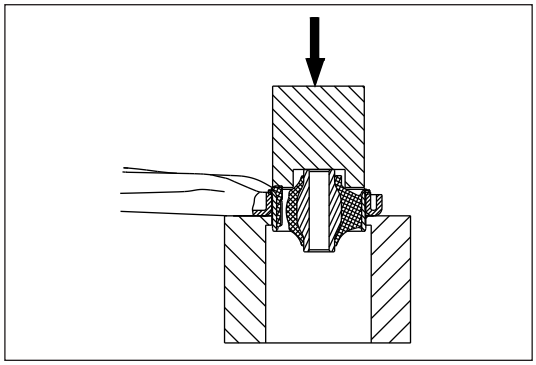
1. Inspect the wear condition of the large and small shaft sleeve of the lower swing arm

Clean the surface of the large and small shaft sleeve of the lower swing arm with water, and inspect whether there are defects such as damage, wear and crack, and change it if there are any.



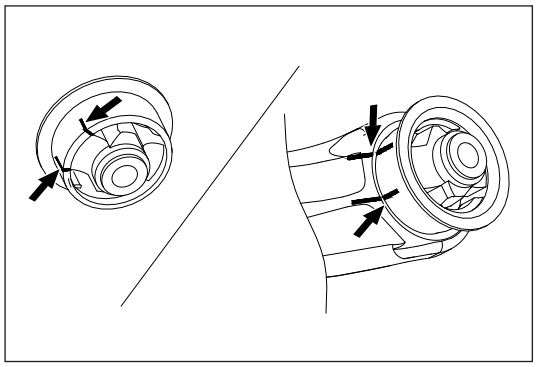
2. Change the large shaft sleeve of the the lower swing arm

(a) Before removal, make two marks on the lower swing arm according to the positon of the shaft sleeve so that it can be used as reference pisition during press assembling.

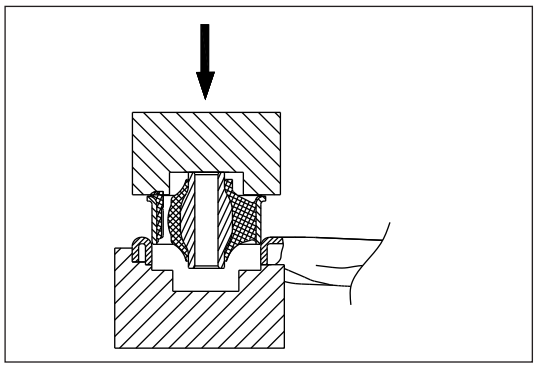


(b) Press the large shaft sleeve of the lower swing arm on the pressing machine with special tools, and change new large shaft sleeve of the lower swing arm.

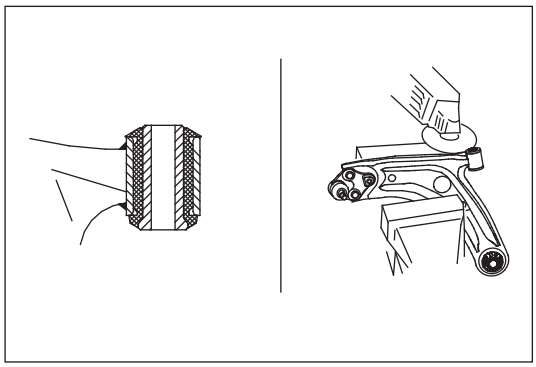
(c) Test the dimension of the lower swing arm large shaft sleeve mounting hole $\Phi 60^{0}_{-0.1}$ mm, and if the measured dimension exceeds the allowance error, the lower swing arm welding assembly should be changed.



(d) Corresponding mark before press mounting.
Make a mark on the new large shaft sleeve of the lower swing arm at the same position so that it can correspond with the mark on the lower swing arm when press mounted, which ensures the relative angle.



(e) Press-mount the new large shaft sleeve of the lower swing arm to the location on the pressing machine with special tools.

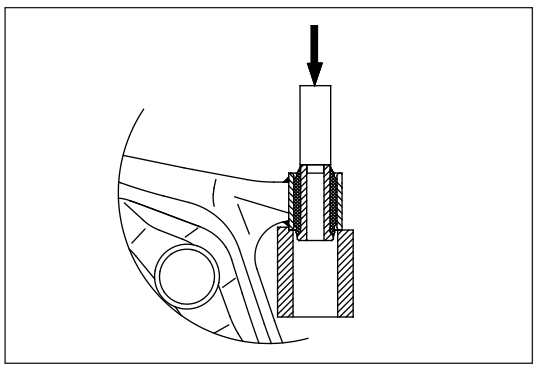


3. Change the small shaft sleeve of the lower beam

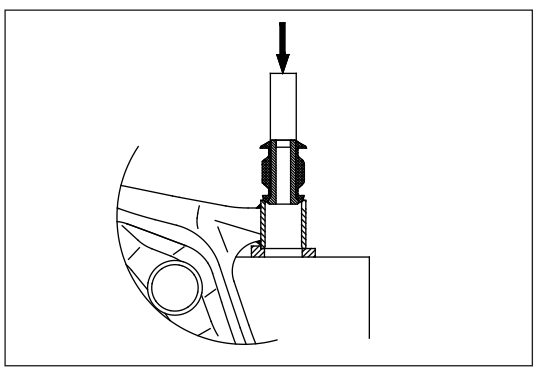
(a) Cut and wear flat the flange of rubber on the small shaft sleeve of lower swing arm with burnish machine.

Note:

When use burnish machine, be sure not to damage the lower swing arm.



(b) Press out the small shaft sleeve of the lower beam on the pressing machine with special tools, and change new lower beam small shaft sleeve.

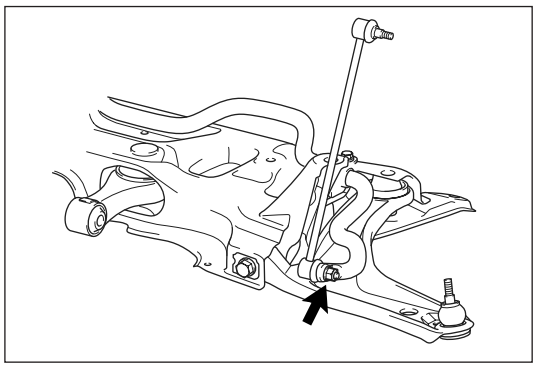


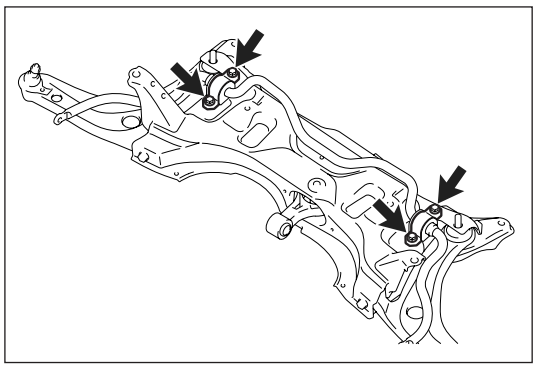
(c) Press-mount the new lower beam small shaft sleeve to the location on the pressing machine with special tools.

FRONT TRANSVERSE STABILIZER ASSEMBLY

Removal

1. **Lift the vehicle up with lifter, and remove the wheels of both sides**
2. **Remove the auxiliary frame assembly**
3. **Remove the link**

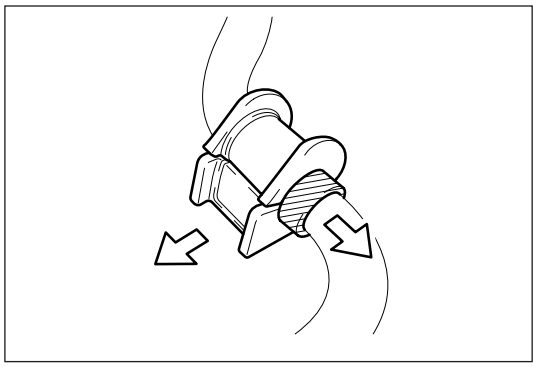




4. **Remove the stabilizer**
   (a) Take apart the bolts at the place where stabilizer bracket and auxiliary frame are fixed.
   (b) Take down the stabilizer bracket and bushing.
   (c) Take apart the stabilizer.

Inspection

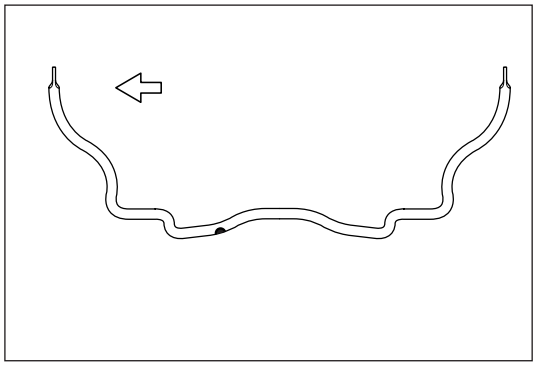
1. **Front transverse stabilizer assembly**
   Inspect whether there are defects such as damage and deformation. If there are, please change it.
2. **Front transverse stabilizer rubber bushing**
   Inspect whether there are defects such as damage, wearing or aging. If there are, please change it.
3. **Front transverse stabilizer link assembly**



4. **Stabilizer joint**
   (a) Inspect whether it turns flexibly
   (b) Inspect whether the ball joint is damaged
   (c) Inspect whether the rubber is damaged

   Note:

   It is not allowed to remove the link assembly. Wherever there are any damages, it is necessary to change the front transverse stabilizer link assembly.



Installation

Remark:

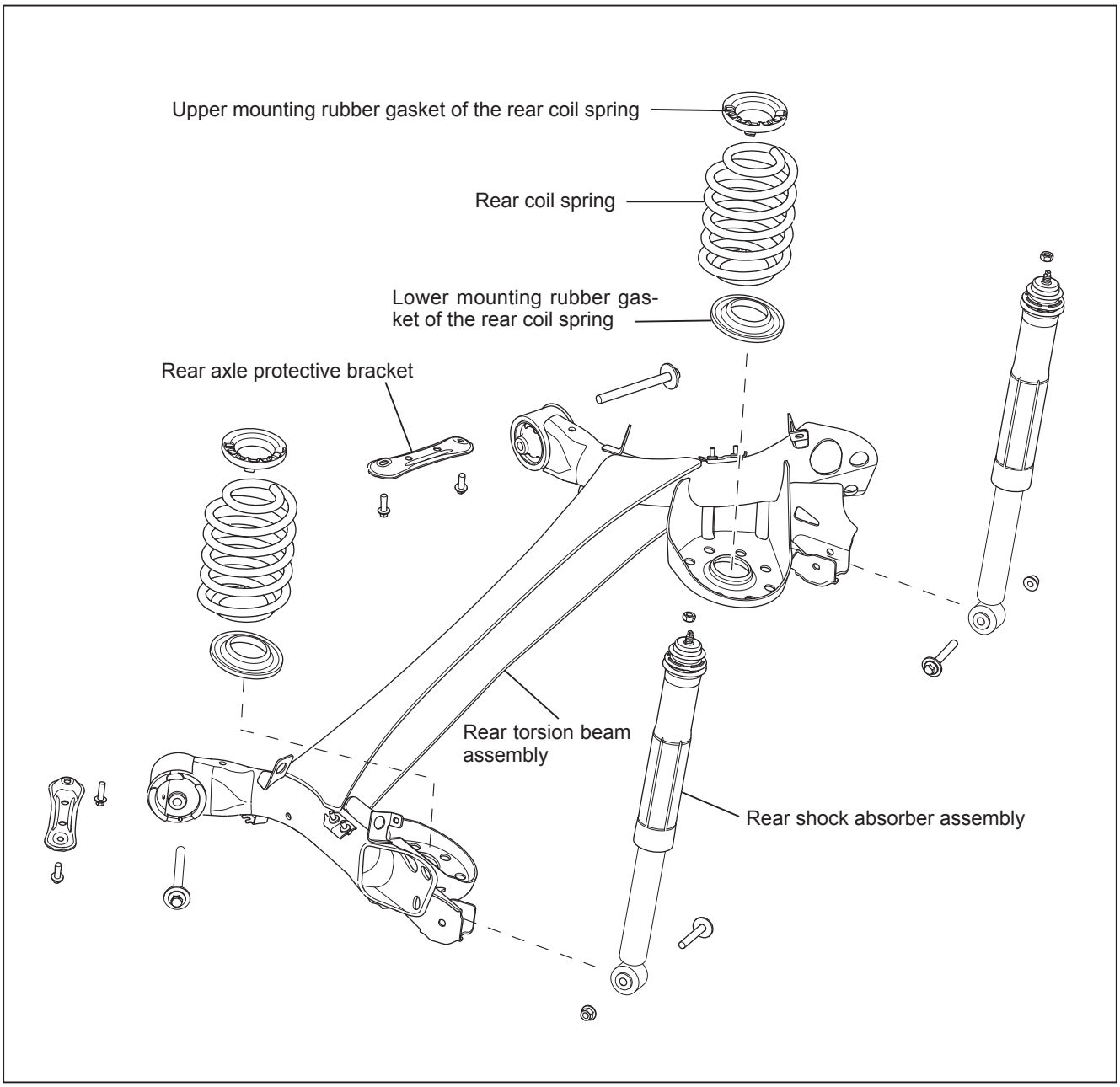
The installation order is contrary to the Removal order.

Note:

1. Inspect and adjust the wheel alignment.
2. Let out the braking fluid and fill in new braking fluid.

REAR SUSPENSION

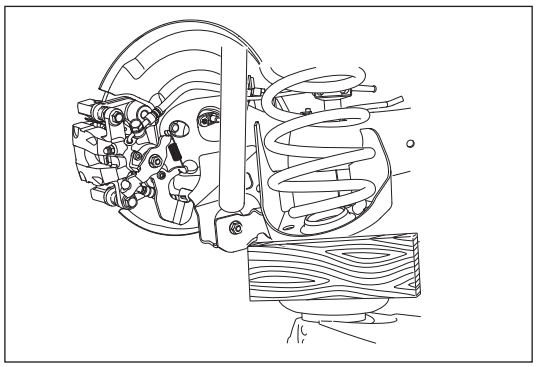
STRUCTURE DIAGRAM



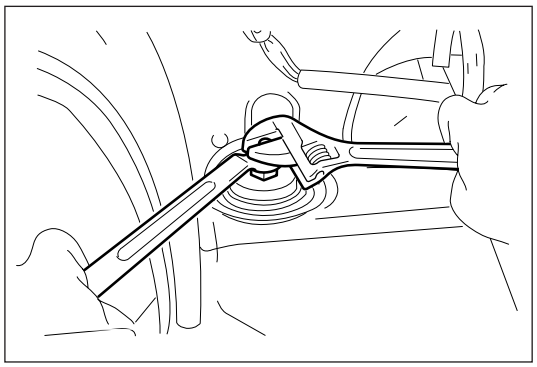
REAR SHOCK ABSORBER

Removal

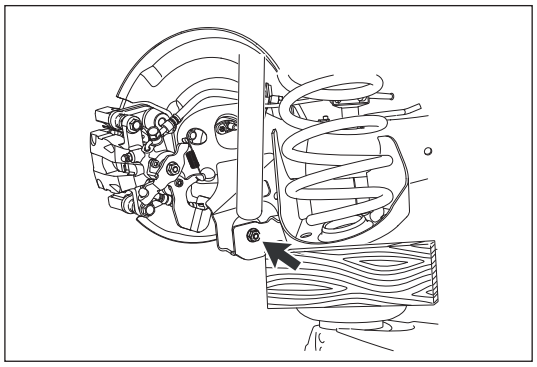
1. **Remove the rear doorsill guard plate**
2. **Remove the sealed strip of the rear door**
3. **Remove the back seats**
4. **Remove the bolts at the fixed points under the back row seat belts**
5. **Remove the guard plate under pillar C**
6. **Support shield of back row seats**
7. **Remove the rear wheel house**



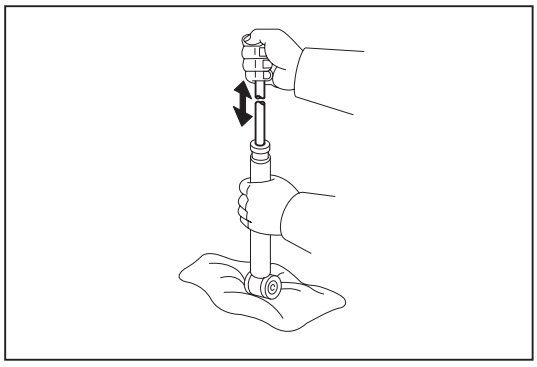
8. **Remove the rear shock absorber assembly**
   (a) Jack the rear torsion beam up with lifting jack.



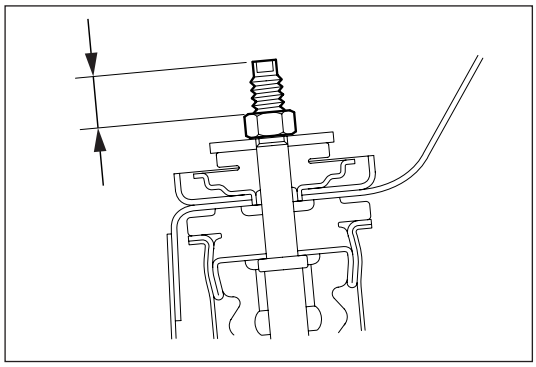
(b) Remove the upper mount point of the shock absorber.



(c) Remove the lower mount point of the shock absorber.

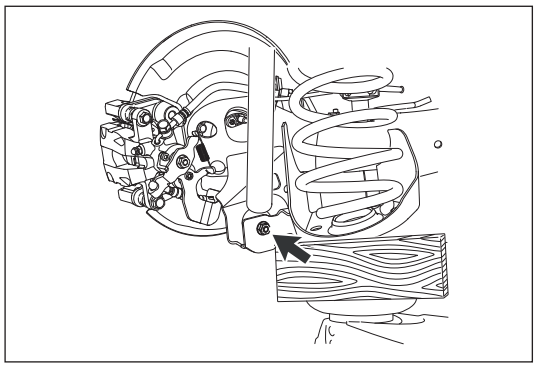


9. **Inspect the left rear shock absorber assembly**
   Compress and stretch the shock absorber rod, inspect and confirm that there are no abnormal resistance and abnormal sounds during the operation.
   If there is any abnormal sound, change the shock absorber with a new one.
   Note:
   When the shock absorber is abandoned, see the "abandon" part.

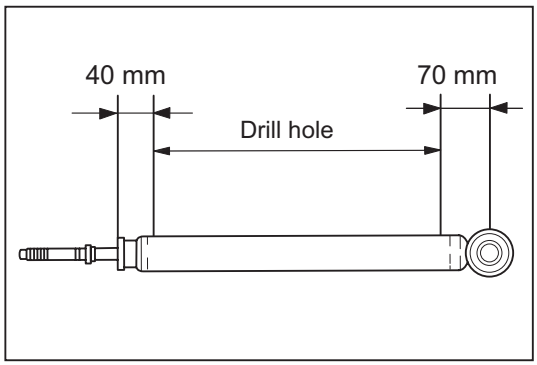


Installation

1. **The upper mount point of the shock absorber**
   After the first nut is installed, make the distance between its top surface to the top of the pusher bar within the range of 14~16mm



2. **Install the lower mount point of the shock absorber**



Abandon

1. **Abandon the left rear shock absorber assembly**
   (a) Fully stretch the shock absorber lever.
   (b) As shown in the figure, drill holes on the air cylinder with drilling machine to let out the gas in it.

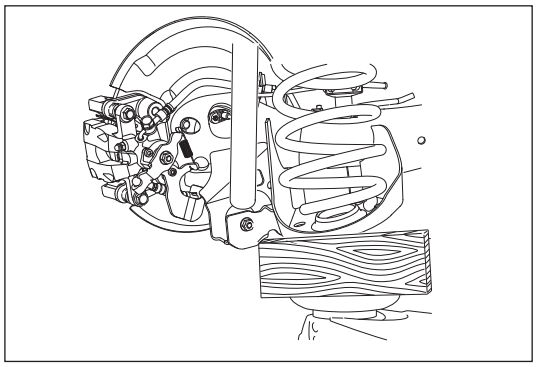
   Note:

   Be careful when drill holes, since the metal fragment may splash, so be sure to use proper safety equipment.

   The gas has no color, no taste and no poison.

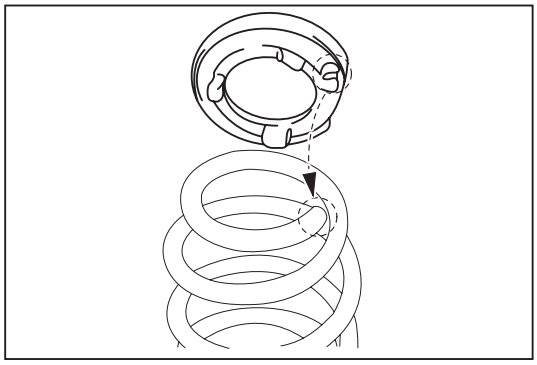
REAR COIL SPRING

Removal

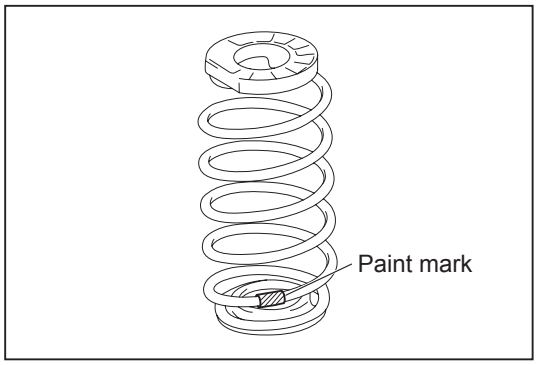


1. **Lift the whole vehicle up with double-post lifter**
2. **Remove the lower mount point of the shock absorber**
3. **Remove the coil spring**
   Use force upward to remove the bolts, put down slowly, and take out the coil spring.

Installation



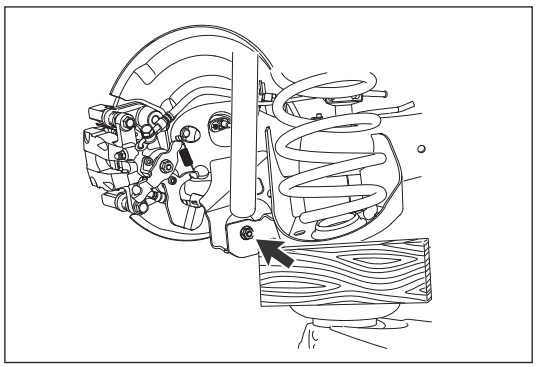
1. **Install the rear coil spring**
   (a) Install the vibration isolator on the rear coil spring and make its clearance to conform to the end of the rear coil spring.



   (b) Install the vibration isolator under the rear coil spring and the left rear coil spring on the rear torsion beam.

   Note:

   Make sure the paint mark face downward when install the coil spring.

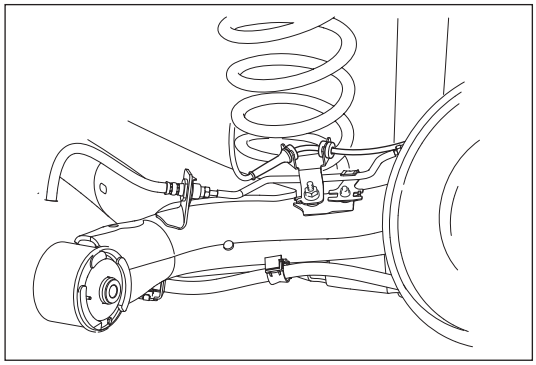


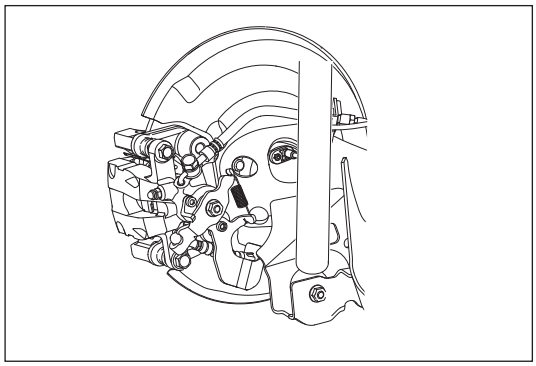
2. **Install the lower mount point of the shock absorber**
3. **Install the rear wheel**
   Torque: 110 N•m
4. **Inspect the rear wheel alignment**

REAR TORSION BEAM ASSEMBLY

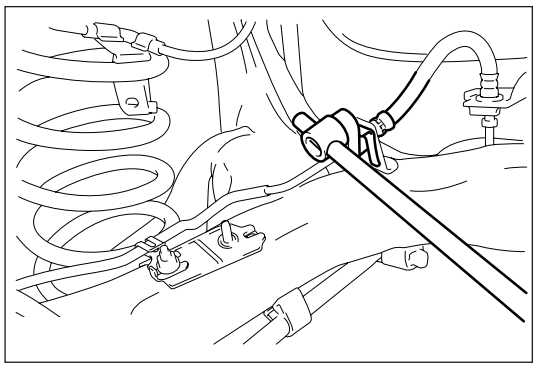
Removal

1. **Remove the rear wheels**
2. **Take apart the wheel speed sensor harness**
   (a) Draw out the harness on the torsion beam wheel speed sensor bracket.

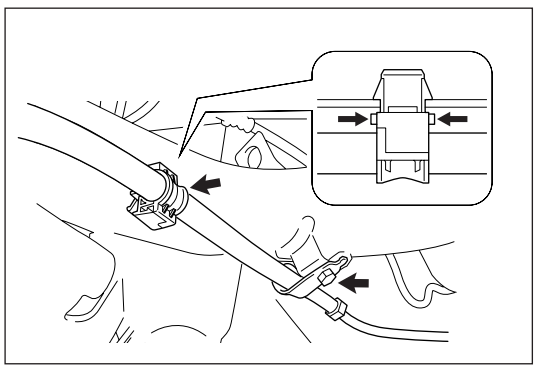




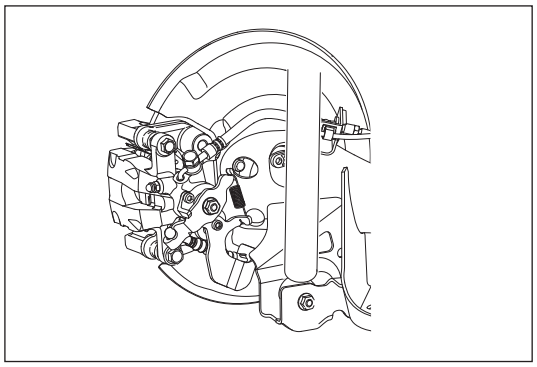
   (b) Remove the fixing bolts of the wheel speed sensor on the brake.



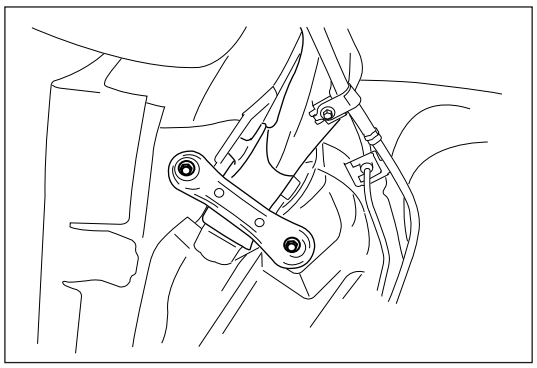
3. **Take apart the brake hose**
   Note:
   Hold the brake fluid with specified container.



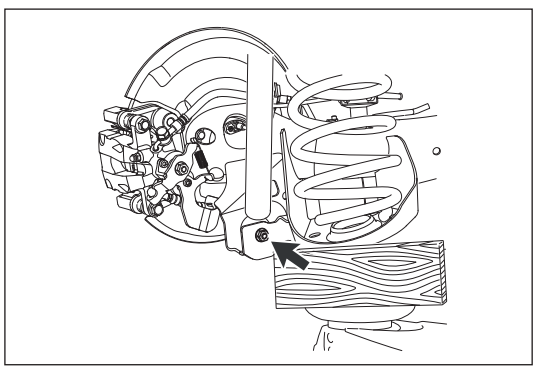
4. **Take apart the brake cable assembly**
   (a) Remove the fixing clip of the torsion beam.
   (b) Remove the fixing bolts on the torsion beam.



(c) Remove the fixing bolts on the brake.



5. Remove the rear axle protective bracket
Remove the bolts of the rear axle protective bracket, and remove the rear axle protective bracket.



6. Remove the rear shock absorber

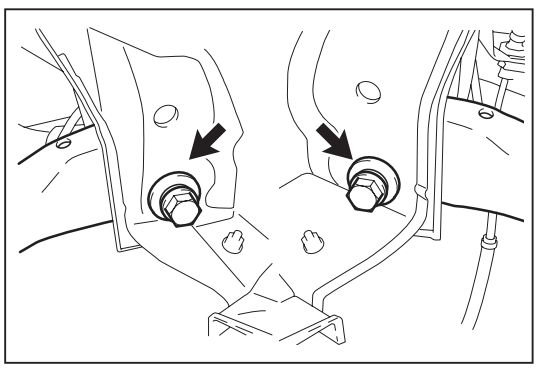
7. Remove the rear coil spring
Note:
The speed should be slow when put the rear torsion beam downward, and hold the spring with hand to prevent the coil spring from bouncing out.

8. Remove the rear wheel brake drum sub assembly

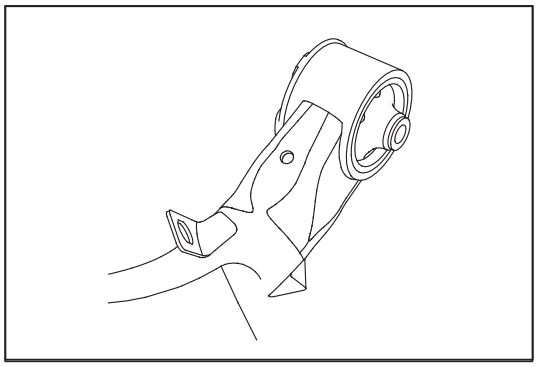
9. Remove the left rear axle hub and bearing assembly

(a) Remove 4 bolts and left rear axle hub and bearing assembly.

(b) Take apart the rear wheel brake assembly from the rear torsion beam.



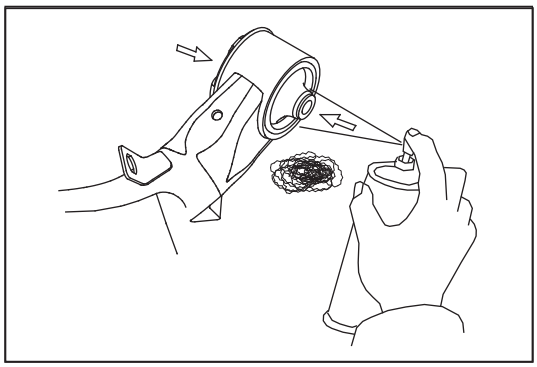
10. Remove the rear torsion beam



Longitudinal Arm Shaft Sleeve Assembly

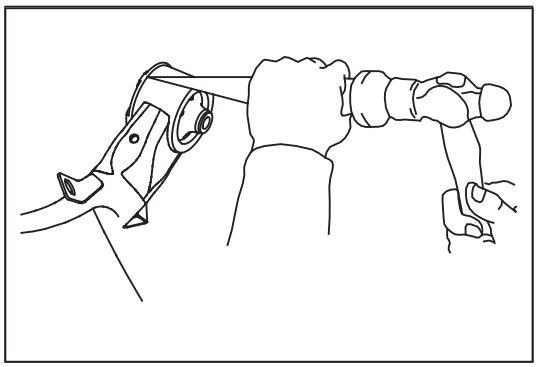
1. Inspect the longitudinal arm shaft sleeve

(a) Inspect whether there are deformation, dislocation, offset or serious cracks, and whether the seal is loose.



(b) If it's hard to recognize whether the longitudinal arm shaft sleeve is damaged, the following measures should be taken: clean the rubber part of the longitudinal arm shaft sleeve with clean water, and at the same time wipe it clean with cotton waste, and inspect whether there are the above defects on the rubber surface.

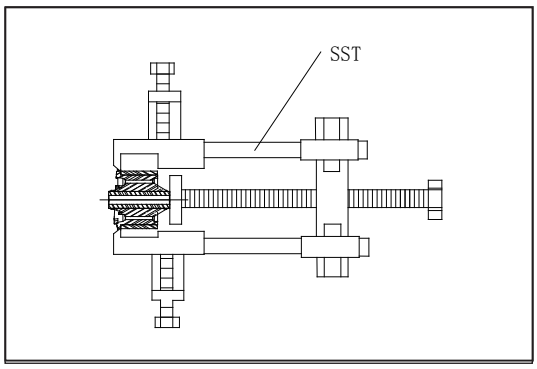
(c) If there are above defects, the longitudinal arm shaft sleeve should be changed for a new one.



2. Remove the longitudinal arm shaft sleeve

(a) Make a mark with white paint marker, and remember the direction of the longitudinal arm shaft sleeve assembly.

(b) The longitudinal arm shaft sleeve is disposable part and if it is damaged, first prize the outer tube edge of the longitudinal arm shaft sleeve outward with steel shod lever so that special tools can be installed.



(c) Stick the bush mounting tube with special tool, tighten 2 bolts, turn the bolts with spanner, and push off the bush, express it out with pressing machine if necessary.

Note:

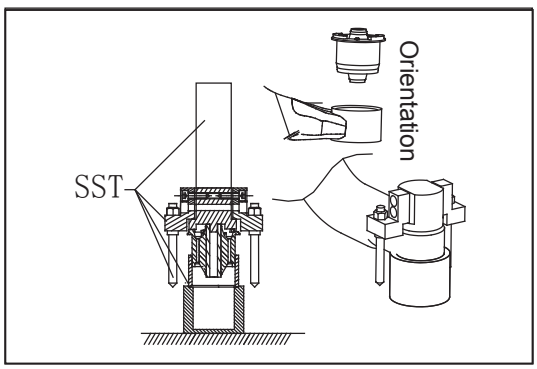
Make sure to press out the longitudinal arm shaft sleeve vertically during the pressing process.

3. Install new longitudinal arm shaft sleeve assembly

(a) Before the press mounting of new longitudinal arm shaft sleeve assembly, first recognize its assembly direction, and the direction mark on the longitudinal arm shaft sleeve assembly points to the underside of the torsion beam welding assembly.

Note:

Do not install the longitudinal arm shaft sleeve assembly backward.



(b) Fix the longitudinal arm shaft sleeve assembly with special tools, and it should be pressed in slowly on the pressing machine.

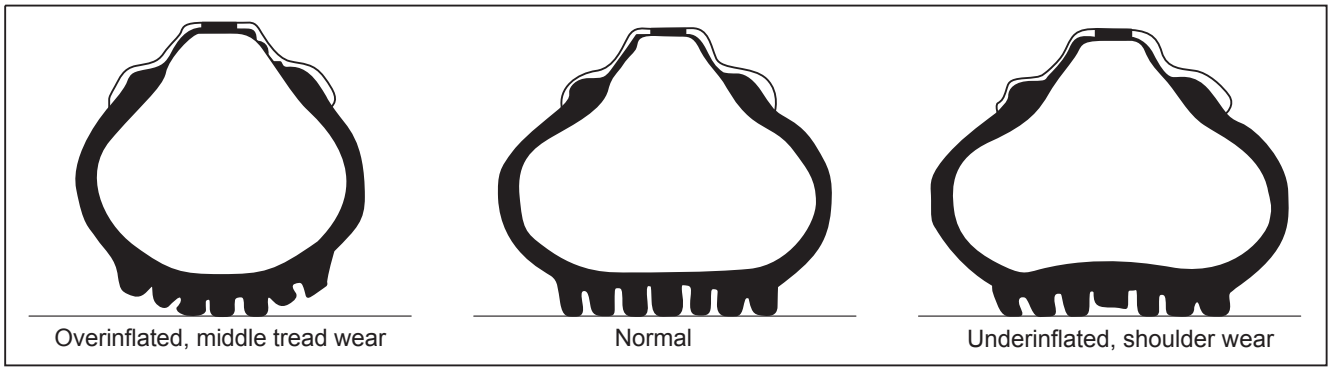
Note:

Make sure to press the longitudinal arm shaft sleeve in vertically during the pressing process.

TIRES AND WHEELS

TIRES

This type of tire adopts tubeless type tire. When the air pressure in the tires reaches the recommended pressure and the load of the tires is in a full-load state, this means the tires have been in an optimal-design state. Proper tire pressure and correct driving habits have an important impact on the tire life, and can not only achieve the vehicle comfort, stability and handleability but also reduce the tread wear, prolong the tire life and avoid the tire damage. Any overloading, speeding and unnecessary emergency braking would increase the tire wear.

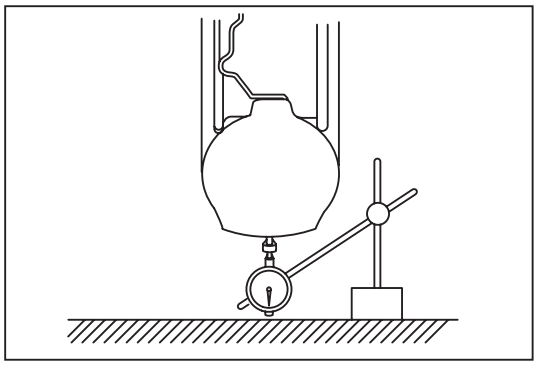


Measure the tire pressure at a normal temperature. The tire pressure will increase by reason of the heat caused by movement in driving. After cooling off, the tire pressure will be restored to its original pressure. Therefore, don't reduce the tire pressure when the tire pressure increases. Check the air pressure at least once a month for the air pressure will gradually decrease naturally even if the tires are used in normal driving conditions. The spare tire should be available at any time. The recommended inflation pressure of this model of car has been carefully calculated and specified. Check the pressure in the tires when they are cold. Adjust the tire pressure to match the specified cold pressure. It is recommended to check the air pressure at least once a month or before any long-distance travel. Remember to check the spare tire at the same time you check all the other tires.

Some Potential Troubles Resulting From the Tire Pressure

Higher than recommended cold tire pressure	Less than recommended cold tire pressure	Different tire pressures on one car
1. Bumpy driving	1. Tires make noises when steering.	1. Braking imbalance
2. Tire scratched or carcass broken	2. Difficult steering	2. Deviating when steering
3. High –wear center tread	3. High-wear and uneven-wear tread edge	3. Control failure
	4. Tire rim bruised and broken	4. Deviating when accelerating
	5. Tire cord rupture	
	6. High tire temperature	
	7. High fuel consumption	
	8. Control failure	

Tire Inflating



New tires' size will increase for heat from movement at the initial stage of use, decreasing the relative lower pressure. Therefore, inflate the tires if you use them for 24 h and drive 2000~3000 km.

(a) Check the tires for normal tire pressure.
Cold tire pressure: 220±10 KPa

(b) Check the tire for radial run-out with a dial indicator.
Tire radi al runout: 1.4 mm or less

Warning:

Do not stand on the tire when inflating so as to avoid serious personal injury.

Notice for Tire Inflating:

1. Pay attention to safety when inflating a tire. Look at the tire gauge at any moment until the tire pressure matches the specified cold pressure to prevent the tire from blowing out for being overinflated.
2. Do not inflate the tire until the tire is cold by stopping driving. The tire temperature will ramp up when the car is running, and this has some influence on the tire pressure.
3. Check the tire valve and the valve core. If the valve did not fit the core evenly with convex or concave phenomenon and other defects, it would be inconvenient to inflate the tire and be difficult to measure the tire pressure.
4. Be careful of cleanliness. The inflated air should not mix with any moisture or oil fluid to prevent the layer of rubber sealing from deteriorating and being damaged.
5. In the course of tire inflating, do not deflate the tire upon the tire pressure much higher than the specified pressure, and nor overinflate the tire for worrying about there would be no possibility to inflate the tire for long-term outgoing. If the tire pressure is much higher than the specified pressure, the cord would be overextended, and this should reduce the tire strength and influence the tire life.
6. Wipe off the dust on the tire valve. Do not loosen the valve core. Coat some soap solution onto the valve core after inflating. Check the valve core for leakage (if any, there would be some little bubble.) Match the valve core cap evenly and install it securely to prevent mud and sand from entering into the inside of the valve core.
7. Periodically calibrate the pressure gauge which comes with the car or is used in a tire workshop so as to guarantee the accuracy of the pressure to be checked.

Description of Tire and Wheel (Steel Wheel) Assembly

When assembling the tire and the wheel, align the hard radial part (also called "the high point") of the tire with the minimum radius (also called "the low point"). The "high point" of the tire is marked with the paint point on the external side of the tire initially. The painting point will be washed off. The "low point" of the wheel is marked with the paint point on the wheel rim originally. If you can not find the position of the paint point on the tire, draw a line on the tire and the wheel in order to ensure the tire and the wheel to be re-assembled in the same position before disassembling. Whenever you install the tire, perform a dynamic balance for the tire and the wheel over again to ensure the smooth running of the car.

Notice for common tire assembly:

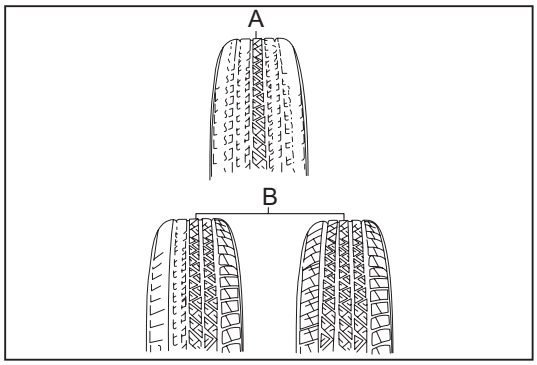
1. Be careful to match the specifications of the tire to the specifications of the wheel rim. No deformation, rust, crack, chip or other on the rim is permitted. Otherwise, this can cause damage to the tire.
2. Keep the rim clean when re-installing it. If hard granular objects, such as sand and scrap iron, goes into the inside of the tire, this can cause local heat-generating of the tire.
3. Do not install the tires with different specifications or patterns to the same car. Otherwise, this can cause uneven wear of the tires.
4. Be careful to protect the valve core when disassembling and assembling the tire. Be sure to keep the valve core perfect and clean.
5. Promptly remove the stone inclusion, hard objects, or other sharp objects on the tire tread to reduce the tire damage.
6. Renovate and repair any rupture and cut on the tire crown, shoulder and sidewall. Otherwise, the tire would be more seriously damaged.

Abnormal Tire Wear

Abnormal tire wear includes irregular tire wear and quick tire wear. This can be caused by many reasons, such as, abnormal tire pressure, lack of regular tire rotation, bad driving habits and incorrect wheel alignment, etc.

Replace the Tire When One of the Following Traces Occurs.

1. Different degrees of wear between the front tires and the rear tires.
2. Uneven wear of any tire tread.
3. Different degree of wear between the left front tire and the right front tire.
4. Different degree of wear between the left rear tire and the right rear tire.
5. Abnormal tread wear and flat tire ground contact point.

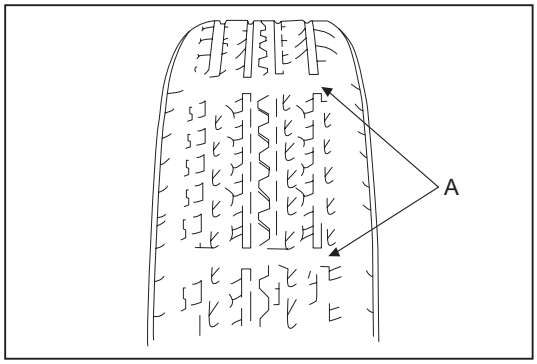


Check the Front Wheel Alignment When One of the Following Traces Occurs.

1. Different degree of wear between the left front tire and the right front tire.
2. Uneven wear of any tire tread.
3. Serious wear of one-sided tire strips or tire lugs of the front tires.

A: Difficult steering, low air pressure or lack of regular tire rotation.

B: Abnormal front wheel alignment, disuniform tire or wheel structure.

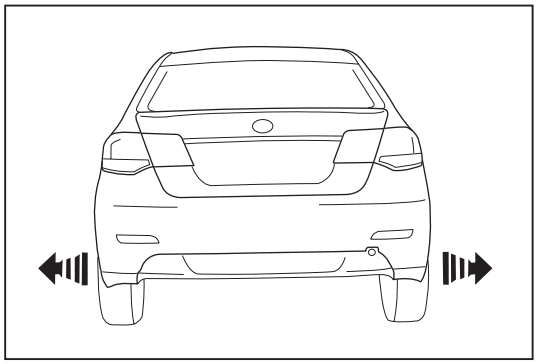


Wear Indicators

Your car's tires have some wear indicators molded into the tire groove (as shown in A of the left figure). When the tread wears down to that point, replace the tire.

The service limit of tire refers to the residual tire pattern depth up to 1.6 mm (ie. The bottom bugles of the main pattern groove are even). For your safety, please replace the tires before you can see such indicators.

Serious one-side wear can cause local plies exposed, or if the damage depth of goes down to the tire plies or bead rings, stop using the tire.

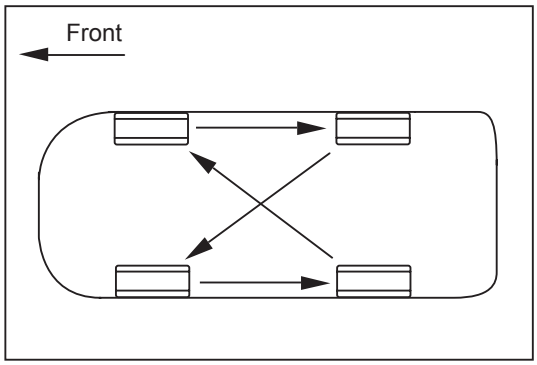


Radial Tire Swing

This swing means that the front, the rear or both the front and rear of the car sway towards both sides at the same time. The tire swing is caused by the non-straight tire bead. When the car is running at a speed of 8~48 km/h, the tire swing is the most obvious. You can identify the defective tires through road test. If the failed tire is located in the rear of the car, the rear of the car will produce right to left side sway. This is also called "swing." At this moment, you would feel as if someone was pushing the car on one side of the car. If the failed tire is located in the front of the car, the swing will be more obvious.

Method for Vehicle Road Test

1. Drive the car to determine the swing occurs at the front wheel or the rear wheel. Then, replace the swinging wheel with the standard wheel which has been verified on another car of the same model.
2. If you cannot identify which wheel is swinging, replace the rear wheel. Repeat the road test. If the situation has been improved obviously, re-install the original wheel. Replace one each time until the swinging wheel has been determined.
3. Otherwise, replace the tires with four standard tires, and then replace with the original tires one by one and check with the said method.



Tire Rotation

To ensure even tire wear, rotate the tires in accordance with the required period. The rotation principle is shown as the left figure. Periodically rotate the radial tires, and inflate the tires as required.

Note:

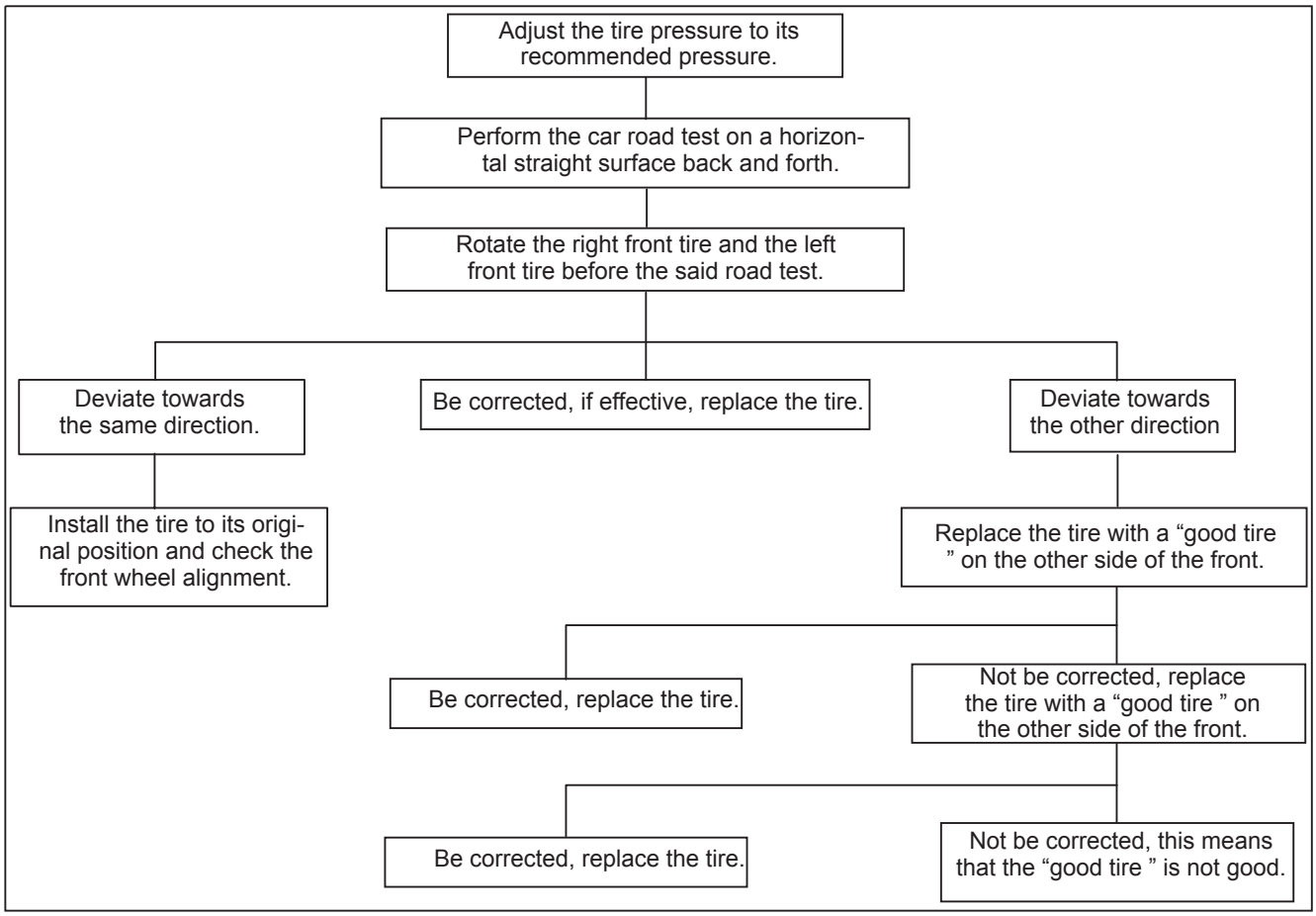
For the structural causes, the radial tires often wear quickly at the shoulder, especially the front tires. If you have your tires rotated every 8000~12000 km once, your tire life can increase by 20%. This makes the regular tire rotation is particularly necessary.

Replacing Tires

Use the same size originally supplied with the car when it is necessary to replace tires. You should replace the tires that came with your car with the tires of the same size, load range and construction. If you use other sizes or types of tires, this can affect your car's ride comfort, handling, speed odometer calibration, ground clearance and so on. It is best to install a pair of new tires on the same axle. If you need to replace one tire only, be sure to match a tire which is the most similar to the original tire tread to balance its braking ability and traction.

Warning:

Unless an emergency, mixing radial, bias-ply and bias-belted tires on your car is not allowed. Mixing radial, bias-ply and bias-belted tires on your car can seriously reduce its handleability and stability and might cause its loss of control.



Reasons for Deviation

- Incorrect tire and front wheel alignment.
- Uneven braking force.
- Tire construction problems.

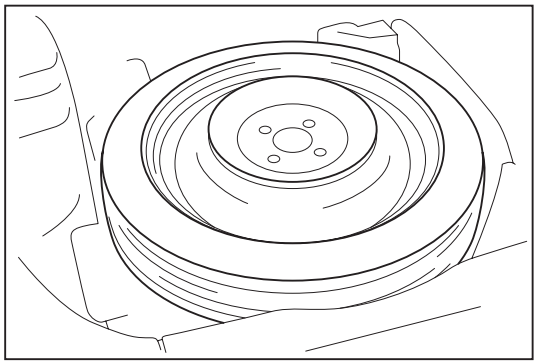
Tire manufacturing method can also cause the car deviation. For example, the steel belt arrangement within the tire. The steel belts which deviate from the tire center line within a radial tire can produce a lateral force when the tire is rolling along a straight line. If the tire diameter of one side is larger than that of the other side, the tire will roll to deviate towards one side, and this can also generate a lateral force (i.e. the conicity) to cause the car deviation. In the case of correct front wheel alignment, the above procedure can also apply to determine the deviation of tires, and the rear tires cannot cause deviation.

Tire Installation and Disassembly

1. Use a tire changer to install or disassemble tires. Operate the machine following the instruction book of its manufacturer. Do not simply use manual tools or tire pry bars to replace tires. Using a manual tool or tire iron to replace tires can damage tire beads or wheel rims.
2. Use a steel brush or coarse steel cotton to clean the bead seat to wipe off the grease, old rubber and mild rust. Before installing or removing the tire, fully lubricate the bead area thoroughly with specified tire lubricant first.
3. After installation, inflate the tire to match the specified pressure and check whether the bead is fully seated or not.

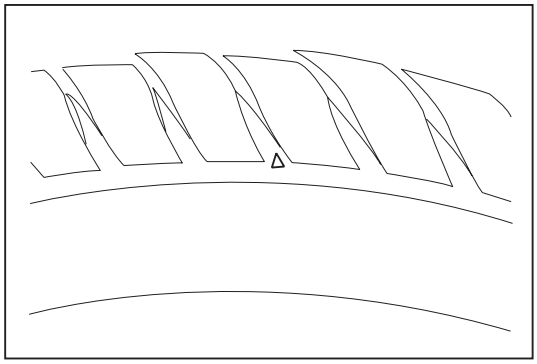
Note:

Do not overinflate tires. When the bead expansion is beyond the safety limit of the wheel rim, the bead may rupture and cause serious personal injury. Do not exceed the specified pressure when inflating. If the specified pressure can not get the bead properly seated, then deflate the tire and re-lubricate and re-inflate it.



Use of Spare Tires

- The standard spare tire pressure is 420±10 kPa.
- Measure the spare tire pressure at the room temperature.
- After inflating the spare tire, use soap solution to measure the valve core for leakage and lock the valve core cap securely.
- Keep the spare tire available at any moment. Check its pressure at least once a month.
- The service limit of spare tire refers to the residual tire pattern depth up to 1.6 mm (ie. The bottom bugles of the main pattern groove are even). For your safety, do not continue to use such spare tire.



Note:

- **You car's spare tire has wear indicators which are shown with "△" patterns on the tire side (as shown in the figure).**
- **The spare tire's maximum speed is 80 km/h with a maximum traveling distance of 200 km once.**
- **Each car can only use one spare tire.**

WHEELS

General Balance Steps

Clean the accumulated soil and other objects on the inside of the wheel rims.

Note:

Remove the stone on the tread to prevent it from flying off and injuring the operator in the course of rotary balance. This can achieve a good balance. Check the tire for damage in details. And then, perform balance operations as recommended by the manufacturer of the balance device.

Off-Board Balance

Most off-board balancers are more accurate than on-board rotary balancers, providing a convenience of use and dynamic (double) balances. Unlike the on-board balance, they cannot correct the brake drum or brake disc for imbalance, but they can overcome this shortcoming through their accuracy.

On-Board Balance

The on-board balance depends on the equipment and tool manufacturer. Therefore, be sure to follow the instructions of various manufacturers to perform balance operations.

Note:

Control the wheel rotative speed within 55 km /h as shown in the speedometer. This restriction is necessary because when a drive wheel is slipping and the other drive wheel is static, the speedometer only shows half of the actual wheel speed. Be careful when the wheel is slipping because the slipping wheel can reach a very high speed. This can cause tire peeling off or damage to differentials, and cause serious personal injuries or serious damage to cars.

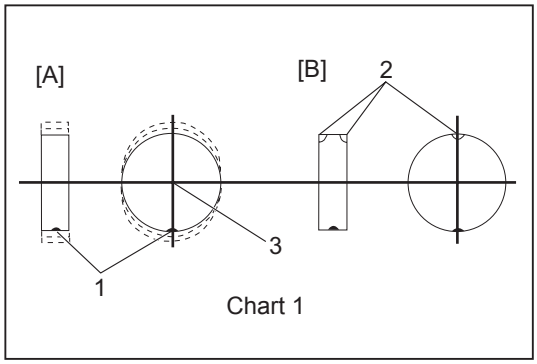


Chart 1

Dynamic Balance and Static Balance

There are two types of wheel balance: static and dynamic. Chart 1 represents the static balance and Chart 2 represents the dynamic balance. The static balance refers to the weight distribution around the wheel are equal. The wheel imbalance in respect of the static balance can cause intense bouncing up and down. This is called the bouncing vibration. This eventually can cause uneven tire wear, as shown in Chart 1.

1. Wheel bouncing points	[A]: without balance blocks
2. Points with balance blocks	[B]: With balance blocks
3. Axle center	

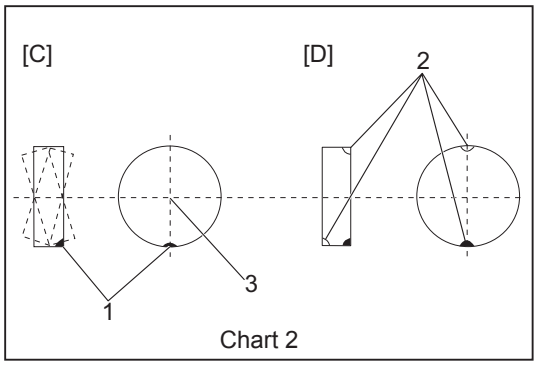
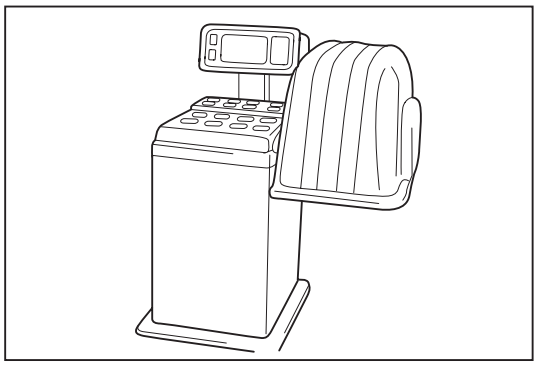


Chart 2

The dynamic balance refers to the weight distribution on both sides of the wheel center plane are equal so that the assembly will not tend to move from one side of the center plane to the other side in the process of the tire rotation. The wheel imbalance in respect of the dynamic balance can cause oscillating, as shown in Chart 2.

1. Wheel oscillating points	[C]: without balance blocks
2. Points with balance blocks	[D]: With balance blocks
3. Axle center	

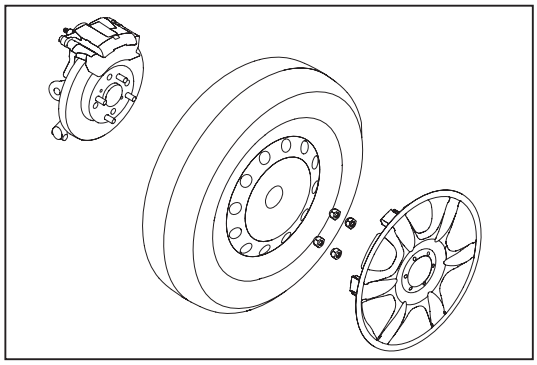


The Test Methods for Wheel Dynamic Balance Are As Follows:

1. Clean the wheel to be tested, removing the dirt, sand and stone and remove the old balance block.
2. Inflate the tire to match the specified pressure.
3. Install the wheel to the dynamic balancer and lock it securely.
4. Turn on the power supply switch and check the indicating device for correct indication.
5. Key in the rim diameter and the rim width, measure the distance from the rim flange to the machine box and key it in.
6. Put down the shield, press down the starting key and start to measure.
7. After the wheel stopping rotating automatically, read the dynamic imbalance masses and positions inside and outside the wheel from the indicating device.
8. Rotate the wheel manually at a slow speed. When the indicating device of the dynamic balancer sends signals, stop rotating the wheel.
9. Place the dynamic imbalance masses shown by the dynamic balancer onto the upper of the rim flange according to the inside and outside positions and clamp them securely.
10. Re-start the dynamic balancer to perform the dynamic balance test until the dynamic imbalance weight is less than 5g and the machine shows it is qualified.
11. Remove the wheel and turn off the power supply, and this means the completion of the test. The operating methods for using various dynamic balancer models and brands are different so it is necessary to read the relevant manuals before using.

Wheel Maintenance

No welding, heating or hammering is allowed to be used to repair the wheel. Replace all damaged wheels. Replace all wheels for their distortion, deformation, excessive lateral or radial runout, leakage from weld, elongated bolt holes, loose nut with cap or severe rust. Too large wheel bouncing can cause a negative vibration. The wheels required to replace should be the same as the wheels that came with your car in respect of load capacity, diameter, rim width, deviation and installation structure. The inappropriate type of wheel size can affect the wheel life and bearing life, the brake cooling effect, the speed / odometer calibration, the ground clearance as well as the gap between the tire and the body and the gap between the tire and the chassis.



Removal of Wheels (Steel Wheels)

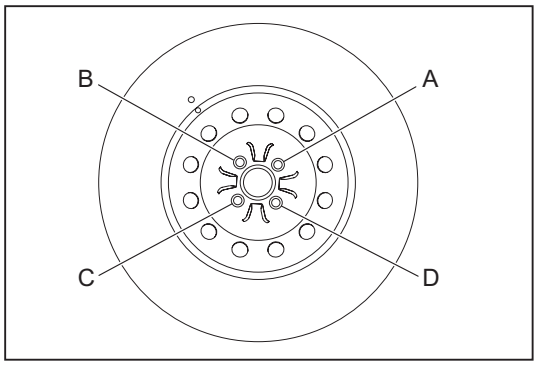
1. **Remove the wheel cap and loosen the nuts for 1~2 turns as recommended.**
2. **Lift the car.**
3. **Unscrew the nuts and remove the wheel.**
   Tightening torque for the nuts: 110 N•m
   Note:
   Never loosen the tightened wheel by heating. Otherwise, the service life of the heated wheel would be reduced and the hub bearings would be damaged.
   Use a tire changer to remove tires. Do not simply use manual tools or tire pry bars to remove tires from wheels. Otherwise, the tire beads or wheel rims would be damaged.

Checking Wheel Mounting-Face

Replace all wheels for their bending, concave or excessive end face runout or radial runout. The wheel bouncing which exceeds the specified value can cause unpleasant vibrations.

Note:

If your car is equipped with tires with directional tread pattern, you should confirm the directional arrow on the outside of the tire should point toward the forward rotating direction of the tire.



Wheel (Steel Wheel) Installation

Install wheels in accordance with the steps opposite to the removal and perform installation as follows:

Tighten the wheel nuts orderly to match the specified torque to prevent the wheel or the brake disc from deforming. When installing the wheel cap, align the wheel cap gap with the valve core.

Tightening sequence: A-C-B-D

Note:

Before installing the wheel, first of all, use a steel brush to scratch off and clean cut the corrosion on the wheel mounting- surface and the brake drum or disc mounting-surface in order to get a good metal-to- metal contact on the mounting-surface when installing the wheel. Otherwise, such bad contact can cause the wheel nut loose, resulting in the wheel fall-off in the course of the car driving, and can cause loss of control and potential injuries.

STEERING SYSTEM

STEERING SYSTEM

OVERVIEW 2
FAULT SYMPTOM TABLE 3

STEERING CONTROL MECHANISM

STRUCTURE DIAGRAM 6
ON-BOARD CHECK 7
REPLACING 9

POWER STEERING SYSTEM

STRUCTURE DIAGRAM 14
ON-BOARD CHECK 15
POWER STEERING OIL RESERVOIR 18
POWER STEERING PUMP 20
POWER STEERING GEAR 22

STEERING SYSTEM

OVERVIEW

Steering Mechanism Parameters

Steering gear:Hydraulic power rack and pinion type, gear ratio 47.02mm/r.

Steering column: Safety energy-absorbing type variable-angle steering column, with a upwards or downwards adjustable angle of 3.8°.

Steering wheel:Three-spoke leather steering wheel with air bag, with a diameter of 370mm, maximum number of steering turns of steering wheel in the steering system are 2.978 turns.

Wheel steer angle:Maximum inner steered angle (30~35)°,Maximum outer steered angle (34.5~39.5)° (in theory).

Steering wheel and Steering column

Note:

To ensure the energy-absorbing function of the steering column, be sure to use the specified screws, bolts and nuts to tighten to match the required torques.

In addition to the steering function, the steering column also provides the safety protection function.

When you have ever a severe frontal collision, the energy-absorbing column will shrink so as to reduce the possibility to make you injured.

The ignition switch and lock is mounted onto the steering column, and this can lock the ignition and steering operation to prevent the car from being stolen.

The control lever on the steering column is used to trigger steering signals, the headlight beam and the front windscreen washer and wiper.

The tilt steering column provides the telescopic function, and this can ascend and descend the steering wheel and tilt it inward and outward. Therefore, you can adjust the steering wheel to your comfort position.

ATTENTIONS

1. **For the steering system operation**
   (a) Be careful to replace any part. Misproper replacement can affect the performance of the steering system and can cause dangerous driving.
2. **For the airbag system operation**
   (a) This car is equipped with a SRS (Supplemental Restraint System), such as the driver's airbag and the passenger's airbag. If you do not have your SRS repaired in correct order, there is some possibility to deploy your SRS accidentally in the process of the maintenance, and that can cause serious accidents. Before maintenance (including removal or installation, check or replacement of parts), read the notice about the SRS.
3. **In the following case, replace the power steering fluid:**
   After replacing any one of such components as the power steering gear, the power steering pump and the steering pipeline.
   Note:
   1. Do not re-use the power steering oil fluid discharged for replacing the power steering components.
   2. Only the power steering oil fluid ATF DEXRON III can be used.
   3. Whenever you see the fluid level of the steering oilcan falling, check such components as the steering oilcan, the steering pump, the power steering gear and the steering pipeline as well as the reliability of seals of all connection positions.
4. **Refilling the steering oil fluid**
   When refilling the steering fluid, both people should operate simultaneously. With the turnoff of the engine, one should fill the steering oilcan with the steering fluid, the other should turn the steering wheel (to the limit positions) right and left repeatedly for more than 10 turns until the steering fluid appears between the mark MAX and the mark MIN. And then, start the engine and turn the steering wheel (to the limit positions, staying at the limit position within 5 seconds is permitted.) right and left. At this moment, the fluid level of the steering oilcan may fall, supply the steering fluid to get the fluid level between the mark MAX and the mark MIN.

FAULT SYMPTOM TABLE

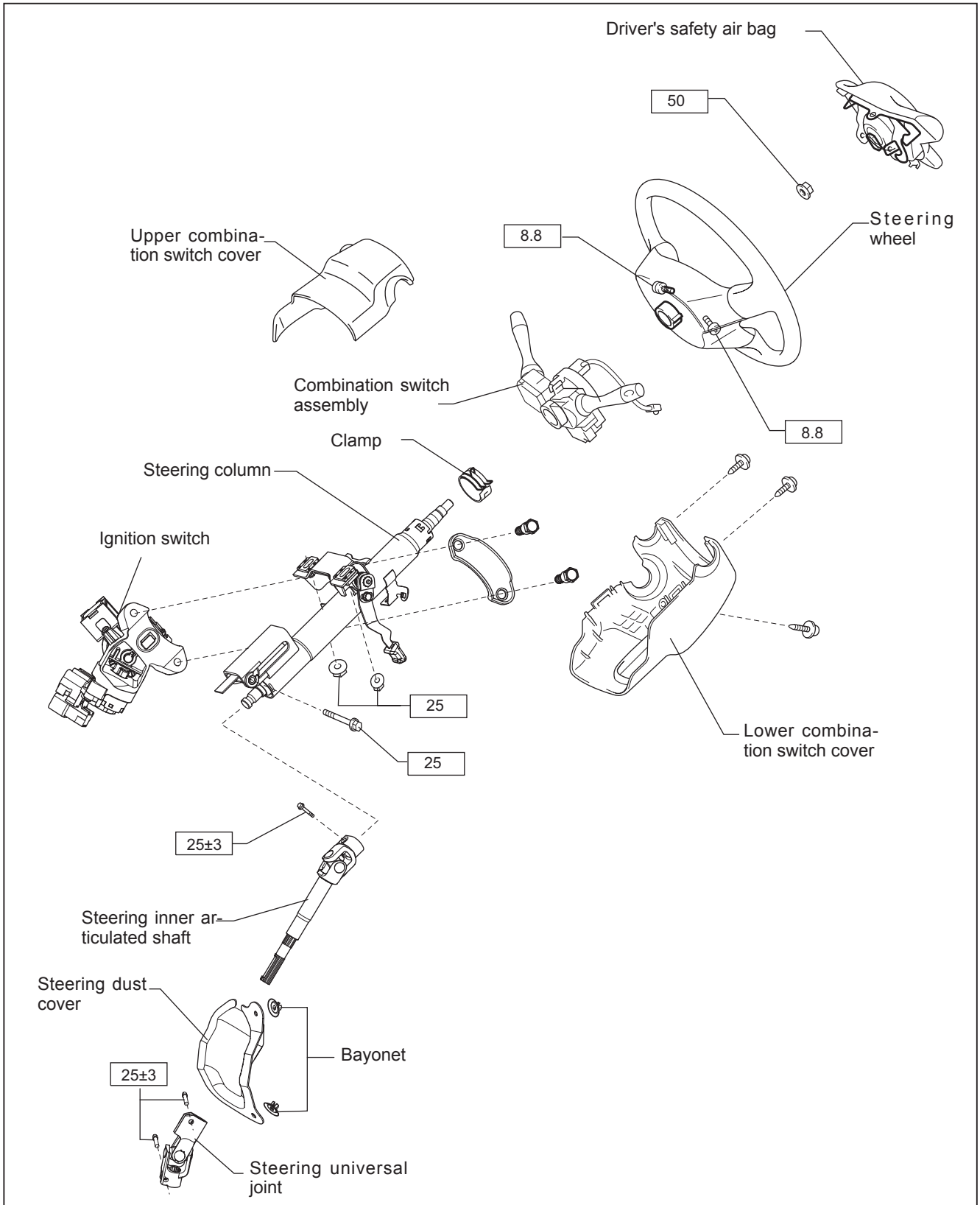
Failure Symptom	Fault Causes	Troubleshooting
The steering wheel's free play is too large/ the steering wheel noises abnormally.	1. The clearance between steering pinion and steering rack is too large. 2. The internal-external ball pins of the steering tie rod are worn. 3. The steering universal joint is worn. 4. The connection between the steering inner articulated shaft and the steering gear is loose. 5. The connection between the steering wheel and the steering column is loose. 6. The installation bolts of the steering gear are loose. 7. The slide spline of the inner articulated shaft is worn and loose.	1. Have the clearance adjusted by professionals. Replace the steering gear if no adjustment can be made. 2. Replace the ball pin as required upon check and confirmation. 3. Replace the lower segment of the steering column. 4. Re-tighten the connecting bolts according to the specified torques. 5. Tighten the steering wheel locknuts. If the spline has been damaged, replace the steering wheel or the steering column. 6. Tighten the installing bolts of the steering gear. 7. Replace the lower segment of the steering column.
Heavy-duty steering	1. The tire pressure is underinflated. 2. The front wheel alignment is incorrect. 3. The backlash of steering gear is small. 4. The cross bearings of the steering universal joint is damaged. 5. The ball pin of the steering tie rod is in oil shortage or damaged. 6. The upper pedestal bearings of the front absorber are damaged. 7. The ball end of the lower pitman arm is damaged. 8. The steering oil pump is damaged so that the output flow and the output pressure are insufficient. 9. The belt of the power steering oil pump is sliding. 10. The power steering gear leaks oil seriously. 11. The power steering fluid mixes with air bubble and accompanies abnormal noises. 12. The power steering fluid is insufficient.	1. Inflate the tire according to the specified pressure. 2. Check and adjust the front wheel alignment. 3. Replace the steering gear or adjust the backlash by professionals. 4. Replace the steering universal joint. 5. Replace the ball end of the steering tie rod. 6. Replace the upper pedestal connecting elements of the front absorber. 7. Replace the lower pitman arm. 8. Replace the power steering oil pump. 9. Adjust the belt tension. 10. Replace the power steering gear. 11. Rotate the steering wheel repeatedly for spot turn to discharge any bubble. 12. Keep static for an hour, and then refill the specified power steering fluid to the specified mark of the steering oil reservoir.

Failure Symptom	Fault Causes	Troubleshooting
Poor alignability/poor stability of straight driving	1. The tire pressure is underinflated.	1. Inflate the tire according to the specified pressure.
	2. Poor wheel dynamic balance results from such factor as wheel balance blocks falling off.	2. Re-correct the wheel dynamic balance.
	3. The rubber bushing of the lower pitman arm is aging, and the right-to left stiffness discrepancy is large.	3. Replace the lower pitman arm.
	4. The upper pedestal bearings of the front absorber and the ball end of the lower pitman arm lack lubrication.	4. Refill the grease of the specified model.
	5. The four-wheel alignment parameters are incorrect.	5. Re-measure and adjust the four-wheel alignment parameters.
	6. The meshing condition between the steering pinion and the steering rack is weakening, and the converse resistance is large.	6. Replace the steering gear.
	7. The steering column bearing and the cross bearing are damaged.	7. Replace the steering column assembly.
	8. The oil supply of the power steering pump is insufficient.	8. Replace the power steering oil pump.
	9. The performance of the interior control valve of the steering gear reduces.	9. Replace the power steering gear.
The power steering gear clucks	1. Check whether the power steering tube collides with the body.	1. Ensure the power steering tube's proper installation.
	2. Check the power steering gear for insufficient lubrication.	2. Lubricate the steering gear.
	3. Check the power steering gear seat for improper installation.	3. Tighten the bolts of the mounting bracket of the power steering gear.
	4. Check the outer steering tie rod for improper installation.	4. Tighten the ball joint of the outer steering tie rod. Replace the outer steering tie rod.
The steering wheel cannot return to the center.	1. Check whether the steering wheel collides with the combination switch housing.	1. Adjust the combination switch housing.
	2. Check the intermediate joint for seizing-up or loose.	2. Replace the countershaft.
	3. Check the flow-limiting valve of the power steering pump for seizing-up or disalignment.	3. Replace the power steering pump.
	4. Check the wheel alignment.	4. Align the wheel.
	5. Check the wheel bearings for wear or damage.	5. Replace the wheel bearings.
	6. Check the steering tie rod for seizing-up or loose.	6. Tighten the steering tie rod and ball joint. Replace the steering tie rod and ball joint.
	7. Check the adjustment of the power steering gear.	7. Perform the check for straight driving.
	8. Check whether the steering column seal rubs the steering shaft.	8. Replace the seal of the front-wall panel.

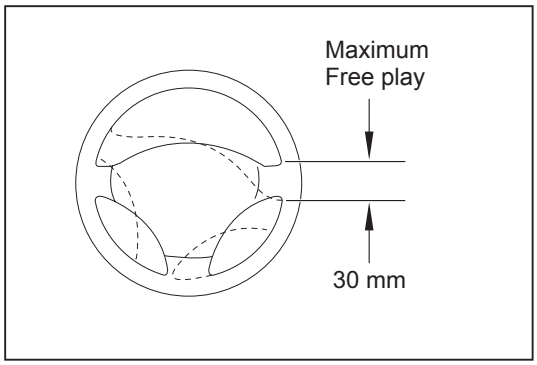
Failure Symptom	Fault Causes	Troubleshooting
Quickly-rotating the steering wheel feels heavy all of a sudden.	1. Check the power steering pump for inside leakage. 2. Check the tube for damage or blocking the oil flow. 3. Check the oil fluid level of the power steering fluid. 4. Check the flow-limiting valve of the power steering pump for seizing-up or improper operation.	1. Replace the power steering pump. 2. Replace the power steering tube and/or connecting pipe. 3. Add the steering fluid to the power steering oil reservoir. 4. Replace the power steering pump.
The chattering occurs when turning during the engine running.	1. Check the power steering pump for insufficient pressure. 2. Check the flow-limiting valve of the power steering pump for seizing-up or improper operation. 3. Check the belt of the power steering pump for sliding. 4. Check the power steering system for air pollution.	1. Replace the power steering pump. 2. Replace the power steering pump. 3. Tension the belt of the power steering pump. 4. Let the air in the power steering system out.
There is steering shock when low-speed or static steering.	1. Check the power steering system for air pollution. 2. Check whether the belt of the power steering pump is too loose.	1. Let the air in the power steering system out. 2. Tension the belt of the power steering pump.
The steering wheel' s kick-back is too large or loose.	1. Check the power steering system for air pollution 2. Check the wheel bearings for wear or damage. 3. Check the power steering gear seat for improper installation. 4. Check the joint of the countershaft for improper installation. 5. Check the outer steering tie rod and ball joint for loose.	1. Let the air in the power steering system out. 2. Replace the wheel bearings. 3. Tighten the mounting bolts of the power steering gear. 4. Adjust the joint between the power steering gear and the steering column. 5. Tighten the steering tie rod and ball joint. Replace the steering tie rod and ball joint.
Difficult steering or poor booster (especially when parking)	1. Check the inner articulated shaft and the universal joint between the power steering gear and the steering column. 2. Check the flow-limiting valve for the power steering pump for seizing-up or improper installation. 3. Check the power steering pump for insufficient pressure. 4. Check the power steering pump for inside leakage. 5. Check the inner articulated shaft for loose or wear. 6. Check the power steering pump belt for degree of tension.	1. Adjust the inner articulated shaft and the universal joint between the power steering gear and the steering column. Replace the universal joint if necessary. 2. Replace the power steering pump. 3. Replace the power steering pump. 4. Replace the power steering pump. 5. Tighten the inner articulated shaft. If necessary, replace the inner articulated shaft. 6. Tension the power steering pump belt.

STEERING CONTROL MECHANISM

STRUCTURE DIAGRAM



N·m : Specified torque



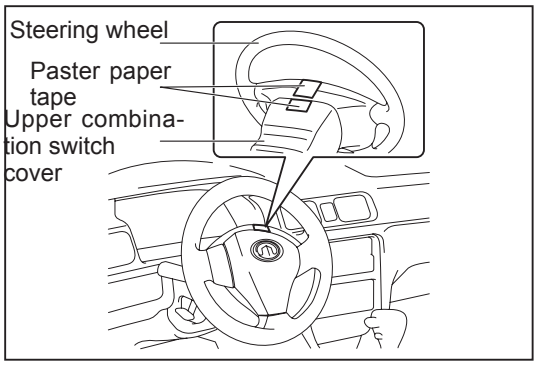
ON-BOARD CHECK

1. Check the free play of steering wheel

(a) Park the car and get its tires to front toward straight.

(b) Rotate the steering wheel clockwise and counter-clockwise until the resistance increases, and check the free play of the steering wheel.

Maximum free play: 30 mm

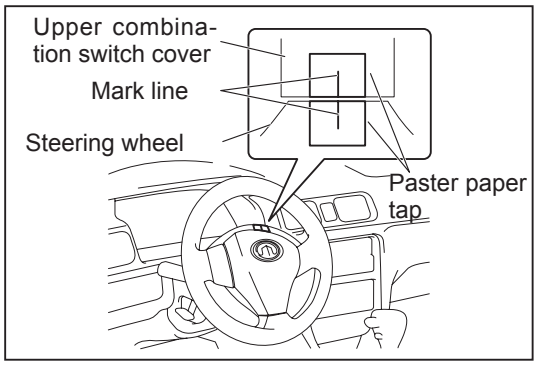


2. Check and maintenance procedures for steering eccentricity

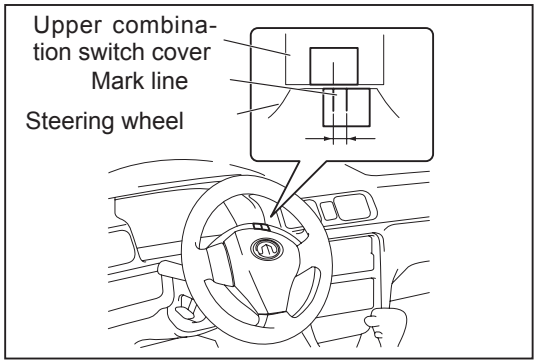
(a) Check the eccentricity of the steering wheel.

(1) Post the paste paper tape onto the center of the upper steering wheel and the upper combination switch cover.

(2) Drive the car forward for a straight distance of 100 m at a constant speed of 56 km/h, and grasp the steering wheel to maintain this course.



(3) As shown in the figures, mark the paste paper tape(drawing a line).



(4) Rotate the steering wheel to its middle position.

Tip:

As for the middle position, please refer to the upper steering wheel surface, the steering wheel stroke and the SRS airbag line.

(5) As shown in the figures, draw a new line on the paste paper tape on the steering wheel.

(6) Measure the distance between two lines of the paste paper tape on the steering wheel.

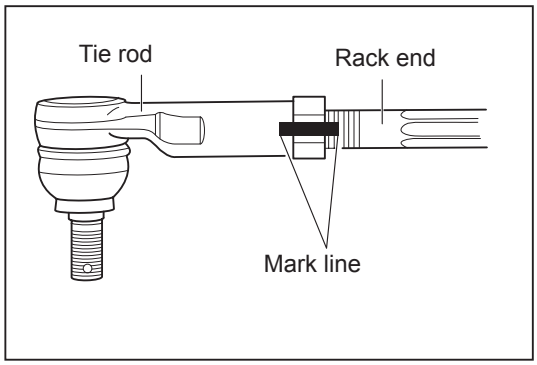
(7) Convert the measured distance into the steering angle.

The measured distance is 1 mm (about 1°steering angle).

Tip:

Record the steering angle.

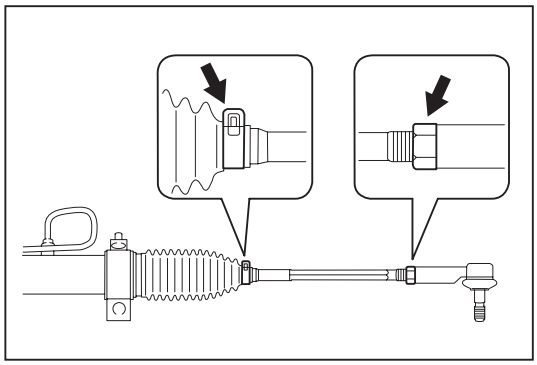
(b) Adjust the steering angle.



(c) Perform the following steps on the right side and the left side respectively.

(1) Mark at the obvious location on the tie rod and the rack end.

(2) Use a gauge to measure the distance between the tie rod and the rack end screw thread.



(3) Loosen the right locknuts and left locknuts.

(4) Rotate the right rack end and the left rack end at the same angle of rotation (but different direction of rotation). Rotate the rack end for 360° (level movement for 1.5 mm) - 12° of steering angle.

(5) Tighten the right locknuts and left locknuts.

Torque: 74±7 N•m

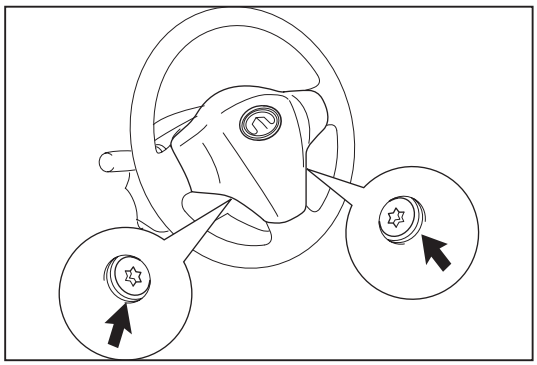
Note:

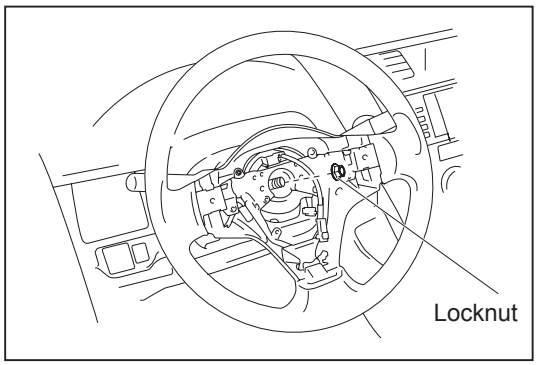
Make sure the length difference between the right tie rod end or the left tie rod end and the rack end screw thread should be within 1.5 mm.

(6) Install the clamps of the right dust cover and the left dust cover.

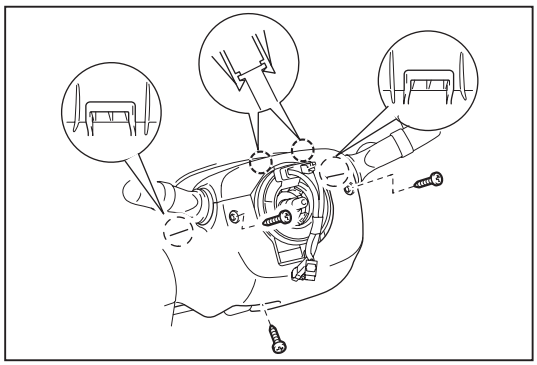
REPLACING

1. **ATTENTIONS**
2. **Disconnect the negative terminal of the battery.**
3. **Locate the front wheel to front forward straight.**
4. **Removing the driver's safety air bag.**
   (a) Remove two bolts and the driver's safety air bag.

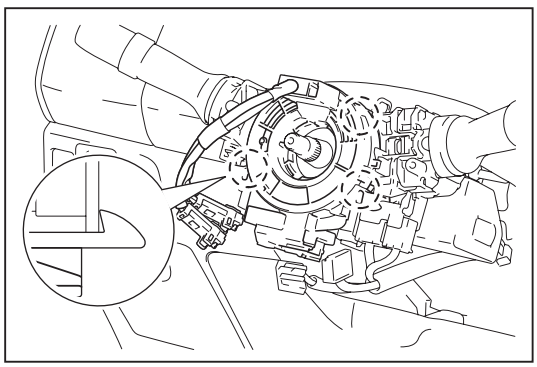




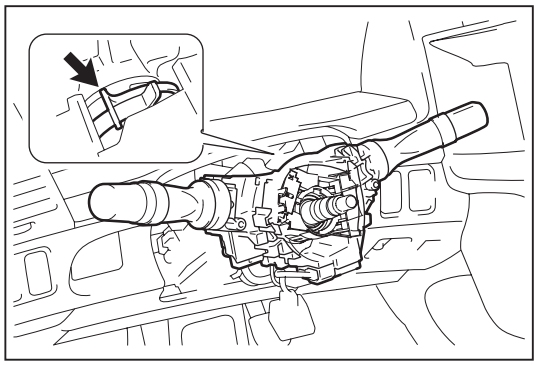
5. **Removing the steering wheel**
   (a) Use a M18 socket wrench to screw off the steering wheel locknuts counter-clockwise.
   (b) Hold the steering wheel shake for a few times right and left, back and forth, and pull the steering wheel out upward.



6. **Removing the combination switch covers**
   (a) Remove three screws.
   (b) Remove the upper combination switch cover.
   (c) Remove the lower combination switch cover.



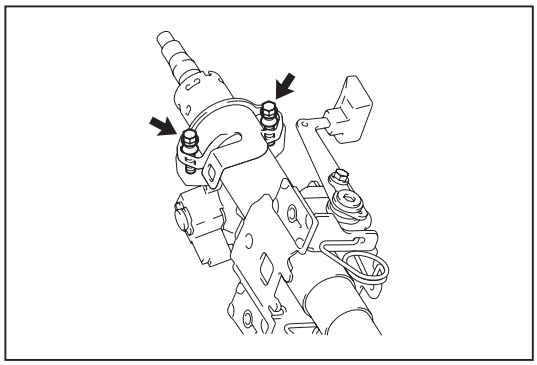
7. **Removing the clock spring sub-assembly**
   (a) Release three clamps.



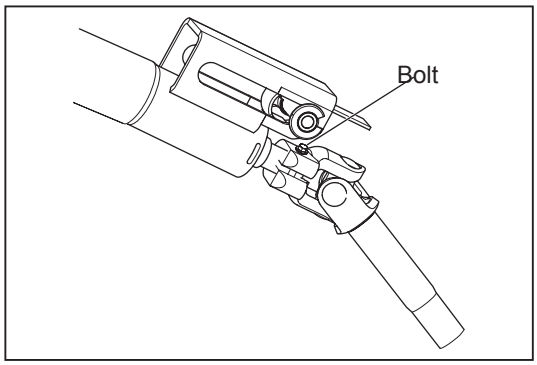
8. Removing the right combination switch, the left combination switch and the ignition switch

(a) Disconnect the wiring harness on the combination switch and the ignition switch.

(b) Remove the combination switches. (Both the right combination switch and the left combination switch are integral.)



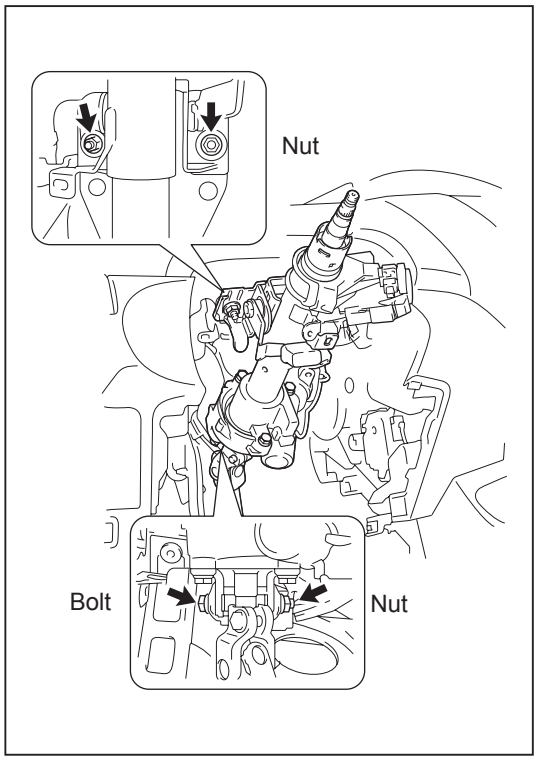
(c) Remove two mounting-bolts of the ignition switch, and take it off.



9. Disengaging the steering column and the steering inner articulated shaft

(a) Make assembly marks on the steering inner articulated shaft and the steering column.

(b) Use a M13 socket wrench to remove the bolts and Release the steering inner articulated shaft.

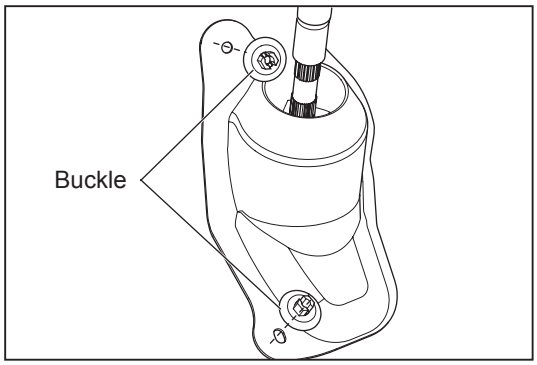


10. Removing the steering column

(a) Use a M10 socket wrench to remove two connecting nuts to the instrument reinforced beam.

(b) Use a M10 socket wrench to remove the bolts connected to the instrument reinforced beam.

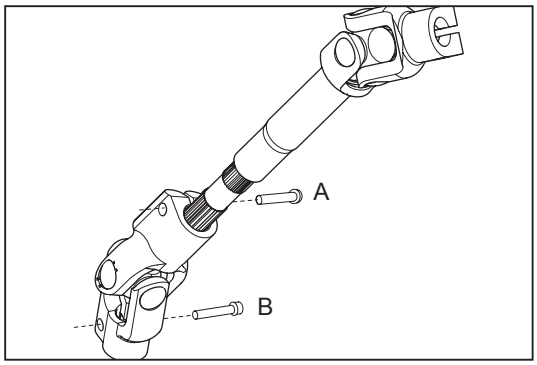
(c) Pull the steering column out upward along the upper column axial line.



11. Removing the dust cover of the steering column

(a) Rotate the plastic buckle by hand counter-clockwise.

(b) Remove the dust cover of the steering column from the steering inner articulated shaft.



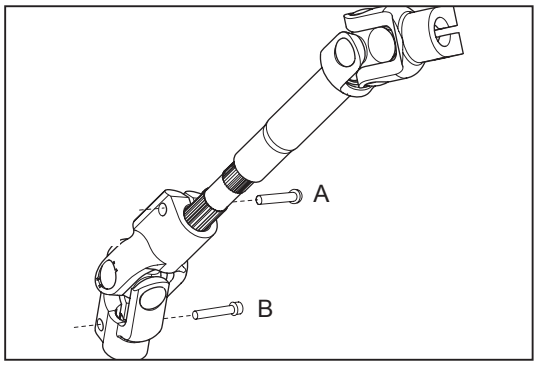
12. Removing the steering inner articulated shaft

(a) Make assembly marks on the steering inner articulated shaft and the steering universal joint.

(b) Use a M13 socket wrench to remove the bolt A from the steering inner articulated shaft.

(c) Use a M13 socket wrench to remove the lock-bolt B.

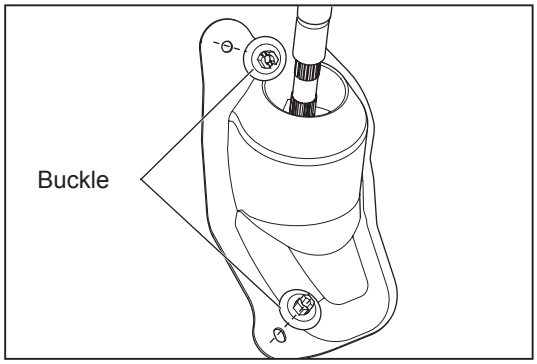
(d) Remove the steering inner articulated shaft.



13. Connecting the steering inner articulated shaft and power steering assembly

(a) Connect the steering inner articulated shaft with the steering universal joint.

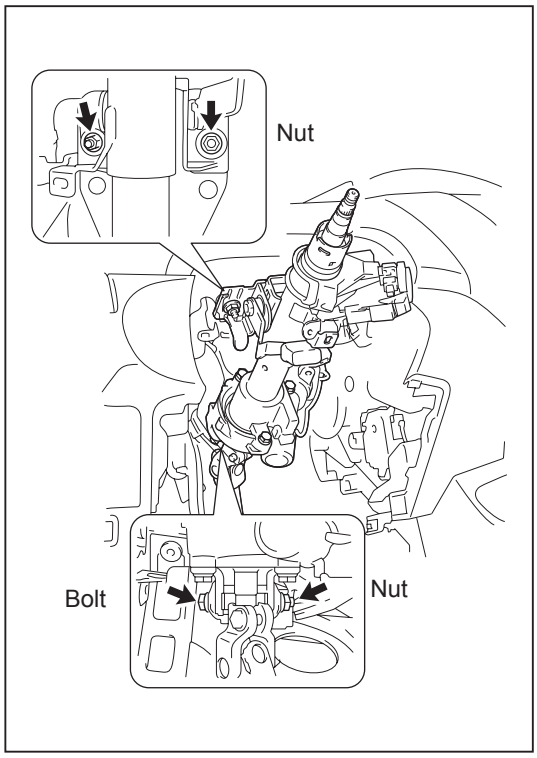
(b) Connect the steering inner articulated shaft to the power steering gear assembly.



14. Installing the dust cover of the steering column

(a) Install the dust cover of the steering column to the steering inner articulated shaft.

(b) Rotate two plastic buckles clockwise by and hand and install them.

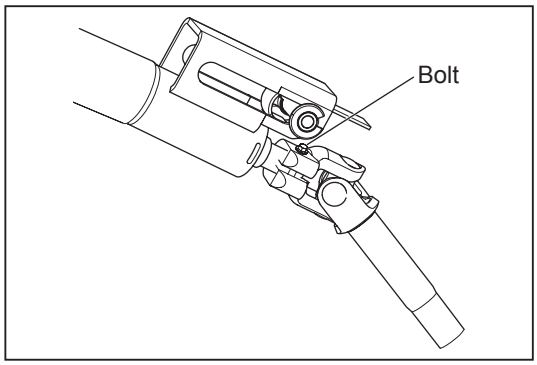


15. Installing the steering column

(a) Insert the steering column assembly downward along the upper column axial line.

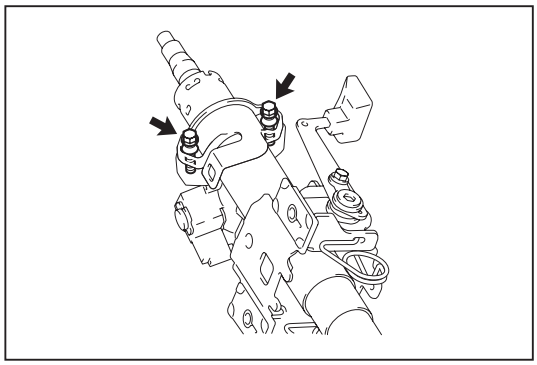
(b) Install two nuts connected with the instrument reinforced beam.

(c) Install one bolt connected with the instrument reinforced beam.



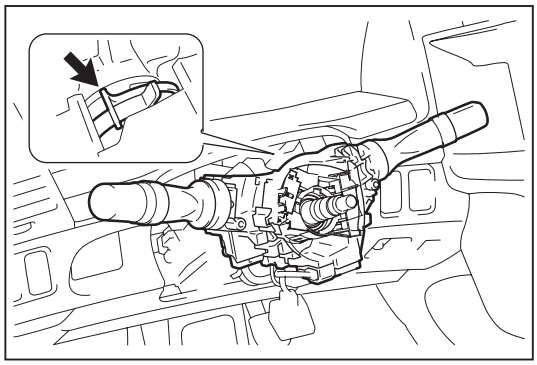
16. Connecting the steering column and the steering inner articulated shaft

(a) Connect the steering inner articulated shaft to the steering column and tighten the bolt.



17. Installing the right combination switch, the left combination switch and the ignition switch

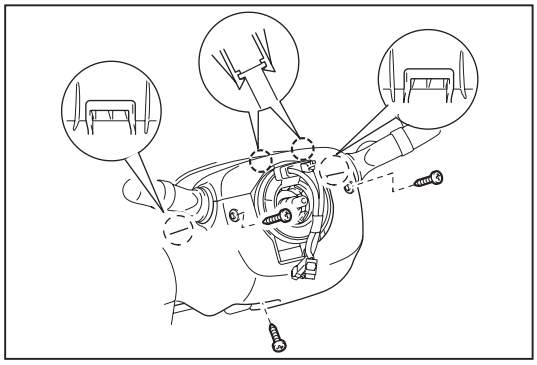
(a) Install two bolts of the ignition switch.



(b) Install the combination switches. (Both the right combination switch and the left combination switch are integral.)

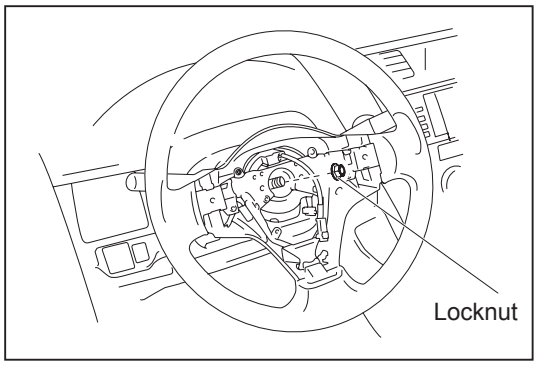
(c) Connect the wiring harness on the combination switches and the ignition switch.

18. Installing the clock spring sub-assembly



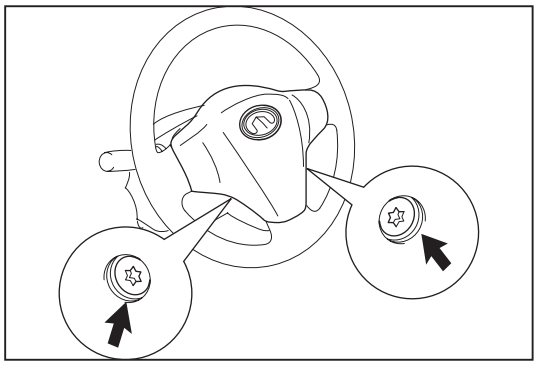
19. Installing the combination switch covers

(a) Install the lower combination switch cover.
(b) Install the upper combination switch cover.
(c) Install three screws.



20. Installing the steering wheel

(a) Install the steering wheel along the axial line direction.
(b) Use a M18 socket wrench to rotate the steering wheel locknut inward clockwise.



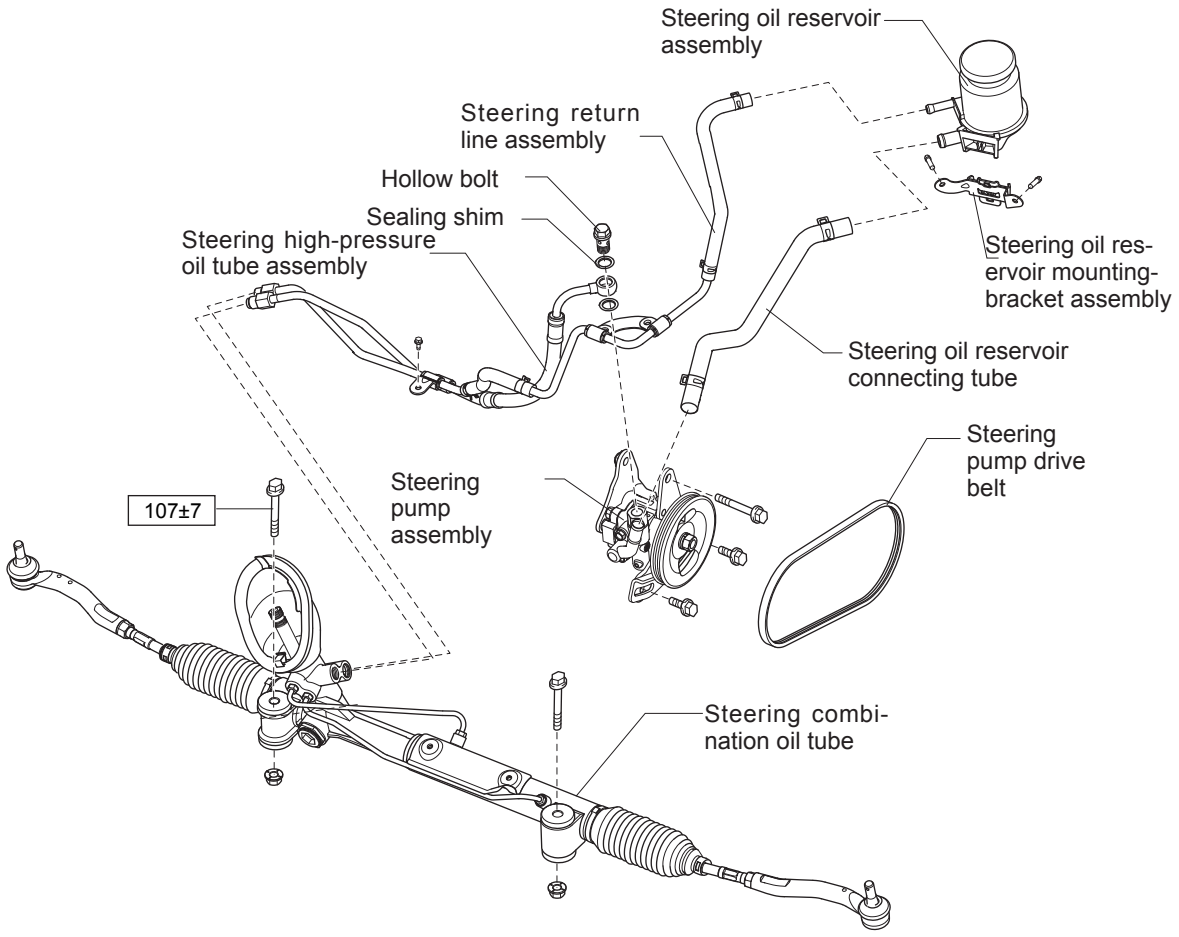
21. Install ing the driver's safety air bag

(a) Install the driver's safety air bag and two bolts.

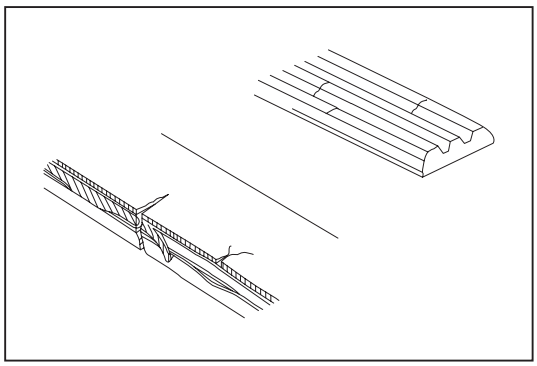
22. Connect ing the negative terminal of the battery

POWER STEERING SYSTEM

STRUCTURE DIAGRAM



N•m : Specified torque



ON-BOARD CHECK

1. Checking the steering pump belt

Check visually the steering pump belt for over-wear or the cord for damage. If you find any defect, replace the steering pump belt.

Tip:

It is acceptable that there are some cracks on the side of the belt ridge of the steering pump belt. However, if the belt ridge has any defect, replace the belt.

2. Deflating the power steering system

(a) Check the fluid-level.

(b) Jack the front car side and hold the car with a bracket.

(c) Rotate the steering wheel.
In the case of the engine stopping running, rotate slowly the steering wheel to the left to the end and then to the right to the end, and repeat several times.

(d) Lower the car.

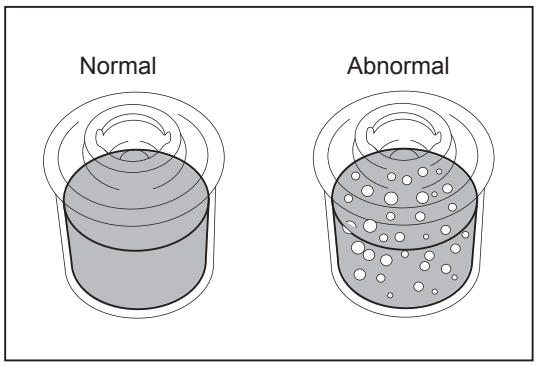
(e) Start the engine.
Let the engine idle-running for several minutes.

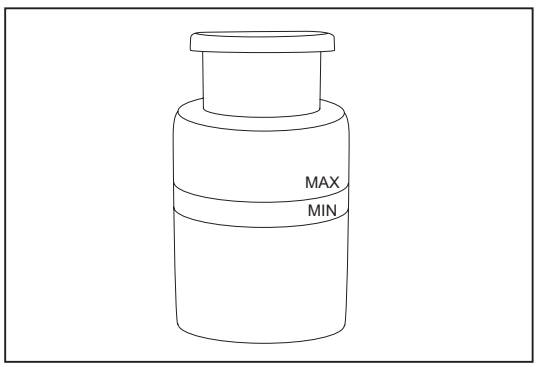
(f) Rotate the steering wheel.
(1) In the case of the engine idle-running, turn the steering wheel to the left to the end or to the right to the end and staying for 2-3 seconds, and then turn the steering wheel in reverse to the end and staying for 2-3 seconds.
(2) Repeat (1) several times.

(g) Turn off the engine.

(h) Check the bubble or emulsification phenomenon.
If the bubble or emulsification results in bleeding the system twice, be sure to check the system for oil leakage.

(i) Check the fluid-level.





3. Checking the fluid-level

(a) Keep the car level.

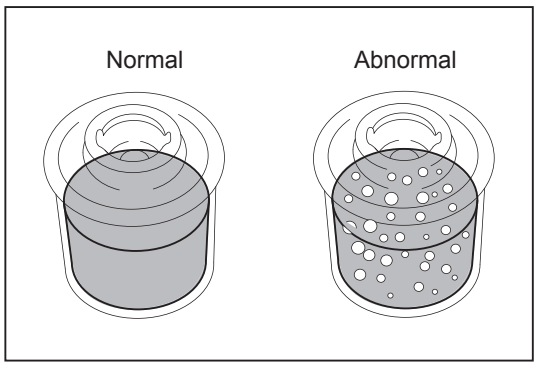
(b) At the moment when the engine stop, check the fluid-level of the steering oil reservoir. If necessary, add the oil fluid.
Oil fluid:ATF DEXRON III

Tip:

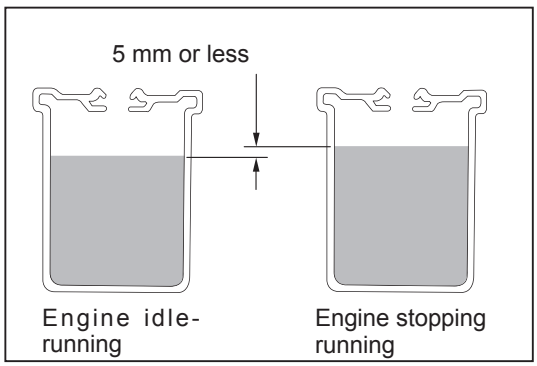
Check and confirm the fluid-level between the mark MAX and the mark MIN.

(c) Start the engine and keep it idle-running.

(d) Turn the steering wheel to the left and then to the right to the end, repeat several times to ramp up the oil fluid.
Oil temperature: 80°C



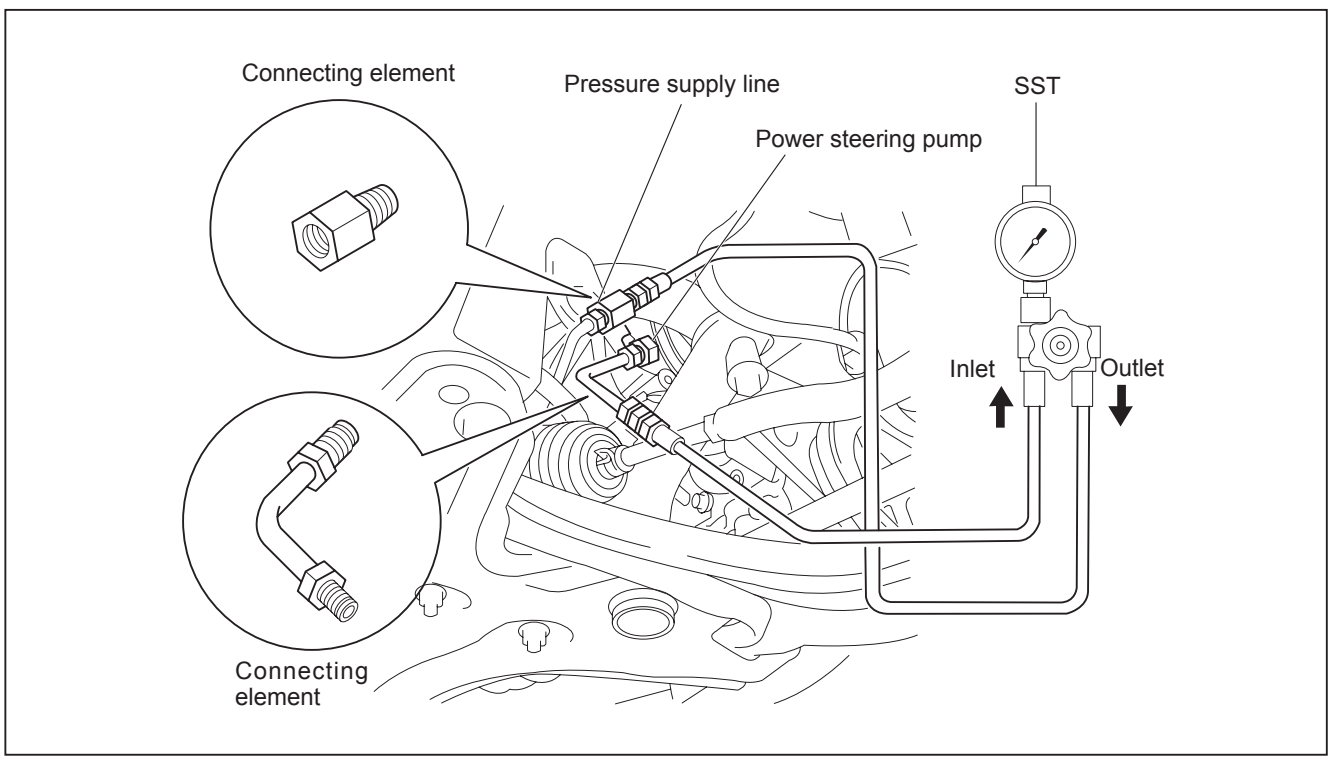
(e) Check the bubble or emulsification phenomenon.
If it is confirmed that there is bubble or emulsification phenomenon, bleed the power steering system.

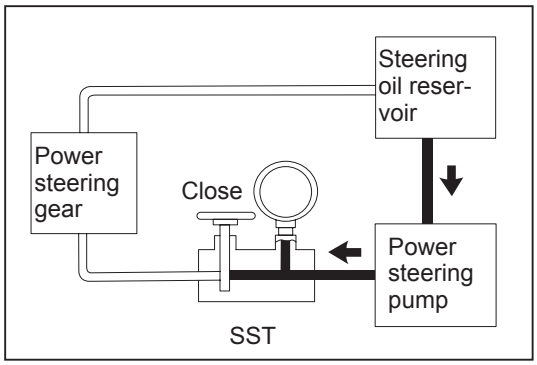


(f) When the engine idle-running, measure the fluid-level of the steering oil reservoir.
(g) Turn off the engine.
(h) Wait for several minutes, re-measure the fluid-level of the steering oil reservoir.
Maximum fluid-level increase: 5 mm
If there is any problem, bleed the power steering system.
(i) Check the fluid-level.

4. Checking the steering oil fluid pressure

(a) Disconnect the pressure supply line from the power steering pump.
(b) Connect the SST as shown in the following charts.
Tip:
Check and verify the valve of the SST has been opened.
(c) Bleed the power steering system.
(d) Start the engine and keep it idle-running.
(e) Turn the steering wheel to the left and then to the right to the end, repeat several times to ramp up the oil fluid.
Oil temperature: 75°C to 80°C



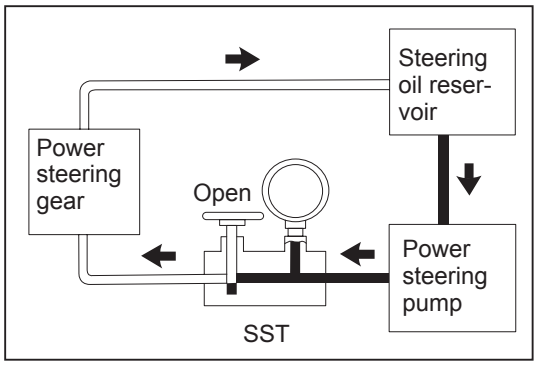


(f) When the engine idle-running, close the valve of the SST and look at the readings on the SST.
Minimum oil fluid pressure: 5,900 kPa

Caution:

The time for the closure of the valve should not more than 10 seconds.

Too high oil-fluid temperature is not permitted.

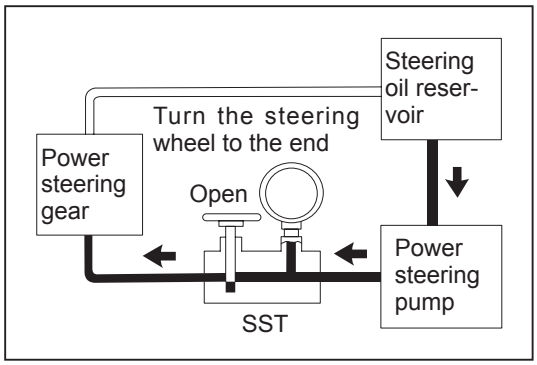


(g) Open the valve fully when the engine idle-running.

(h) When the engine revolves at 1000 rpm and 3000rpm, measure the oil fluid pressure.
Oil pressure difference: 490 kPa or less

Note:

Do not rotate the steering wheel.



(i) When the engine idle-running and the valve being opened fully, turn the steering wheel to the left and then to the right to the end.
Minimum oil pressure difference: 5,900 kPa

Note:

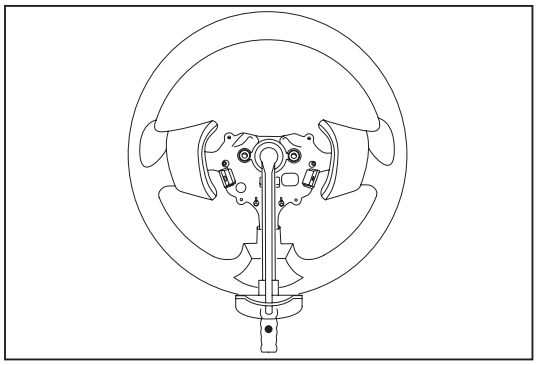
Do not stay for more than 10 seconds when turning the steering wheel to the end.

Too high oil-fluid temperature is not permitted.

(j) Disconnect the SST.

(k) Connect the pressure supply line to the power steering pump.

(l) Bleed the power steering system.



5. Checking the steering torque

(a) Locate the steering wheel assembly at the center position.

(b) Remove the driver's safety air bag.

(c) Start the engine and keep it running .

(d) Measure the steering torque in the left direction and in the right direction.
Steering torque (for reference): 6 N•m orless

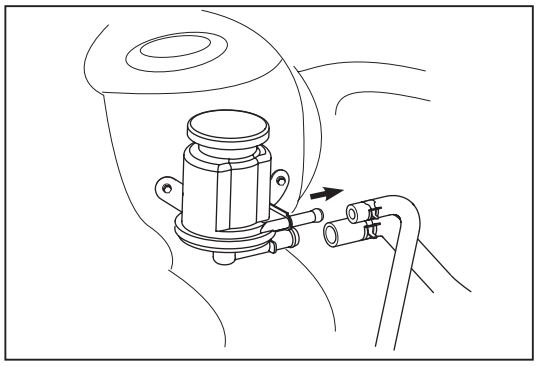
Tip:

Before diagnosis, consider such factors as tire type, pressure and contact area.

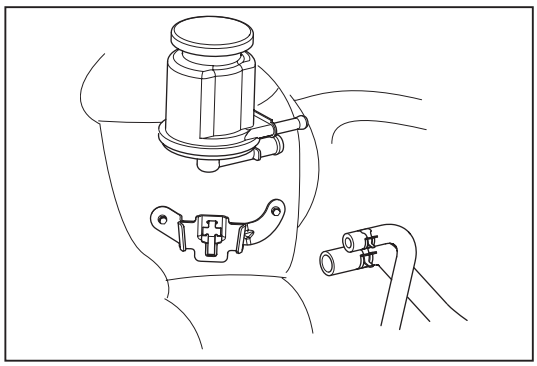
(e) Tighten the locknut of the steering wheel assembly.
Torque: 50 N•m

(f) Install the driver’s airbag.

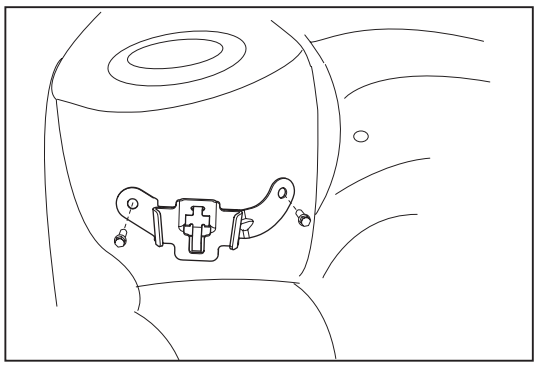
POWER STEERING OIL RESERVOIR



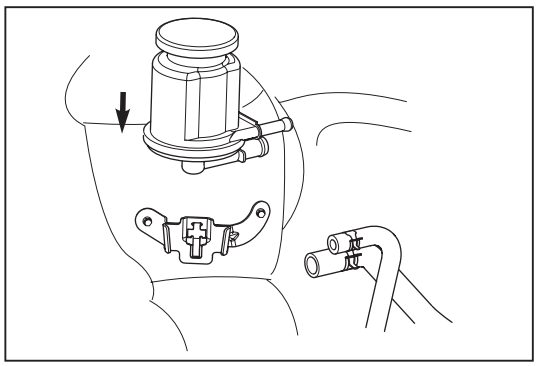
1. **Lift the engine hood.**
2. **Remove the connecting tube of the steering oil reservoir and the steering return line**
   (a) Use a plier to expand the two steel-band ring clamps on the connecting tube of the steering reservoir and the steering return line and push them back to the positions as shown in the left figures.
   (b) Disconnect the connecting tube of the steering reservoir and the steering return line according to the directions as shown in the figures, and use a container to receive the power steering oil discharged.



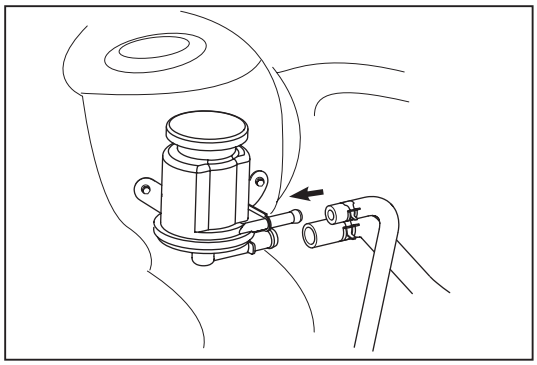
3. **Remove the steering oil reservoir**
   (a) Use a flat-tip screwdriver to press down the spring clip until the spring clip retreats from the locking position, and use the other hand to push it out of the steering oil reservoir upward.



4. **Remove the steering oil reservoir bracket**
   (a) Use a wrench to remove the two bolts, and take off the steering oil reservoir bracket.
5. **Install the steering oil reservoir bracket**
   (a) Use the two bolts to install the steering oil bracket.



6. **Install the steering oil reservoir**
   (a) Install the steering oil reservoir downward to the bracket of the steering oil reservoir.

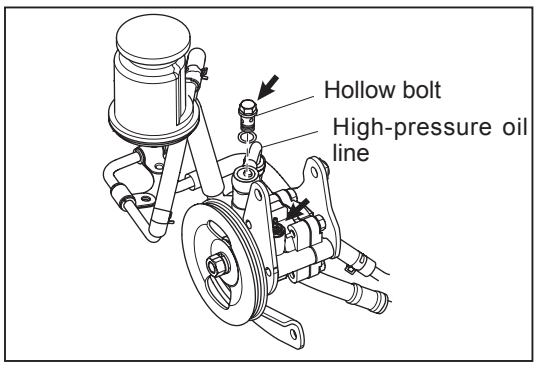


7. **Install the connecting tube of the steering oil reservoir and the steering return line**
   (a) Install the connecting tube of the steering oil reservoir and the steering return line to the steering oil reservoir according to the direction as shown in the figure.
   (b) Use a plier to expand the two steel-band ring clamps on the connecting tube of the steering reservoir and the steering return line and clamp the tube connector.
8. **Add the power steering oil**
9. **Bleeding the power steering system**
10. **Check the oil fluid for leakage**
11. **Check the fluid-level of the power steering oil in the power steering oil reservoir**
12. **Install the steering reservoir cap**
13. **Close the engine hood**

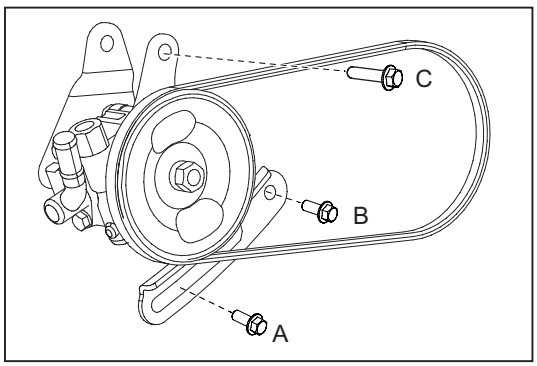
POWER STEERING PUMP

Replacing

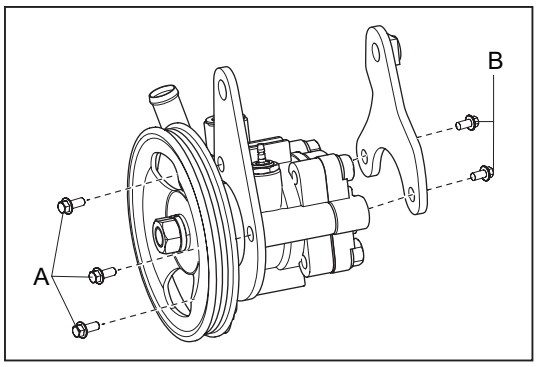
1. **Remove the steering oil reservoir cap.**
2. **Drain the power steering oil.**
   (a) Disconnect the inlet tube on the power steering pump and use a container to receive the power steering oil discharged.
3. **Remove the right front wheel.**
4. **Remove the deflecting plate on the right side.**



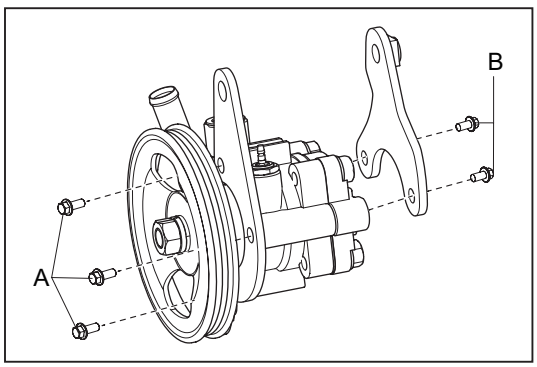
5. **Release the high-pressure steering line and the oil-pressure sensor.**
   (a) Remove the hollow bolt from the power steering pump, and disconnect the high-pressure line.
   (b) Disconnect the connector of the oil-pressure sensor.



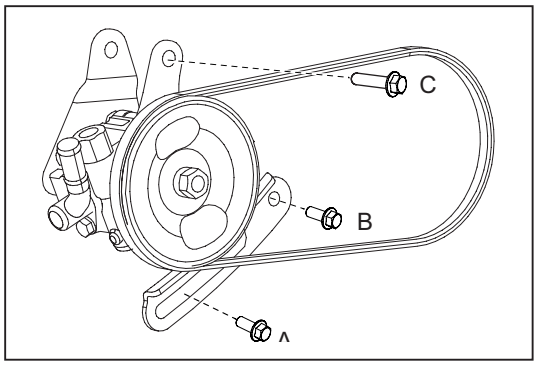
6. **Remove the power steering pump.**
   (a) Remove the tension-adjustable bolt A and the power steering pump belt.
   (b) Remove the bolt B, and take off the tension-adjustable bracket.
   (c) Remove the fixing bolt C from the steering pump, and take off the steering pump.

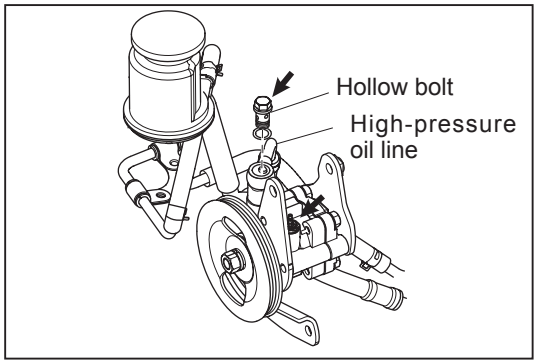


7. **Remove the power steering pump bracket.**
   (a) Unscrew off the three bolts A and two bolts B, and take off the power steering pump bracket.



8. **Install the power steering pump bracket.**
   (a) Install the front bolts A and the rear bolts B of the steering pump bracket.
   Torque: 18±2 N•m





9. Install the power steering pump.

(a) Use the bolt C to fix the steering pump bracket assembly to the engine.

(b) Install the steering pump belt and use the bolt B to fix the tension-adjustable bracket to the engine.

(c) Adjust the belt tension properly before tightening the bolt A.

Torques:

Bolt A: 30±3 N•m

Bolt B: 40±4 N•m

Bolt C: 40±4 N•m

10. Install the high-pressure steering oil line and the oil-pressure sensor.

(a) Use the hollow bolt to fix the high-pressure oil line to the steering pump.

Torque: 30±4 N•m

(b) Connect the connector of the oil-pressure sensor.

11. Connect the inlet tube to the power steering pump.

12. Add the power steering oil.

13. Bleed the power steering system.

14. Check the oil for leakage.

15. Install the right-side deflector of the engine.

16. Install the right front wheel.

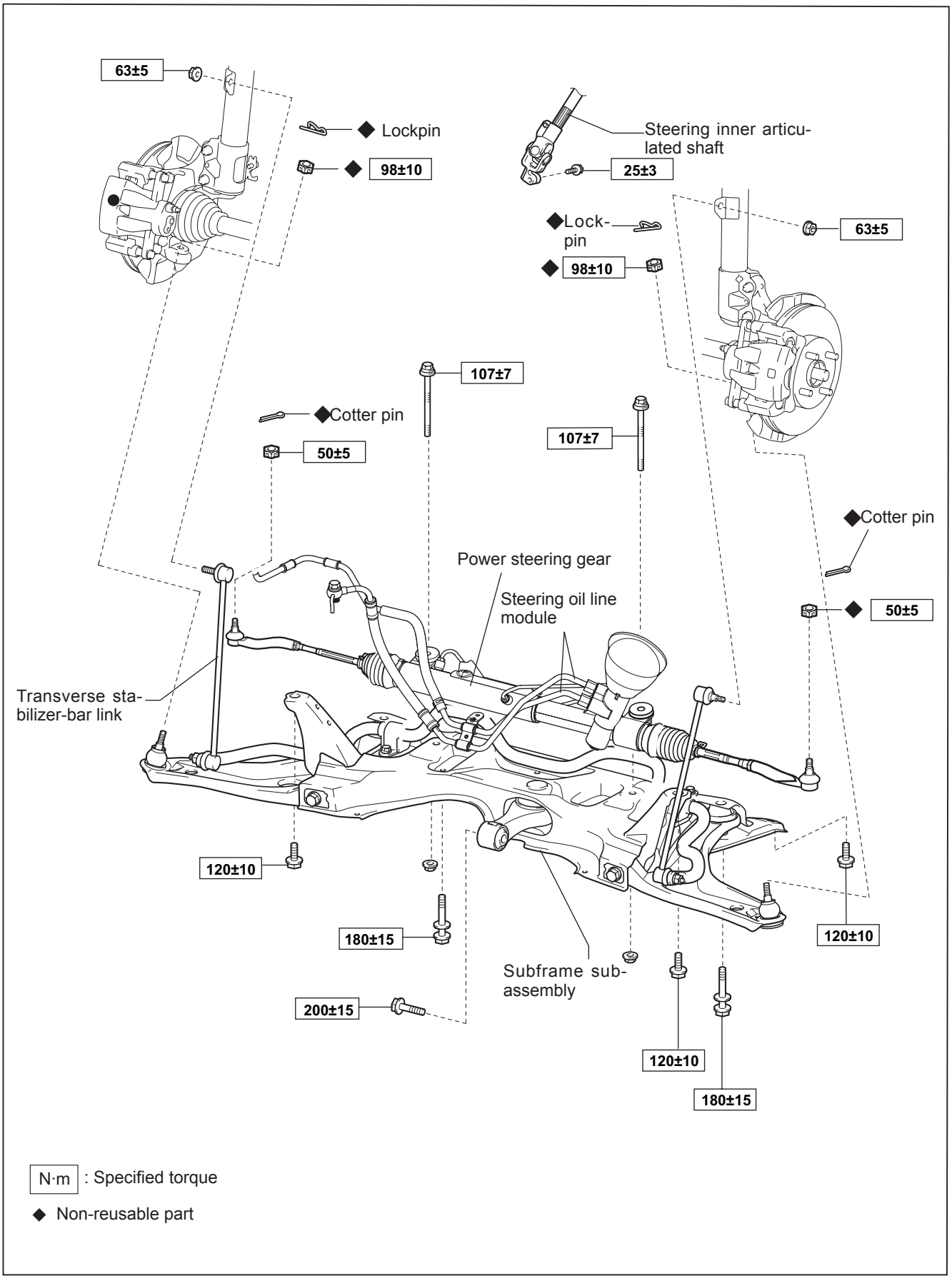
Torque: 110±10 N•m

17. Check the fluid-level of the power steering oil in the steering oil reservoir.

18. Install the steering oil reservoir cap.

POWER STEERING GEAR

Structure Diagram

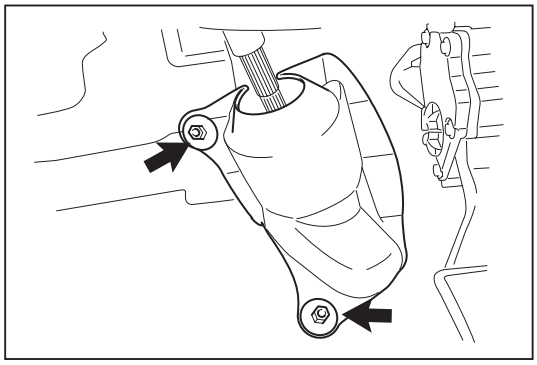


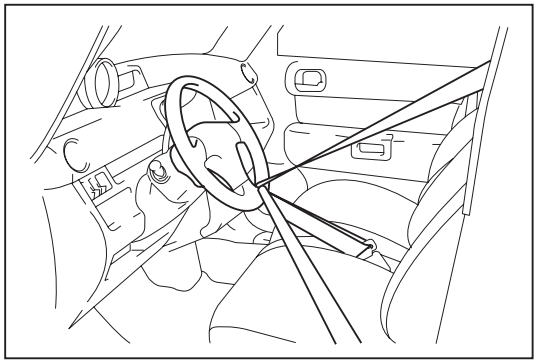
N·m : Specified torque

◆ Non-reusable part

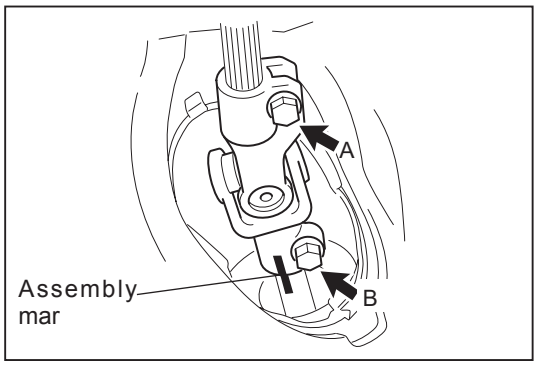
Replacing The Power Steering Gear

1. **Make the front wheels just front forward.**
2. **Remove the dust cover of the steering column.**



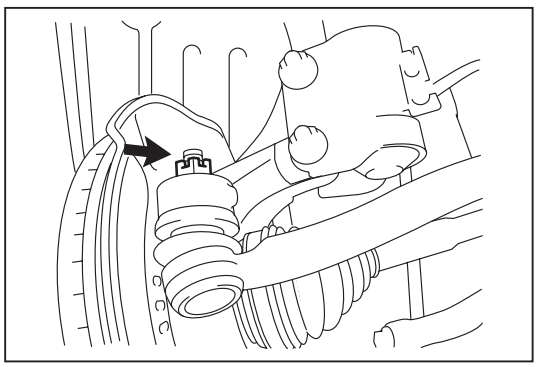


3. **Release the steering drive universal.**
   (a) Use the seat belt to fix the steering wheel to prevent rotating.
   Tip:
   This operation can also help prevent damaging the clock spring.

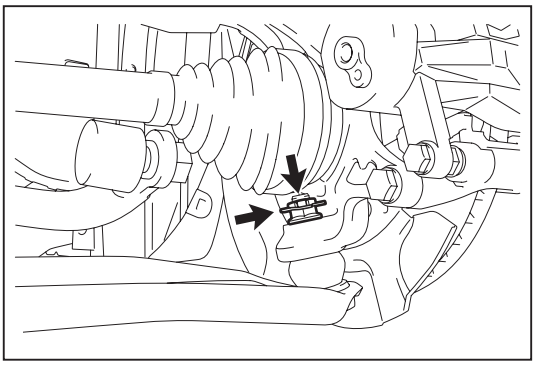


   (b) Make assembly marks on the steering drive universal joint and the steering inner articulated shaft.
   (c) Remove the bolt, and then Release the steering drive universal joint from the steering inner articulated shaft.

4. **Lift the engine hood.**
5. **Drain the power steering oil.**
6. **Remove the steering line module of the oil pump.**
7. **Remove the front wheels.**



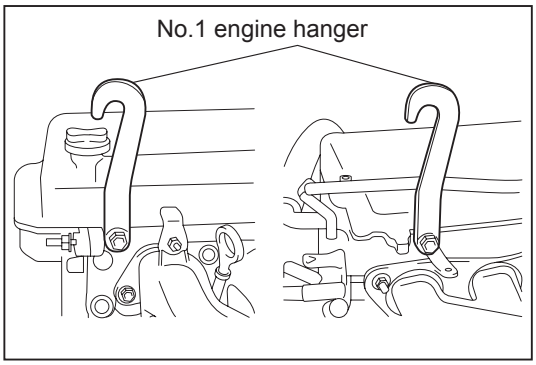
8. **Release the ball joint assembly of the left-side steering tie rod.**
   (a) Remove the cotter pin and the nut.
   (b) Release the ball joint assembly of the left-side steering tie rod from the steering knuckle.
9. **Release the ball joint assembly of the right-side steering tie rod.**
   Tip:
   Do the same operation on the other side.
10. **Remove the front transverse stabilizer-rod link.**
    Tip:
    Perform the same operation on the right side.



11. Release the left suspension lower swing arm.

Tip:

Perform the same operation on the right side.



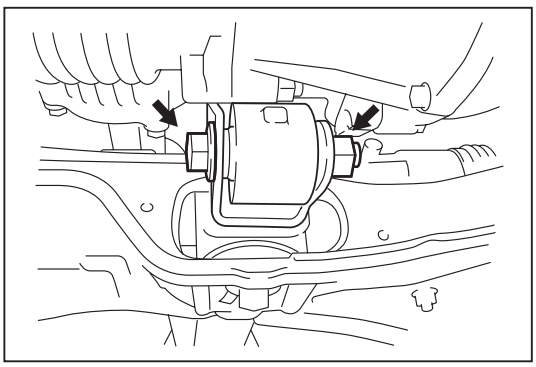
12. Suspend the engine assembly.

(a) Use the bolts to install the two No.1 engine hangers according to the proper direction.
Torque: 40 N•m

(b) Hang the chain of the engine hoist to the engine hanger.

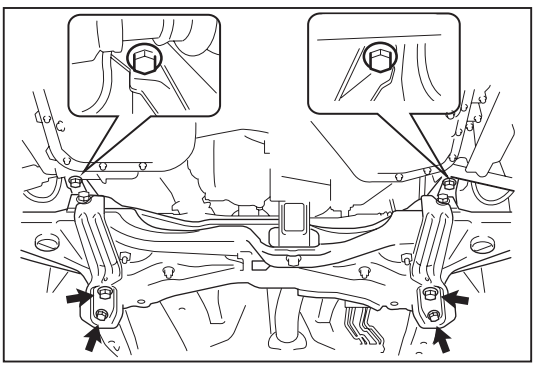
Note:

Do not hang the chain to any other part to suspend the engine.



13. Remove the subframe subassembly.

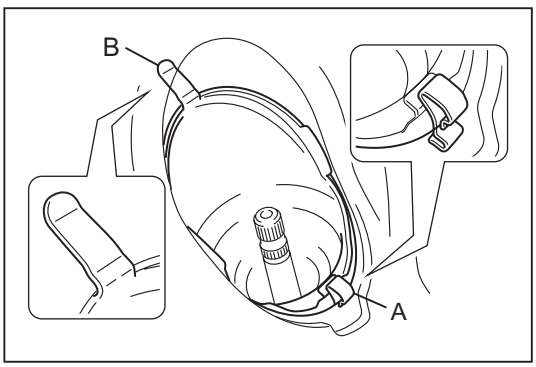
(a) Remove the rear suspension bolts and nuts of the engine.



(b) Use a jack to support the subframe subassembly.

(c) Remove the six connecting bolts between the subframe and the body.

(d) Remove the subframe subassembly.

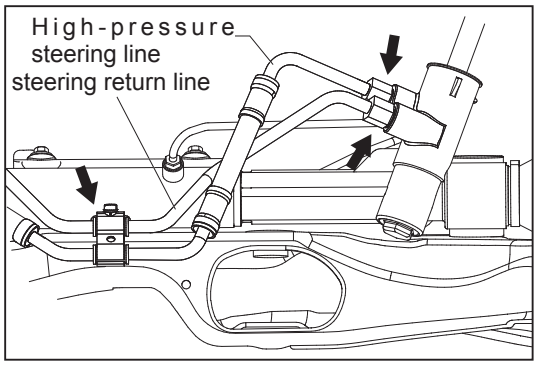


14. Release the steering shaft jacket assembly.

(a) Release the clip A and the clip B of the steering shaft jacket.

Note:

Do not damage the clips.

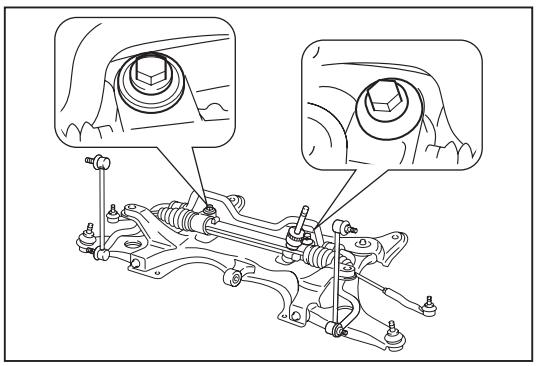


15. Remove the steering line module.

(a) Use a fork wrench to loosen the joint nut of the steering return line and the steering gear, and disconnect the steering return line.

(b) Use a fork wrench to loosen the joint nut of the high-pressure steering line and the steering gear, and disconnect the high-pressure steering line.

(c) Remove the bolt and release the line clamp.

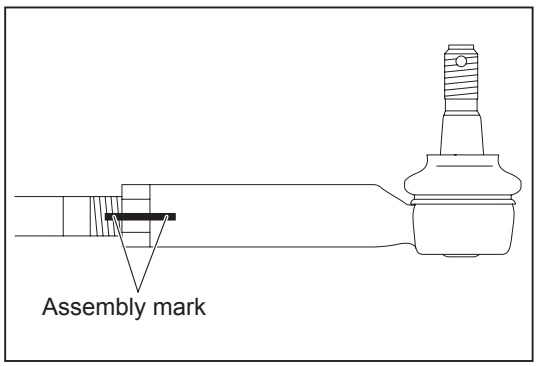


16. Remove the power steering gear.

(a) Remove the two bolts and nuts and the power steering gear.

Note:

Fix the nut in order to remove the bolt.



17. Remove the ball end assembly of the left-side steering tie rod.

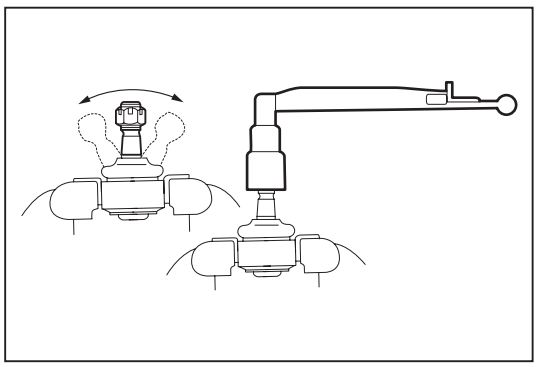
(a) Draw assembly marks on the ball end assembly of the left-side steering tie rod and the rack end sub-assembly.

(b) Loosen the locknut and remove the ball end assembly of the left-side steering tie rod and the locknut.

18. Remove the ball end assembly of the right-side steering tie rod.

Tip:

Perform the same operation on the other side.



19. Check the ball end assembly of the left-side steering tie rod.

(a) Fix the ball end assembly of the left-side steering tie rod to the vice.

(b) Install the nut to the ball spin.

(c) Move the ball spin back and forth for 5 times.

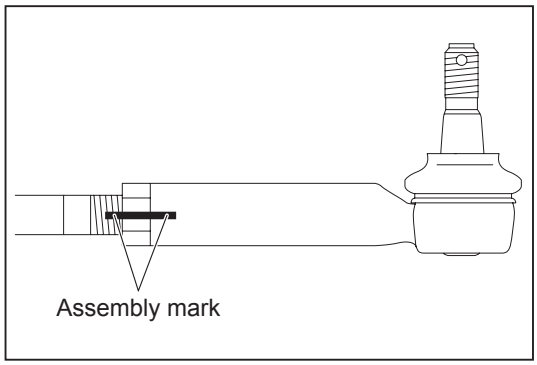
(d) Use a box wrench to rotate the nut continuously at a rate of 2-4 turns per second, and read the torque at the fifth turn.

Torque: 0.8 - 3.4 N•m

20. Check the ball end assembly of the right-side steering tie rod.

Tip :

Perform the same operation on the other side.



21. Install the ball end assembly of the left-side steering tie rod.

(a) Fix the locknut and the ball end assembly of the left-side steering tie rod to the rack end assembly, be sure to align the assembly marks.
Torque: 74 N•m

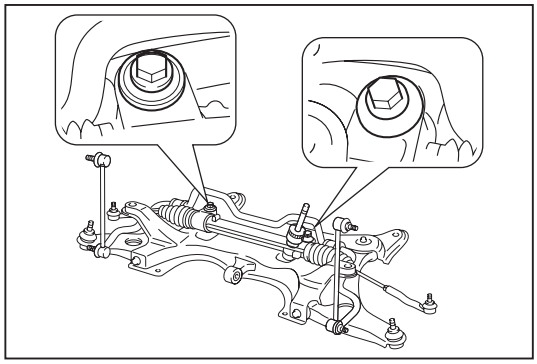
Tip:

Adjust the toe-in before tightening the locknut.

22. Install the ball end assembly of the right-side steering tie rod.

Tip :

Perform the same operation on the other side.

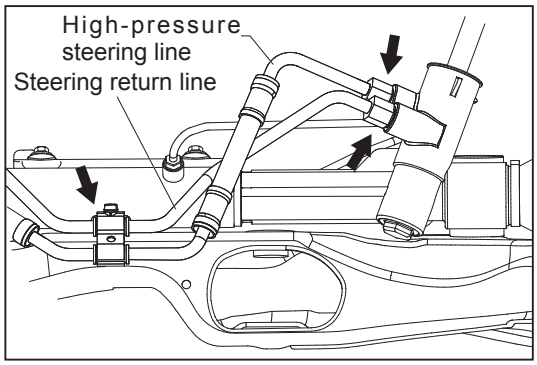


23. Install the power steering gear

(a) Use two bolts and nuts to assemble the power steering gear and the subframe together.
Torque: 107±7 N•m

Note:

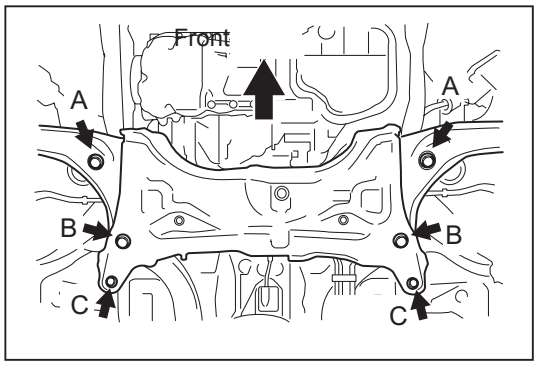
Fix the nut in order to tighten the bolt.



24. Install the steering line module.

(a) Install the steering return line and the high-pressure steering line.
Torque: 16±2 N•m

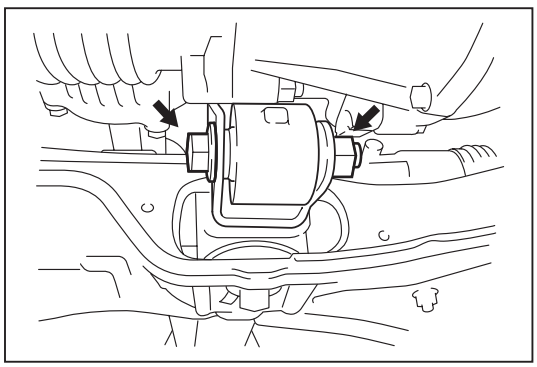
(b) Install the clamps of the lines.



25. Install the subframe subassembly.

(a) Use a jack to support the subframe subassembly.

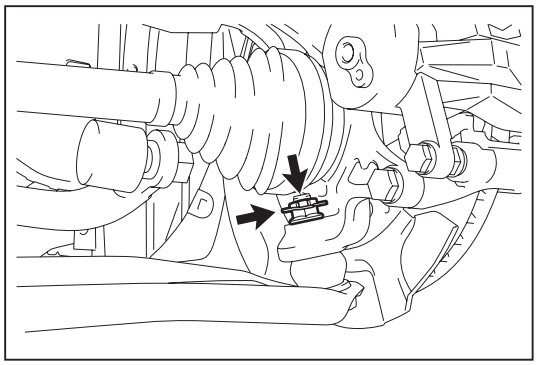
(b) Install the six connecting bolts between the subframe and the body.



(c) Install the rear suspension bolts and nuts of the engine.
Torque: 164±8 N•m

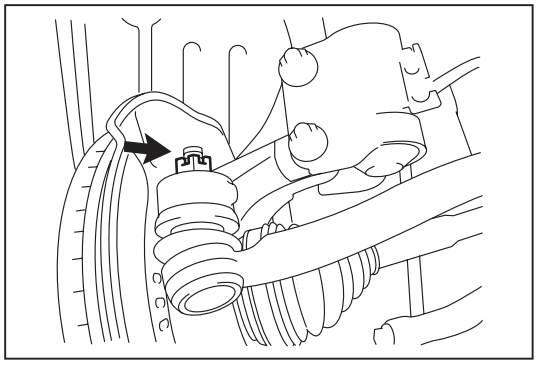
Note:

Fix the nut in order to tighten the bolt.



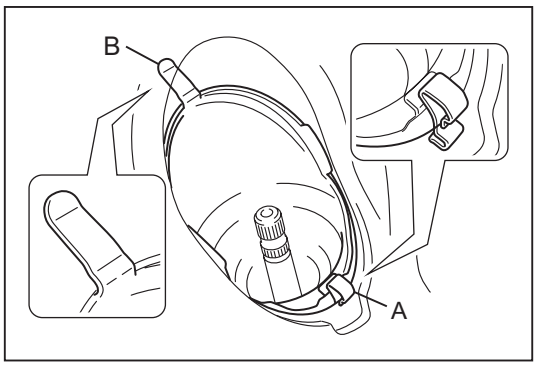
26. Install the left front suspension lower swing arm.
27. Install the right front suspension lower swing arm.

28. Install the front transverse stabilizer-bar link.

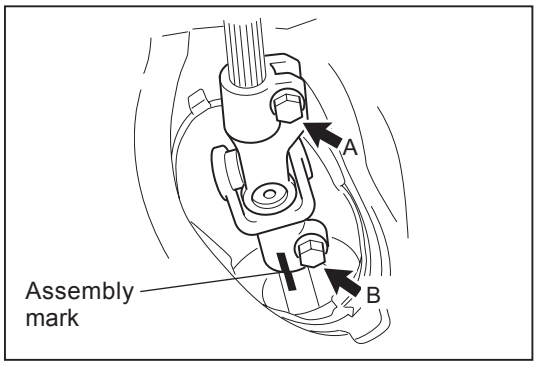


29. Install the ball end assembly of the left-side steering tie rod.
(a) Install the nut and the cotter pin.
Torque: 50±5 N•m
30. Install the ball end assembly of the right-side steering tie rod.

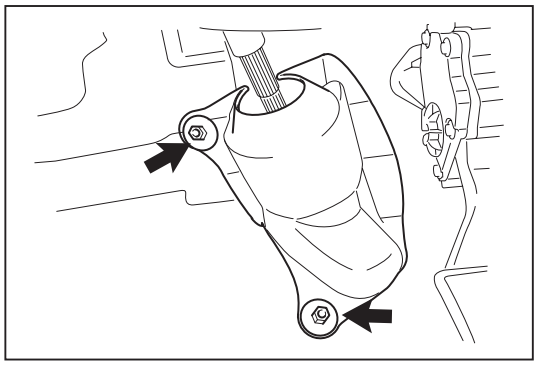
31. Install the front wheels.
Torque: 110±10N•m
32. Install the engine assembly.
33. Install the steering line module connected to the pump.



34. Install the steering drive jacket assembly.
(a) Put the clip A and the clip B of the steering drive jacket assembly in place.
Note:
Do not damage any clip.



35. Install the steering dive shaft universal joint.
(a) Align the assembly marks on the steering drive shaft universal joint and the steering drive connecting shaft.
(b) Tighten the bolt(s).
Torque: 25±3 N•m



36. Make the front wheels just front forward
37. Install the steering column jacket assembly.
38. Release the seat belt from the steering wheel.
39. Add the power steering oil.
40. Bleed the power steering system.
41. Check the fluid-level of the power steering oil in the steering oil reservoir.
42. Check the oil fluid for leakage.
43. Check and adjust the front wheel alignment.

BRAKE SYSTEM

BRAKE SYSTEM

STRUCTURE DIAGRAM 2
FAULT SYMPTOM TABLE 3
BRAKE SYSTEM TESTING 5

HYDRAULIC BRAKE

BRAKE FLUID 6
BRAKE PEDAL 10
VACUUM BOOSTER WITH MASTER BRAKE CYLINDER ... 14
BRAKE HOSE 22

FRONT CALIPER ASSEMBLY

STRUCTURE DIAGRAM 24
INNER AND OUTER BRAKE PADS 24
FRONT CALIPER PISTON 26

REAR WHEEL BRAKE

REAR AXLE ASSEMBLY 29
REAR CALIPER ASSEMBLY 33
BRAKE PAD ASSEMBLY 34
REAR CALIPER PISTON 35

ABS BRAKE SYSTEM (ANTILOCK BRAKE SYSTEM)

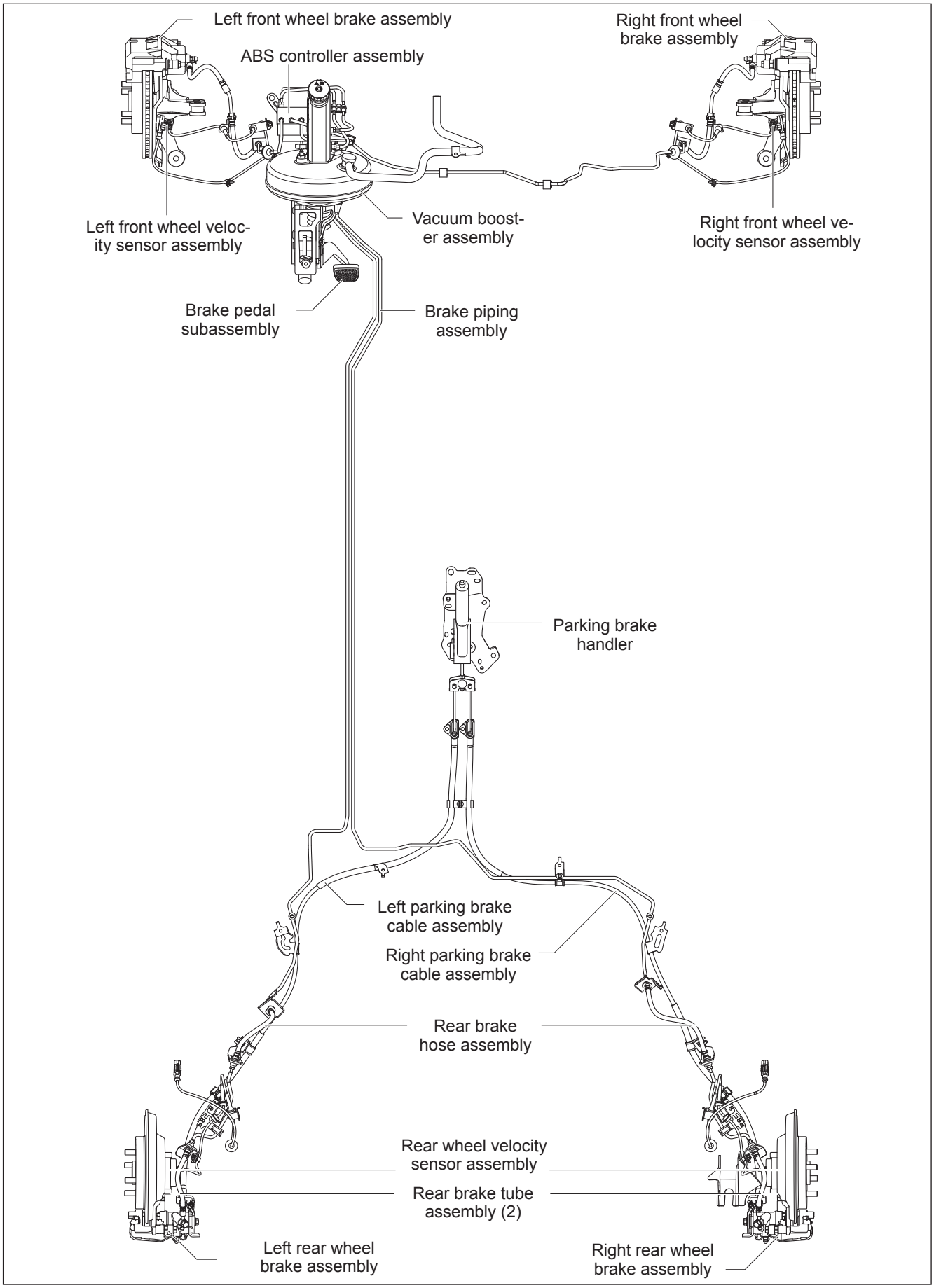
SHORT DESCRIPTION ON ABS/EBD 37
COMMON TROUBLE AND MAINTENANCE 38
ABS CONTROLLER ASSEMBLY 40
FRONT WHEEL VELOCITY SENSOR 42
REAR WHEEL VELOCITY SENSOR 43

PARKING BRAKE

STRUCTURE DIAGRAM 44
TROUBLE LIST 46
PARKING BRAKE HANDLER 47
PARKING BRAKE CABLE 48

BRAKE SYSTEM

STRUCTURE DIAGRAM



FAULT SYMPTOM TABLE

Referring to the following list can help to determine the cause of trouble. The serial number represents the possibility of the cause of trouble. Check every part in order. f necessary, replace such parts.

Symptom	Potential trouble location
The brake pedal position is too low or the pedal is soft.	1. Brake fluid leakage in the brake system. 2. There should be some air in the brake system. 3. Piston seal (worn or damaged) 4. Serious fluid shortage of the brake fluid reservoir. 5. Actuating brake cylinder (fault) 6. Booster pushrod (maladjustment) 7. The brake pedal's free travel might be too large.
Brake drag	1. The brake pedal's free travel might be too small. 2. Parking brake lever stroke (maladjustment) 3. Parking brake cable (broken) 4. Brake lining (rupture or deformation) 5. Disc brake piston (seizing-up) 6. Retaining spring or return spring (damage) 7. Booster pushrod (maladjustment) 8. Vacuum leakage in the booster system 9. Actuating brake cylinder (fault)
Braking deviation	1. Disc brake piston (seizing-up) 2. Brake lining (oil dirt) 3. Incorrect front wheel alignment 4. Brake disc (scratch) 5. Brake lining (rupture or deformation)
Braking failure	1. Brake fluid leakage in the brake system. 2. There is air in the brake system. 3. Brake lining (wear) 4. Brake lining (rupture or deformation) 5. Brake lining (oil dirt) 6. Brake lining (grinding) 7. Brake disc (scratch) 8. Booster pushrod (maladjustment) 9. Vacuum leakage in the booster system
Brake noise	1. Brake lining (rupture or deformation) 2. Mounting bolt (loose) 3. Brake disc (scratch) 4. Brake lining spreader spring (loose) 5. Brake guide pin (wear) 6. Brake lining (dirt) 7. Brake lining (grinding) 8. Brake guide pin, return spring or retaining spring (damage) 9. Silent pad (damage)

Symptom	Potential trouble location
Brake ineffectiveness	1. There should be some oil leakage from the master cylinder, the wheel-brake cylinder, the pipe line or the pipe joints. 2. The master cylinder reservoir might be in shortage of oil or have no oil. 3. The brake fluid might have deteriorated (become thinner or thicker) or the pipe inner wall might have been begrimed too much. 4. There should be any air in the brake fluid. 5. The rubber cup, piston or cylinder of the master cylinder should have been worn too much. 6. The rubber cup, piston or cylinder of the wheel-brake cylinder should have been worn too much. 7. The inlet port and the compensating hole of the master cylinder or the venthole of the oil reservoir should have been blocked. 8. The outlet valve and the return valve of the master cylinder should not be sealed well or the piston return spring's pretightening force might be too small. 9. The through pinhole on the front-end of the master cylinder piston should have been blocked or the rubber cup of the master cylinder might adhere or swell. 10. The rubber cup of the wheel-brake cylinder might adhere or swell. 11. The efficiency of the turbo or booster is poor or ineffective. 12. The pipe line might be concave or the hose inner hole might be blocked. 13. The free travel of the brake pedal might be too large.

BRAKE SYSTEM TESTING

Test the brake on the dry, clean and level road. If the road is wet and slippery or unclean, each tire' s adhesive capacity will be different, so that the tested braking performance will be untrue. The central raised road surface is not suitable for bake testing because the wheels are prone to bouncing due to the uneven gravity distribution. It is necessary to test the brake at various speeds and by stepping down the brake pedal lightly and heavily. However, never lock the brake to make the tires slide on the road surface. Locking the brake and sliding the tires on the road surface cannot indicate a high braking efficiency. Stepping down the brake pedal heavily but keeping the wheels turning can achieve a stopping distance which is shorter than that of locking the brake. Stepping down the brake pedal heavily but keeping the wheels turning can also achieve a larger friction force of tire to road than that of tire sliding.

The external factors affecting the braking performance are as follows:

- The tires with different contact areas and adhesive capacities of tire to road can cause uneven braking. All tires have to share an equal air pressure. The left tire's tread pattern depth should approximate that of the right tire.
- Uneven vehicle load can also affect braking performance. A heavy-duty wheel needs a larger brake force than any other wheel.
- Wheel misplacement, especially when the camber and kingpin caster are overlarge, can cause brake deviation.

Brake disc

Use the mechanical output force which the disc brake lining exerts upon the brake disc frictional face to slow down the rotating-speed of the tire and wheel assembly.

Brake caliper bracket

This brake caliper bracket is designed for installing the hydraulic caliper and fixing the caliper in place so as to keep a correct position relative to the brake disc. When there is any mechanical output force exerting on the bracket, this will enable the caliper to slide relative to the brake linings so as to pull the outside brake lining to withstand the brake disc through the counter force of the brake caliper bracket. Make sure the acting forces on the brake linings on the two sides of the brake disc are equal.

Brake caliper

The brake caliper is equipped with two hydraulic pistons (front) or a single hydraulic piston (rear), and is equipped with oil seal as well. When applying the hydraulic pressure, the mechanical output force on the piston will exert upon the inner brake lining which will withstand the brake disc. When releasing the hydraulic pressure, the piston oil seal will enable the piston to retract a little, and this can release the moving parts sufficiently and enable the brake lining to press close to the brake disc without seizing-up. Automatic wear adjustment will be performed.

HYDRAULIC BRAKE

BRAKE FLUID

Check

The brake fluid can affect directly the braking performance and the brake system elements' working conditions and service life. The brake fluid provides stronger hygroscopicity. Therefore, the brake fluid is prone to water absorption, causing metal elements to be corroded and rubber elements to be deteriorated. The polluted and deteriorated brake fluid or the mixed brake fluid can always cause the brake fluid boiling and gasifying as well as the brake efficiency declining. As a result, when adding or replacing the brake fluid, pay more attention to the following:

(a) Cover and seal the container with brake fluid securely.

(b) The brake fluid is poisonous and can damage paint surfaces. Therefore, if you spray the brake fluid onto the body surface, you should wipe it off promptly.

(c) If you find that there is water or other contamination mixed with the brake fluid and the seal of the piston of the actuating brake cylinder has been damaged, you should replace the brake fluid inside the brake system and all rubber elements, including the brake hose.

(d) The correct brake fluid-level in the fluid reservoir should be maintained between the upper level (MAX) and the lower level (MIN).If you drive the car more than 1000Km, you should check the brake fluid-level in the fluid reservoir. If the brake fluid-level does not match the specified level, add the brake fluid to the fluid reservoir up to the upper level.

Check and Repair of Hydraulic Elements

(a) If the oily solvent enters into the hydraulic system, rinse the whole system and replace all rubber elements.

(b) Wash your hands clean before installing new rubber elements or other elements.

(c) When examining and repairing or rinsing the hydraulic elements, do not use common solvent (such as kerosene or gasoline), but use degreasing alcohol or the brake fluid.

(d) After examining and repairing the elements, drain the brake fluid in the system. Use new brake fluid to rinse the system before adding new brake fluid and performing the hydraulic system exhaust.

(e) Do not stop rinsing until the brake fluid from the unloading valve is limpid without any dirt.

Hydraulic System Drain

If you want to drain the brake fluid in the whole hydraulic system completely, unscrew all air bleed screws. Plug each screw in a hose to drain the brake fluid into the container, stepping down the brake pedal slowly until all air bleeding off. Be sure to ensure all valves open during this period.

Hydraulic sy stem bleed

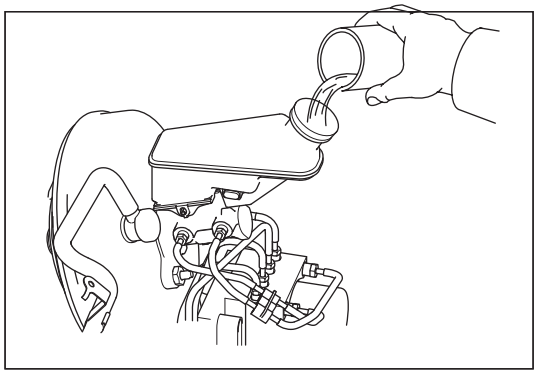
The hydraulic brake system can only operate under no air. The air entering into the hydraulic system can cause the brake softening or the brake failure. If you want to make the brake system operate or doubt that there is some air in the brake system, it is necessary for you to bleed the system.

Note:

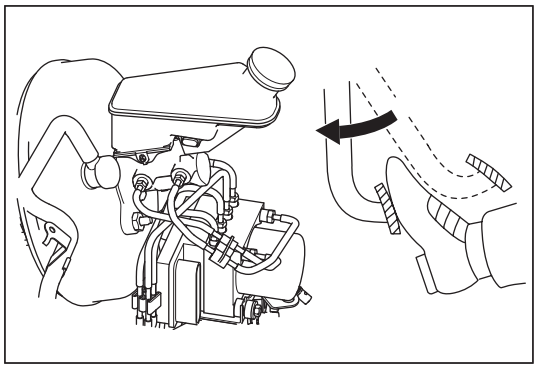
If you perform any maintenance of the brake system or doubt that there is some air in the brake system, bleed the brake system.

Warning:

If the brake fluid adheres to any paint surface, please wash it clean promptly.



1. **Add the brake fluid to the oil reservoir**
   Brake fluid: DOT4 synthetic brake fluid
   Tip:
   The fluid-level of the brake fluid in the reservoir should be between the MIN and the MAX.



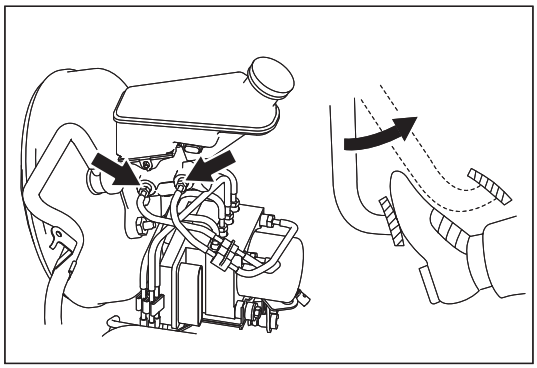
2. Bleed the actuating brake cylinder.

Tip:

If the actuating brake cylinder has been dismantled or the oil reservoir has been empty, bleed the actuating brake cylinder. When bleeding, it is necessary for two people to cooperate.

(a) Disconnect the brake piping from the actuating brake cylinder.

(b) Step down the brake pedal slowly.

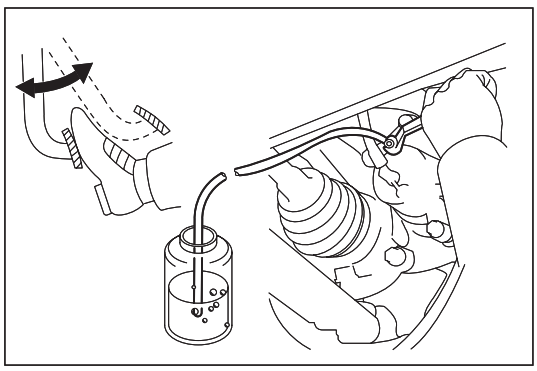


(c) Use your fingers to plug up the external hole, and release the brake pedal.

(d) Repeat (b) and (c) for three or four times.

(e) Connect the brake piping to the actuating brake cylinder.

Torque: 16 N•m



3. Bleed the brake piping.

(a) Connect the plastic hose to the air bleed screw.

(b) Step down the brake pedal for several times, and then release the air bleed screw when stepping down the brake pedal.

(c) When the brake fluid stopping flowing out, tighten the air bleed screw, and then release the brake pedal.

Torque: 11.N•m

(d) Repeat (b) and (c) until bleed off all air in the brake fluid.

(e) Repeat above steps to bleed the air in all wheel brake piping.

4. Bleed ABS hydraulic control elements.

Warning:

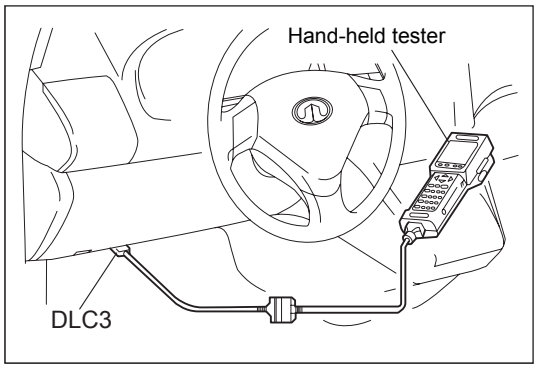
After the normal air bleeding of the brake system, if you cannot achieve the proper height or touch perception of the brake pedal, use a hand-held tester to bleed the ABS controller assembly according to the following steps.

(a) When the engine turning off, press down the brake pedal for more than 20 times.

(b) Connect the hand-held tester to the DLC3, and then turn on the ignition switch.

Note:

Do not start the engine.



(c) Select the “AIR BLEEDING” of the hand-held tester.

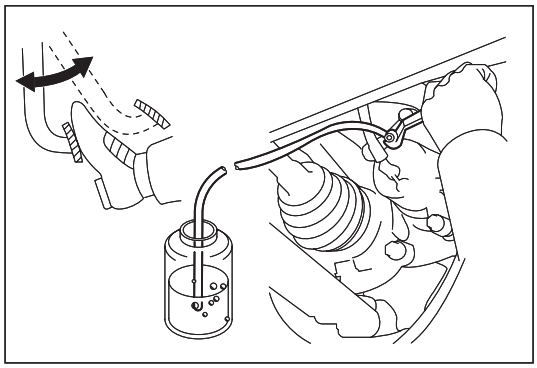
Tip:

For details, refer to the operation manual of the hand-held tester.

(d) When the hand-held tester indicates “Step 1: Increase”, bleed the air in the brake piping.

Warning!

- **Perform the air bleeding according to the steps indicated by the hand-held tester.**
- **Be sure not to drain the brake fluid in the reservoir of the actuating brake cylinder.**



(1) Connect the plastic hose to the air bleed screw.
(2) Step down the brake pedal several times, and then release the air bleed screw when stepping down the brake pedal.
(3) When the brake fluid stopping flowing out, tighten the air bleed screw, and then release the brake pedal.
(4) Repeat (2) and (3) until bleeding off all air in the brake fluid.
(5) Repeat the above steps to discharge the air in each wheel brake piping.

(e) Let the air in the inhalation piping out when the hand-held tester indicating “Step 2: Inhalation”.

Warning!

- **Perform the air bleeding according to the steps indicated by the hand-held tester.**
- **Be sure not to drain the brake fluid in the reservoir of the actuating brake cylinder.**

(1) Connect the plastic hose to the air bleed screw on the right front wheel or the right rear wheel, and then release the air bleed screw.
(2) Use a hand-held tester to operate the ABS controller assembly to let air out.

Warning!

- **This operation should be terminated within 4 seconds.**
- **Make sure to release the brake pedal at this moment.**

(3) Check and verify the termination of the operation through the screen of the hand-held tester.
(4) Repeat (2) and (3) until bleeding off all air in the brake fluid.
(5) Perform the air bleed of the other wheels according to the above procedures.

(f) Let the air in the relief line out when the hand-held tester indicating “Step 3: Decrease.”

Warning!

- **Perform the air bleeding according to the steps indicated by the hand-held tester.**
- **Be sure not to drain the brake fluid in the reservoir of the actuating brake cylinder.**

(1) Connect the plastic hose to either air bleed screw.
(2) Release the air bleed screw.
(3) Use a hand-held tester to operate the ABS controller assembly to keep stepping down the brake pedal fully.

Warning!

- **This operation should be terminated within 4 seconds. When implementing this procedure continuously, keep an interval of 20 seconds at least.**
- **After the completion of this operation, the brake pedal will descend a little, and this is normal when opening the solenoid valve.**
- **During this period, the brake pedal may appear heavy, however, it is still necessary to step down the brake pedal fully to enable the brake fluid to flow out from the air bleed screw.**
- **Ensure to step on the brake pedal. Be sure not to step down and release the brake pedal repeatedly.**

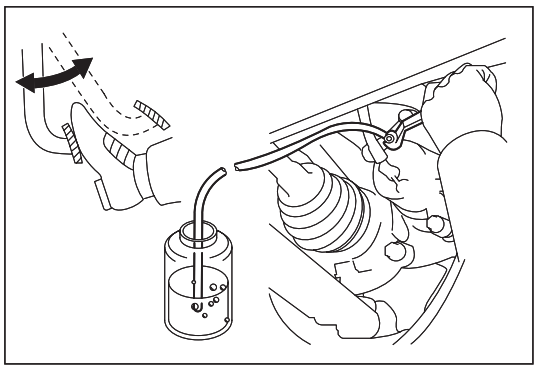
(4) Tighten the air bleed screw, and then release the brake pedal.
(5) Repeat (2) and (4) until bleeding off all air in the brake fluid.
(6) Repeat the above steps to discharge the air in each wheel brake piping.

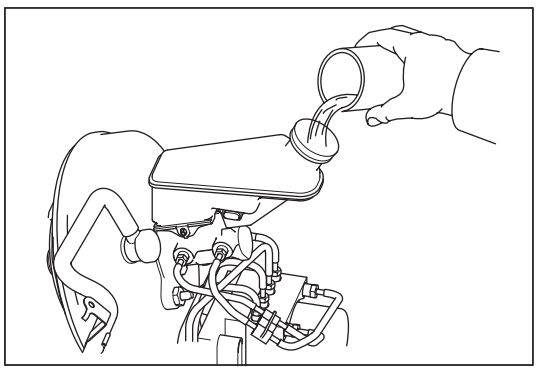
(g) When the hand-held tester indicating “Step 4: Increase”, let the air in the brake line out again.

Warning!

- **Perform the air bleeding according to the steps indicated by the hand-held tester.**
- **Be sure not to drain the brake fluid in the reservoir of the actuating brake cylinder.**

(1) Connect the plastic hose to either air bleed screw.
(2) Step down the brake pedal several times, and then release the air bleed screw on either wheel.
(3) When no brake fluid flowing out, tighten the air bleed screw, and then release the brake pedal.
(4) Repeat (2) and (3) until bleeding off all air in the brake fluid.
(5) Repeat the above steps to discharge the air in each wheel brake piping.





5. Check the fluid-level of the oil reservoir.

(a) Check the fluid-level, if necessary, add the brake fluid to the reservoir.
Brake fluid: DOT4 synthetic brake fluid

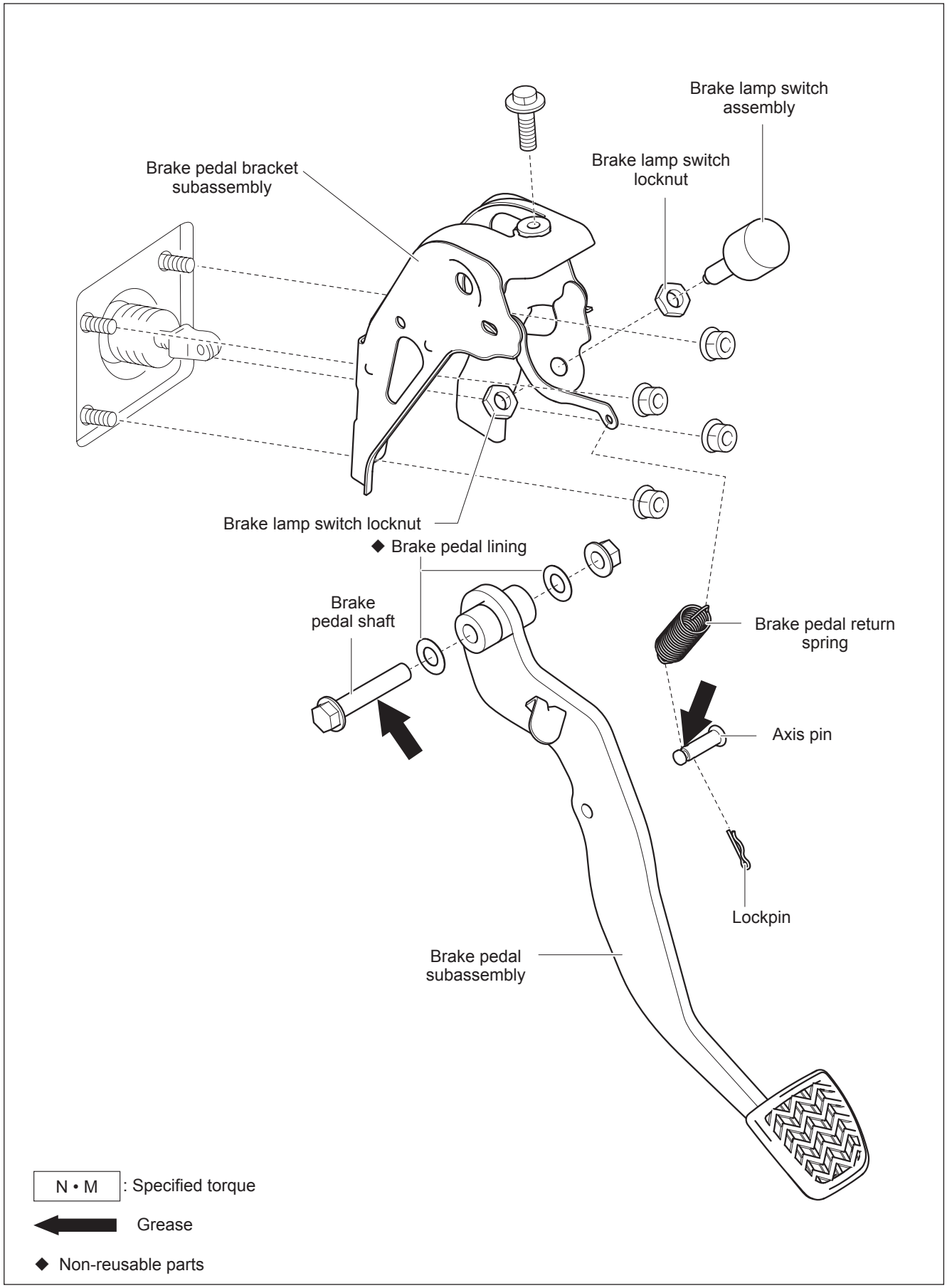
Note:

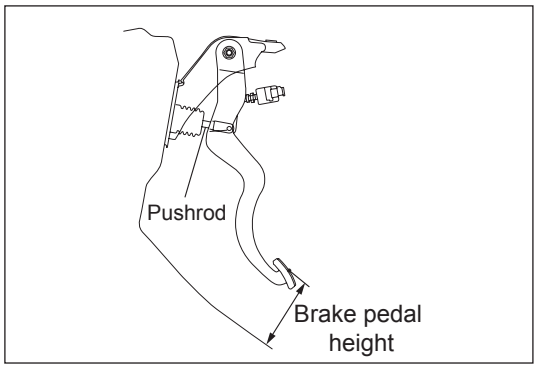
In the course of the air bleed, be careful to check the fluid-level of the oil reservoir. If the fluid-level is too low, add the brake fluid promptly.

The tightening torque for the air bleed screw: 11N•m

BRAKE PEDAL

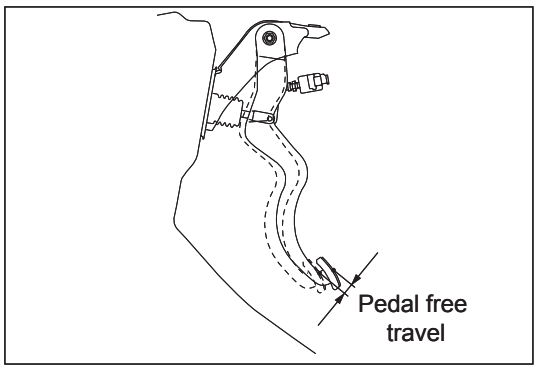
Structure Diagram



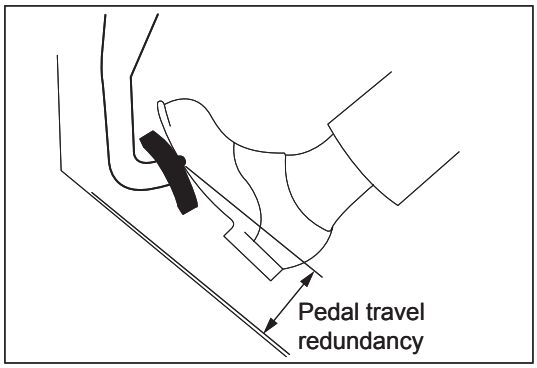


Adjusting

1. **Check the brake pedal height.**
   (a) Check the brake pedal height.
   Pedal height from the front-wall panel:
   123 to 130 mm
2. **Adjust the brake pedal height.**
   (a) Remove the protection cover from the panel.
   (b) Disconnect the connector from the brake lamp switch assembly.
   (c) Loosen the brake lamp switch locknut, and remove the brake lamp switch assembly.
   (d) Loosen the U type locknut of the actuating brake cylinder pushrod.
   (e) Adjust the pedal height by rotating the pedal push-rod.
   (f) Tighten the pushrod locknut.
   Torque: 18 N•m
   (g) Install the brake lamp switch assembly.
   (h) Connect the connector to the brake lamp switch assembly.
   (i) Push the brake pedal for 6 to 9 mm and turn the brake lamp switch assembly to the position of the brake lamp off so as to tighten the nut.
   (j) After installation, push the brake pedal for 6 to 9 mm, and check and verify the brake lamp on.



3. **Check the pedal free travel.**
   (a) Turn off the engine and step down the brake pedal several times until no vacuum in the vacuum booster.
   (b) Step down the brake pedal until sensing the resistance, and then measure the distance as shown in the figure.
   Pedal free travel: 6-9mm.
   If the play does not match the specified value, check the brake lamp switch play.
   If the play is normal, perform troubleshooting to the brake system.
   Brake lamp switch play: 0.5-2.4mm

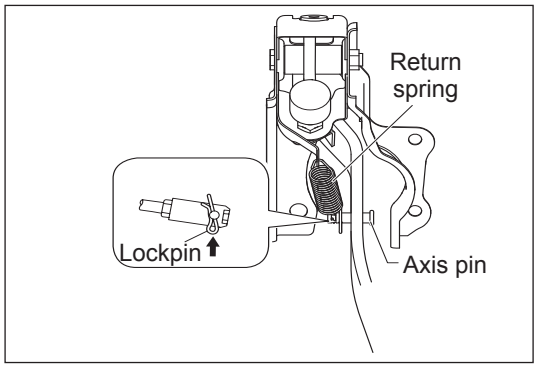


4. **Check the pedal travel redundancy.**
   (a) Release the parking brake handler.
   When the engine running, step down the pedal and measure the pedal travel redundancy as shown in the figure.
   Pedal travel redundancy from the front-wall penal (for 490N): more than 55mm.
   If the travel redundancy does not match the specified value, perform troubleshooting to the brake system.

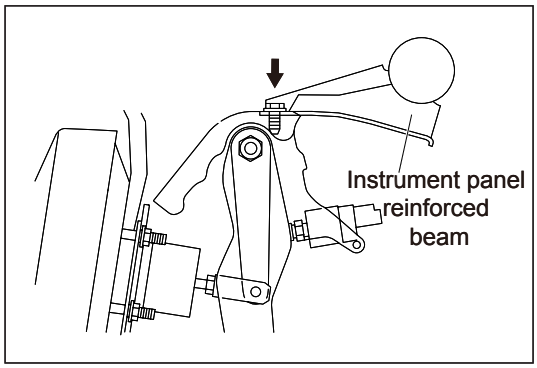
Replacing

Remarks:

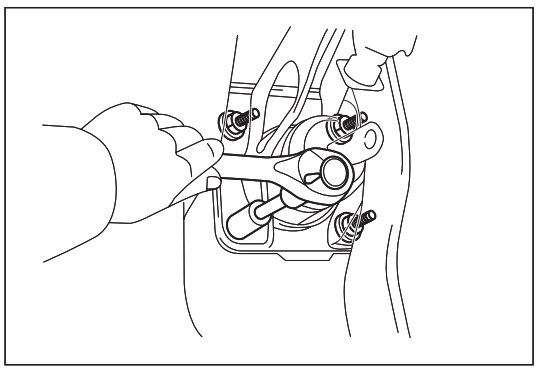
After the completion of installation, check and adjust the brake pedal height, free travel and the brake pedal travel redundancy.



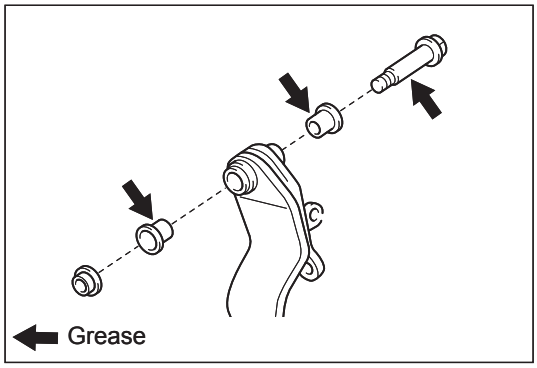
1. **Disconnect the negative terminal of the battery.**
2. **Remove the penal body.**
3. **Release the U type clamp of the actuating brake cylinder pushrod.**
   (a) Disconnect the connector of the brake lamp switch.
   (b) Remove the return spring of the brake pedal.
   (c) Remove the lockpin and the axis pin and release the U type clamp of the actuating brake cylinder pushrod from the brake pedal subassembly.



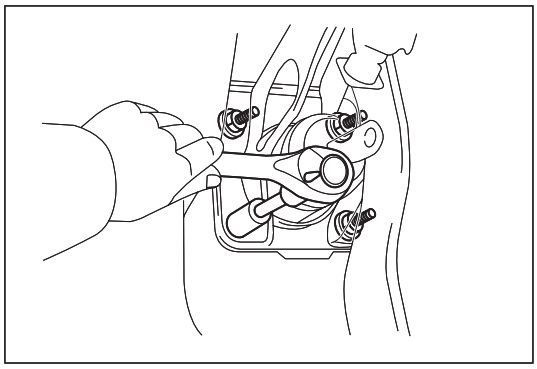
4. **Remove the brake pedal bracket assembly.**
   (a) Remove the bolts from the brake pedal bracket assembly.



   (b) Remove the four nuts and the brake pedal bracket assembly.
5. **Remove the brake pedal subassembly.**
   (a) Remove the brake pedal shaft and nuts from the brake pedal bracket subassembly.
   (b) Remove the brake pedal subassembly and the two linings.
6. **Remove the brake lamp switch assembly.**
   (a) Loosen the brake lamp switch locknut.
   (b) Remove the brake lamp switch assembly from the brake pedal bracket subassembly.
7. **Install the brake lamp switch assembly.**
   (a) Use the nuts to install the brake lamp switch assembly.
   Torque: 27.5±2.5 N•m

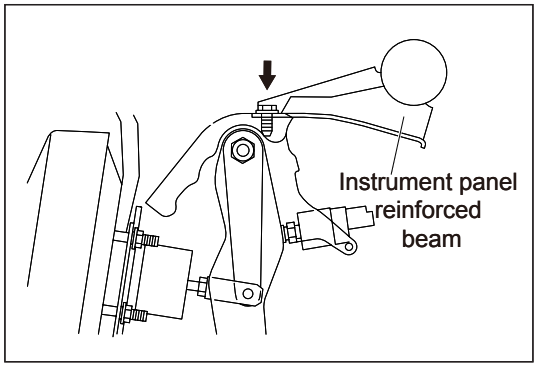


8. **Install the brake pedal subassembly.**
   (a) Coat the grease onto the ends and sides of the two new brake pedal linings.
   (b) Use the brake pedal shaft and nuts to fix the brake pedal subassembly and the two brake pedal linings to the brake pedal bracket.
   Torque: 30 N•m

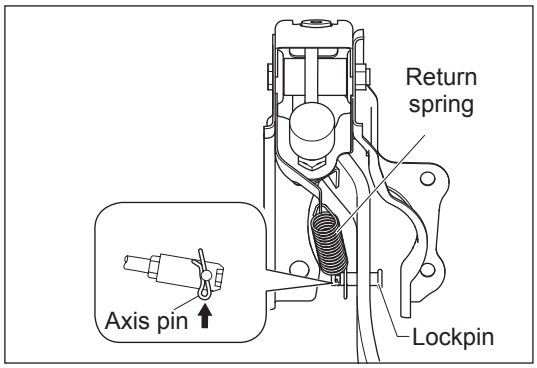


9. Install the brake pedal bracket assembly.

(a) Use the four nuts to install the brake pedal bracket assembly.
Torque:23 N•m



(b) Install the bolts to the brake pedal bracket assembly.
Torque:23 N•m

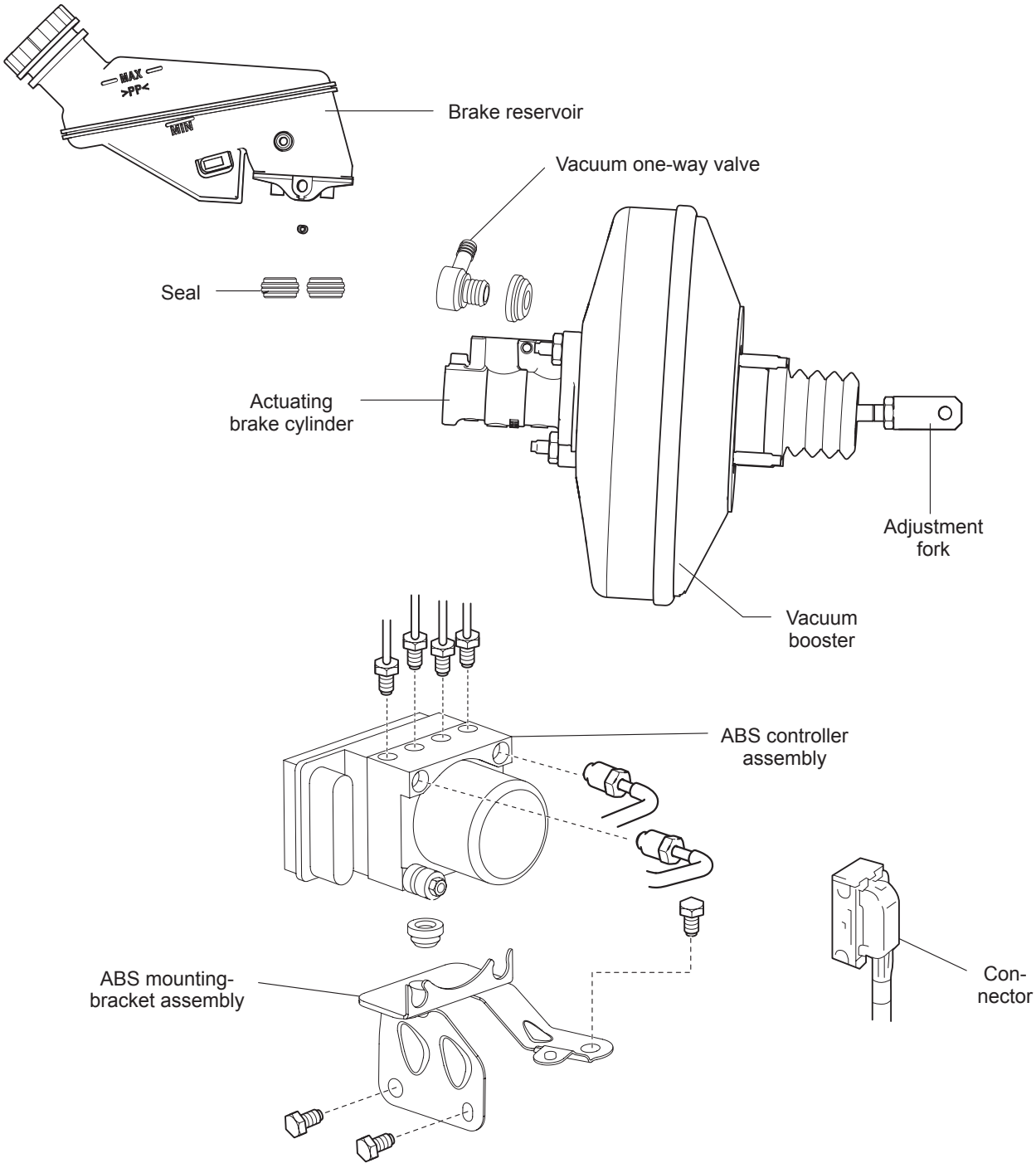


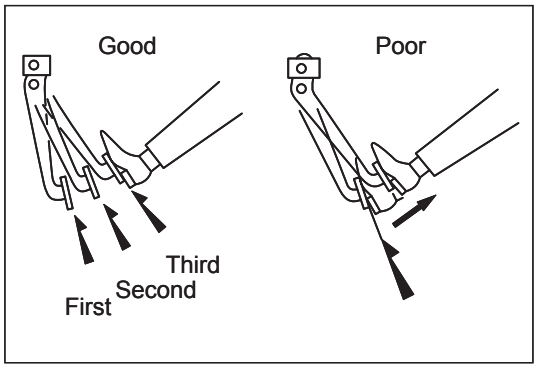
10. Connect the U type clamp of the actuating brake cylinder pushrod.

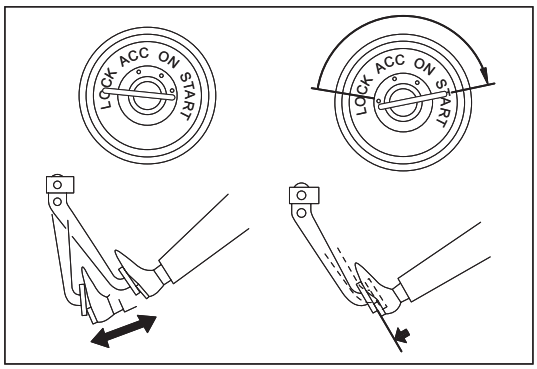
(a) Coat grease onto the axis pin.
(b) Install the axis pins and the lockpins.
Note:
Install the lockpins according to the direction shown in the figure.
(c) Install the brake pedal return spring.
(d) Connect the connector of the brake lamp switch to the brake lamp switch assembly.

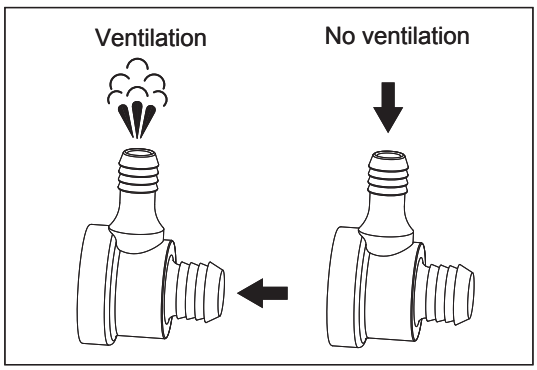
VACUUM BOOSTER WITH MASTER BRAKE CYLINDER

Structure Diagram









On-board check

1. Check the vacuum booster.

(a) Check its air tightness.

(1) Start the engine and keep it running for 1-2 minutes before stopping. Step down the brake pedal slowly several times.

Tip:

Although you step down the pedal to the end for the first time, raise the pedal gradually for the second time or the third time, this means the booster has good air tightness.

(2) When the engine running, you step down the brake pedal, and when stepping down the brake pedal, turn off the engine.

Tip:

After stepping on the pedal for 30 seconds, if there is no change in the pedal travel redundancy, this means the booster has good air tightness.

(b) Check operation.

(1) When the engine misfires, step down the brake pedal several times to eliminate the booster vacuum.

(2) Step down the brake pedal and keep this position. Check and verify that there is no change in the pedal travel redundancy.

(3) Start the engine.

Tip:

If the pedal moves downward gently, this means that the pedal is in a normal working condition.

If the brake pedal cannot descend, there might be some faults in the vacuum system (such as vacuum hose, vacuum vale and other), it is necessary to check.

If there is no failure in the vacuum system after inspection, there might be some troubles in the booster itself.

2. Check the vacuum one-way valve.

(a) Slide the clamp and disconnect the vacuum booster hose.

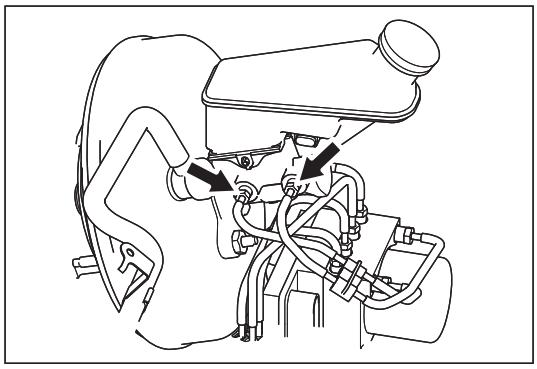
(b) Remove the vacuum one-way valve.

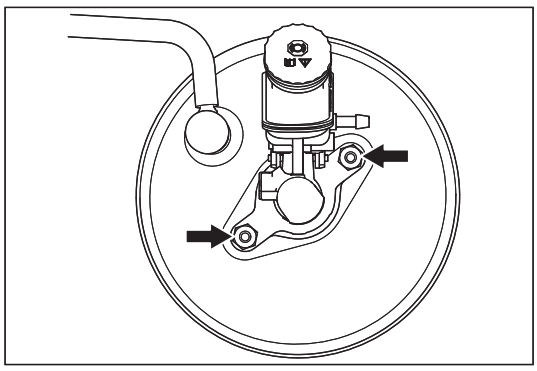
(c) Check and verify there is ventilation from the booster to the engine, and there is no ventilation from the engine to the booster.

(d) If there is any trouble, replace the vacuum one-way valve.

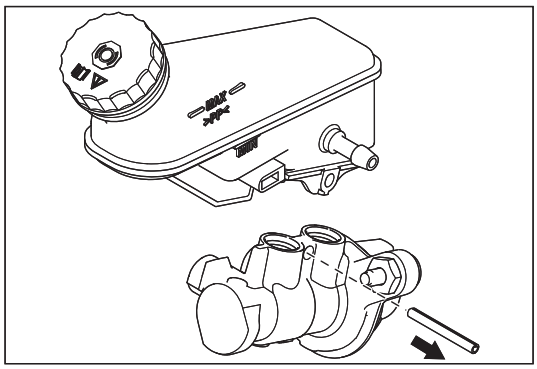
Replacing the Actuating Brake Cylinder

1. **Drain the brake fluid.**
   Note:
   If the brake fluid adheres to any paint surface, wash it clean promptly.
2. **Remove the air filter cover subassembly.**
3. **Disconnect the fluid-storage hose of the clutch.**
   Slide the clamp and disconnect the fluid-storage hose of the clutch.
4. **Remove the actuating brake cylinder.**
   (a) Disconnect the switch connector of the fluid-level alarm light.
   (b) Use tools to disconnect the two brake lines from the actuating brake cylinder.

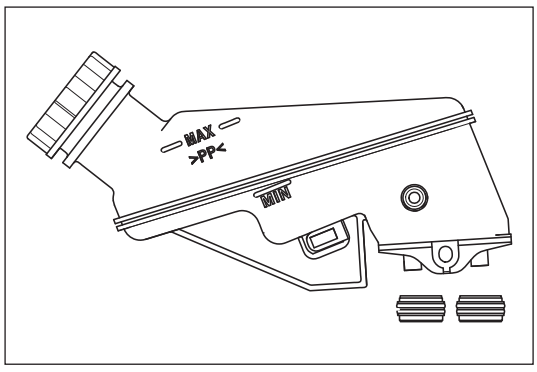




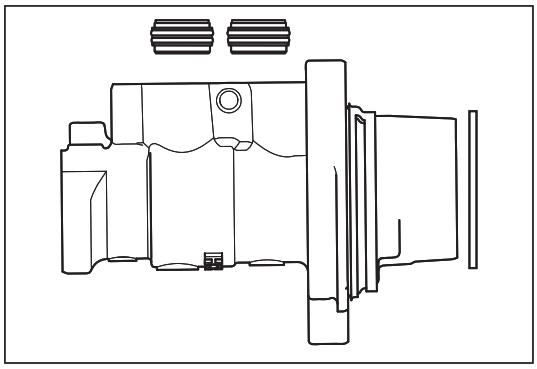
   (c) Remove the two nuts and pull the actuating brake cylinder out.



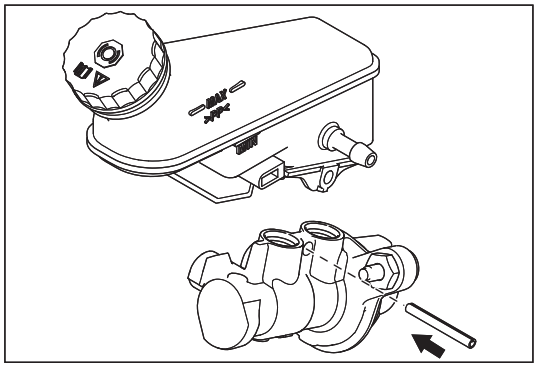
5. **Remove the actuating brake cylinder subassembly without oil reservoir.**
   (a) Draw out the axis pin of the brake oil reservoir.



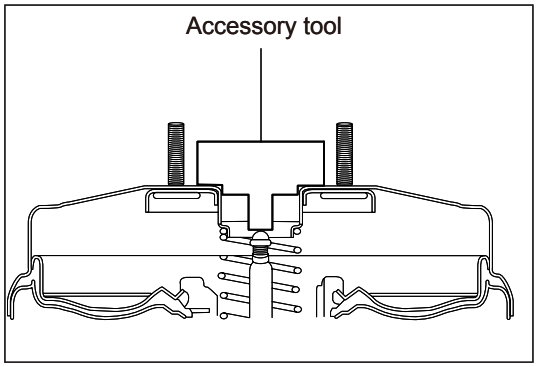
   (b) Remove the brake oil reservoir and the two seals.



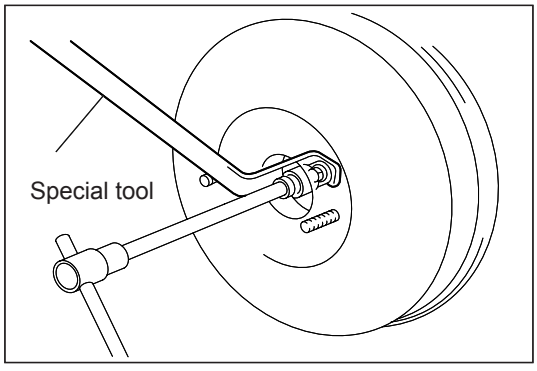
6. **Install the actuating brake cylinder subassembly without oil reservoir.**
   (a) Coat grease onto the two seals and fix them to the actuating brake cylinder subassembly without oil reservoir.



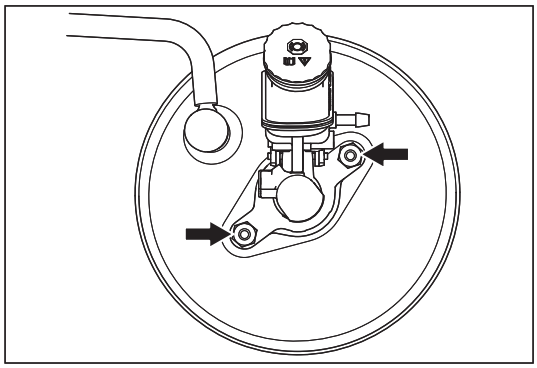
   (b) Use the axis pin of the brake oil reservoir to install the brake oil reservoir assembly.
7. **Check and adjust the vacuum booster pushrod.**
   Note:
   Perform this adjustment under no vacuum of the vacuum booster assembly.(When the engine stops, step down the brake pedal several times.)
   Tip:
   When using a new actuating brake cylinder subassembly to replace, it is necessary to adjust the vacuum booster pushrod.
   Re-install the actuating brake cylinder subassembly and it is needless to adjust when using a new vacuum booster assembly to replace.
   (a) Coat chalk powder onto the head of the accessory tool.
   Tip:
   Encapsulate the accessory tool and the new actuating brake cylinder subassembly together.



   (b) Place the accessory tool into the vacuum booster assembly.
   (c) Measure the clearance between the vacuum booster pushrod and the accessory tool.
   Clearance: 0 mm
   Adjust the clearance in the following cases:
   - Even if there is a clearance between the accessory tool and the vacuum booster housing(floating the accessory tool), but the clearance is too small.
   - Even if the chalk powder dose not adhere to the head of the vacuum booster pushrod, and the clearance is too large.

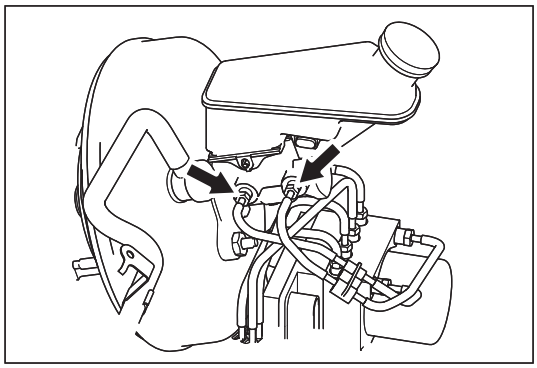


   (d) If the clearance exceeds the required range, use the special tool to fix the pushrod and adjust the length of the protruding bolt.
   Tip:
   When adjusting the pushrod, step down the brake pedal sufficiently in order to protrude the pushrod.



8. Install the actuating brake cylinder.

(a) Use the two nuts to install the actuating brake cylinder to the booster.
Torque:13 N•m



(b) Use tools to connect the two brake lines to the actuating brake cylinder.
Torque:16 N•m

(c) Connect the switch connector of the fluid-level alarm light.

9. Connect the oil reservoir of the clutch.
Slide the clamp and connect the oil reservoir of the clutch.

10. Install the air filter cover subassembly.

11. Add the brake fluid to the oil reservoir.

12. Bleed the actuating brake cylinder.

13. Bleed the clutch line.

14. Check the fluid-level of the oil reservoir.

15. Check the brake fluid for leakage.

Replacing the Vacuum Booster

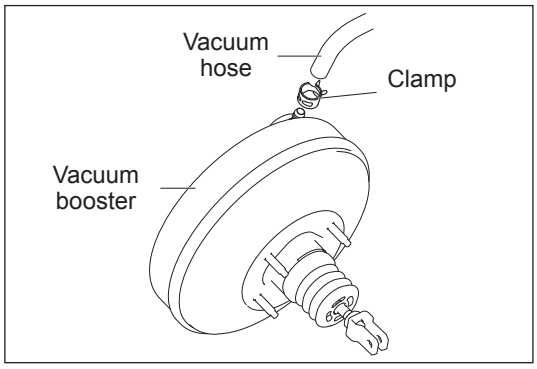
Note:

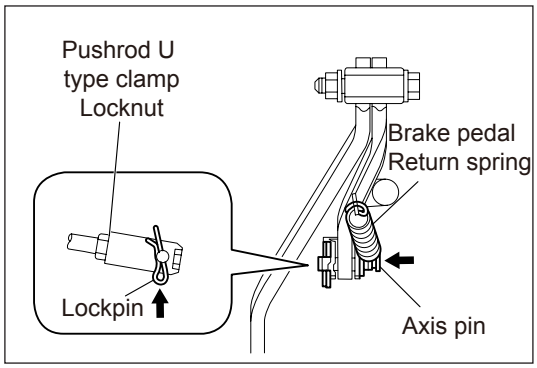
If the brake fluid adheres to any paint surface, wash it clean promptly.

1. **Drain the brake fluid.**
2. **Remove the air filter subassembly.**
3. **Disconnect the oil-storage hose of the clutch.**

   Slide the clamp and disconnect the oil-storage hose of the clutch.
4. **Remove the actuating brake cylinder.**
5. **Remove the battery.**
6. **Remove the ABS controller with bracket.**
7. **Remove the vacuum booster assembly.**

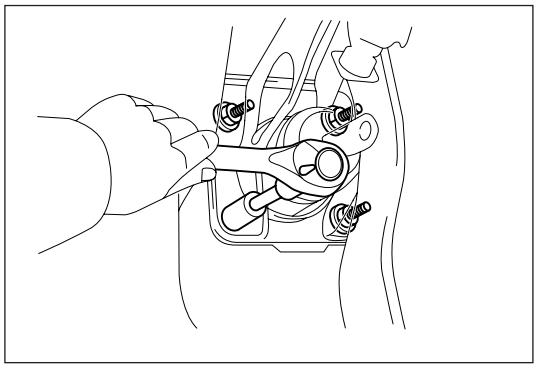
   (a) Slide the clamp and disconnect the vacuum hose from the vacuum booster assembly.





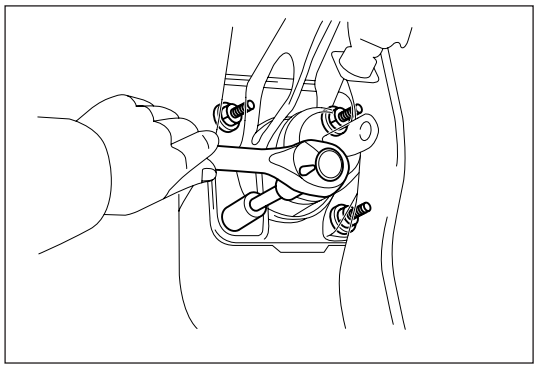
(b) Remove the brake pedal's return spring, lockpins and axis pins.

(c) Loosen the locknut of the pushrod U type clamp.



(d) Remove the four nuts and the pushrod U type clamp.

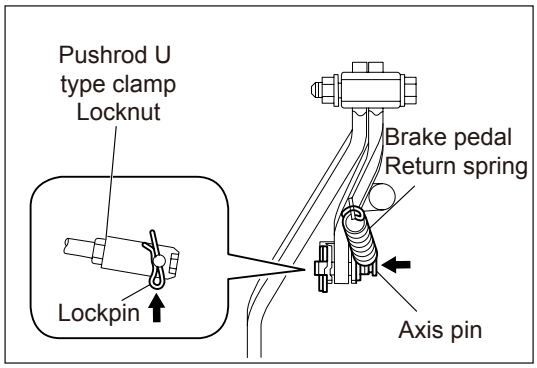
(e) Pull the vacuum booster assembly and the gaskets.



8. Install the vacuum booster assembly.

(a) Install the vacuum booster assembly and new gaskets.

(b) Use the four nuts and the pushrod U type clamp to install the vacuum booster assembly.



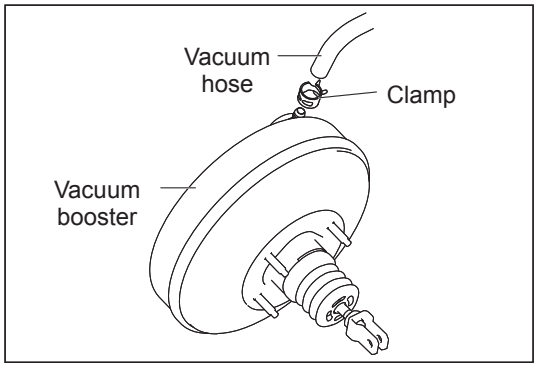
(c) Coat grease onto the axis pin.

(d) Install the lockpin and the axis pin.

Note:

Install the lockpin according to the direction shown in the figure.

(e) Install the brake pedal return spring.



(f) Connect the vacuum hose to the vacuum booster assembly and slide the clamp.

9. Check and adjust the vacuum booster pushrod.

Note:

Perform this adjustment under no vacuum of the vacuum booster assembly.(When the engine stops, step down the brake pedal several times.)

Tip:

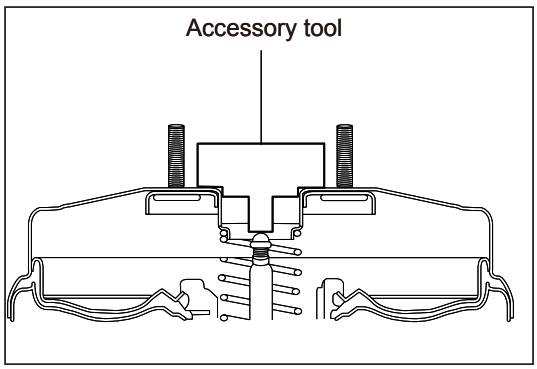
When using a new actuating brake cylinder subassembly to replace, it is necessary to adjust the vacuum booster pushrod.

Re-install the actuating brake cylinder subassembly and it is needless to adjust when using a new vacuum booster assembly to replace.

(a) Coat chalk powder onto the head of the accessory tool.

Tip:

Encapsulate the accessory tool and the new actuating brake cylinder subassembly together.



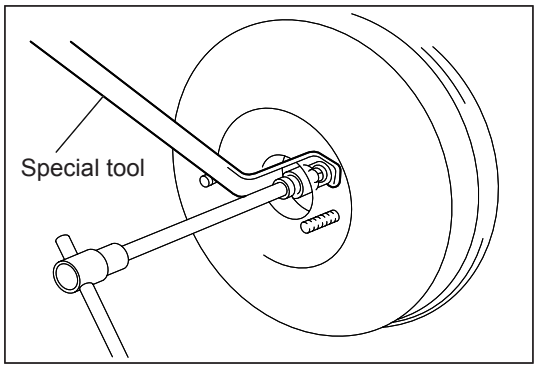
(b) Place the accessory tool into the vacuum booster assembly.

(c) Measure the clearance between the vacuum booster pushrod and the accessory tool.

Clearance: 0 mm

Adjust the clearance in the following cases:

- Even if there is a clearance between the accessory tool and the vacuum booster housing(floating the accessory tool), but the clearance is too small.
- Even if the chalk powder dose not adhere to the head of the vacuum booster pushrod, and the clearance is too large.



(d) If the clearance exceeds the required range, use the special tool to fix the pushrod and adjust the length of the protruding bolt.

Tip:

When adjusting the pushrod, step down the brake pedal sufficiently in order to protrude the pushrod.

10. **Install the ABS controller with bracket.**
11. **Install the actuating brake cylinder.**
12. **Connect the oil reservoir of the clutch.**
    Slide the clamp and connect the oil reservoir of the clutch.
13. **Install the air filter cover subassembly.**
14. **Install the battery.**
15. **Add the brake fluid to the oil reservoir.**
16. **Bleed the actuating brake cylinder.**
17. **Bleed the brake line.**
18. **Bleed the clutch line.**
19. **Check and adjust the brake pedal height.**
20. **Check the brake pedal free travel.**
21. **Check the brake pedal travel reduandancy.**
22. **Check the fluid-level of the oil reservoir.**
23. **Check the brake fluid for leakage.**
24. **Use the hand-held tester to check the ABS controller.**

BRAKE HOSE

Check

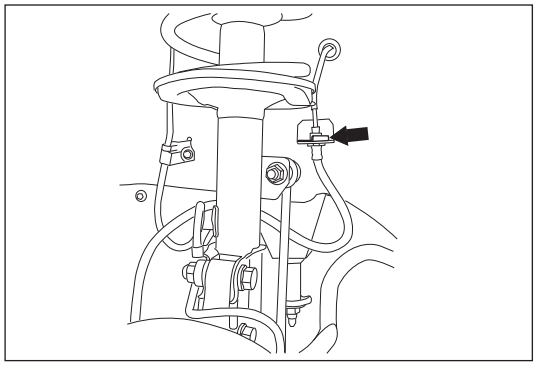
Check the hydraulic brake hose at least twice a year.
Check the brake hose cover for road breakdown, crack, wear as well as leakage or bulge.
Check the hose laying and installation for correctness. f the brake hose rubs any suspension component, it will be worn soon and be failed.
Whenever you find the above conditions, adjust or replace the hose if necessary.

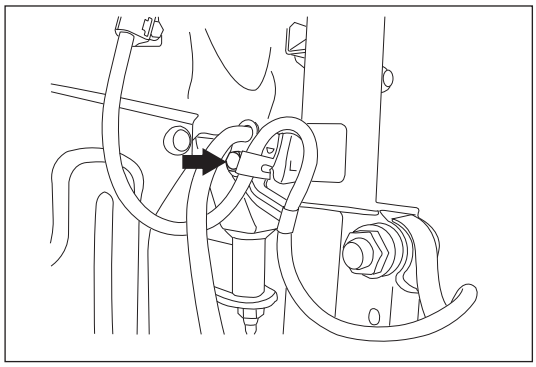
Note:

Of all times, you should discharge all or partial brake fluid from the brake system as long as you remove or disconnect any hydraulic element.

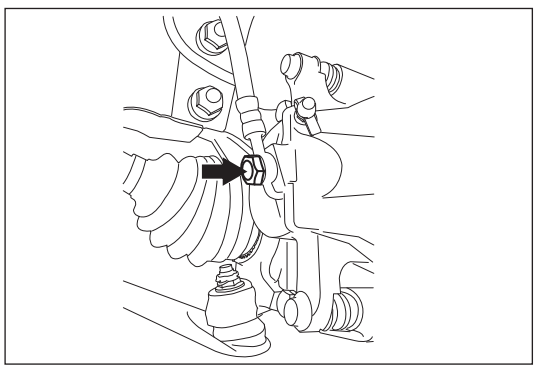
Front Brake Hose

1. **Support the car properly to lift it.**
2. **Remove the clamp of the brake hose.**
3. **Disconnect the oil line.**
   Note:
   Use a container to receive the discharged brake fluid.

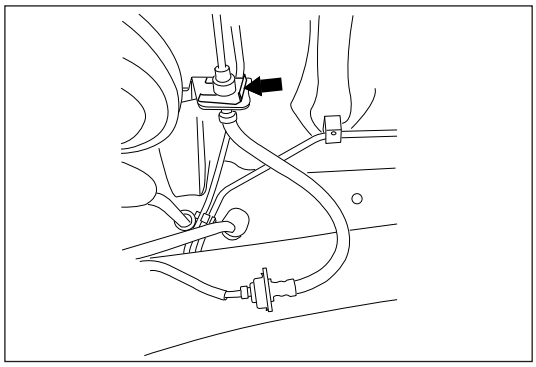




4. **Remove the brake hose from the front shock absorber.**

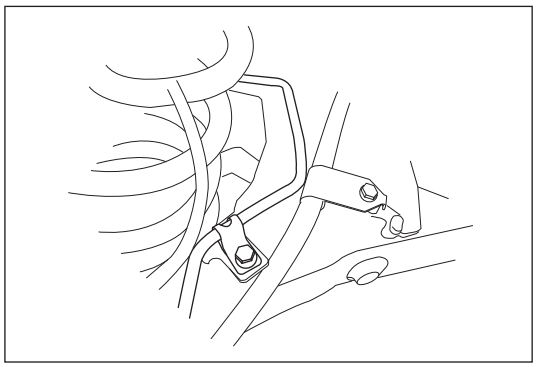


5. **Remove the bolts from the caliper.**
6. **Remove the seal and the brake hose.**
7. **The installation sequence is just reverse to the removal sequence.**
8. **Add the brake fluid to the oil reservoir.**
9. **Bleed the actuating brake cylinder.**
10. **Bleed the brake line.**
11. **Bleed the clutch line.**
12. **Check and adjust the brake pedal height.**
13. **Check the brake pedal free travel.**
14. **Check the brake pedal travel redundancy.**
15. **Check the fluid-level of the oil reservoir.**
16. **Check the brake fluid for leakage.**

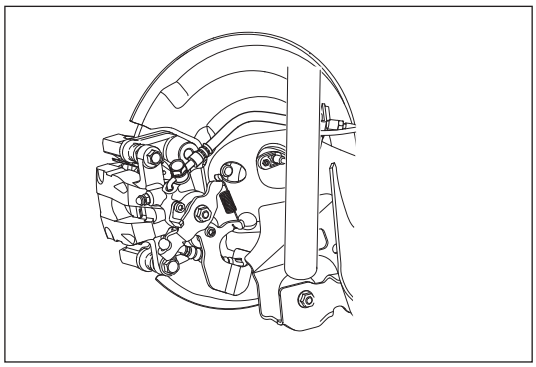


Rear Brake Hose

1. **Support the car properly to lift it.**
2. **Remove the clamp of the brake hose.**
3. **Disconnect the oil line.**
   Note:
   Use a container to receive the discharged brake fluid.



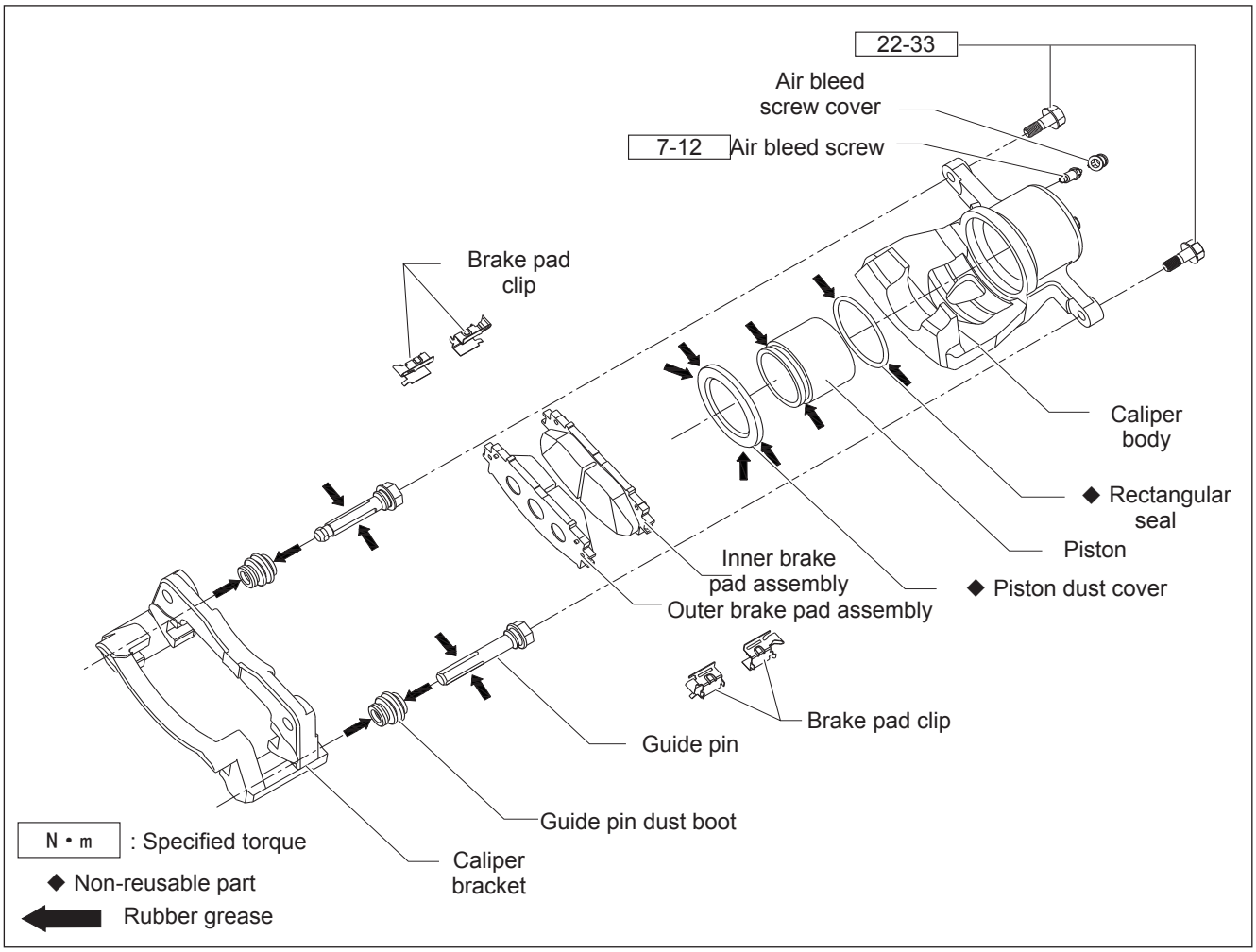
4. **Remove the brake hose from the twist beam.**

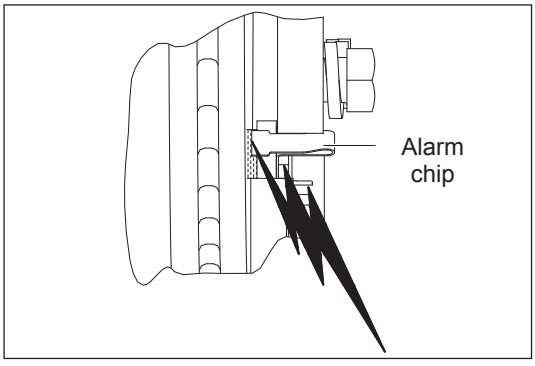


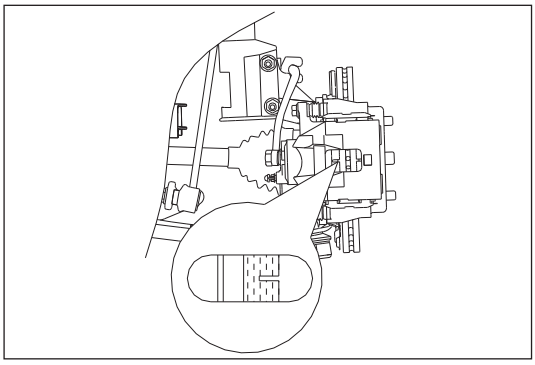
5. **Remove the bolts from the brake hub.**
6. **Remove the seal and the brake hose.**
7. **The installation sequence is just reverse to the removal sequence.**
8. **Add the brake fluid to the oil reservoir.**
9. **Bleed the actuating brake cylinder.**
10. **Bleed the brake line.**
11. **Bleed the clutch line.**
12. **Check and adjust the brake pedal height.**
13. **Check the brake pedal free travel.**
14. **Check the brake pedal travel redundancy.**
15. **Check the fluid-level of the oil reservoir.**
16. **Check the brake fluid for leakage.**

FRONT CALIPER ASSEMBLY

STRUCTURE DIAGRAM







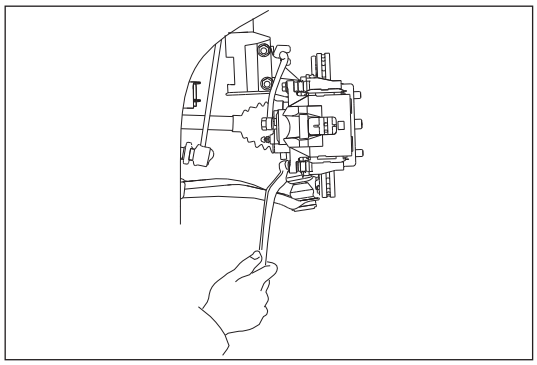
INNER AND OUTER BRAKE PADS

Check

Tip:

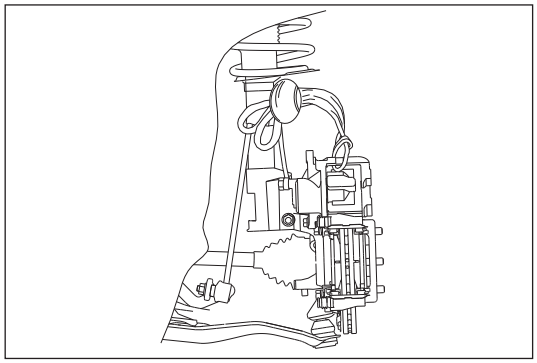
When braking in the course of driving, if the front wheels utter continuous scream, check the alarm chip for the wear limit of the inner and outer brake pads. If there is any friction trace of alarm chip to brake disc, replace the inner brake pad assembly and the outer brake pad assembly.

1. **Remove the front wheels.**
2. **Check the thickness of the frictional materials of the inner brake pad and the outer brake pad.**
   Check the thickness through the inspection hole on the caliper body. If the thickness exceeds the specified range, replace the friction pad.
   Minimum thickness: 2.0 mm



Replacing

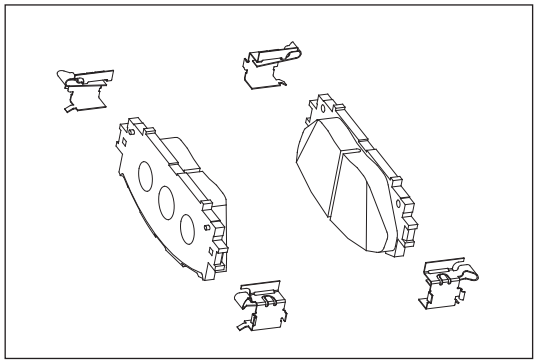
1. **Remove the front wheels.**
2. **Remove the caliper body assembly.**
   (a) Remove a hexagon flange bolt which connects the caliper body with the lower caliper bracket.



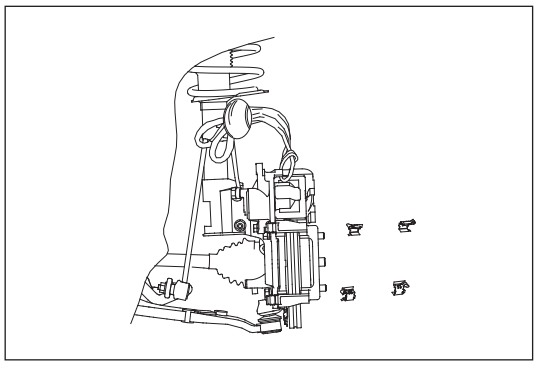
(b) Lift the caliper body assembly, and use a cable to hang it so as to protect the brake line.

Note:

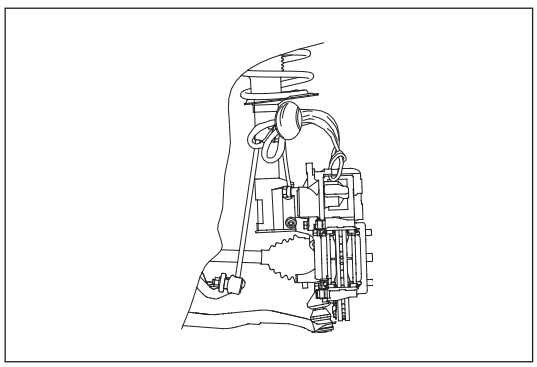
Do not loosen the brake line and the air bleed screw.



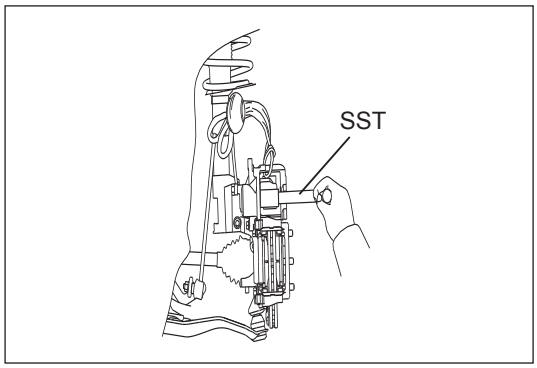
3. **Remove the following parts.**
   Remove the inner brake pad and the outer brake pad.
   Remove the clip of the brake pad.
4. **Measure the thickness of the brake disc.**
   Standard thickness: 22.0 mm
   Minimum thickness: 20.0 mm
5. **Measure the axial runout of the brake disc.**
   Maximum axial runout:0.1mm



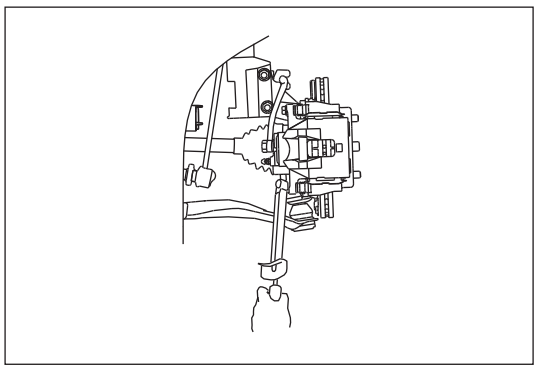
6. **Install the yoke spring.**
   Fix the brake pad clip to the caliper bracket.



7. **Install the inner brake pad assembly and the outer brake pad assembly to the caliper bracket.**
   Note:
   No grease or paint contamination on the working surfaces of the inner brake pad assembly, the outer brake pad assembly and the brake disc is permitted.



8. **Install the caliper body assembly.**
   (a) Suck a little brake fluid out of the reservoir to prevent the brake fluid from overflowing.
   (b) Use the SST tool to press the piston into the caliper.

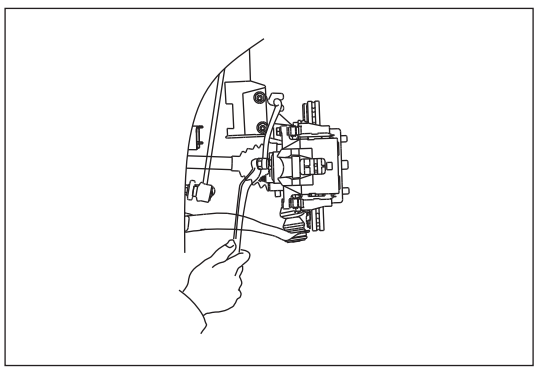


   (c) Release the cable, lay the caliper body assembly down and tighten the hexagon flange bolt.
   Tightening torque:22-30 N•m

Remarks:

Only replace the brake pad on one wheel every time to prevent the piston of the other wheel from going out.

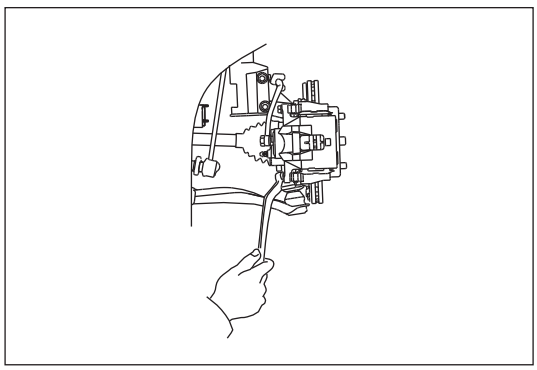
9. **Install the front wheels**
   Tightening torque for wheel fixed bolts: 110±10 N•m



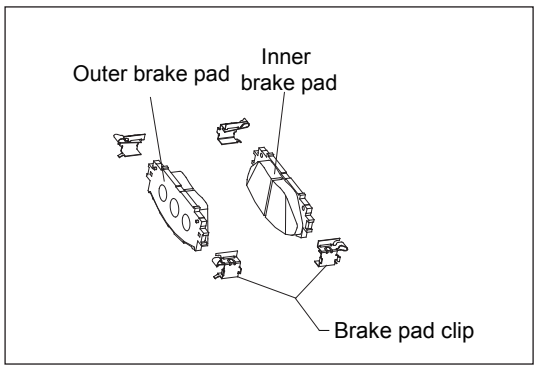
FRONT CALIPER PISTON

Removing

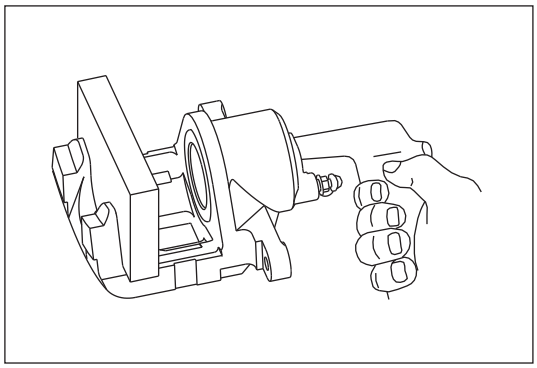
1. **Remove the brake line.**
   (a) Remove the brake line. Use a clean container to receive the brake fluid.



2. **Remove the caliper body assembly.**
   (a) Remove the two hexagon flange bolts which connect the caliper body with the caliper bracket.
   (b) Remove the caliper body assembly from the caliper bracket.



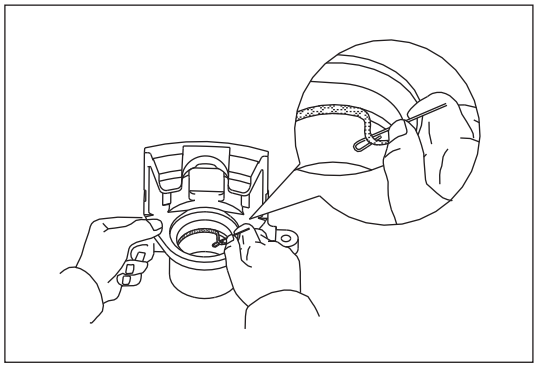
3. **Remove the following part.**
   Remove the brake pad clips.



4. **Remove the piston and the piston dust boot from the caliper body.**
   (a) Place the wooden block in the middle of the caliper body.
   (b) Use an air gun or a windpipe to align the hole of the brake line, and remove the piston from the caliper body and remove the piston dust boot as well.
   (c) Take out the piston with clean cloth or other soft cloth.

   Warning!

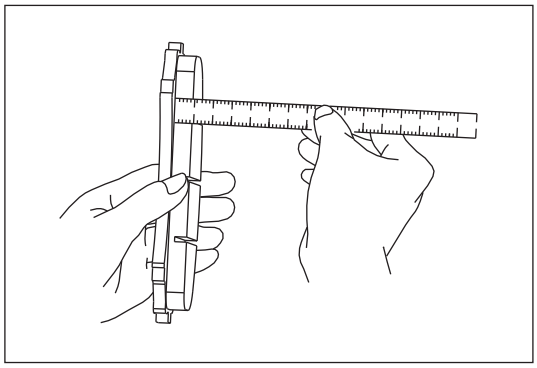
   When using compressed air, do not put your fingers in the front of the piston.



5. **Remove the rectangular seal from the caliper body.**
   Use a paper clip to remove the rectangular seal.

   Note:

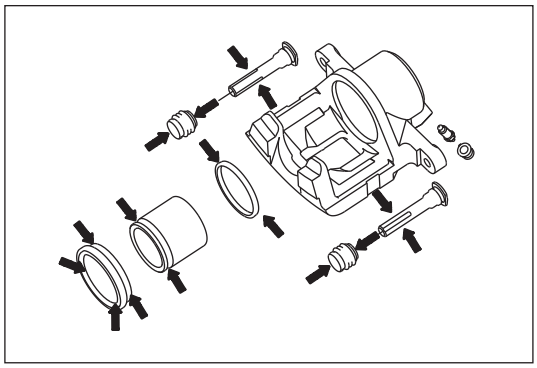
   Do not use a sharp tool, avoiding scratching the rectangular seal.



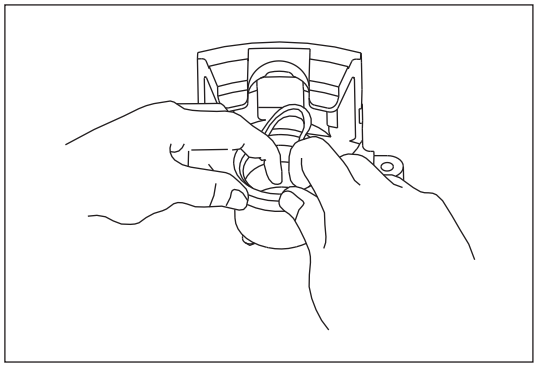
6. **Measure the thickness of the inner brake pad assembly and the outer brake pad assembly.**
   Standard thickness: 8.5 mm
   Minimum thickness: 2.0 mm

   If the measured thickness is less than the minimum thickness or there is any uneven wear trace, replace the brake pad.

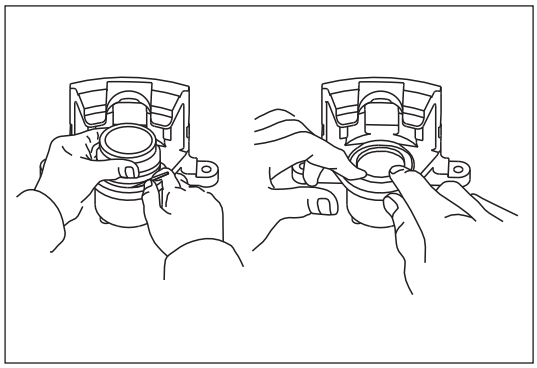
Installation



1. **Preparation**
   Ensure all parts clean and pure before assembly. When assembling, coat a proper amount of rubber grease onto the working surfaces of the guide pin and the piston, and of the rectangular seal and the piston dust boot.



2. **Install the rectangular seal into the caliper body.**
   (a) Screw the air bleed screw into the air-bleeding hole of the caliper body with a tightening torque of 7~12N•m.
   (b) Coat a proper amount of rubber grease onto the working surface of the rectangular seal before installing it into the seal groove of the caliper body.

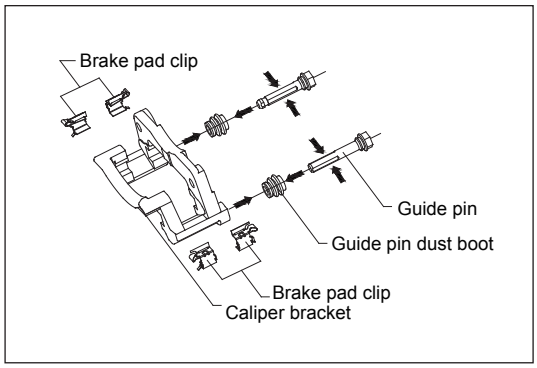


3. **Install the piston with piston dust boot into the caliper body.**
   (a) Cover the piston dust boot onto the piston.
   (b) Elongate the piston dust boot to make its retaining edge exposed to the bottom of the piston. Use a tool (for example, an iron wire of Φ2mm) to assist in slipping the dust boot's retaining edge into the groove of the retaining edge of the cylinder hole.

   Note:

   Do not use a sharp tool, avoiding scratching the dust boot.

   (c) And then, press the piston to the bottom of the cylinder hole by hand.

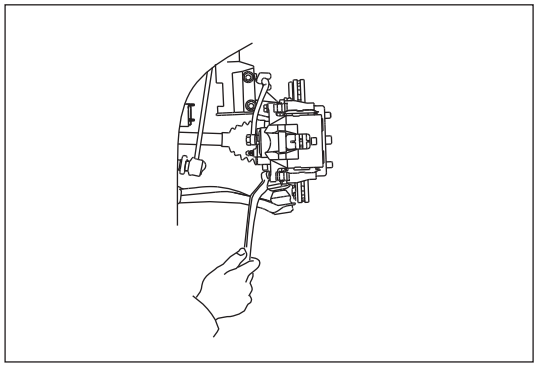


4. **Install the guide pin and the guide pin dust boot on the caliper bracket.**
   (a) Install the guide pin dust boot to the guide pin.
   (b) Screw the guide pin into the caliper bracket.

   Note:

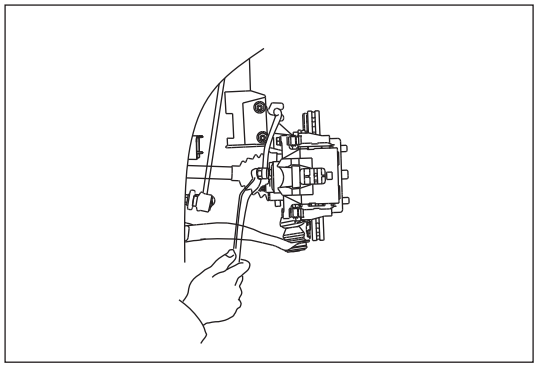
   Do not damage the guide pin dust boot.

5. **Install the inner brake pad assembly, the outer brake pad assembly and the inner and outer silent pad module.**
6. **Install the brake pad clip and the inner brake pad assembly, the outer brake pad assembly and the inner and outer silent pad module to the caliper bracket.**



7. **Install the caliper body assembly.**
   (a) Install the caliper body assembly.
   (b) Install and tighten the hexagon flange bolt.

   Tightening torque:22-33 N•m.



8. **Connect the brake line.**
   Connect the brake line with the caliper body.
9. **Fill the brake oil reservoir with the brake fluid and let the air in the brake system out.**
10. **Check the brake fluid for leakage.**

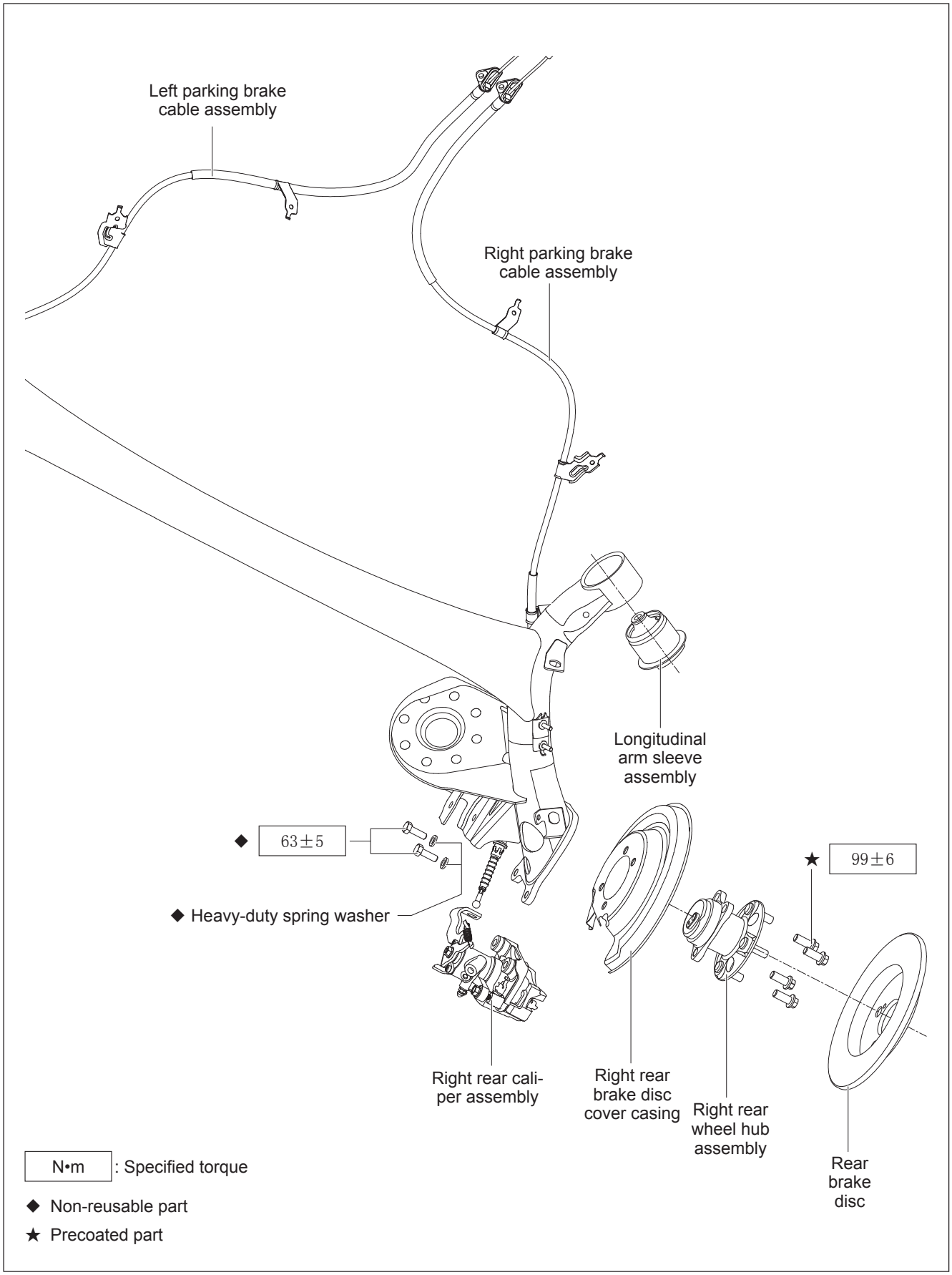
    Not e:

    After the completion of replacement, perform the air-bleeding.

REAR WHEEL BRAKE

REAR AXLE ASSEMBLY

Structure Diagram



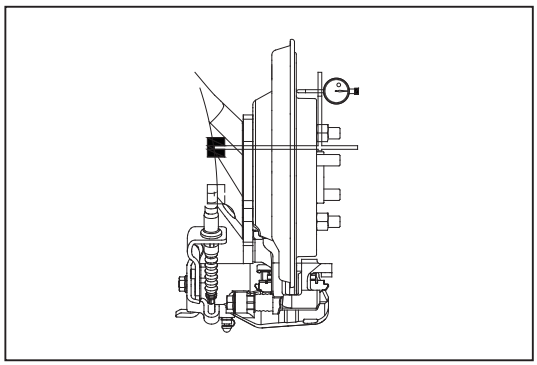
Check and removal

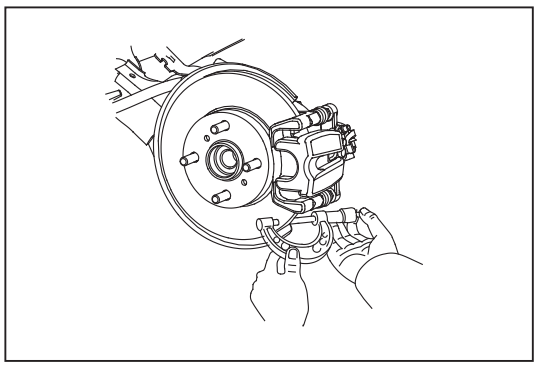
1. Check and repair of rear brake disc

(a) Use a jack to lift the car.

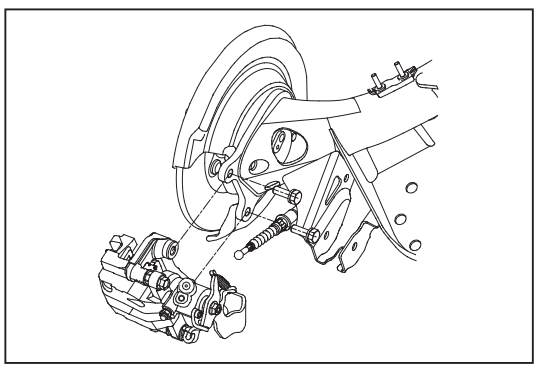
(b) Diagonally unscrew the fastening bolts of the wheel and remove the wheel.

(c) Check the disc face runout of the rear brake disc. When measuring, tighten the two wheel nuts at the symmetry positions. It is necessary to measure within the range of Φ186mm-Φ262mm of the circle of the rear brake disc. The disk runout should be less than 0.11mm. If the measured runout exceeds such value, repair or replace the rear brake disc.





(d) Check the thickness of the rear brake disc. Use a micrometer to measure the thickness of the rear brake disc.
Minimum thickness: 7.5 mm
Maximum thickness: 9 mm
When the thickness of the rear brake disc is less than the minimum thickness, replace it with a new one.

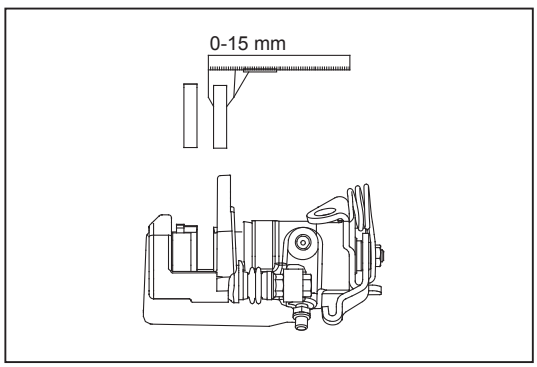


2. Removing the rear brake caliper assembly

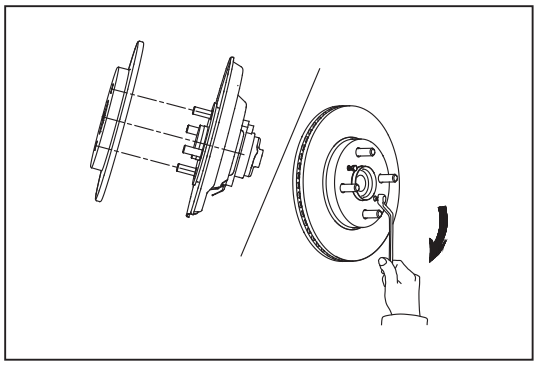
(a) Use a M10 fork wrench to unscrew the two fastened bolts for the rear brake disc before removing the rear brake caliper assembly.

Note:

Remove the rear caliper and use a steel cable or other to suspend the brake caliper securely, avoiding the failure of the brake line due to being over-distorted, bent or pulled out.



(b) If you hear any friction noise from the steel plate in the process of braking, replace the old ones with new friction linings.
If the thickness of the friction material is ≤2m m, replace the old ones with new friction linings. (For the method for measuring shown in the figure, it is necessary to add the thickness of the steel plate of 5mm.)

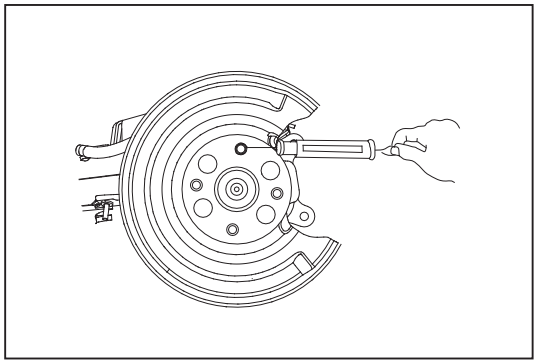


3. Removing rear brake disc

It is not easy to remove the brake disc after driving for some time. Screw two M8 bolts into the brake disc to remove the screw thread hole. Use a wrench to screw the two bolts alternatively so as to push the brake disc out.

Note:

Check the rear brake disc for wear. If the rear brake disc has any obvious scratch, replace the rear brake disc.



4. Checking the starting torque of the rear wheel hub assembly

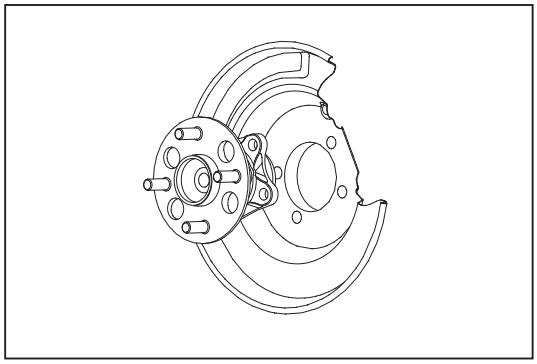
(a) Rotate the rear wheel hub by hand to determine abnormal noise and looseness. If there is any abnormal noise or looseness, replace the rear wheel hub assembly.

(b) Use a spring strain-gauge to check the pre-load.
Pre-load(starting): 1.5 N•m

Note:

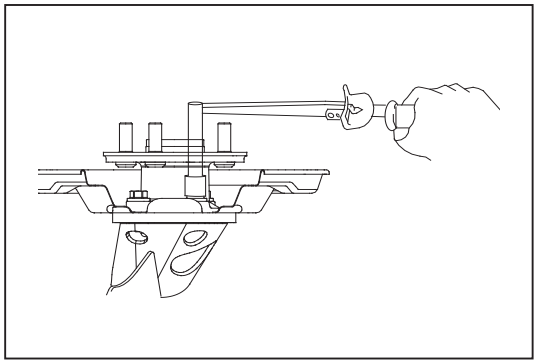
If the pre-load is more than 1.5 N•m, it is necessary to replace the rear wheel hub assembly.

Assembly

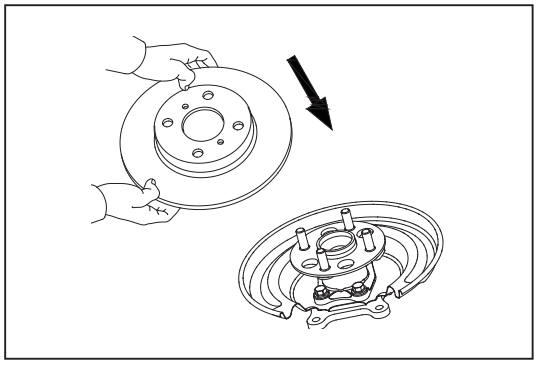


1. Installing the rear brake disc cover casing and the rear wheel hub assembly

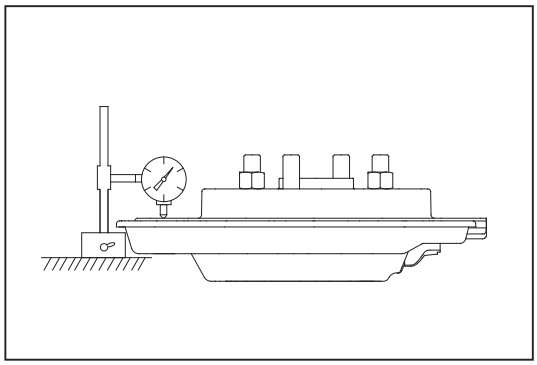
(a) Put the rear brake disc cover casing on the rear wheel hub assembly to align the four holes respectively.



(b) Fix the rear wheel hub assembly with cover casing to the installation position on the rear wheel hub bracket, and align the four holes on the rear wheel hub assembly with the four installation holes on the rear wheel hub bracket. And then, use a M12 torque wrench to screw the four brake installation bolts.
Tightening torque: 99±6 N•m

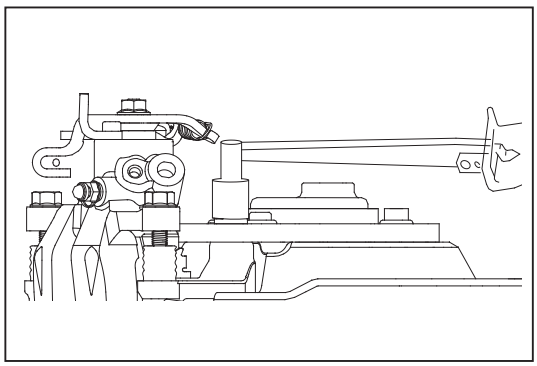


2. Installing the rear brake disc



3. Checking the disc face runout of the rear brake dics

When measuring, tighten the two wheel nuts at the symmetry positions. It is necessary to measure within the range of Φ186mm-Φ262mm of the circle of the rear brake disc. The disk runout should be less than 0.11mm.



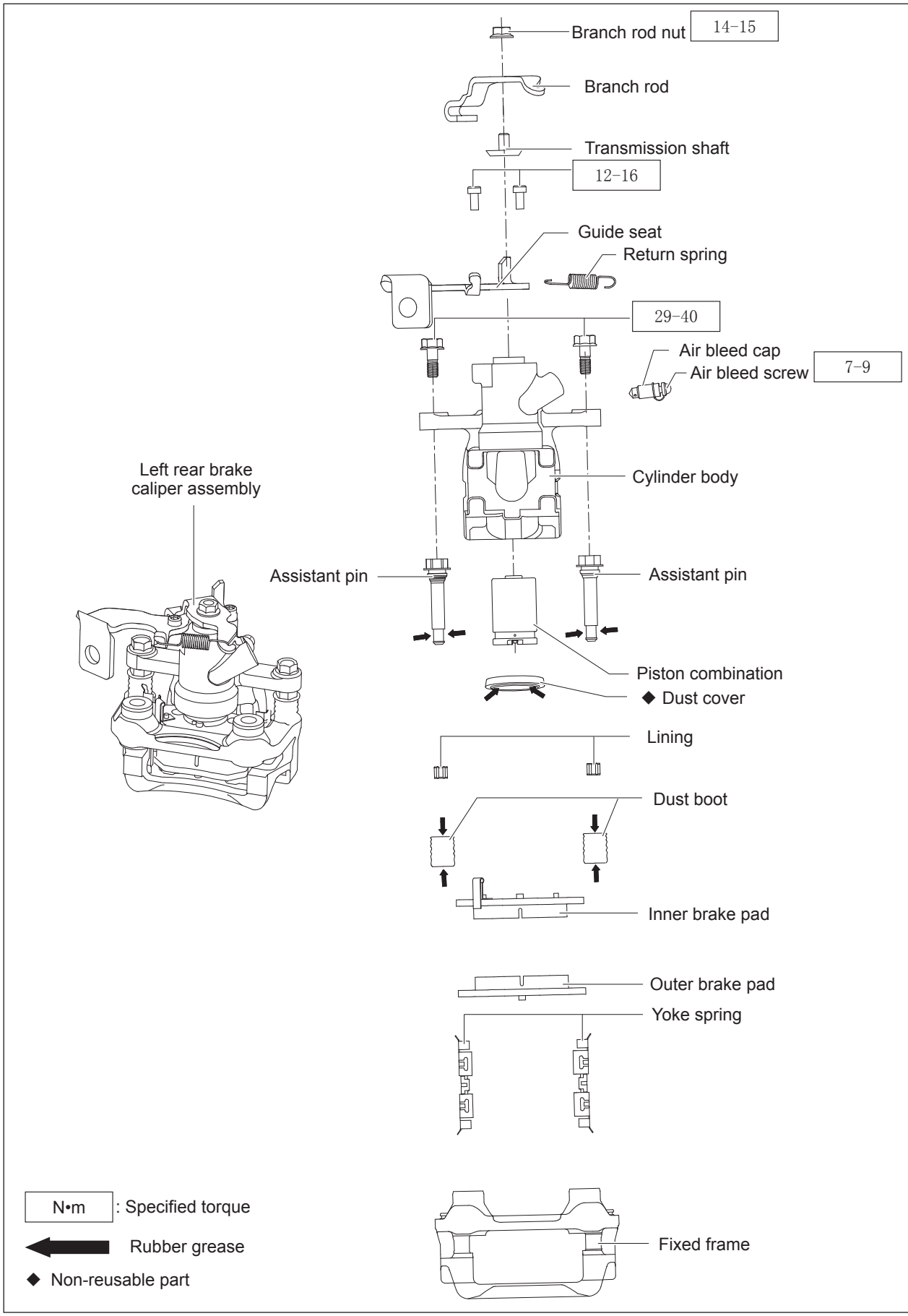
4. Installing the rear brake caliper assembly

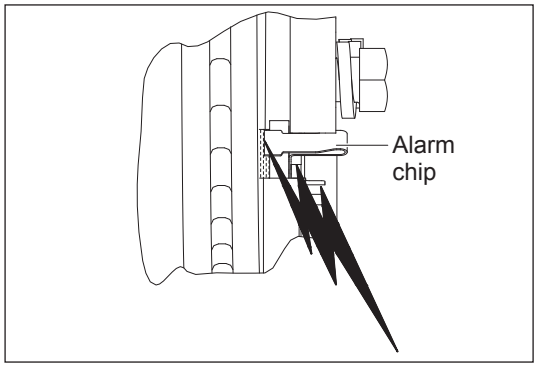
Use a M10 torque wrench to screw the two fastened bolts for the rear brake disc.

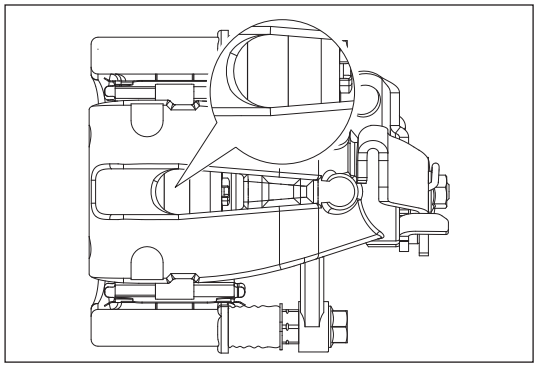
Tightening torque: 63±5 N•m

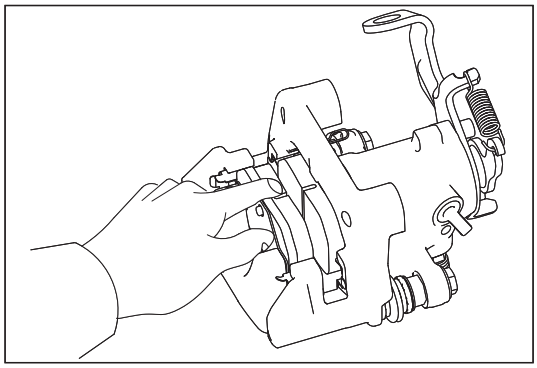
REAR CALIPER ASSEMBLY

Structure Diagram









BRAKE PAD ASSEMBLY

Check

Tip:

This method is applied to the rear brake caliper on the left side and the one on the right side.

If you hear a continuous metallic “screeching” sound when you apply the brakes in the process of driving, you should have the right/left brake pad wear indicators checked. If the thickness of the friction material of the brake pad is less than 2.0mm, that is, there is some friction traces of alarm chip-to-brake disc, you should have the right/left brake pad assembly replaced.

1. **Removing the rear wheels**
2. **Checking the thickness of the friction material of the brake pad**

   Use the inspection hole on the caliper body to check the thickness of the friction material of the brake pad. If the thickness exceeds the specified range, replace the brake pad.

   Minimum thickness: 2 mm

Replacing

1. **Removing the rear wheels**
2. **Removing the rear brake caliper assembly**

   Refer to the “Check and repair of the rear brake caliper assembly” of this chapter.
3. **Removing the following parts**
   (a) Remove the right/left brake pad assembly(Use the right /left thumb to push down the brake pads on both sides).
   (b) Remove the brake pad clips.
4. **Installing new right/left brake pad assembly and brake pad clips**

   Install the right/left brake pad assembly and the brake pad clips onto the caliper bracket(Reverse to Step 3).

   Note:

   1. When having the brake pads replaced with new ones, use a needle nose pliers to clamp two of the four pits on the bottom of the piston, and screw the piston into the caliper body clockwise.
   2. No grease or paint pollutant on the working surfaces of the right/left brake pad assembly, the brake pad clips and the brake discs is permitted.
5. **Installing the caliper body assembly**

   Release the cable to lay down the caliper body assembly and tighten the hexagon flange bolts.

   Tightening torque: 63±5 N•m
6. **Installing the wheels**

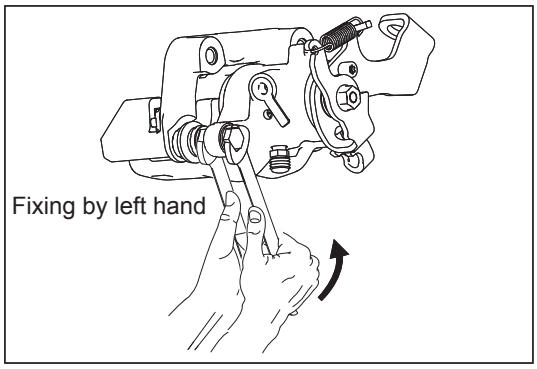
REAR CALIPER PISTON

Disassembling

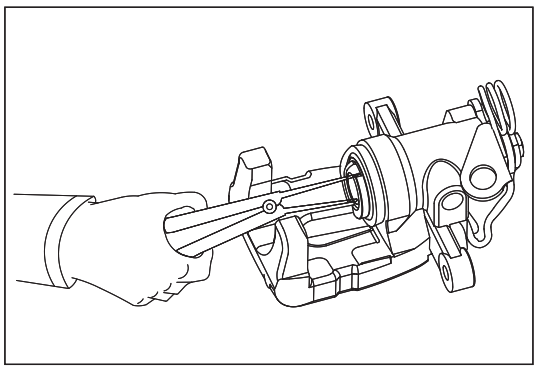
Tip:

This method for disassembling is applied to the right/left rear brake calipers.

1. **Removing the brake line**
   When removing the brake caliper line, use a clean container to gather the brake fluid.
2. **Removing the rear brake caliper assembly**
   Refer to the “Check and repair of the rear brake caliper assembly” of this chapter.
3. **Removing the two brake pads and the two brake pad clips**
   Refer to the “Replacement of right/left brake pad assembly” of this chapter.



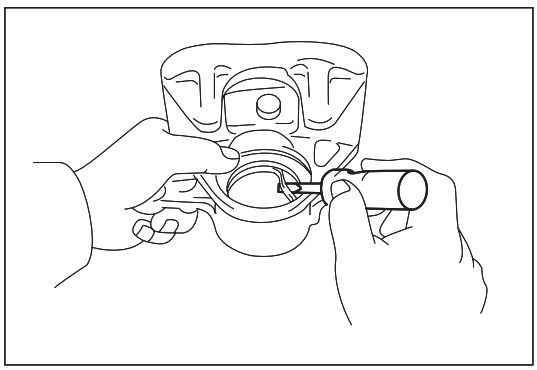
4. **Removing the caliper body assembly**
   (a) Remove the two hexagon flange bolts which connect the caliper body with the caliper bracket.
   (b) Release the caliper bracket and the caliper body assembly.



5. **Removing the piston and the piston dust boot from the caliper body**
   (a) Use a needle nose pliers to clamp two of the four pits on the bottom of the piston, and rotate the piston counterclockwise to move out of the caliper body.
   (b) Remove the dust boot from the piston.
   (c) Take the piston out with clean cloth or other soft cloth.
   (d) Remove the piston dust boot from the caliper body lightly by hand.

   Warning!

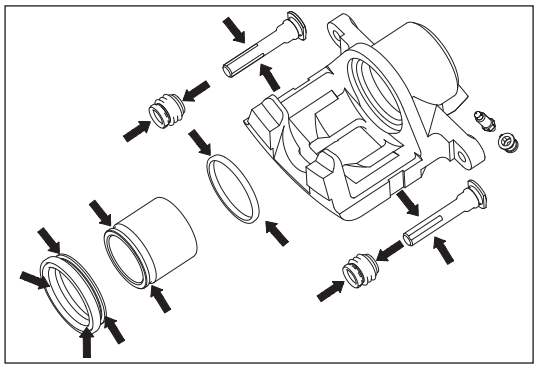
   When removing the piston, be sure to be gentle, avoiding damage to the piston due to excessive force.



6. **Removing the rectangular seal from the caliper body**
   Use a screwdriver to remove the rectangular seal from the brake cylinder.

   Warning!

   Do not make any damage to the inner cylinder and the brake cylinder groove.
7. **Checking the brake cylinder and the piston**
   Check the brake cylinder holes and the piston for rust or scratch.



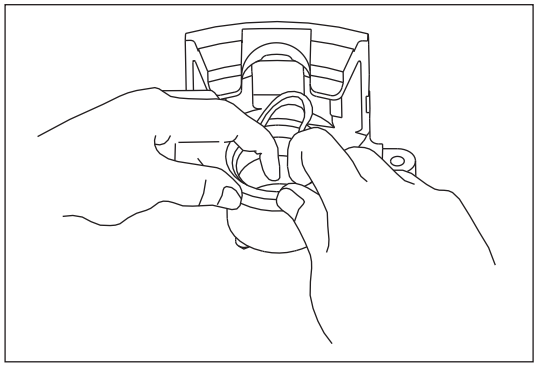
Assembling the Rear Brake Caliper Assembly

1. Preparation

Ensure all parts clean and pure before assembly. When assembling, coat a proper amount of rubber grease onto the working surfaces of the guide pin and the piston, and of the rectangular seal and the piston dust boot.

Note:

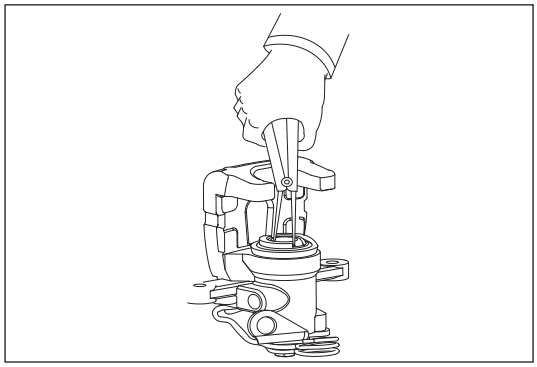
The arrow in the figure represents the coating position.



2. Installing the rectangular seal into the caliper body

(a) Screw the air bleed screw into the air-bleeding hole of the caliper body.

(b) Coat a proper amount of rubber grease onto the working surface of the rectangular seal before installing it into the seal groove of the caliper body.



3. Installing the piston with piston dust boot into the caliper body

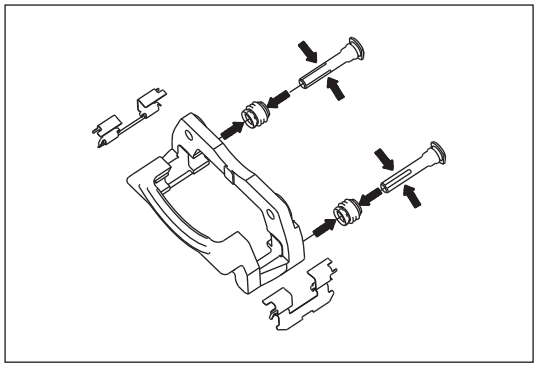
(a) Cover the piston dust boot onto the piston.

(b) And then, use a needle nose pliers to screw the piton to the bottom of the cylinder hole.

(c) Use a tool (for example, an iron wire of Φ2mm) to assist in slipping the retaining edge into the groove of the retaining edge of the cylinder hole.

Note:

Do not use a sharp tool, avoiding scratching the dust boot.



4. Installing the guide pin and the guide pin dust boot onto the caliper bracket

(a) Install the guide pin dust boot to the guide pin.

(b) Screw the guide pin into the caliper bracket.

Note:

Do not make any damage to the guide pin dust boot.

5. Installing the brake pad assembly and the brake pad clips

6. Installing the caliper body assembly

(a) Install the caliper body assembly.

(b) Install and tighten the hexagon flange bolt.
Tightening torque: 35±5 N•m

7. Connecting the brake line

Connect the brake line with the caliper body.

8. Filling the brake oil reservoir with the brake fluid

9. Bleeding the brake system

10. Checking the brake fluid for leakage

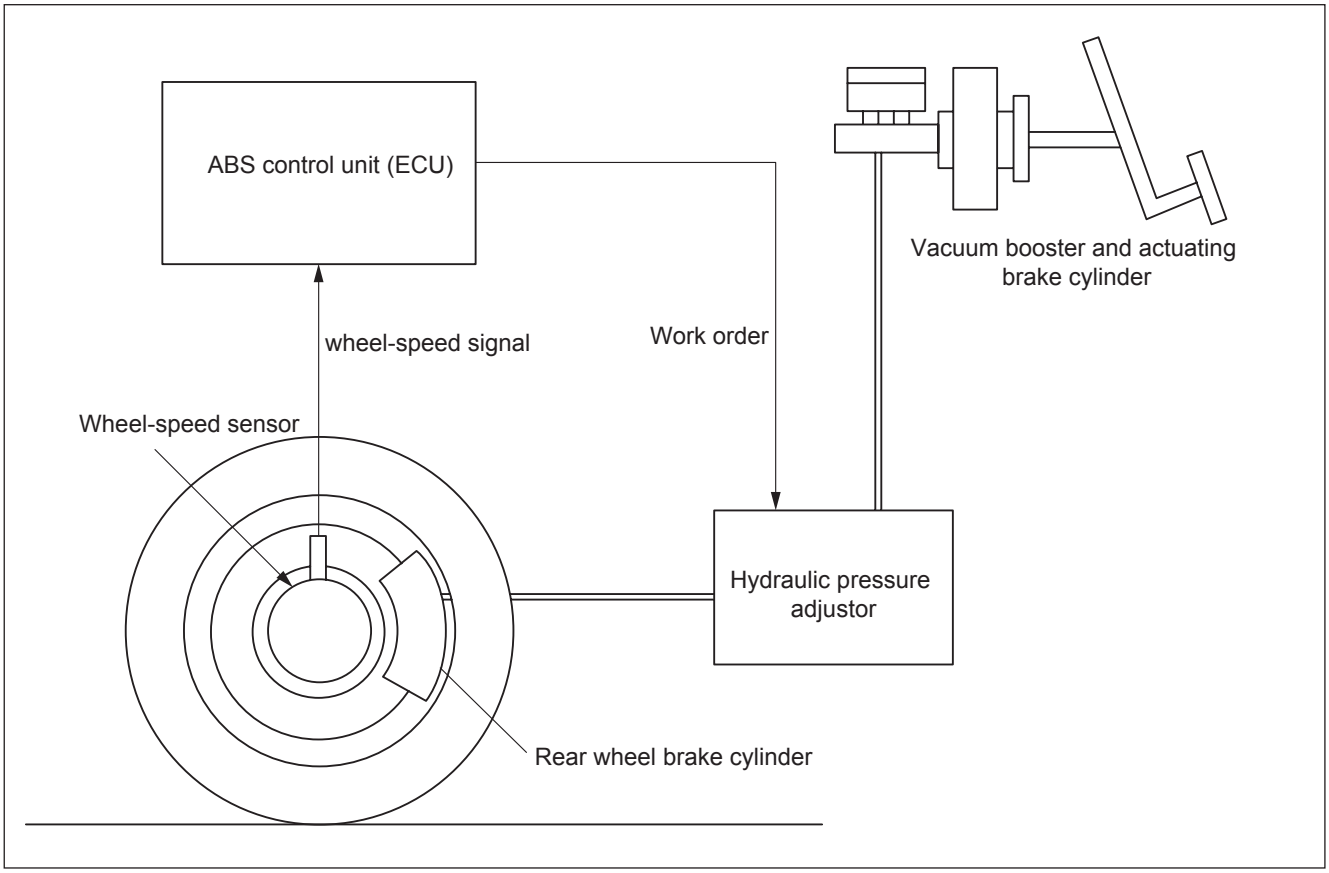
ABS BRAKE SYSTEM (ANTILOCK BRAKE SYSTEM)

SHORT DESCRIPTION ON ABS/EBD

This ABS brake system adopts wheel-speed sensors to detect wheel velocities. After signal processing, the wheel speed signals are sent to the ECU which will control the operating states of the solenoid valves based on the wheel speed signals and control the hydraulic pressure in the wheel-cylinders to prevent the wheels from locking up and skidding

The electronic brake-force distribution (EBD) control unit uses the ABS components to adjust the hydraulic pressure to the rear wheel's brake caliper when braking but the ABS not working, and this can balance the braking pressure to the front/rear wheels and achieve the best braking efficiency.

System Diagram



Attentions

1. **Sometimes, in order to determine a problem results from whether the conventional brake system or the ABS brake system, it is necessary to shut down the ABS, that is, to unplug the ABS ECU connector or fuse, and this means the anti-lock function of the ABS / EBD of the braking system has shut down. It is possible to see such phenomenon as tail whip and side slip on mud, snow and ice road surfaces. As a result, it is necessary to avoid emergency braking whenever possible.**
2. **The ABS system provides a very low failure rate. When the brake system is in trouble (alarm light is off), it is necessary to eliminate any fault of the conventional brake system first, and then take the ABS system failure into consideration.**
3. **The ABS may require more time to adjust on rainy or sand-gravel surfaces than on normal surfaces. A car with ABS may require a longer distance to stop because unstable adhesion coefficients on such surfaces can cause different measurement and calculation on slip rates. It is necessary to remind the drivers to exercise greater cautious when driving on such surfaces.**
4. **ABS ECU Attentions:**
   (a) Any collision and striking can easily cause damage to ABS ECU, therefore, be sure to avoid any collision and striking to the ECU.

(b) High temperature conditions can easily cause damage to ECU, therefore, when performing stoving operation, remove the ECU from the car.

(c) When the power switch is in the ON position, do not dismantle and install the electric elements and the wiring harness plugs of the system so as not to make damage to the ECU. If you need to dismantle, you should turn off the ignition switch first. When welding the system components or lines, disconnect the connector from the ECU.

(d) Do not let the oil contamination to pollute the ECU, in particular, the ECU terminals. Otherwise, the connector's terminals will contact poor.

COMMON TROUBLE AND MAINTENANCE

1. When braking, the ABS hydraulic adjustor sending much more noise

(a) When the ABS activates, the motor in the hydraulic adjustor keeps rotating, and you will feel a pulsation in the brake pedal. Moreover, such pulsation varies with the wheel speed and the surface conditions.

(b) When performing the activation testing, you can also hear the sound of the motor operating. When driving a car, you do not apply the brakes, but can hear the sound of the motor operating once in a while. This is the ABS checking elements, and nothing goes wrong.

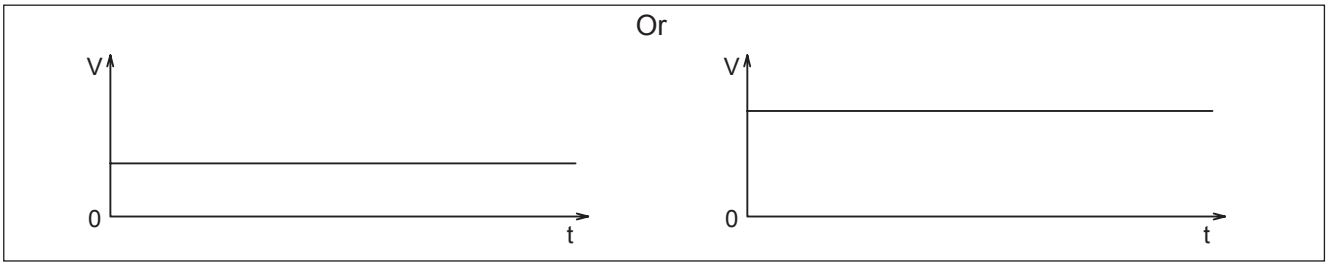
(c) If you feel an abnormal sound of the ABS hydraulic adjustor, you can carry out activation testing, comparing to the normal car, so as to determine whether the sound of the ABS hydraulic adjustor is normal or not.

2. Oil inlet/return solenoid valve failure

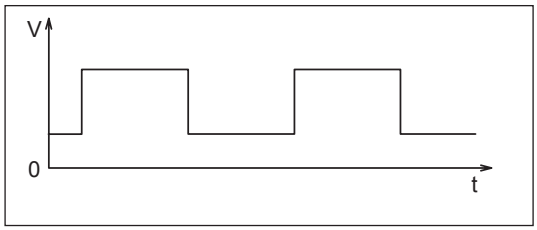
After switching on the ignition switch every time, the ABS control unit will be self-checking automatically. If anything goes wrong, such as open or short circuit of oil inlet/return solenoid valve, the ABS control unit will record this fault and the fault indicator light will come on. The anti-lock function of the brake system will shut down. If using a diagnostic tester to display the corresponding malfunction code and determining the solenoid valve failure through activation testing, replace the hydraulic adjustor assembly directly.

3. Wheel-speed sensor failure

Under the state of engine ignition, use an oscillograph to detect the voltage between the sensor signal line and the grounding. When the wheel at rest, the output signals as follows:



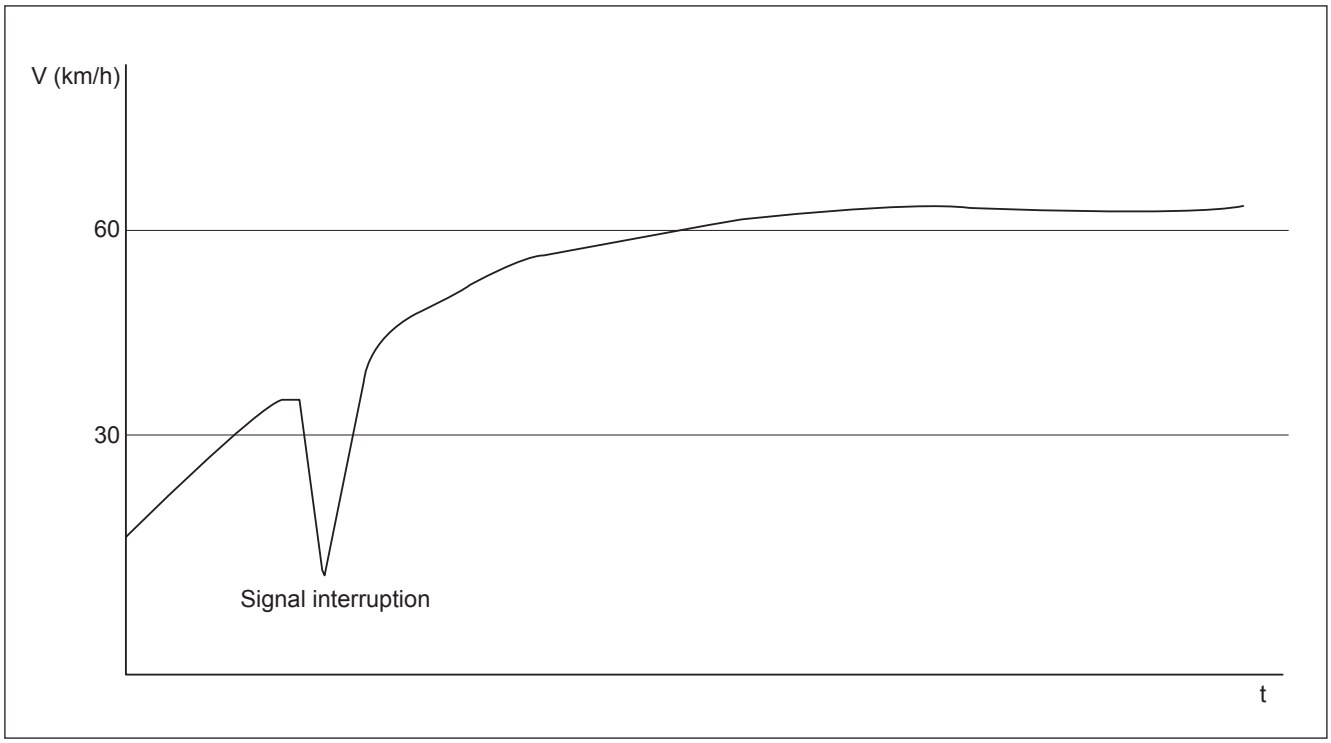
When rotating wheels, the output signal is: the signal form is 0.44 V and 1.26 V square wave signal, duty cycle: 50:50.



The X431 diagnostic tester provides a function of displaying data stream in a form of waveform. For intermittent faults, such as wheel speed signal error only at a higher speed (wheel-speed sensor failure), occasional wheel-speed signal error in the course of operating, you can observe the waveform in a successive way to determine whether it is abnormal or not. When driving a car straight on level road surfaces, the waves of the four wheel-speed sensors are very similar, so that you can simultaneously contrast the signal waves of the two front wheels or the two rear wheels.

Mechanical causes: The deformed signal gears or the loosened wheel hub bearings, the stained sensor surfaces and other are likely to cause wheel speed signal interruption and deviation.

Failure instance:



As shown above, the ABS control unit will record the sensor fault and lighten the alarm lamp once detecting an intermittent fault of the wheel-speed sensor signal.

4. Wheel-speed sensor rate failure

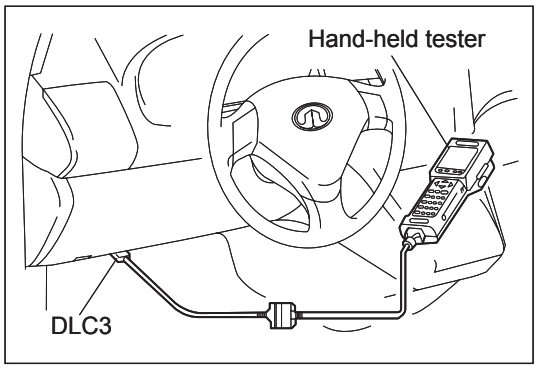
If the ECU detects a wheel-speed sensor signal is significantly different from the other wheel-speed sensor signal, it is possible that the gap of the gear ring speed sensors exceeds the difference or the speed sensor signal is interfered. Therefore, first of all, it is necessary to determine the sensor with signal deviation, and then eliminate the fault by referring to the list of trouble.

List of ABS malfunction codes:

Malfunction code	Fault description
C0035	Faulty left front wheel-speed sensor line, speed error
C0040	Faulty right front wheel-speed sensor line, speed error
C0045	Faulty left rear wheel-speed sensor line, speed error
C0050	Faulty right rear wheel-speed sensor line, speed error
C0060	Faulty left front ABS outlet solenoid vale
C0065	Faulty left front ABS inlet solenoid vale
C0070	Faulty right front ABS outlet solenoid vale
C0075	Faulty right front ABS inlet solenoid vale
C0080	Faulty left rear ABS outlet solenoid vale
C0085	Faulty left rear ABS inlet solenoid vale
C0090	Faulty right rear ABS outlet solenoid vale
C0095	Faulty right rear ABS inlet solenoid vale
C0110	Faulty pump motor line, run-time error
C0121	Faulty solenoid valve relay line
C0161	Faulty brake switch circuit
C0245	Incorrect wheel-speed sensor frequency, faulty wheel-speed signal
C0287	Faulty accelerating sensor
C0550	Faulty ECU
C0800	Faulty voltage, lower or higher voltage
C0232	Short-circuited positive pole by alarm lamp, Short-circuited grounding wire by alarm light

ABS CONTROLLER ASSEMBLY

On-board Check



1. Connecting the hand-held tester:

(a) Connect the hand-held tester to the DLC3.

(b) Start the engine and keep it idle-running.

(c) Select the ACTIVE TEST mode of the hand-held tester.

Tip:

For details, please refer to the Operation Manual of Hand-held Tester.

2. Checking the working conditions of the actuator motor

(a) When switch on the motor relay, check the working sound of the actuator motor.

(b) Switch off the motor relay.

3. Checking the working conditions of the right front wheel

(a) Step down the brake pedal for about 15 seconds. Verify that it is unlikely to press down the brake pedal further.

(b) When switching on the motor relay, verify the brake pedal vibrating.

Note:

Do not switch on the motor relay successively for more than 5 seconds. When the relay continuously working, set an interval of more than 20 seconds for it.

(c) Switch off the motor relay and release the brake pedal.

Note:

When switching on the solenoid valve, be sure to follow the following procedures.

(d) When stepping down the brake pedal, perform the following operations.

(e) Switch on the EVFR and AVFR solenoid valves at the same time, and confirm that it is unlikely to press down the brake pedal further.

Note:

Do not switch on the solenoid valves successively for more than 5 seconds. When the solenoid valves continuously working, set an interval of more than 20 seconds for them.

(f) Switch off the EVFR and AVFR solenoid valves at the same time, and confirm that it is unlikely to press down the brake pedal.

(g) Switch on the motor relay and confirm the brake pedal return.

Note:

Do not switch on the motor relay successively for more than 5 seconds. When the relay continuously working, set an interval of more than 20 seconds for it.

(h) Switch off the motor relay and release the brake pedal.

4. Checking the working conditions of the other wheel

Use the same procedures to check the solenoid valves of the other wheels.

Note:

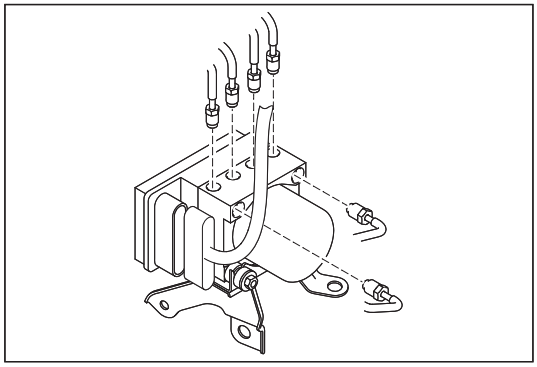
Do not press down the brake pedal under the condition of only switching on the relief solenoid vale.

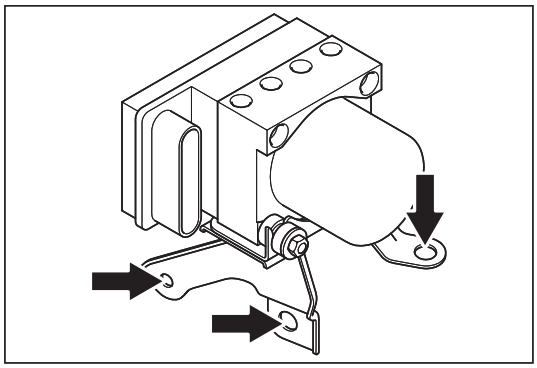
Tip:

Right front wheel: EVFL, AVFL
Right rear wheel:EVRR, AVRR
Left rear wheel:EVRR, AVRR

Replacing

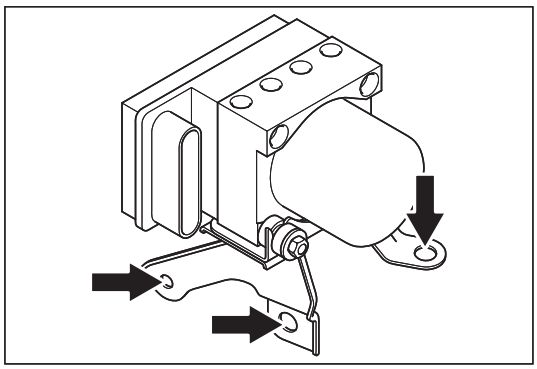
1. **Draining the brake fluid.**
   Note:
   If the brake fluid adheres to any paint surface, wash it clean promptly.
2. **Removing the battery**
3. **Removing the ABS controller with bracket**
   (a) Loosen the bolts of the connector of the ABS controller to disconnect the connector.
   (b) Draw marks on the six brake lines and then disconnect the connection between the brake line and the ABS controller.

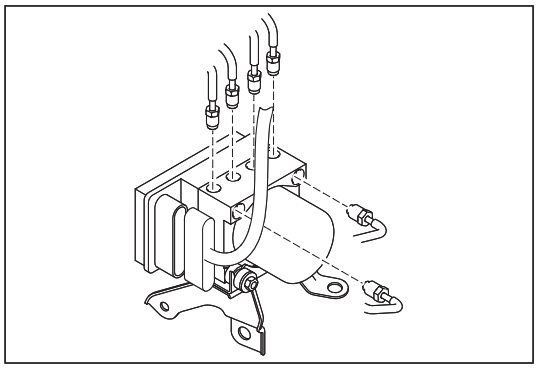




   (c) Remove the three bolts and the ABS controller with bracket.

4. **Removing the ABS controller assembly**
   (a) Unscrew the two nuts on the ABS controller.
   (b) Pull out the installation pin of the ABS controller assembly from the shock pad.
5. **Installing the ABS controller assembly**
   (a) Press the installation pin of the ABS controller assembly into the shock pad.
   (b) Tighten the ABS installation nuts.
6. **Installing the ABS controller with bracket**
   (a) Use the three bolts to install the ABS controller with bracket.





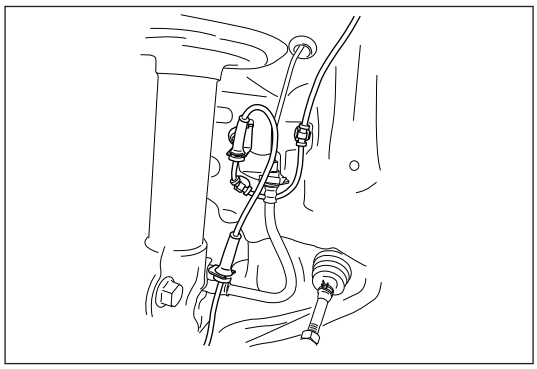
(b) According to the labels or ready-made records, use a tool to connect the six brake lines to the correct positions of the ABS controller.
Torque: 16 N•m
(c) Connect the connector of the ABS controller.

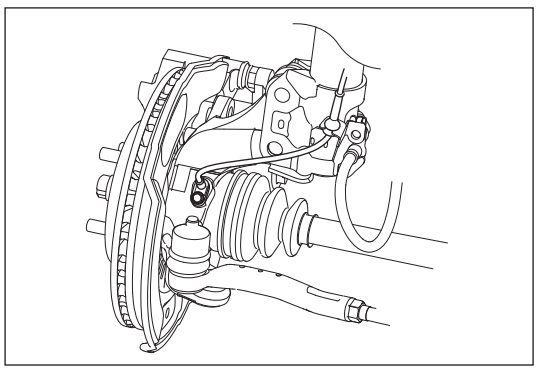
7. **Installing the battery**
8. **Adding the brake fluid to the reservoir**
9. **Bleeding the actuating brake cylinder**
10. **Bleeding the brake line**
11. **Checking the fluid-level of the reservoir**
12. **Checking the brake fluid for leakage**
13. **Using a hand-held tester to check the ABS controller**

FRONT WHEEL VELOCITY SENSOR

Removing

1. **Jacking the car properly to lift it**
2. **Removing the wheels**
3. **Removing the wheel-speed sensors**
   (a) Disconnect the connector between the sensor and the harness inside the body fender.
   (b) Pull out the harness on the body bracket and the shock absorber bracket.
   (c) Pull out the two clamps on the body.



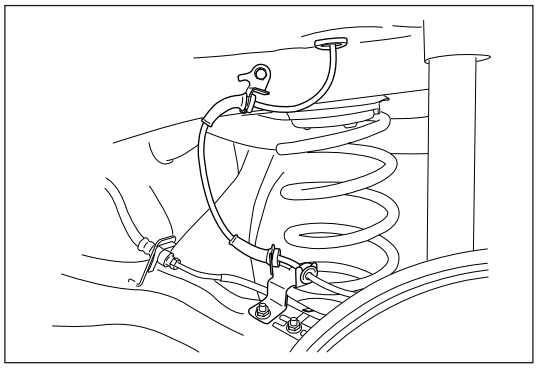


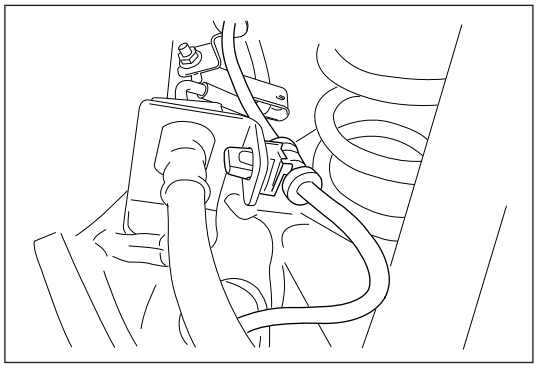
(d) Remove the bolts and the front wheel speed sensor.

REAR WHEEL VELOCITY SENSOR

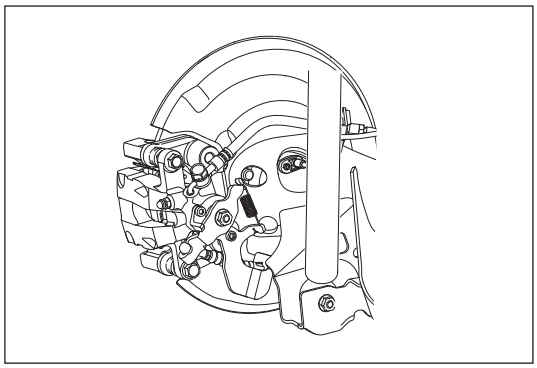
Removing

1. **Removing the guard board of the rear doorsill**
2. **Removing the seal strip of the rear door**
3. **Disassembling the rear seat row**
4. **Removing the bolts at the fixed points under the rear-row belts**
5. **Removing the lower guard board of the C pillar**
6. **Removing the rear wheel speed sensor**
   (a) Disconnect the joint of the rear wheel speed sensor.
   (b) Pull out the harness on the body bracket and the twist beam bracket.





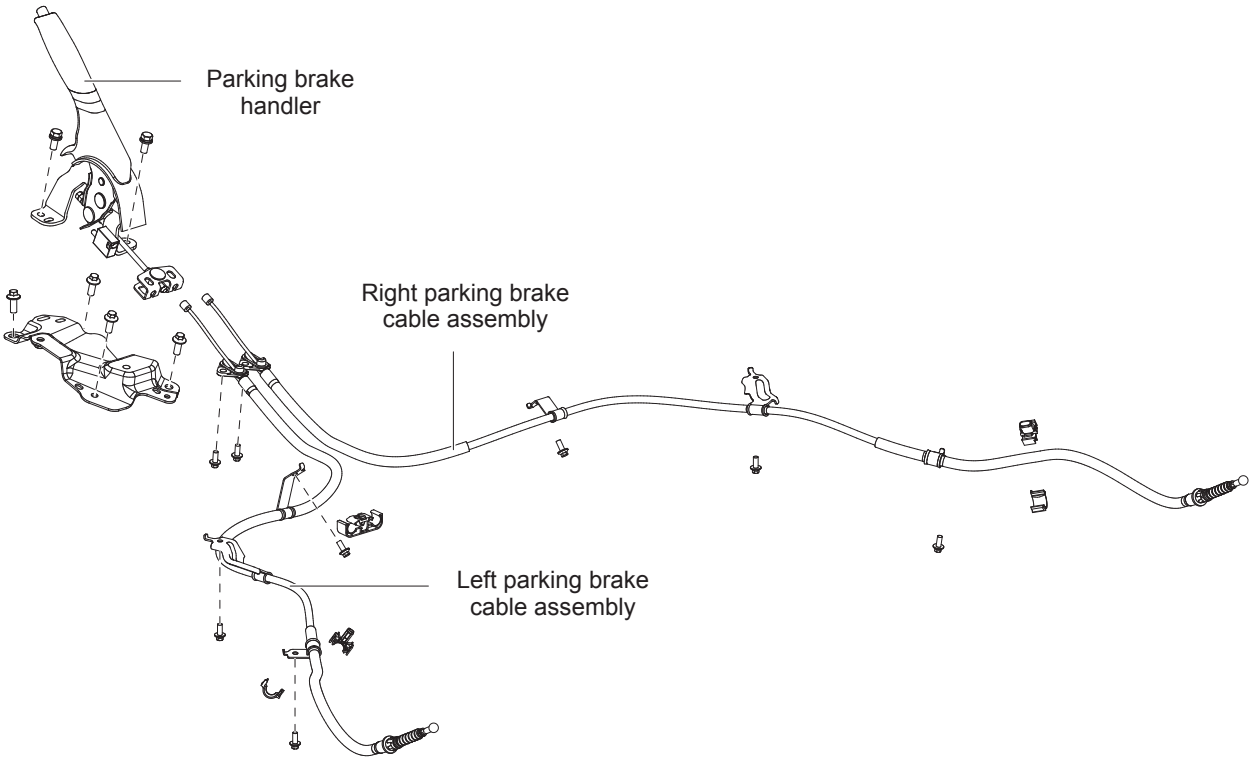
(c) Remove the clamps.

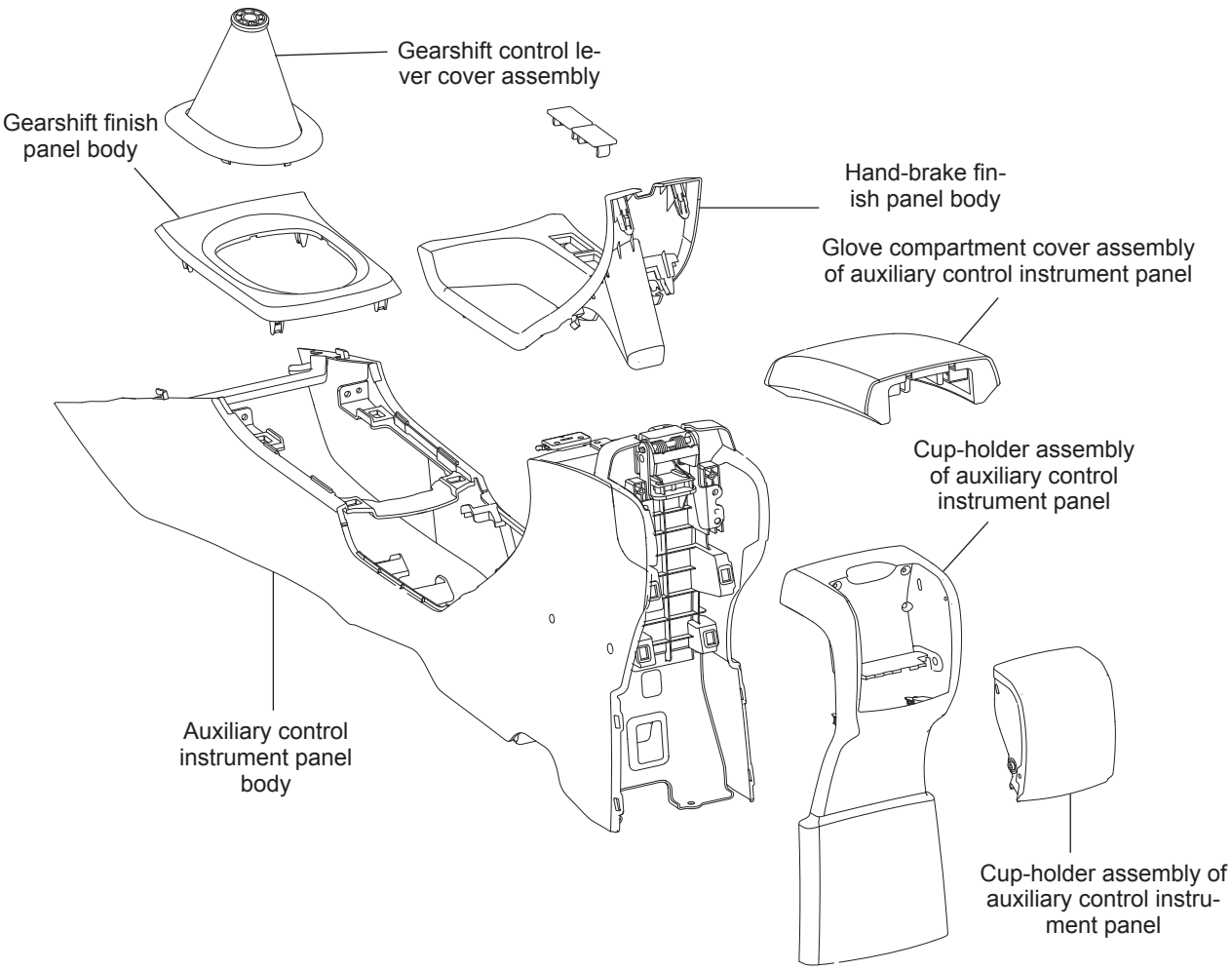


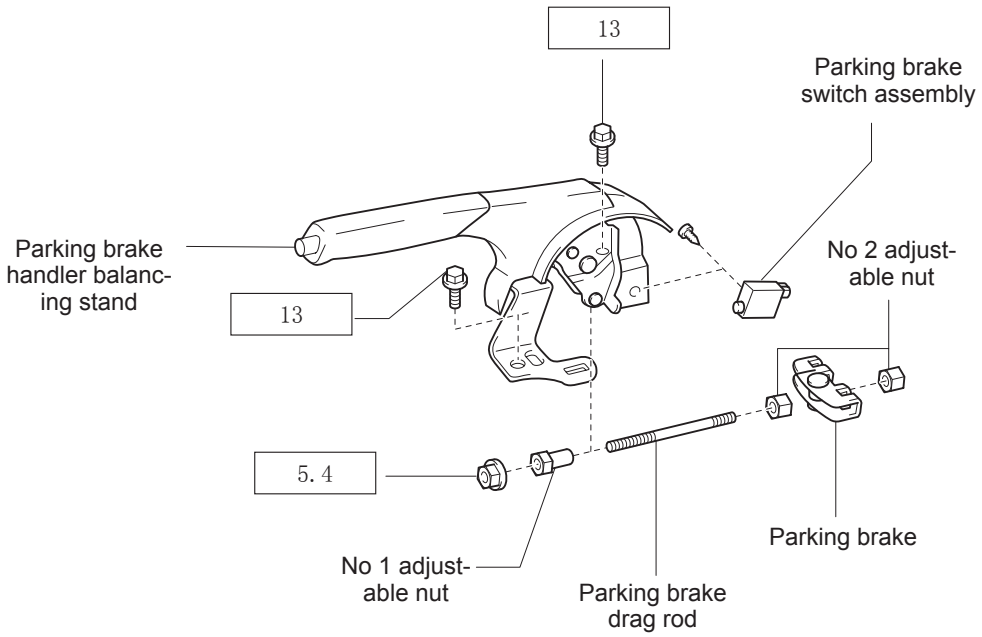
(d) Removes the bolts and the rear wheel speed sensor.

PARKING BRAKE

STRUCTURE DIAGRAM



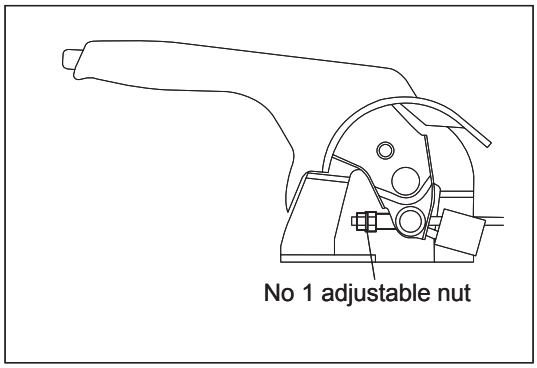




N•m : Specified torque

TROUBLE LIST

Trouble	Potential Trouble position
Poor parking brake	1. Parking brake drag-rod travel(maladjustment) 2. Parking brake cable(rupture) 3. Parking brake shoe clearance (maladjustment) 4. Friction linings of parking brake shoe(rupture or deformation) 5. Retaining spring or return spring(damage) 6. Parking brake drum(wear or ovality) 7. Too small contact area of parking brake shoe friction lining to brake drum

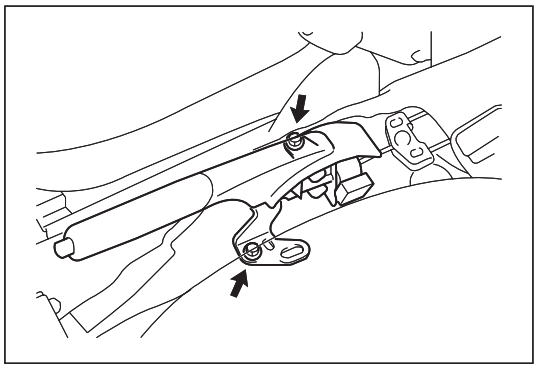


Clearance adjustment

1. **Removing the rear wheels**
2. **Adjusting the clearance of the rear drum brake shoe**
3. **Installing the rear wheels**
   Torque:110 N•m
4. **Checking the travel of the parking brake lever**
   (a) Undraw the parking brake lever fully and compute the number of times of “chuckle” sound.
   Parking brake lever travel: 5-9 teeth
5. **Adjusting the parking brake lever travel**
   (a) Remove the cover board of the parking brake lever.
   (b) Remove the finish carpet of the auxiliary instrument panel.
   (c) Remove the auxiliary instrument panel assembly
   (d) Rotate the No 1 adjustable nut to ensure the lever travel correct.
   (e) Tighten the locknut.
   Torque:5.4 N•m

PARKING BRAKE HANDLER

Replacing

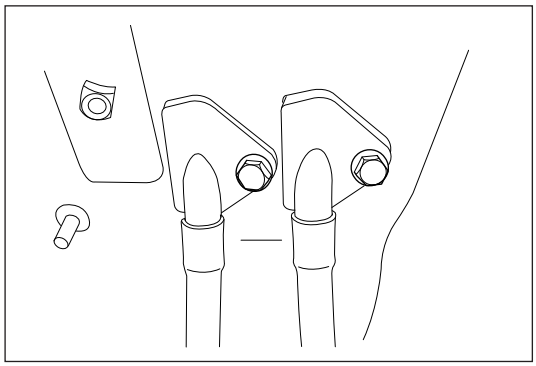


1. **Removing gearshift lever subassembly**
2. **Removing the cover board of the auxiliary instrument panel**
3. **Removing the finish carpet of the auxiliary instrument panel**
4. **Removing the auxiliary instrument panel assembly**
5. **Removing the No 1 adjustable nut**
   (a) Remove the locknut and the No1 adjustable nut.
6. **Removing the parking brake handler**
   (a) Disconnect the parking brake switch connector.
   (b) Remove the two bolts and the parking brake handler.
7. **Removing the parking brake switch assembly**
   (a) Remove the screws and the parking brake switch.
8. **Installing the parking brake switch assembly**
   (a) Use the screws to install the parking brake switch.
9. **Installing the parking brake handler**
   (a) Connect the parking brake drag-rod to the handler and install the locknut and the no 1 adjustable nut.
   (b) Use the two bolts to install the parking brake handler.

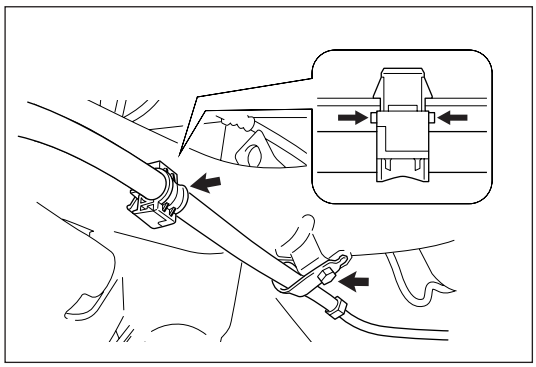
   Torque: 13 N•m
   (c) Connect the parking brake switch connector.
10. **Checking the parking brake lever travel**
11. **Adjusting the parking brake lever travel**

PARKING BRAKE CABLE

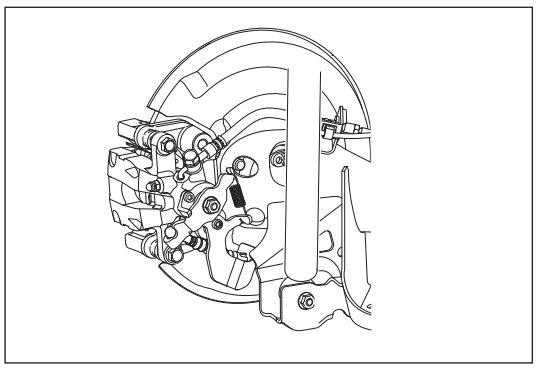
1. **Removing the gearshift lever subassembly**
2. **Removing the cover board of the parking brake lever**
3. **Removing the finish carpet of the auxiliary instrument panel**
4. **Removing the auxiliary instrument panel assembly**
5. **Removing the No 1 adjustable nut**
   Remove the No 1 adjustable nut.



6. **Removing the heat insulation plate of the front floor**
   Remove the three bolts and the heat insulation plate of the front floor.
7. **Removing the cable bracket and the body connecting bolts and the double-hole tube clamps**



8. **Disassembling the parking brake cable assembly**
   (a) Remove the fixed clamps of the twist beam.
   (b) Remove the fixed bolts of the twist beam.



   (c) Remove the fixed clamps of the brake.
   (d) Disassemble the cable connector from the brake.

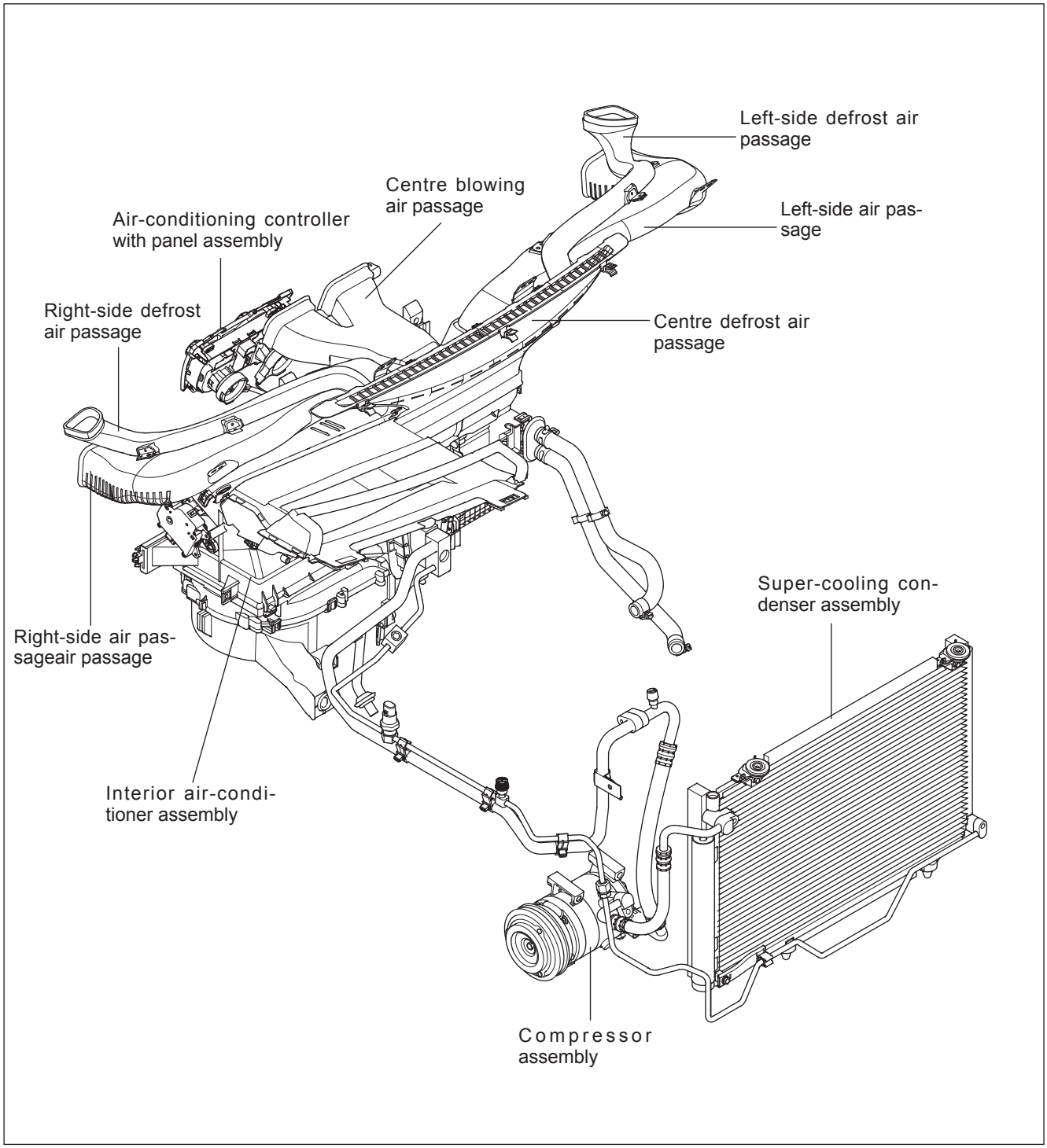
AIR-CONDITIONING SYSTEM

AIR-CONDITIONING SYSTEM

STRUCTURE DIAGRAM 2
STRUCTURE AND PARAMETER.....3
TORQUE SPECIFICATIONS 3
ATTENTIONS.....4
FAULT DIAGNOSIS TABLE 5
ON-BOARD CHECK 8
REGULAR CHECK 11
REFRIGERANT.....20
AIR-CONDITIONING PIPELINE 26
COMPRESSOR ASSEMBLY.....28
SUPER-COOLING CONDENSER 30
A/C CONTROLLER WITH PANEL ASSEMBLY 32
INTERIOR A/C ASSEMBLY.....33

AIR-CONDITIONING SYSTEM

STRUCTURE DIAGRAM

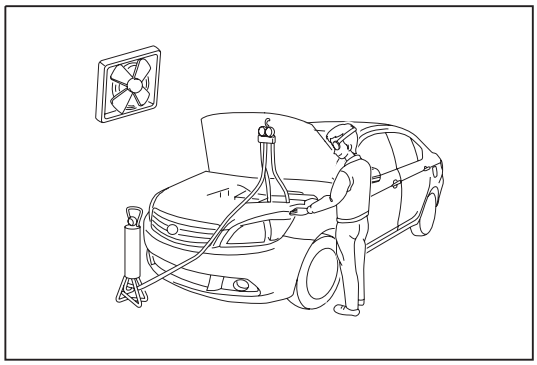


STRUCTURE AND PARAMETER

Serial number	Item	Structure and parameter
1	Structure type	Vapor compression cooling, hot water heating
2	Performance parameter	Refrigerating output: 4.6KW; Blower capacity: 500m3/h; Heating output: 4.9KW
3	Manipulation	Air-conditioner controller assembly operated by knob control and button control, location door and temperature door driven by micromotor or pull-lock, fresh air damper driven by micro-motor, and it is possible to select and regulate air outlet position mode, heating/cooling mode, air inside/outside recirculation pattern and wind speed, temperature and other. The control unit is located in the console panel of the dashboard and the HVAC.
4	Refrigerant	R134a Refrigerant
5	Compressor	Model:JIANSHE96 /SANDEN BX13
6	Condenser	Parallel flow super-cooling type close-packed structure, flat tube thickness: 16mm, receiver and dryer: Φ35mm
7	Interior air-conditioner	Interior air conditioners (HVAC): 2 box type structure, of which, the outlet box consists of the stack-up type evaporator, the parallel flow type heater, the H-type expansion valve and the air distribution box, and the inlet box consists of the centrifugal blower, the dust filter, the inlet air passage and other, providing refrigeration, heating, defrosting and ventilation functions.
8	Cooling hose and heating hose	Cooling tube: compressor intake and exhaust tube assembly is a composite structure of rubber hose and aluminum tube, the other pipe is hard aluminum tube. Hot water tube: molding rubber hose
9	Sensor	Outside temperature sensor (automatically), interior temperature sensor (automatically), evaporator temperature sensor (manual, automatic)
10	Pressure switch	Pressure switch (High, Medium, Low)

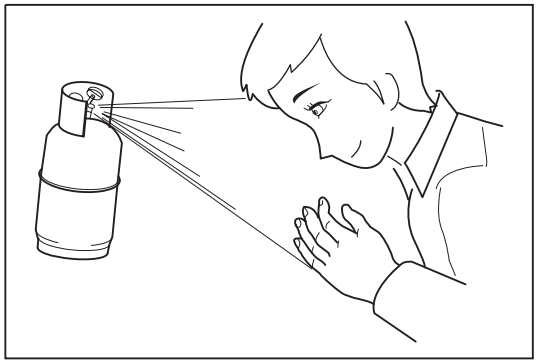
TORQUE SPECIFICATIONS

Fastened part	Tightening torque(N•m)
Connecting nuts between the HVAC and the front panel	15
Connecting bolts between the HVAC and the front panel	15
Connecting bolts between the HVAC and the instrument panel	15
Connecting self-drilling screws between the HVAC and the instrument panel center passage connecting bracket assembly	Tap into
Connecting bolts between the compressor and the engine	32±2
Connecting bolts between the condenser and the body	23
Mounting bolts of the suspension assembly on condenser	10
Mounting bolts of the fluid outlet duct bracket assembly	10
Connecting bolts between the compressor air outlet duct and the compressor	10±2
Connecting bolts between the compressor air intake duct and the compressor	10±2
Connecting bolts between the HVAC inlet/outlet cooling tube with pressure switch assembly and the expansion valve	10±2
Connecting bolts between the condenser fluid outlet duct assembly and the condenser	10±2
Connecting bolts between the compressor air intake duct fixing bracket assembly and the body	10
Connecting bolts between the compressor air intake duct fixing bracket assembly and the HVAC inlet/outlet cooling tube with pressure switch assembly	10±2
Connecting screws between the left-side air passage and the instrument panel body	Tap into
Connecting screws between the right-side air passage and the instrument panel body	Tap into



ATTENTIONS

1. **Do not dispose the refrigerant in enclosed places or near the open flame.**
2. **Be sure to wear goggles**

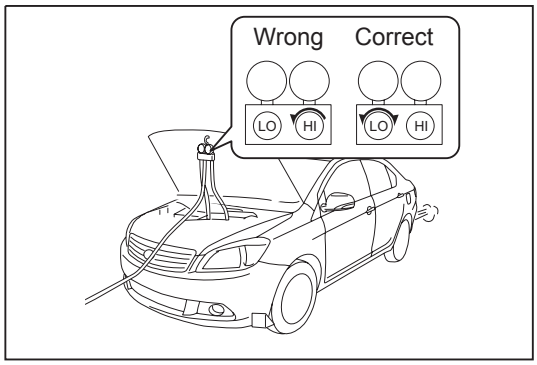


3. **Be careful not to allow liquid refrigerant to splash into your eyes or spray on your skin**
   (a) If liquid refrigerant splashes into your eyes or spray on your skin, wash such areas with a plenty of cold water.

   Note:

   Do not rub your eyes or skin.

   (b) Coat Vaseline on the skin.
   (c) Immediately go to the hospital for specialized treatment.
4. **Never heat the refrigerant or let it close to open flame.**
5. **Be careful not to fall off the refrigerant reservoir or subject it to physical collision.**



6. **If the cooling system has not enough refrigerant, there should be no enough oil lubrication, causing the compressor to be burnt out. To avoid such phenomenon, exercise greater caution.**
   If the cooling system has not enough refrigerant, there should be no enough oil lubrication, causing the compressor to be burnt out. To avoid such phenomenon, exercise greater caution.
7. **When the compressor working, do not open the high pressure manifold valve.**
   If the high-pressure valve is opened, the refrigerant will flow in the opposite direction, causing the filling cylinder to rupture. Therefore, only the low pressure valve can be opened and closed.
8. **Be careful not to over-filling the system with refrigerant.**
   If you add excessive refrigerant, this can result in inadequate cooling, poor fuel economy, engine overheating and so on.

FAULT DIAGNOSIS TABLE

Trouble	Phenomenon	Cause analysis
The air-conditioning system cannot refrigerate.	Compressor cannot pull-in	Fuse burnt out, compressor relay damaged Pressure switch contact disconnected, short-circuited or open-circuited Compressor electromagnetic clutch coil open-circuited Switch burned out Main relay burned out and clutch slipping Compressor belt broken or loosened Compressor fault Refrigerant insufficient, and system pressure less than 0.196MPa System pressure exceeds 3.14MPa Engine water temperature is too high Clutch voltage is less than 7V
	Compressor can pull-in	Compressor relay normally-opened contact bonds, and the system refrigerant leaks seriously, the system has no refrigerant so that the blower does not work.
	No blower wind	Fuse burnt out Blower motor brush damaged Blower switch damaged Wiring plugs disengaged or circuit open-circuited Speed-control module damaged Blower has no wind at high speed, high-speed relay damaged Note: In the process of blower not working, the resistance is approximately 0, when open-circuited, the resistance is up to ∝
Sometimes the air-conditioning system can refrigerate, sometimes not.	Compressor is operating normally	Air-conditioning system ice-blocked Thermistor or temperature-sensing package failure Poor A/C switch contact. Condensing blower damaged
	Compressor is not operating normally	Clutch slipping, clutch coil loosened, poor clutch coil grounding
Insufficient refrigeration	Small air volume	Blower fan is normal: Air supply pipe damaged Cooling fan is not working properly: (1) Blower switch is not normal. (2) Low power-supply power (3) Speed-control module damaged
	Normal air volume	Compressor operating normally. (1) Both low-side pressure and high-side pressure are low. (a) Expansion valve blocked (b) Expansion valve opening is too small (2) Both low-side pressure and high-side pressure are high. (a) high-pressure pipeline failure, there is no smooth flow. (b) Thermistor failure (c) Expansion valve opening is too large. (d) Excessive freezing oil (e) Excessive refrigerant (f) Bad heat dissipation of condenser Note: When the rotating-speed is of 2000r/min, the cold air blower is at its High position and the temperature is at 30 ℃~ 35 ℃, inside the system, the low-side pressure should be 147KPa~ 192KPa and the high-side pressure should be 1373KPa ~1668KPa.

Trouble	Phenomenon	Cause analysis
Insufficient refrigeration	Normal air volume	**Compressor operating normally** (3) High-side pressure is too low (a) Low-pressure pipeline damaged (b) Low-pressure pipeline blocked (4) Low-side pressure is too low (a) Evaporator frosting (b) Expansion valve blocked (c) Low-pressure pipeline is not smooth. (d) Speed-control thermistor failure (5) Sometimes, low-side pressure is normal, sometimes low-side pressure is negative, there is moisture, or ice-blocking in the air-conditioning system. (6) Low-side pressure is negative, and high-side pressure is too low. The air-conditioning system is blocked (7) Low-side pressure is too low, but high-side pressure is too high. (a) Condenser interior blocked (b) High-pressure pipeline blocked (8) Low-side pressure is too high, but high-side pressure is too low. (a) Compressor leaking (b) Compressor valve damaged (9) The condensing blower has a small air volume, causing the condenser's poor heat dissipation. **Compressor operating abnormally** (1) Compressor internal failure (2) Compressor belt loosened, slippery (3) Faulty electromagnetic clutch (a) Low voltage the power-supply (b) Interference of stator to rotor (c) Faulty stabilized idle-speed amplifier (d) Line disconnected, the connection part disengaged (e) Poor switch and relay working (f) Line short-circuited/open-circuited (g) Poor grounding **Other causes** Bad compartment seal
Excessive noise from the cold-air system	Excessive noise	Excessive belt loose or wear Compressor mounting-bracket screws loosened Compressor mounting bracket damaged Compressor internal parts damaged Little or no refrigeration oil volume Slipping clutch noise Clutch bearings is in shortage of oil or damaged. Blower motor bearings damaged Blower bracket broken or loosened Blower blades broken or loosened Blower blades rubbing other components

Trouble	Phenomenon	Cause analysis
Heating system	No heating or inadequate heating	Air-conditioning blower failure Blower relay damaged Hot air pipe blocked Cooling water pipe blocked Hot air and cold air door actuator damaged Insufficient coolant
	Blower does not turn	Fuse burnt out or poor switch contact Blower motor burnt out Blower high-speed relay open-circuited Speed-control resistance damaged Line open-circuited
	Water leakage	Hot air water duct aging, joint loosened
	Overheating	Fan speed-control resistance damaged Hot air and cold air door actuator damaged
	Inadequate hot air for defrosting	Mode guy wire damaged Air damper position is not in place. Air outlet blocked Inadequate heating Unfit air passage mounting Line open-circuited

ON-BOARD CHECK

1. Air-conditioning function check

(a) Install high-pressure measurement meter.

(b) Set the car to be in the following states.

Item	Condition
Car	Car parking in shade
Door	Fully open
Air conditioning switch	Switch on
Engine rotating-speed	2,000 rpm
Damper position of intake mode selector	Outer recirculation
Outlet damper position	Face
Set temperature	Coldest
Blower speed	HI
Air inlet temperature ∗ 2	25 to 30ºC
Condenser pressure (high-pressure measurement meter) ∗ 3	1.5 MPa

Tip:

∗2 Make a correct determination as long as the air inlet temperature is maintained between 25 ℃ and 35 ℃. If the temperature is below 25 ℃, defer this test.

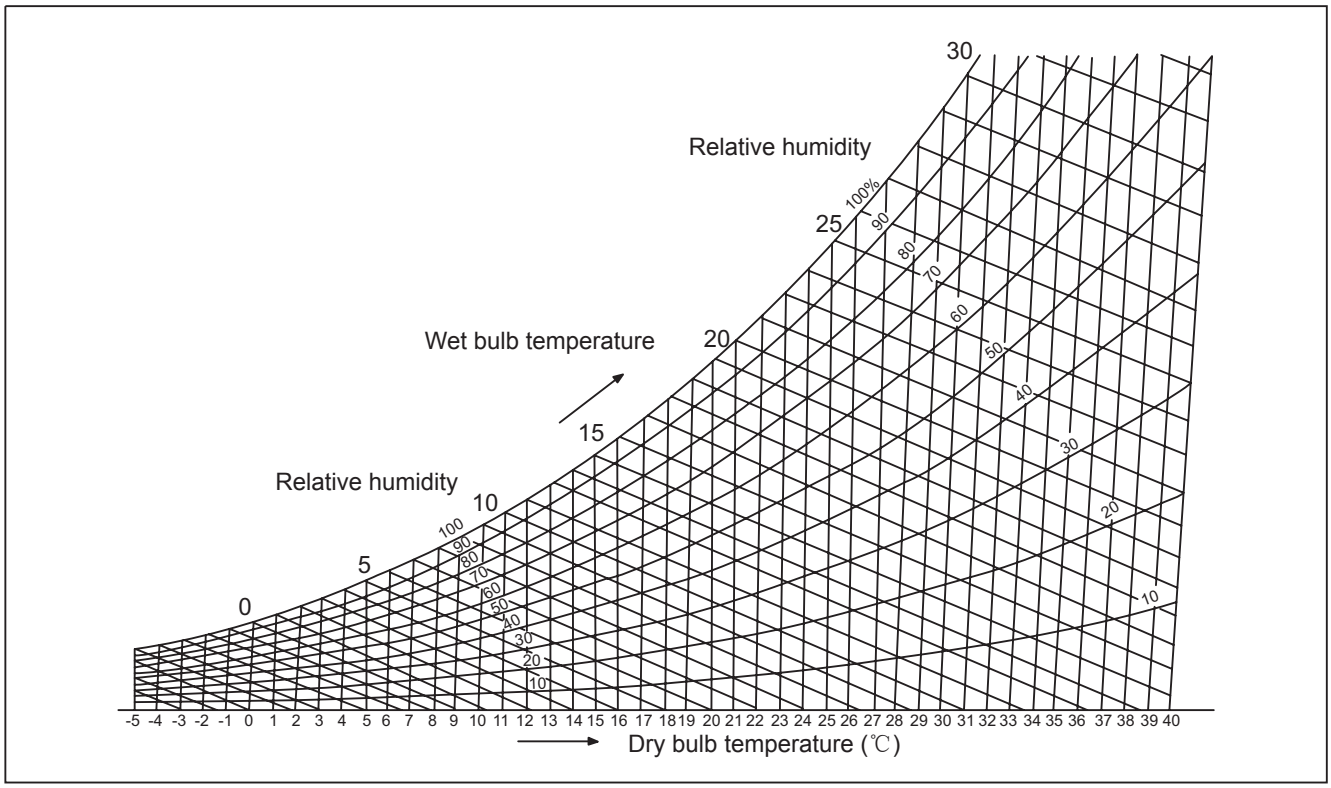
∗3 When the condenser pressure (high-side measurement meter) is higher than 1.5 MPa, it is necessary to spray or pour the condenser with water to reduce the pressure. When the condenser pressure is too low, it is necessary to cover the front side of the condenser to increase the pressure.

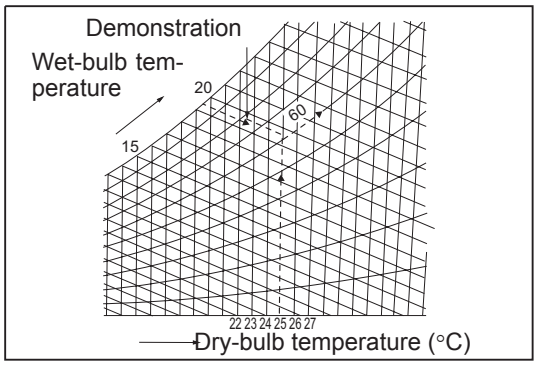
(c) Place the dry/wet bulb thermometer at the air inlet and insert the bulb of the dry-bulb thermometer into the center position of the air outlet.

(d) Operate the air-conditioning after the step [* 1], and keep the air outlet temperature stable (for about 5-6 minutes).

(e) Measure the wet-bulb temperature at the air inlet and measure the dry-bulb temperature at the air outlet.

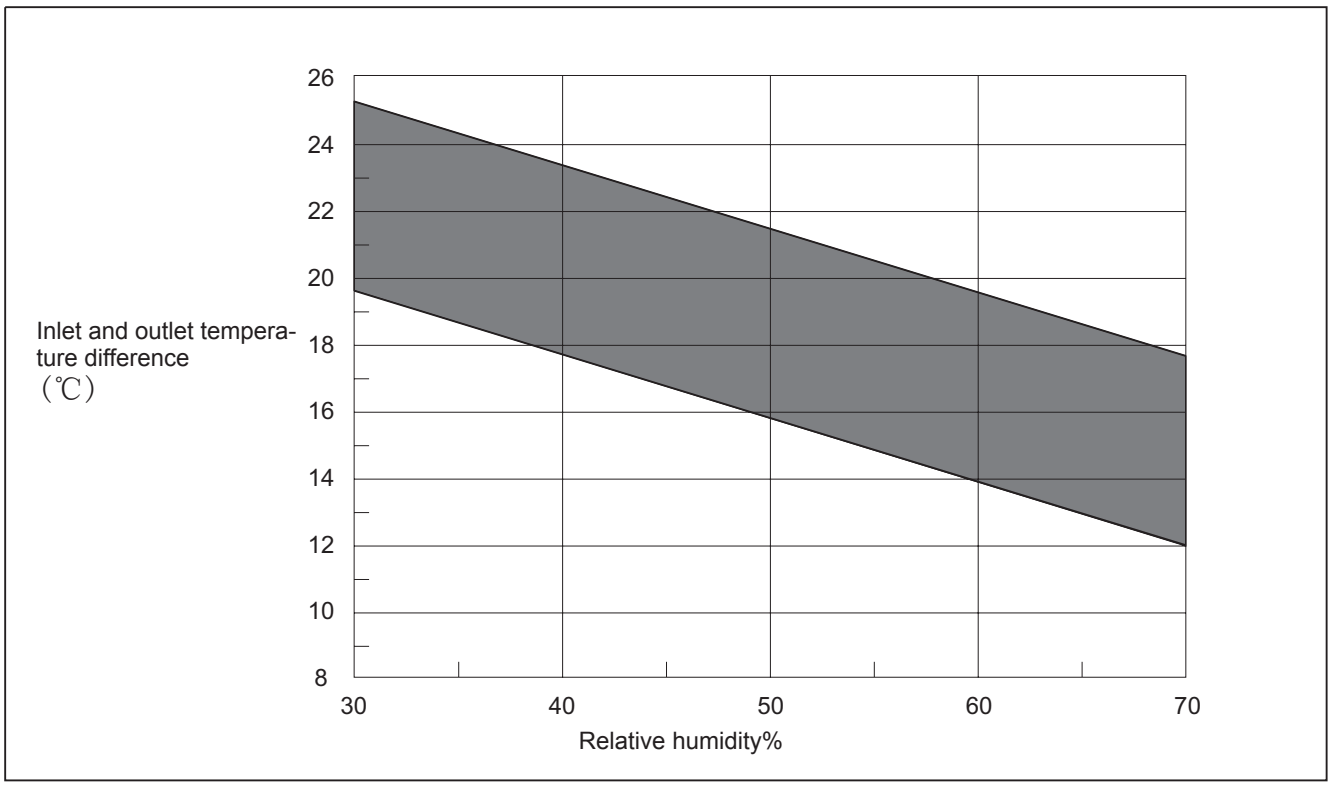
(f) Using the following humidity table, determine the value of relative humidity according to the measured value by the dry/wet bulb thermometer at the air inlet.

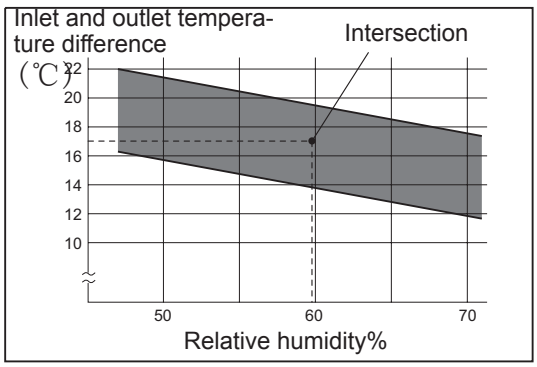




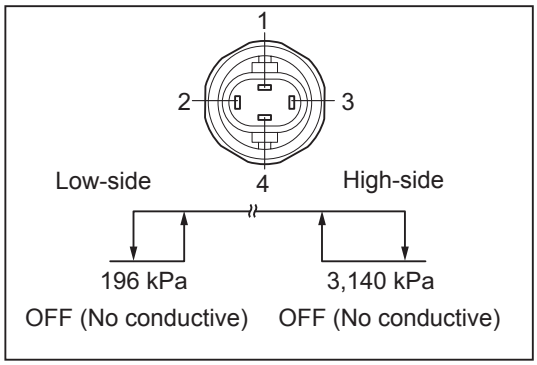
For example, when the dry-bulb temperature is 25℃ and the wet-bulb temperature is 19.5℃, the value of relative humidity is 60%, that is the value at the intersection of the two broken lines as shown in the humidity table.

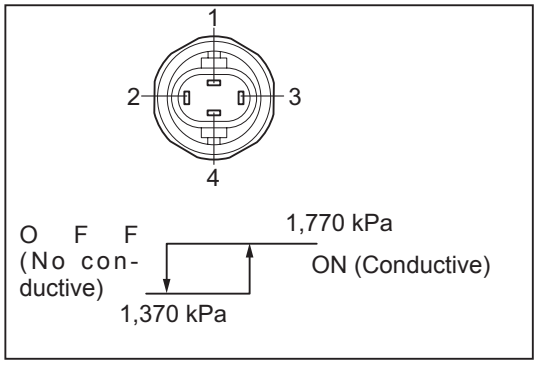
(g) Use the following standard performance chart, finding the temperature difference measured at the air inlet and the air outlet and the intersection of relative humidity. Standards: the intersection is within the diagonal range as shown in the chart.





For example, when the temperature difference measured at the air inlet and the air outlet is 17℃, the relative humidity is 60%, and the intersection is within the diagonal range. Therefore, this air-conditioning is operating normally.





2. Checking the pressure switch

(a) Electromagnetic clutch control:

Check the working conditions of the pressure switch.

(1) Fixing the manifold pressure gauge.

(2) Connect the two leads of the ohmmeter to the terminal 4 and terminal 1.

(3) As shown in the figure, check the conduction between the two terminals when the refrigerant pressure changing.

If the working conditions do not meet the requirements, replace the HVAC inlet/outlet refrigerating tubes with pressure switch assembly.

(b) Cooling fan control:

Check the working conditions of the pressure switch.

(1) Connect the two leads of the ohmmeter to the terminal 2 and terminal 3.

(2) As shown in the figure, check the conduction between the two terminals when the refrigerant pressure changing.

If the working conditions do not meet the requirements, replace the HVAC inlet/outlet refrigerating tubes with pressure switch assembly.

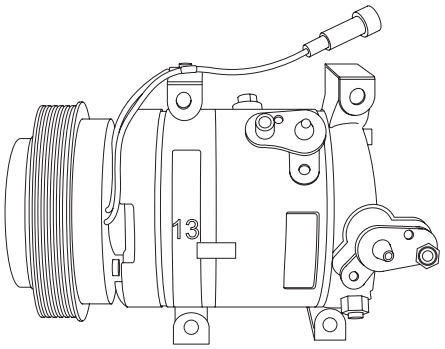
3. Checking Compressor assembly

(a) Check the working conditions.

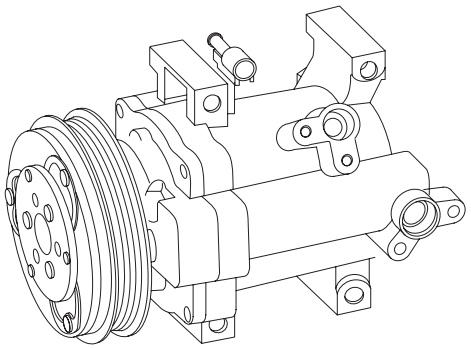
(1) Start the engine.

(2) Check the compressor pulley.

Standards: The compressor can pull-in/ disconnect in a normal way.



8103200-S16



8103100-M18

Two compressor models are parallel and optional

(b) Check the compressor assembly.

(1) Disconnect the connector.

(2) Measure the resistance according to the values shown in the following table.

Standard:

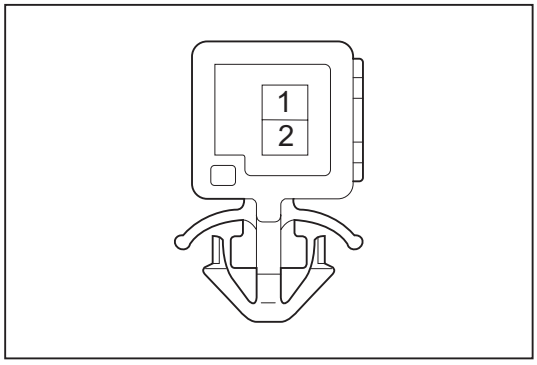
Detector connecting	Specified state
Terminal - compressor housing	4.5 ± 0.5 Ω

Tip:

When there is no means to determine the volume of the refrigerant through the inspection hole, you can connect the pressure gauge to examine whether the system pressure is normal or not when the compressor working, using the method for the compressor relay short-circuited or the pressure switch short-circuited to see whether the air conditioning vent can blow cold air or not.

(c) Compressor Specifications

Item		Parameter
Compressor	Theoretical displacement(ml/r)	Jianshe 96, Sanden Banden Behr 130
	Weight (kg)	5.48 (with clutch)
	Allowable continuous speed (r / min)	800-7800
	Allowable maximum mounting angle (°)	±35
	Refrigerant	R134a
	Compressor oil	See the compressor oil model on the compressor label.
	Oil (ml)	130±10



REGULAR CHECK

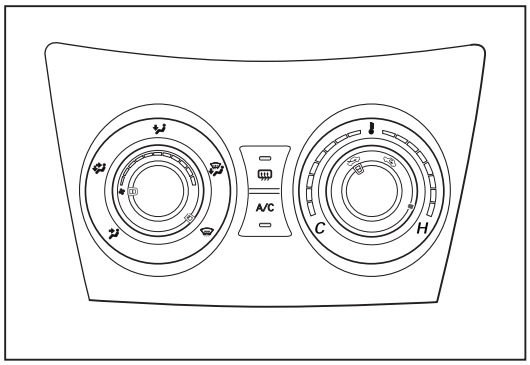
Evaporator Thermistor

1. **Checking the evaporator thermistor for conduction**
   As shown in the figure, measure the resistance between the terminal 1 and the terminal 2 when the evaporator thermistor is at various temperatures.

Standard:

Temperature (℃)	Upper limit (kΩ)	Standard value (kΩ)	Lower limit (kΩ)	Temperature tolerance (℃)	
-20	15.8152	15.2972	14.7903	-0.50	0.50
-19	14.8545	14.3769	13.9091	-0.50	0.50
-18	13.9601	13.5196	13.0877	-0.50	0.50
-17	13.1268	12.7203	12.3215	-0.50	0.50
-16	12.3499	11.9747	11.6063	-0.50	0.50
-15	11.6252	11.2788	10.9383	-0.50	0.50
-14	10.9489	10.6289	10.3142	-0.50	0.50
-13	10.3173	10.0217	9.7307	-0.50	0.50
-12	9.7272	9.4540	9.1848	-0.50	0.50
-11	9.1755	8.9230	8.6739	-0.50	0.50
-10	8.6595	8.4260	8.1955	-0.50	0.50
-9	8.1766	7.9606	7.7472	-0.50	0.50
-8	7.7244	7.5246	7.3271	-0.50	0.50
-7	7.3008	7.1159	6.933	-0.50	0.50
-6	6.9036	6.7325	6.563	-0.50	0.50
-5	6.5311	6.3728	6.2158	-0.40	0.50
-4	6.1817	6.0351	5.8896	-0.40	0.50
-3	5.8536	5.7179	5.5831	-0.40	0.40
-2	5.5456	5.4199	5.295	-0.40	0.40
-1	5.2560	5.1396	5.0238	-0.40	0.40
0	4.9838	4.8760	4.7686	-0.40	0.40
1	4.7277	4.6279	4.5284	-0.40	0.40
2	4.4868	4.3943	4.302	-0.40	0.40
3	4.2600	4.1743	4.0887	-0.40	0.40
4	4.0463	3.9670	3.8877	-0.40	0.40
5	3.8489	3.7715	3.6942	-0.40	0.40
6	3.6625	3.5871	3.5118	-0.40	0.40
7	3.4867	3.4132	3.3399	-0.40	0.40
8	3.3205	3.2488	3.1776	-0.40	0.50

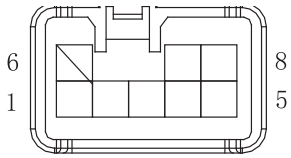
Temperature (℃)	Upper limit (kΩ)	Standard value (kΩ)	Lower limit (kΩ)	Temperature tolerance (℃)	
9	3.1635	3.0938	3.0244	-0.50	0.50
10	3.0151	2.9472	2.8797	-0.50	0.50
11	2.8748	2.8087	2.743	-0.50	0.50
12	2.7420	2.6777	2.6139	-0.50	0.50
13	2.6163	2.5537	2.4916	-0.50	0.50
14	2.4973	2.4364	2.3761	-0.50	0.50
15	2.3846	2.3254	2.2668	-0.50	0.60
16	2.2778	2.2202	2.1632	-0.60	0.60
17	2.1765	2.1205	2.0651	-0.60	0.60
18	2.0806	2.0261	1.9723	-0.60	0.60
19	1.9894	1.9365	1.8842	-0.60	0.60
20	1.9030	1.8515	1.8007	-0.60	0.60
21	1.8209	1.7709	1.7215	-0.60	0.60
22	1.7430	1.6943	1.6463	-0.60	0.70
23	1.6689	1.6213	1.575	-0.70	0.70
24	1.5985	1.5525	1.5072	-0.70	0.70
25	1.5316	1.4869	1.4429	-0.70	0.70
26	1.4679	1.4245	1.3818	-0.70	0.70
27	1.4074	1.3652	1.3237	-0.70	0.70
28	1.3498	1.3087	1.2684	-0.70	0.70
29	1.2949	1.255	1.2158	-0.70	0.80
30	1.2426	1.2038	1.1657	-0.80	0.80
31	1.1928	1.1551	1.1181	-0.80	0.80
32	1.1454	1.1087	1.0728	-0.80	0.80
33	1.1002	1.0645	1.0296	-0.80	0.80
34	1.057	1.0223	0.9884	-0.80	0.80
35	1.0158	0.9821	0.9491	-0.80	0.90
36	0.9766	0.9438	0.9117	-0.90	0.90
37	0.9391	0.9072	0.876	-0.90	0.90
38	0.9033	0.8723	0.842	-0.90	0.90
39	0.8691	0.8389	0.8094	-0.90	0.90
40	0.8365	0.8071	0.7785	-0.90	0.90
41	0.8053	0.7767	0.7489	-0.90	1.00
42	0.7754	0.7476	0.7205	-1.00	1.00
43	0.7468	0.7198	0.6935	-1.00	1.00
44	0.7196	0.6933	0.6677	-1.00	1.00
45	0.6935	0.6679	0.643	-1.00	1.00
46	0.6685	0.6436	0.6194	-1.00	1.00
47	0.6446	0.6203	0.5967	-1.00	1.00
48	0.6216	0.598	0.5751	-1.10	1.00
49	0.5997	0.5767	0.5544	-1.10	1.00
50	0.5787	0.5563	0.5346	-1.10	1.00
51	0.5585	0.5367	0.5155	-1.10	1.00
52	0.5392	0.518	0.4974	-1.10	1.00
53	0.5207	0.5	0.48	-1.10	1.20
54	0.5029	0.4828	0.4633	-1.20	1.20
55	0.4859	0.4663	0.4473	-1.20	1.20
56	0.4695	0.4504	0.4319	-1.20	1.20
57	0.4538	0.4352	0.4172	-1.20	1.20
58	0.4387	0.4206	0.403	-1.20	1.30
59	0.4243	0.4066	0.3895	-1.30	0.70
60	0.4103	0.3931	0.3764	-1.30	0.70



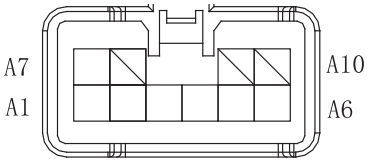
Checking air conditioning controller

1. Manual air conditioning controller testing

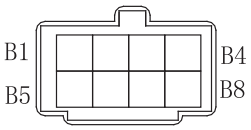
(a) Control function check



A/C, defrosting lead definition



Internal and external recirculation lead definition

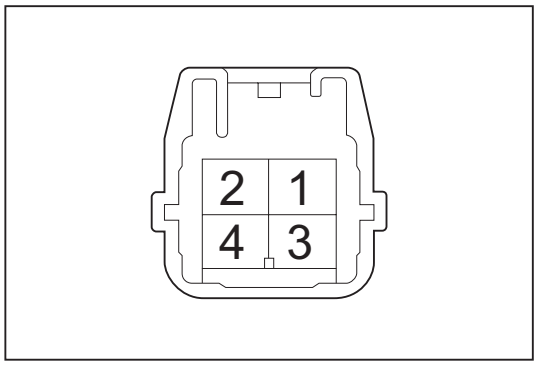


Blower switch lead definition

	Switch function state		Detecting terminal	Detecting qualified state
Air volume switch	Grade 0		B1-B2-B3-B4-B5-B6-B7-B8	10 kΩ or more
	Grade 1		B3-B6-B7	Less than 1 Ω
	Grade 2		B3-B5-B7	Less than 1 Ω
	Grade 3		B2-B3-B7	Less than 1 Ω
	Grade 4		B1-B3-B7	Less than 1 Ω
A/C switch / Later defrosting switch	A/C	OFF	1-2	10 kΩ or more
		ON	1-2	Less than 1 Ω
	Later defrosting switch	OFF	3-4	10 kΩ or more
		ON	3-4	Less than 1 Ω
Internal and external recirculation switch	Internal recirculation		A3 - A4，A5 - A6	Less than 1 Ω
	External recirculation		A2 - A3，A4 - A5	Less than 1 Ω

Checking night lighting indicator lamps

Switch	Detecting state	Detecting qualified state
Air volume switch control module	Battery positive pole- B4, Battery negative pole- B8	on
A/C, later defrosting control module	Battery positive pole- 7, Battery negative pole- B8	on
Internal and external recirculation control module	Battery positive pole- A1, Battery negative pole- A7	on



(b) Blower speed-control resistance check

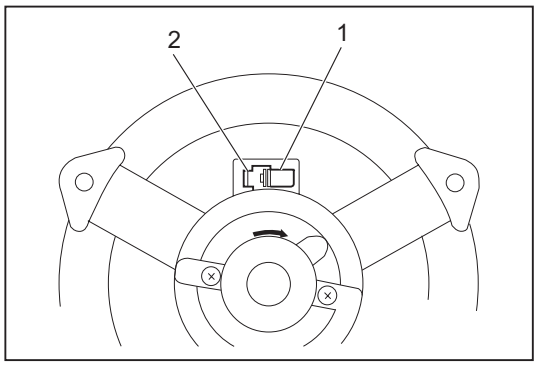
(1) Check the blower speed-control resistance for conduction.

Measure the resistance based on the values shown in the following table.

Standard:

Detector connecting	Specified state
1 - 2	1.09 ± 10% Ω
1 - 3	0.39 ± 10% Ω
1 - 4	1.27 ± 10% Ω

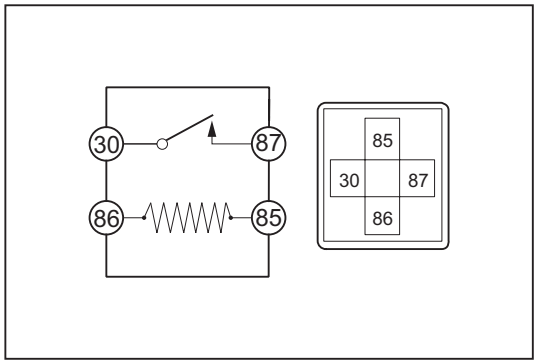
If the measured resistance does not match the specified values, replace the blower speed-control resistance.



(2) Check the blower assembly.

Connect the lead of the battery positive pole(+) to the terminal 2, and connecting the lead of the negative pole(-) to the terminal 1, and then check and confirm the motor for smooth working.

If the blower motor's working conditions do not meet the requirements, replace it.



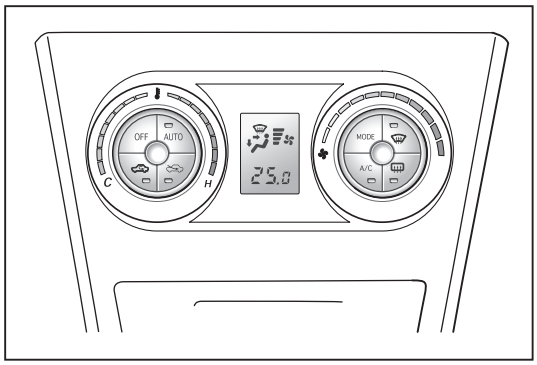
(3) Check the relay for conduction.

Measure the resistance based on the values shown in the following table.

Standard:

Condition	Detector connecting	Specified state
Normal	87 - 30	10 kW or more
Apply B+ between the terminal 85 and the terminal 86	87 - 30	Less than 1 W

If the measured resistances do not match the specified values,then replace the relay.

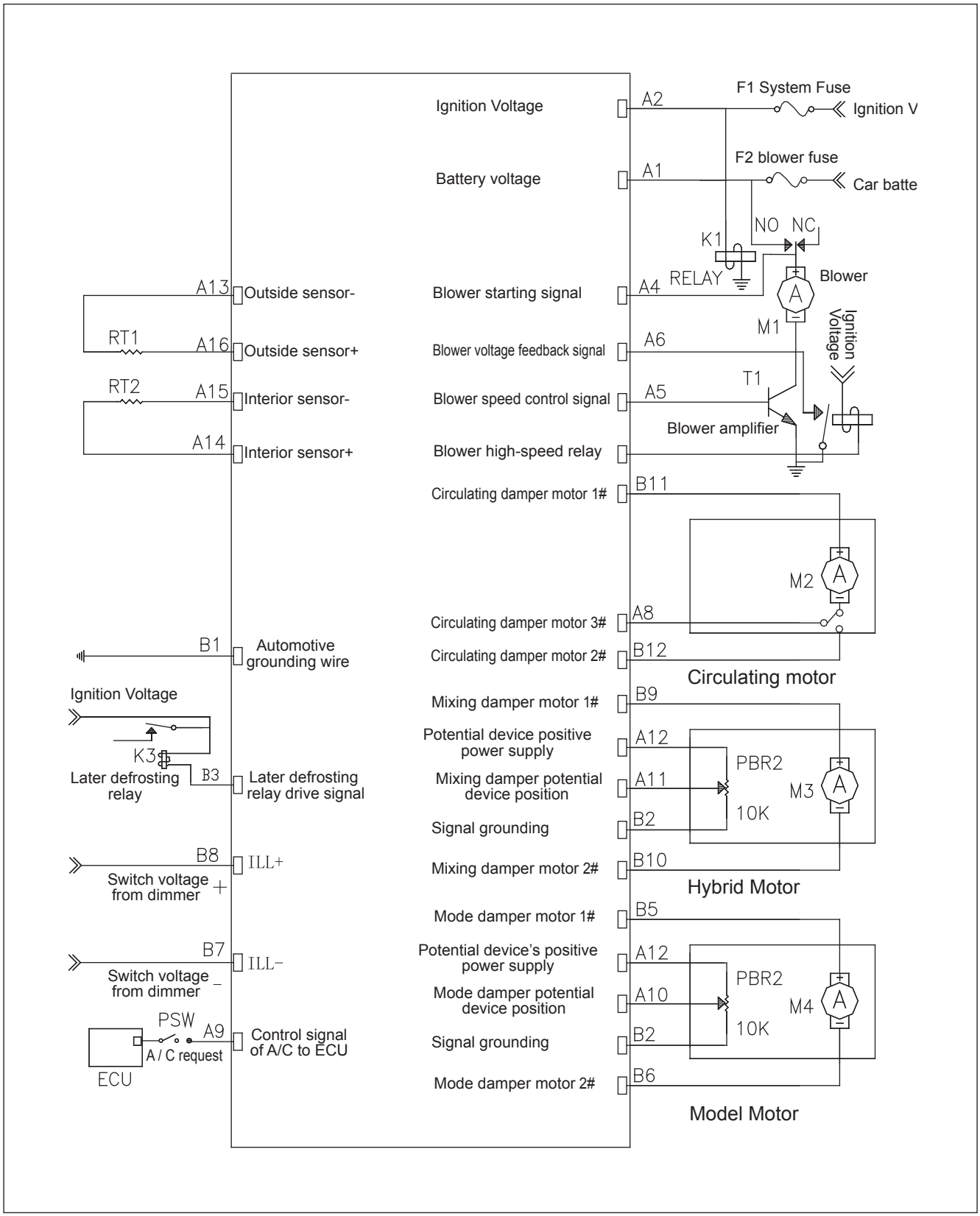


2. Automatic air conditioning controller detecting

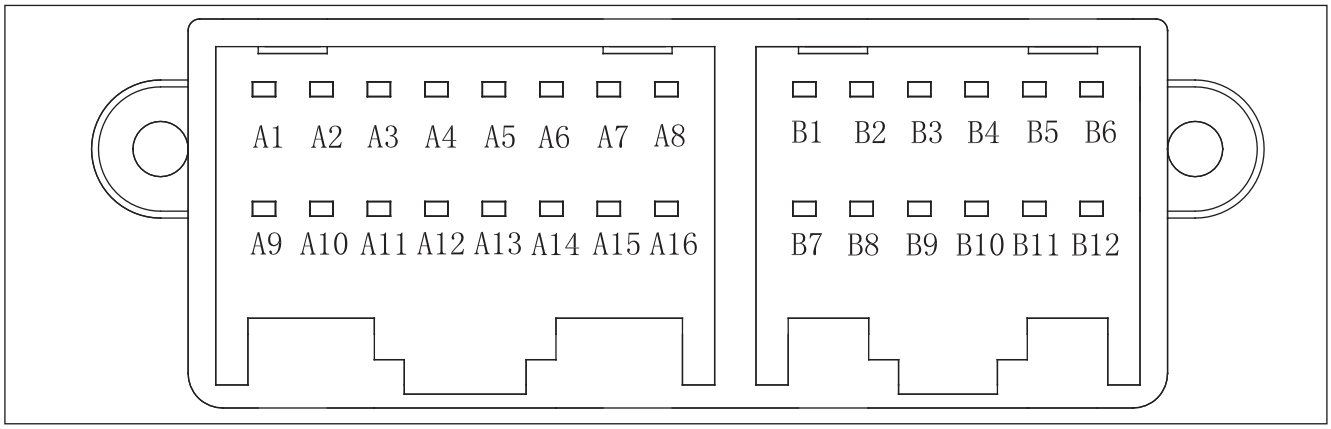
When the ignition key is at ON grade, the automatic air-conditioning controller can perform the self-diagnostic function. The specific operation is as follows:

- Press the OFF button, then press the defrosting button, the system is self-checking fault diagnosis. Then set the temperature to the nearest whole number.
- After entering diagnosis, and if no fault occurs, display the code 00 for 4 seconds before automatically returning to the shutdown state.
- Fault Code: Each fault code displays for 4 seconds, displaying in turn according to the order of 1 to 9. After display, exit automatically and return to the shutdown state.
  - 01: Interior temp. sensor short-circuited or open-circuited
  - 02: Ambient temp. sensor short-circuited or open-circuited
  - 03: Circulating motor drive module overheating or over-current
  - 04: Mode motor drive module overheating or over-current
  - 05: Temperature-control motor drive module overheating or over-current
  - 06: Mode motor feedback potential device failure
  - 07: Temperature-control motor feedback potential device fault
  - 08: Mode motor fault
  - 09: Temperature-control motor fault

(a) System electrical connection diagrm



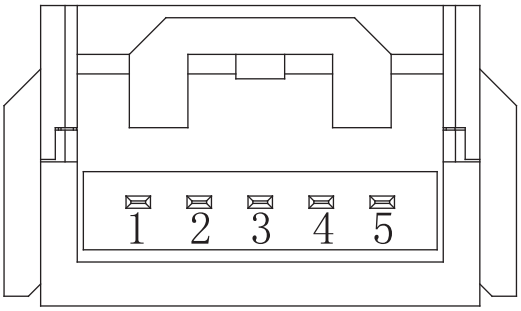
(b) Connector's terminal distribution



Connector terminal definiton

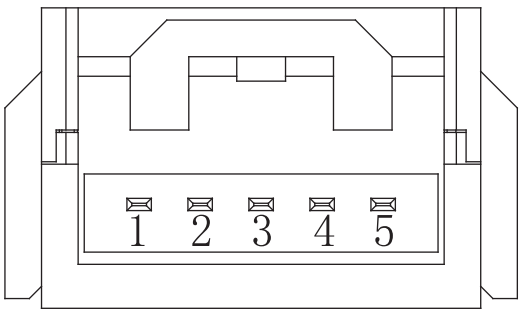
Terminal No.	Terminal No.code	Terminal function	Direction	Voltage range (V)	Current	Remarks
A1	BATT+	Battery voltage positive		12	<100mA	
A2	IG2	Ignition Voltage		12	<1500mA	
A3	NC					
A4	BLOWER_ON	Blower motor startng signal	Input	0/12	<10mA	Effective high electric level
A5	FET-G	Blower motor drive (G polar)	Output	0～8	<50mA	
A6	FET-D	Blower motor feedback voltage	Input	0～12	<5mA	
A7	HI-DRIVER	Blower high-speed drive	Output	0/12	<100mA	
A8	IGN_REC	Circulating motor 3#	Output	0/12	<800mA	
A9	A/C SIGNAL	A/C signal	Output	12/0	<30mA	Effective high electric level
A10	MODE-F/B	Model motor position feedback	Input	0.1～4.9	Input	
A11	TEMP-FB	Temperature control motor feedback	Input	0.1～4.9	Input	
A12	VREF（5V）	Potential device's positive power supply		5		
A13	AMBIENT-	Ambient temperature sensor -				
A14	IN_CAR-	Room temperature sensor -				
A15	IN-SENSOR	Room temperature sensor	Input	0.1～4.9	<5mA	
A16	AMBIENT SENSOR	Ambient temperature sensor	Input	0.1～4.9	<5mA	
B1	GND	Power supply grounding				
B2	S-GND	signal grounding			<5mA	
B3	PRDEF-DRIVER	Later defrosting relay drive	Output	12/0	<100mA	Effective low electric level
B4	REVERSE-SW	Reversing switch signal	Input	12/0		Effective high electric level
B5	VENT	Mode motor 2 # lead	Output	12/0	<800mA	
B6	HEAT	Mode motor 1 # lead	Output	12/0	<800mA	
B7	ILL-	Lighting Power Supply -		12/0	<500mA	
B8	ILL+	Lighting Power Supply +		12/0	<500mA	
B9	HOT	Hybrid motor 1 # lead	Output	12/0	<800mA	
B10	COOL	Hybrid motor2 # lead	Output	12/0	<800mA	
B11	REC	Circulating motor1 # lead	Output	12/0	<800mA	
B12	FRE	Circulating motor2 # lead	Output	12/0	<800mA	

(c) Mode drive



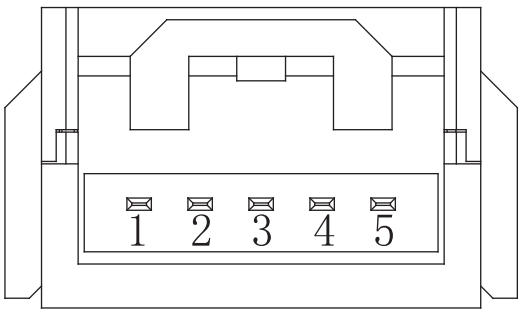
Terminal function					Rotation direction	Position	Feedback voltage
1(B5)	2(B6)	3(A10)	4(A12)	5(B2)			
0V	12V	F	5V	GND	CW	Face blowing	0.13
12V	0V	F	5V	GND	CCW	Defrosting	4.73

(d) Temp.control motor drive



Terminal function					Rotation direction	Position	Feedback voltage
1(B9)	2(B10)	3(A11)	4(A12)	5(B2)			
12V	0V	F	5V	GND	CW	All cold	4.6
0V	12V	F	5V	GND	CCW	All hot	0.33

(e) Circulating motor control



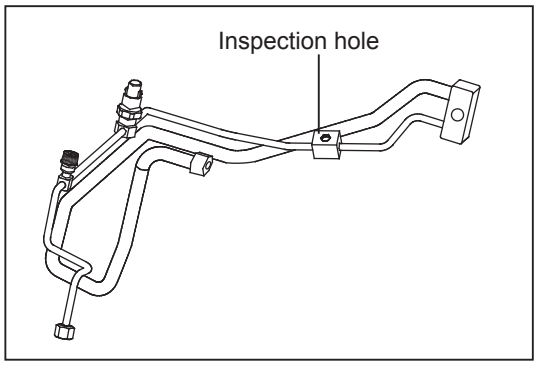
Terminal function			Indicator light	Indicator light	Rotation direction	Position
1(A8)	4(B12)	5(B11)				
12V		0V	Off	On	CW	Internal circulating
0V	12V		On	Off	CCW	Internal circulating

(f) Defrosting drive

State	Indicator light	Relay output
ON	On	Switch on (0V)
OFF	Off	Switch off（12V）

(g) Blower high-speed relay drive

State	High-speed relay output
Blower speed Grade 8	Switch on (0V)
Blower speed non-Grade 8	Switch off （12V）



REFRIGERANT

On-board Check

1. Checking refrigerant volume

Check the inspection hole on the liquid outlet tube of the condenser.

Test conditions:

- The engine runs at a speed of 1,500 rpm.
- The blower speed control switch is set to "HI".
- The air conditioning switch is on.
- The temperature control knob is set to “coldest”.
- Open the doors fully.

Item	Phenomenon	Refrigerant volume	Correction measure
1	Bubble	Insufficient*	1. Check air leakage, repair if necessary. 2. Add refrigerant until bubbles disappear.
2	No bubble	Empty, insufficient or excessive	Refer to 3 and 4.
3	No temperature difference between the inlet and the outlet of the compressor	Empty or a little	1. Use a detector to check air leakage, repair if necessary. 2. Add refrigerant until bubbles disappear.
4	Too large temperature difference between the inlet and the outlet of the compressor	Proper or excessive	Refer to 5 and 6
5	After turning off the air Conditioning, the refrigerant becomes clear immediately.	Excessive	1. Recover Refrigerant. 2. Bleed and add a proper amount of pure refrigerant.
6	After turning off the air Conditioning, the refrigerant bubbles immediately, and then becomes clear.	Proper	-

*: If the refrigerant is enough and the ambient temperature is higher than the normal temperature, the bubbles in the inspection hole can be considered normal.

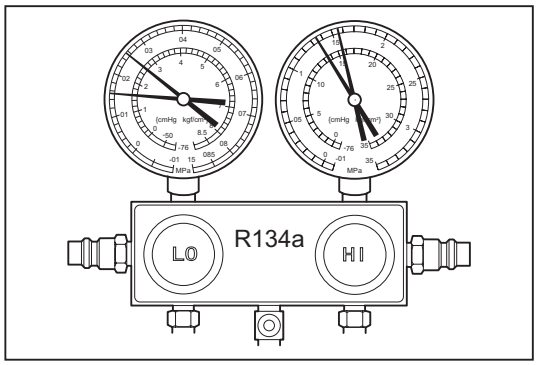
2. Using a manifold pressure gauge unit to check the refrigerant pressure

Using the manifold pressure gauge unit is a method to determine the fault location.

After meeting these conditions, read the pressure on the manifold pressure gauge.

Test conditions:

- When setting the switch at the inner circulating position, the air inlet temperature is 30-35 □.
- The engine runs at a speed of 1,500 rpm.



- The blower speed control switch is set at the top grade position.
- The temperature adjustment knob is set at the “coldest”.
- Switch on the air-conditioning switch.
- Open the doors fully.

(a) The cooling system in a normal working condition.

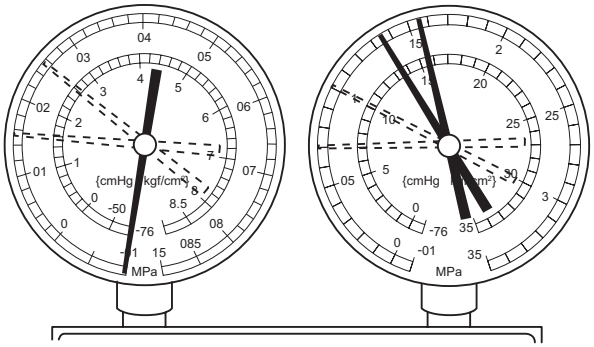
Meter readings:

Low-side: 0.15 to 0.25 MPa

High-side: 1.37 to 1.57 MPa

(b) There is moisture in the refrigeration system.

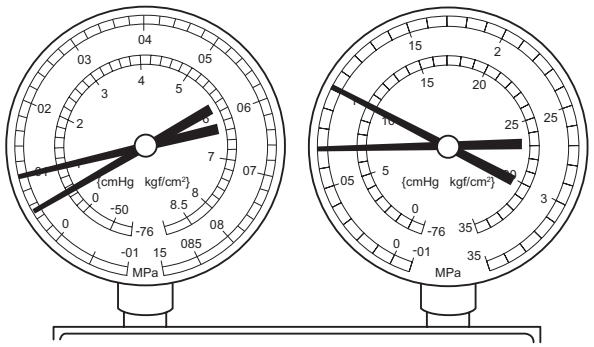
Conditions: periodic cooling, loss of cooling finally



Phenomenon	Potential causes	Diagnostic	Correction measure
During operation, low-side pressure switches between the normal pressure and vacuum.	Moisture in the refrigeration system freezes at the throttle hole of the expansion valve, resulting in temporary circulation stop. However, when the frozen moisture melting, return to normal conditions.	Dryer is oversaturated. Moisture in the refrigeration system freezes at the throttle hole of the expansion valve, resulting in temporary circulation stop.	1. Replace the dryer. 2. let the air out repeated to remove the moisture in the recirculation. 3. Add a proper amount of new refrigerant.

(c) Insufficient refrigeration.

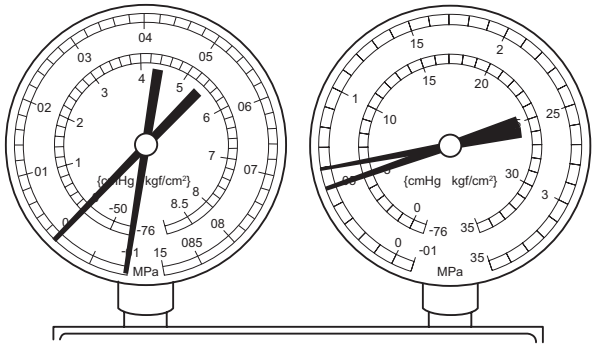
Conditions: The cooling system cannot refrigerate effectively.



Phenomenon	Potential causes	Diagnostic	Correction measure
Both high-side pressure and low-side pressure are low. Bubbles can be seen continually through the inspection hole. Insufficient refrigeration performance.	There should be some air leakage in the cooling system.	Insufficient refrigerant. Refrigerant leakage.	1. Check air leakage, repair if necessary. 2. Add a proper amount of new refrigerant. 3. When connecting the instrument, the indicated pressure should approximate 0. Check and repair the leakage position before generating vacuum.

(d) Poor refrigerant circulating

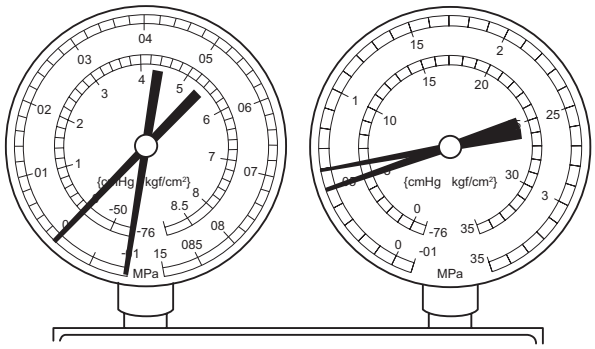
Conditions: The cooling system cannot refrigerate effectively.



Phenomenon	Potential causes	Diagnostic	Correction measure
Both high-side pressure and low-side pressure are low. The pipeline from the condenser to the refrigeration device is frosted.	The flow of the refrigerant is blocked by the dust in the accumulator.	The accumulator blocked.	Replace the accumulator.

(e) No refrigerant circulating.

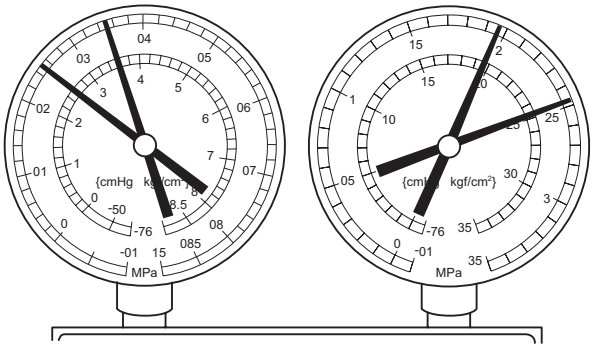
Conditions: The cooling system cannot refrigerate (but sometimes it can).



Phenomenon	Potential causes	Diagnostic	Correction measure
Low-side shows a vacuum, and high-side shows a terribly low pressure. The pipelines on both sides of the receiver/drier or the expansion valve can see frost or condensation.	The flow of the refrigerant is blocked by the moisture or dust in the cooling system. The air leakage from the expansion valve blocks the flow of the refrigerant.	No refrigerant circulating	1. Check the expansion valve. 2. Blow air to remove the dust in the expansion valve. 3. Replace the condenser. 4. Bleed and add a proper amount of new refrigerant. 5. The expansion valve has some air leakage. Replace the expansion valve.

(f) Excessive refrigerant or poor cooling effect of the condenser

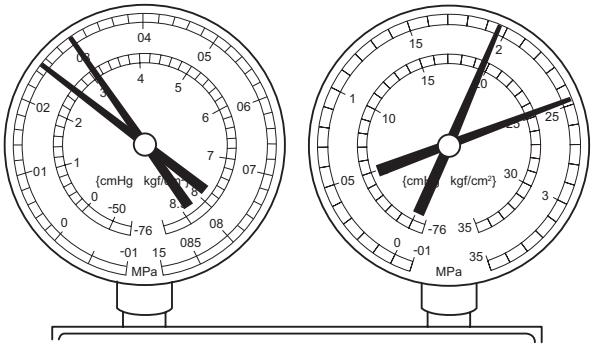
Conditions: The cooling system cannot refrigerate.



Phenomenon	Potential causes	Diagnostic	Correction measure
Both low-side pressure and high-side pressure are too high. Even if the engine slows down, bubbles stall can be seen through the inspection hole.	Excessive use of the cooling system can cause poor performance. Poor cooling effect of the condenser.	Excessive refrigerant in the circulating→ excessive refrigerant has been added. Poor cooling effect of the condenser→the condenser radiating fins of the cooling fan are blocked	1. Clean the condenser. 2. Check the cooling fan when the cooling fan motor running. 3. If the 1 and 2 are normal, check the refrigerant volume and supply a proper amount of refrigerant.

(g) There is some air in the cooling system.

Conditions: The cooling system cannot refrigerate.

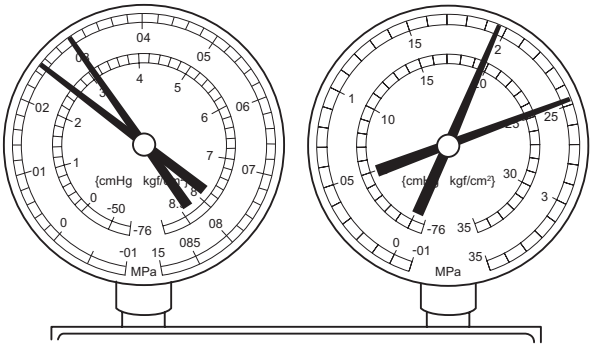


Remarks: Turn on the cooling system, adding the refrigerant without vacuumizing. The measurement gauge will indicate as shown in the figure.

Phenomenon	Potential causes	Diagnostic	Correction measure
Both low-side pressure and high-side pressure are too high. Low pressure piping is too hot to touch. Bubbles can be seen through the inspection hole.	There is some air in the system.	There is some air in the cooling system. Poor purifying.	1. Check the compressor oil for dirt or shortage. 2. Vacuumize and add new refrigerant.

(h) Faulty expansion valve

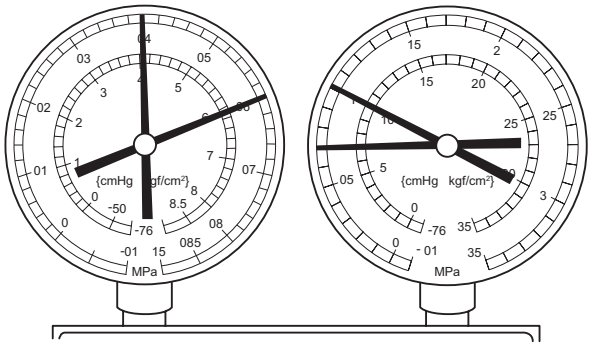
Conditions: Insufficient refrigeration.



Phenomenon	Potential causes	Diagnostic	Correction measure
Both low-side pressure and high-side pressure are too high. The low-side pipeline can see frost or large condensation.	Faulty expansion valve	Excessive refrigerant in the low-pressure pipeling. The opening of the expansion valve is too large.	Check the expansion valve.

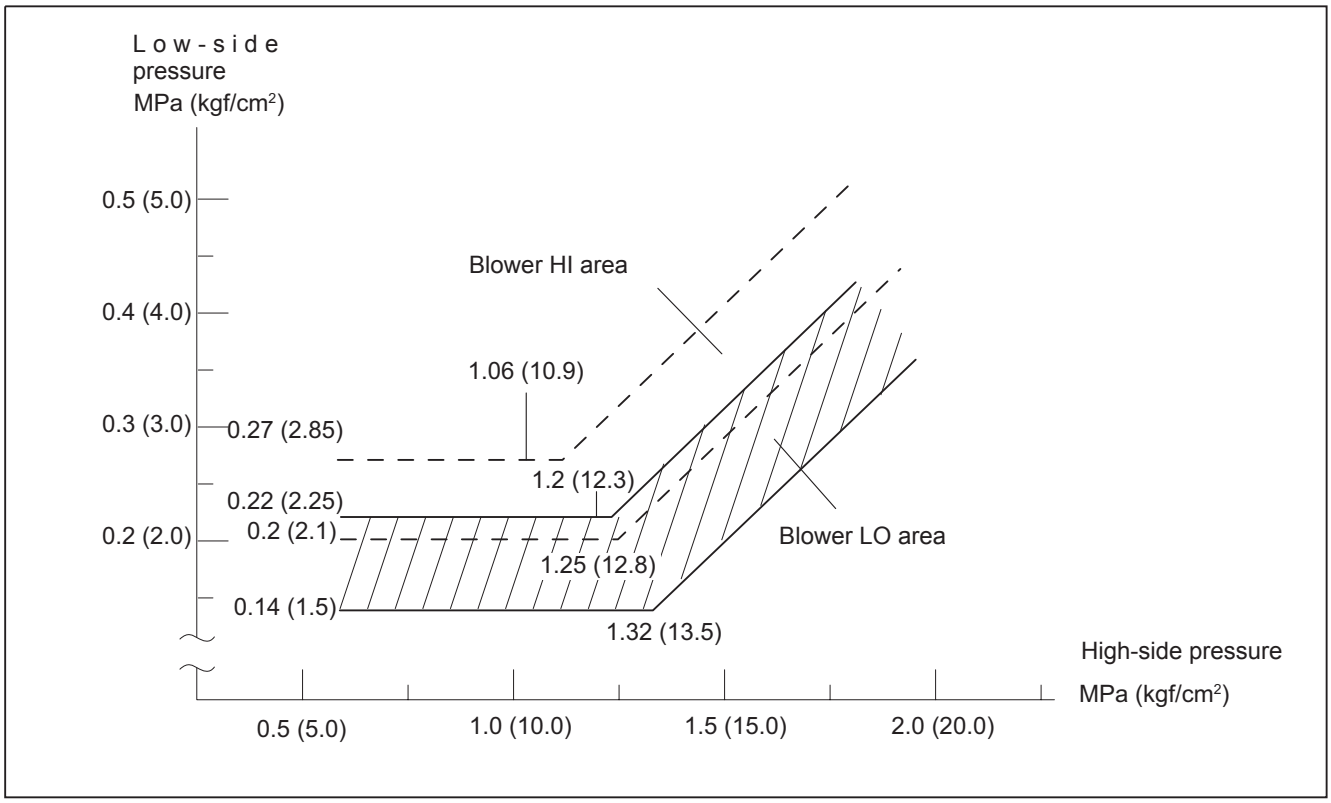
(i) Compressor does not compress wel.

Conditions: Insufficient refrigeration.



Phenomenon	Potential causes	Diagnostic	Correction measure
Both low-side pressure and high-side pressure are too high. The high-side pressure is too low.	Compressor internal leakage.	Compressor fault The damaged valves or broken sliding parts cause leakage.	Repair or replace the compressor.

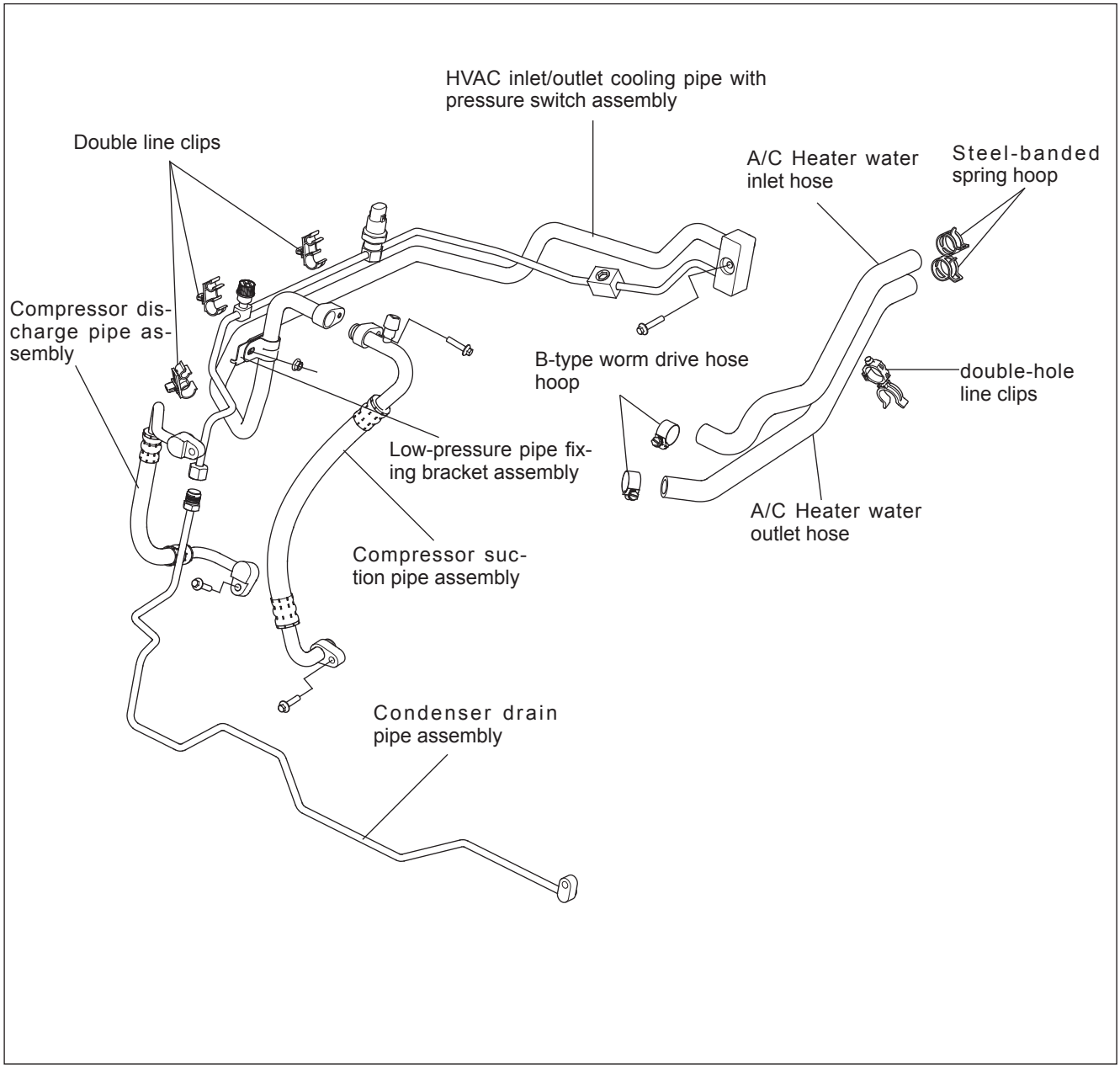
Gauge Readings (for Reference)



Replacing

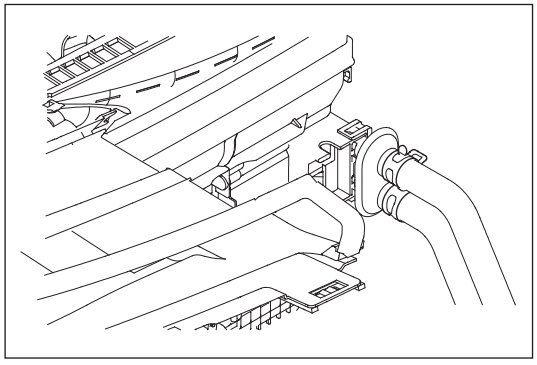
1. **Recovering the refrigerant in the cooling system**
   (a) Turn on the air-conditioning switch.
   (b) When the engine's rotating-speed is about 1,000 rpm, operate the compressor for 5-6minutes to circulate the refrigerant and gather the residual compressor oil in various parts back to the compressor.
   (c) Stop the engine.
   (d) Use the special tool to recover the refrigerant.
2. **Adding the refrigerant**
   (a) Use the vacuum pump to purify the refrigerant system.
   (b) Add the refrigerant, HFC-134a (R134a).
   Standard: 420 ± 10 g
3. **Warming-up the engine**
4. **Checking the refrigerant for leakage**

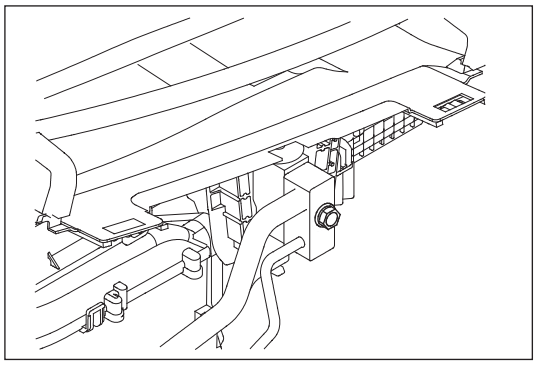
AIR-CONDITIONING PIPELINE



Removal of A/C Heater Water Inlet/outlet Hose

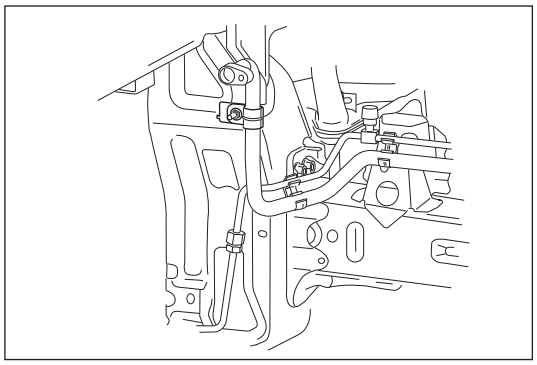
1. **Draining the coolant**
2. **Removing the air cleaner.**
3. **removing the A/C heater water inlet/outlet hose**
   (a) Remove the double-hole line clips used to fix the A/C heater water inlet/outlet hose.
   (b) Disconnect the two spring hoop between the A/C heater water inlet/outlet hose and the interior air conditioner assembly.
   (c) Remove the two hose hoops used to connect the A/C heater water inlet/outlet hose with the engine.



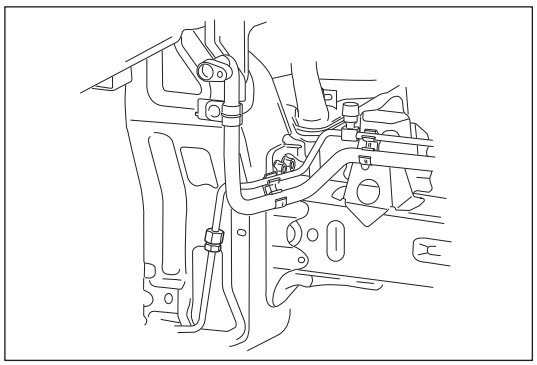


Removal of the HVAC Inlet/outlet Cooling Pipe With Pressure Switch Assembly

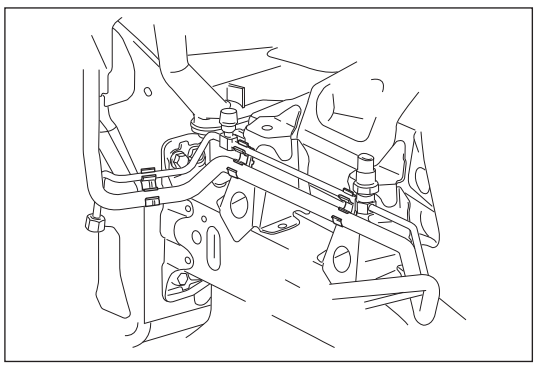
1. **Recovering the refrigerant in the cooling system**
2. **Removing the HVAC inlet/outlet cooling pipe with pressure switch assembly**
   (a) Remove one bolt connecting the HVAC inlet/outlet cooling pipe with pressure switch assembly with the interior air conditioner assembly.



(b) Remove one fixing nut from the low-pressure pipeline fixed bracket assembly of the right pillar body of the front collision avoidance beam.



(c) Disconnect the condenser drain pipe assembly and the HVAC inlet/outlet cooling pipe with pressure switch assembly.

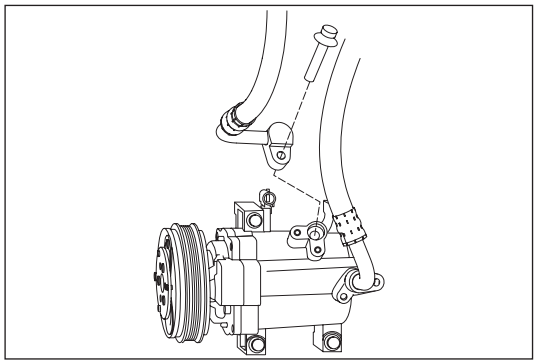


(d) Disconnect the two double line clips from the engine right suspension bracket.
(e) Take off the HVAC inlet/outlet cooling pipe with pressure switch assembly.

COMPRESSOR ASSEMBLY

Replacing

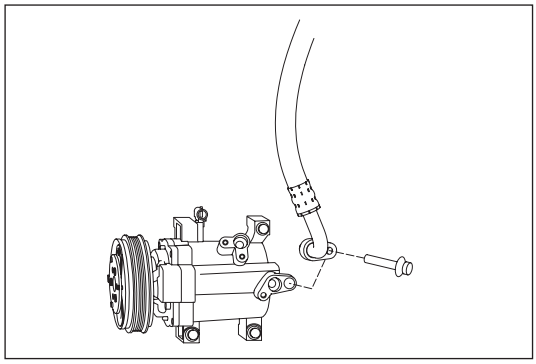
1. **Recovering the refrigerant in the cooling system**
2. **Removing the right/left lower deflecting plate assembly from the engine**
3. **Removing the fan and the generator drive belt.**



4. **Disconnecting the compressor discharge pipe assembly**
   (a) Remove the bolts and disconnect the compressor discharge pipe assembly from the compressor assembly.
   (b) Remove the O-ring from the compressor discharge pipe assembly.

   Note:

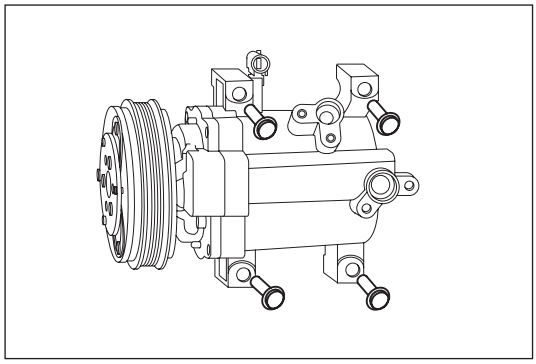
   Use PVC insulating tapes to seal the openings of disconnected parts to prevent moisture and



5. **Disconnecting the compressor suction pipe assembly**
   (a) Remove the bolts and disconnect the compressor suction pipe assembly from the compressor assembly.
   (b) Remove the O-ring from the compressor suction pipe assembly.

   Note:

   Use PVC insulating tapes to seal the openings of disconnected parts to prevent moisture and



6. **Removing the compressor assembly**
   (a) Disconnect the connector.
   (b) Remove the 4 bolts and the compressor assembly.
7. **Checking the compressor oil**
   (a) When replacing the old compressor assembly with a new one, after discharging the refrigerant gas gradually from the service valve, discharge the following oil capacity from the new compressor assembly before installing.

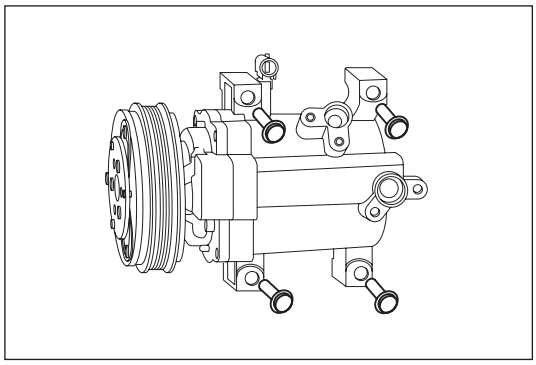
   Note:

   When checking the oil level of the compressor oil, follow the notice of the removal/installation process of the compressor.

   As there is still residual compressor oil in the car pipelines, if installing the new compressor without discharging the residual oil, this can cause the excessive compressor oil, and this can prevent the heat exchange in the process of refrigeration cycle and cause the failure of refrigerant.

   If the residual oil in the removed compressor is insufficient, then check for leakage.

   Ensure to use the same model of compressor oil as that labeled on the compressor body.



8. Installing the compressor assembly

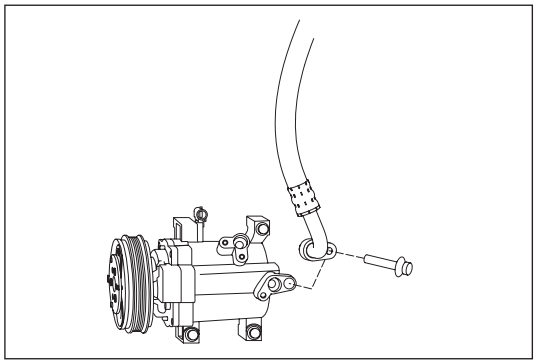
(a) Use the 4 bolts to install the compressor assembly.

Torque:25±5 N•m

Note:

As the sequence shown in the figures, tighten the bolts to install the compressor assembly.

(b) Connecting the connector.



9. Installing the compressor suction pipe assembly

(a) Remove the PVC insulating tapes from the hose.

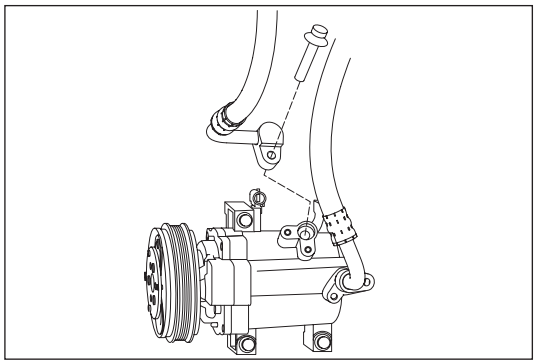
(b) Coat the compressor oil sufficiently onto the assembly surfaces of the new O-ring and the compressor assembly.

For the compressor oil, see the label on the compressor body.

(c) Install the new O-ring onto the compressor suction pipe assembly.

(d) Use the bolts to install the compressor suction pipe assembly onto the compressor assembly.

Torque:10±2 N•m



10. Installing the compressor discharge pipe assembly

(a) Remove the PVC insulating tapes from the hose.

(b) Coat the compressor oil sufficiently onto the assembly surfaces of the new O-ring and the compressor assembly.

For the compressor oil, see the label on the compressor body.

(c) Install the new O-ring onto the compressor discharge pipe assembly, and then use the bolts to install the compressor discharge pipe assembly onto the compressor assembly.

Torque:10±2 N•m

11. Installing the connecting belt of the generator and steering pump

12. Adjusting the generator position to regulate the degree of tension of the belt

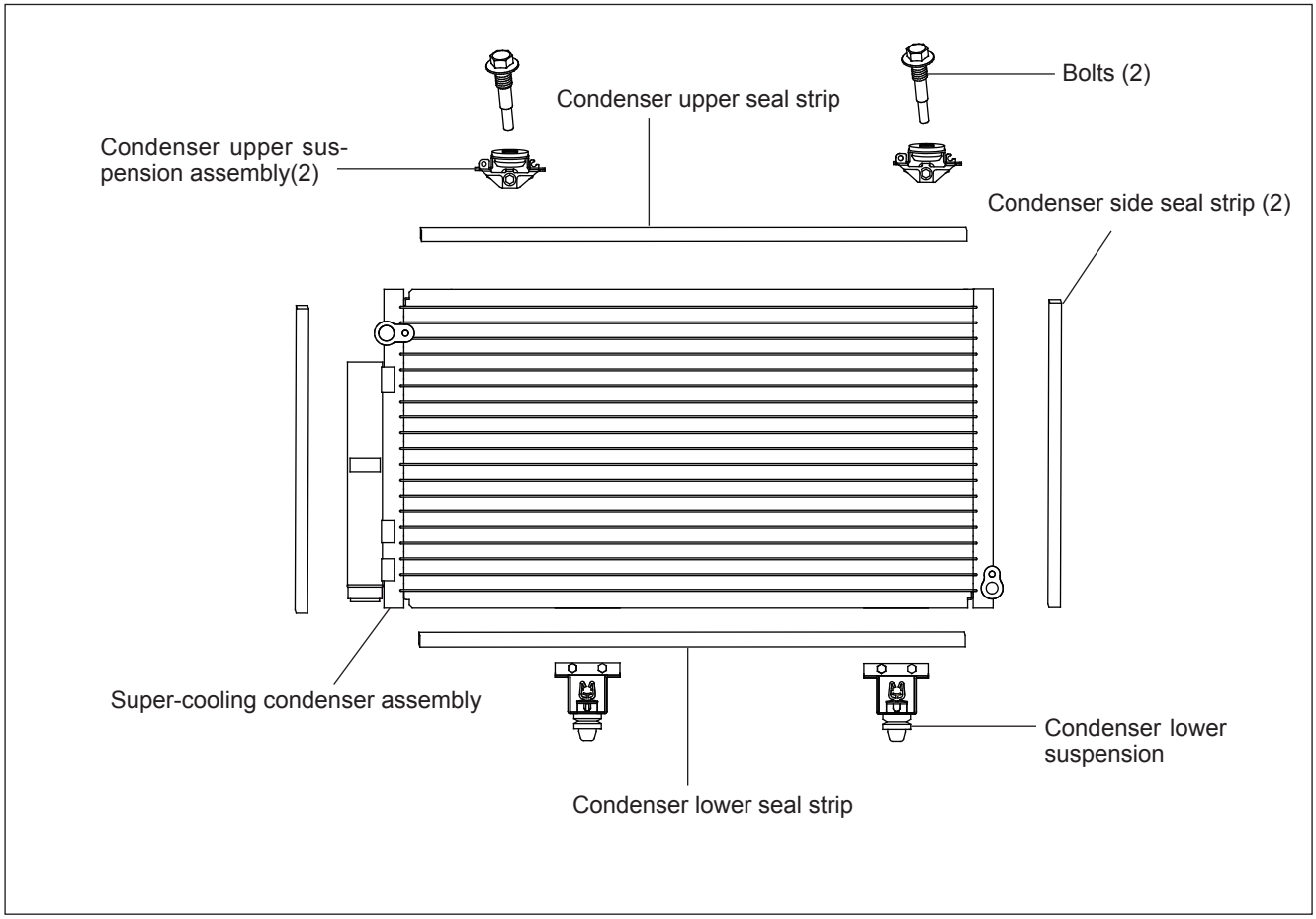
13. Adding the refrigerant
Specified mass: 420 ± 10 g

14. Warming-up the engine

15. Checking the refrigerant for leakage

SUPER-COOLING CONDENSER

Structure Diagram



Inspection Carried Out On The Vehicle

1. **Checking super-cooling condenser assembly**
   (a) If the radiating fins of the super-cooling condenser assembly are dirty, use water to clean them and use compressed air to blow them dry.

   Note:

   Do not make any damage to the radiating fins of the super-cooling condenser assembly.

   (b) If any radiating fin of the super-cooling condenser assembly is bent, use a screwdriver or plier to draw it straight.
2. **Checking the condenser for refrigerant leakage**
   (a) Use a halogen leak detector to check the pipe joints for leakage.
   (b) If any joint leakage is detected, then check the torque of the joint.

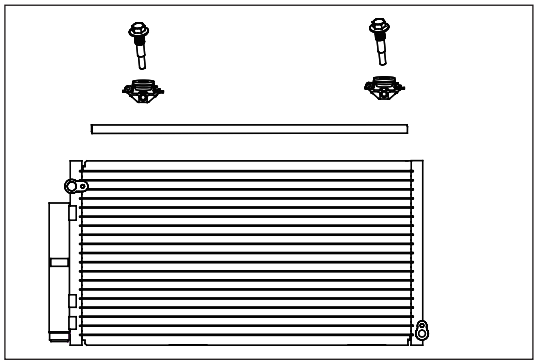
Removing

1. **Recovering the refrigerant in the cooling system**
2. **Removing the grille body from the front bumper**
3. **Removing the front bumper body**
4. **Removing the left lower deflecting plate of the radiator**
5. **Removing the right lower deflecting plate of the radiator**
6. **Removing the left-side deflecting plate body of the radiator**
7. **Removing the right-side deflecting plate body of the radiator**
8. **Removing the electrical horn**
9. **Removing the lock bracket of the engine hood**
10. **Disconnecting the compressor discharge pipe assembly and the condenser drain pipe**
    (a) Remove the bolts and disconnect the compressor discharge pipe assembly from the super-cooling condenser assembly and remove the O-ring from the compressor discharge pipe assembly.
    (b) Remove the condenser drain pipe from the super-cooling condenser assembly and remove the O-ring from the condenser drain pipe.

    Note:

    Use PVC insulating tapes to seal the openings of disconnected parts to prevent moisture and foreign objects.

    (c) Disconnect the drain pipe from the condenser drain



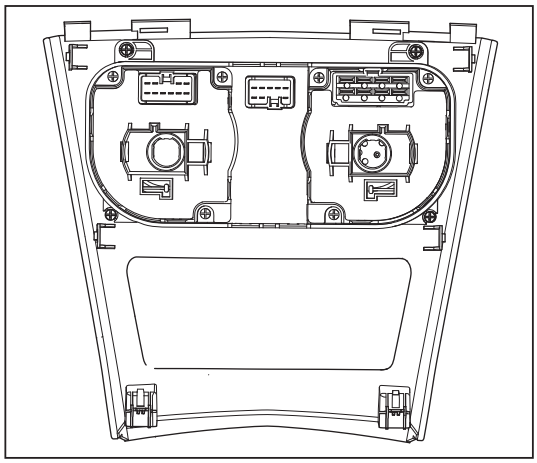
11. **Removing the super-cooling condenser assembly**
    Remove the two bolts and the super-cooling condenser assembly.

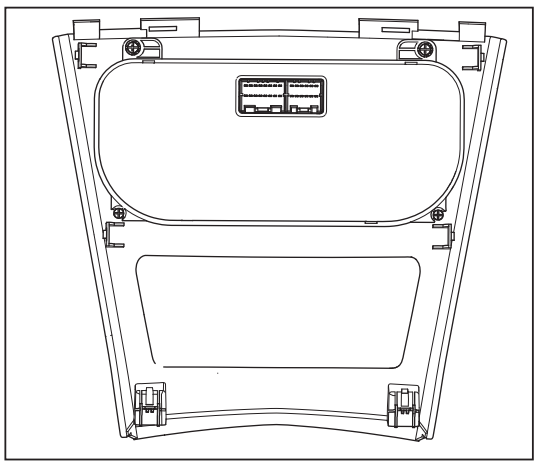
12. **Removing the condenser upper suspension assemblies**
    Remove the two bolts and the two condenser upper suspension assemblies.

A/C CONTROLLER WITH PANEL ASSEMBLY

Removing

1. **Removing the auxiliary instrument panel**
2. **Removing the left trim strip of the instrument panel**
3. **Removing the right trim strip of the instrument panel**
4. **Removing the upper panel of the console**
5. **Removing the A/C controller with panel assembly**
   (a) Remove the ashtray assembly.
   (b) Pull out the three plugs of the manual A/C.





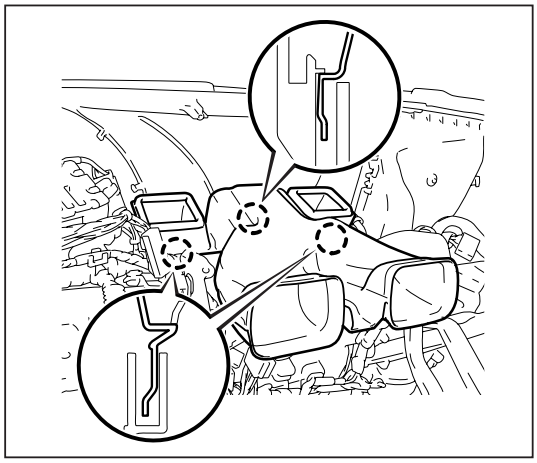
(c) Pull out the one plugs of the automatic A/C.

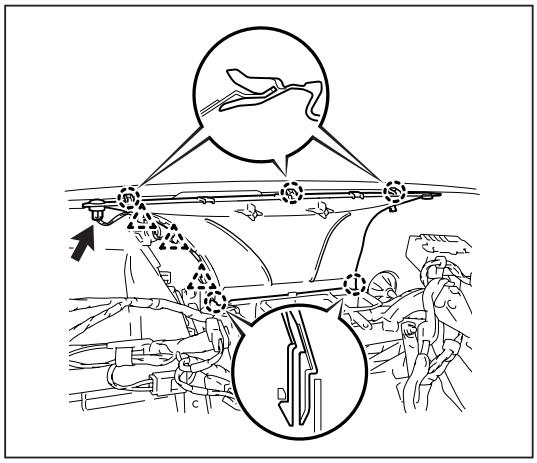
(d) Remove the A/C switch.

INTERIOR A/C ASSEMBLY

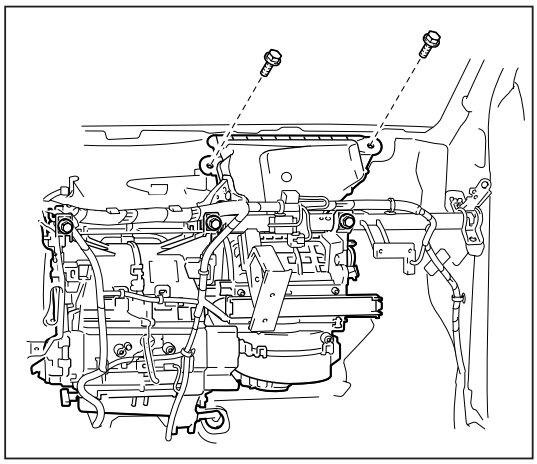
Removing

1. **Removing the upper instrument panel body**
2. **Removing the upper instrument panel body**
3. **Removing the room temperature sensor assembly**
4. **Removing the automatic A/C control panel assembly**
5. **Removing the left side vent assembly**
6. **Removing the right side vent assembly**
7. **Removing the center face-blowing air passage assembly**

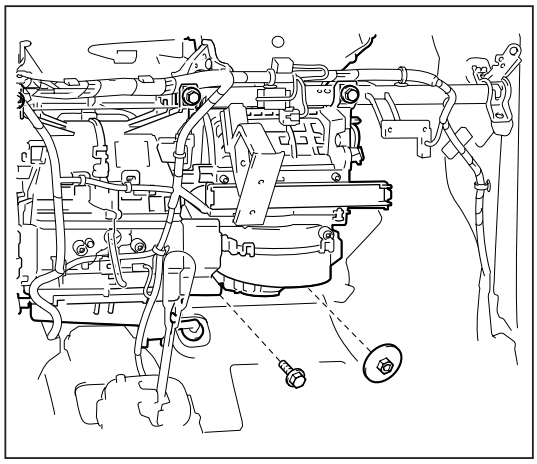




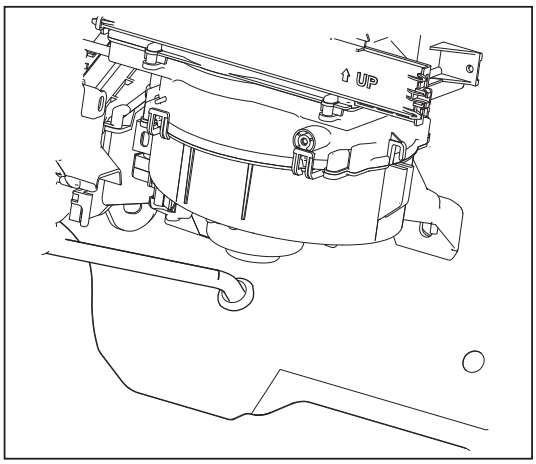
8. **Removing the center defrosting air passage assembly**



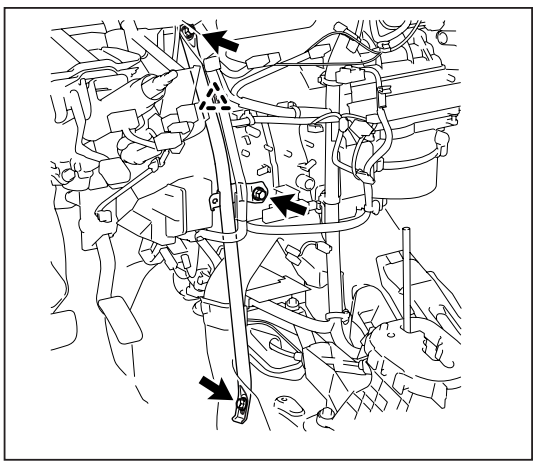
9. **Removing the interior A/C assembly**
   (a) Remove the fixing bolts from the lower body of the two window lower crossbeams.



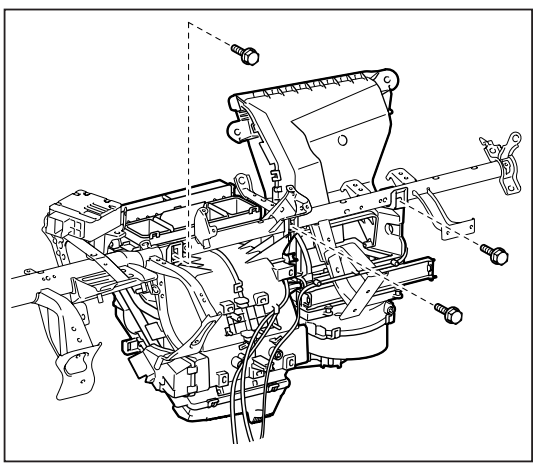
(b) Remove one fixing bolt and one fixing nut from the front-wall panel assembly.
(c) Disconnect the water inlet/outlet pipe.



(d) Disconnect the water drip pipe.



(e) Remove the fixing bolts from the center passage connecting bracket assembly of the lower instrument reinforced beam.



(f) Remove the fixed bolts from the crossbeam assembly of the three instrument reinforced beams.

SAFETY SUPPORT SYSTEMS

SEAT BELT

DESCRIPTION....2
FAULT DIAGNOSIS TABLE....2
FRONT-ROW SEAT BELTS....4
ELECTRONIC CONTROLLING LOCK WITH BUCKLE....6
REAR-ROW SEAT BELT (BOTH SIDES)....7
REAR-ROW MORTISE LOCK ASSEMBLY....10

AIRBAG

ATTENTIONS....11
TROUBLESHOOTING....12
DIAGNOSIS OF COLLISION....17
AIRBAG ECU....18
DRIVER AND PASSENGER SIDE AIRBAG MODULE (DAB, PAB)....19
CLOCK SPRING....21
AIRBAG MODULE REPEAL....23

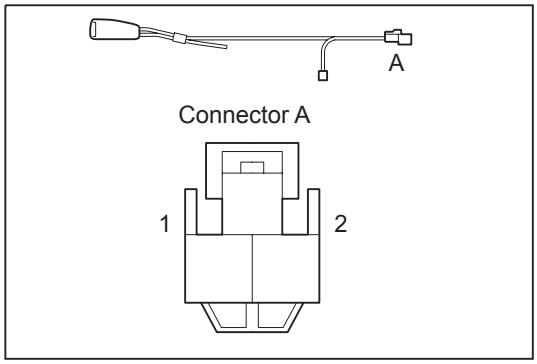
SEAT BELT

DESCRIPTION

The front seats have electronic preloaded lap/shoulder belts and the outside positions of the rear seat have lap/shoulder belts.

FAULT DIAGNOSIS TABLE

Phenomenon	Cause
The indicator light does not come on if the driver has not fastened his/her seat belt.	1. Instrument fuse 2. Combination instrument 3. The driver's seat mortise lock assembly 4. Wiring harness
The indicator light stays on if the driver has not fastened his/her seat belt.	1. Combination instrument 2. The driver's seat mortise lock assembly 3. Wiring harness
The indicator light does not come on if the front passenger has not fastened his/her seat belt.	1. Instrument fuse 2. Console panel body 3. The front passenger's seat mortise lock assembly 4. Combination instrument 5. Wiring harness
The indicator light stays on if the front passenger has not fastened his/her seat belt.	1. Console panel body 2. The front passenger's seat mortise lock assembly 3. Combination instrument 4. Wiring harness



Check

1. **Checking the front passenger's seat mortise lock assembly**

   Check the buckle switch.

   (a) Fasten the passenger's seat belt(The buckle switch is ON).

   (b) Check the resistance between the terminals.

   Standard:

Detector connecting	Specified state
A-1 - A-2	Less than 1 Ω

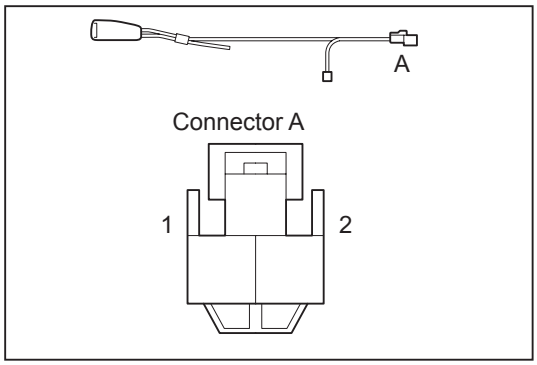
   (c) Release the passenger's seat belt(The buckle switch is OFF)

   (d) Check the resistance between the terminals.

   Standard:

Detector connecting	Specified state
A-1 - A-2	10 kΩ or more

   Otherwise, replace the seat mortise lock assembly.



2. Checking the driver's seat mortise lock assembly

Check the buckle switch.

(a) Fasten the driver's seat belt(The buckle switch is ON).

(b) Check the resistance between the terminals.

Standard:

Detector connecting	Specified state
A-1 - A-2	Less than 1 Ω

(c) Release the driver's seat belt (The buckle switch is OFF).

(d) Check the resistance between the terminals.

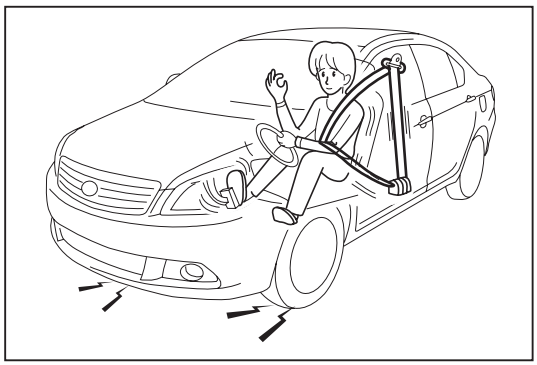
Standard:

Detector connecting	Specified state
A-1 - A-2	10 kΩ or more

Otherwise, replace the seat mortise lock assembly.

Attentions

1. **Replace the faulty parts of the seat belt system(such as outer belts, seat mortise assembly, bolts, nuts, anchor adjusters, belt anchor fittings, reel shafts and so on).**
2. **Check the unused seat belt system in a crash as well, and if you find any damage or abnormal working condition, replace it.**



Trial Run

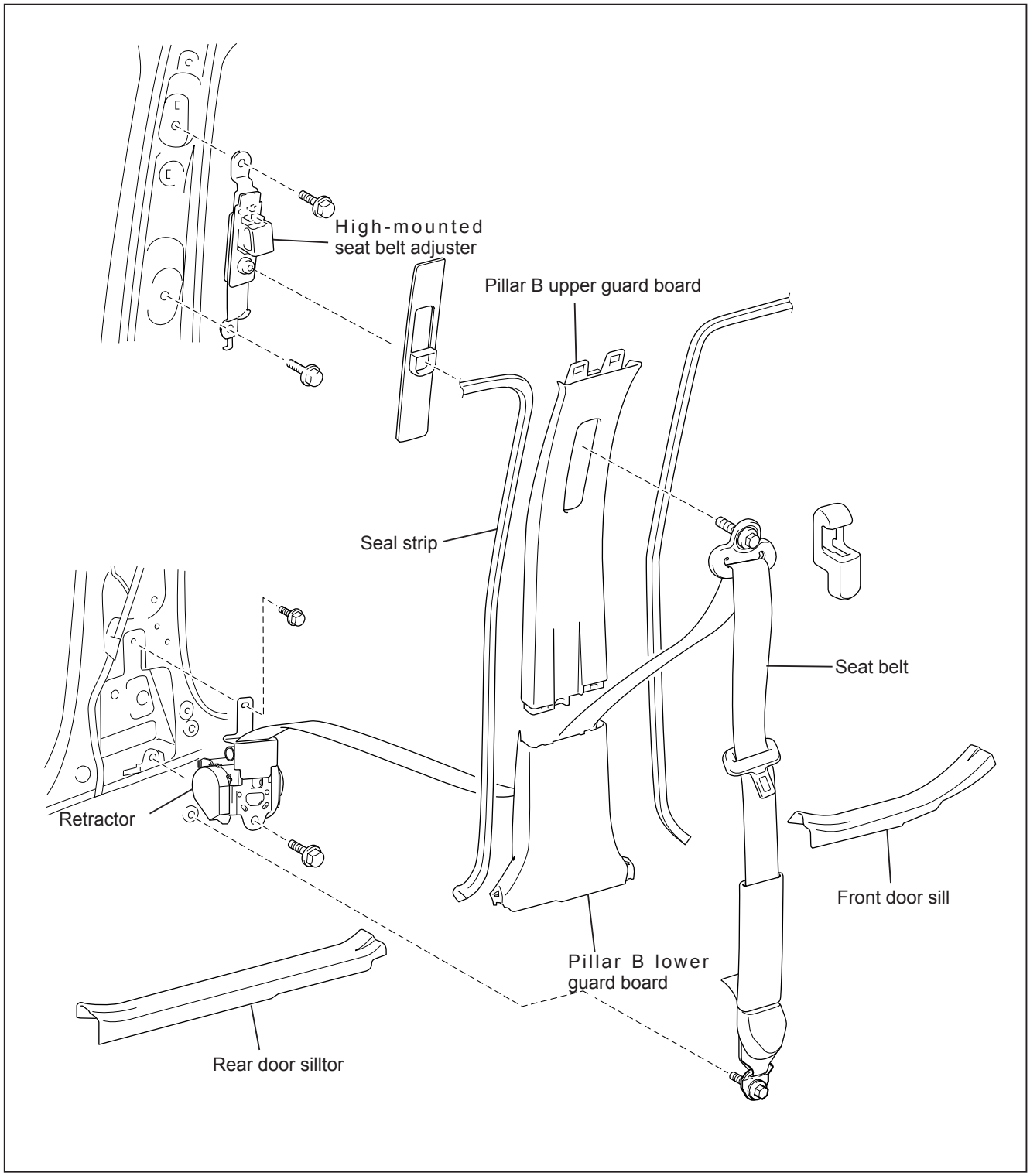
1. **Fasten the front-row seat belts.**
2. **Drive the car at a speed of 16 km/h and step down the brake pedal forcibly. Check and verify that the belts have been securely locked at this moment.**

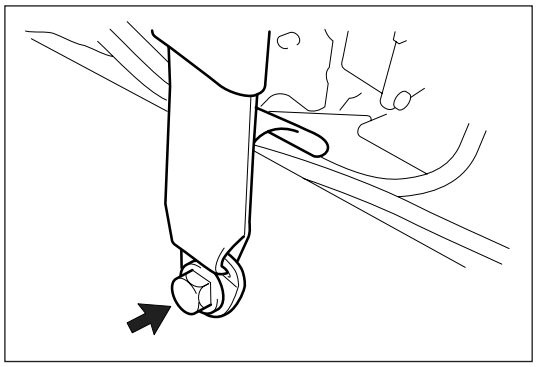
Tip:

Test at the safe areas. If the belts have not been securely locked, disassemble the seat belt assembly to check. Moreover, whenever installing a new seat belt assembly, verify its normal working conditions before installing.

FRONT-ROW SEAT BELTS

Location Diagram

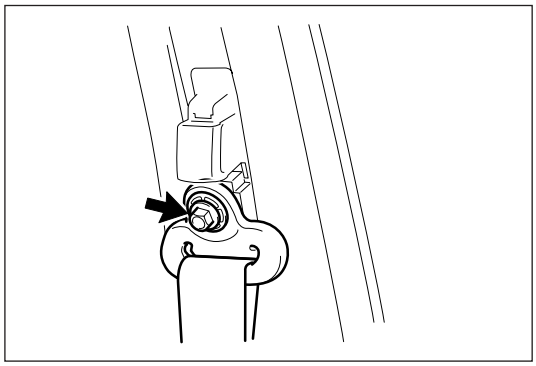




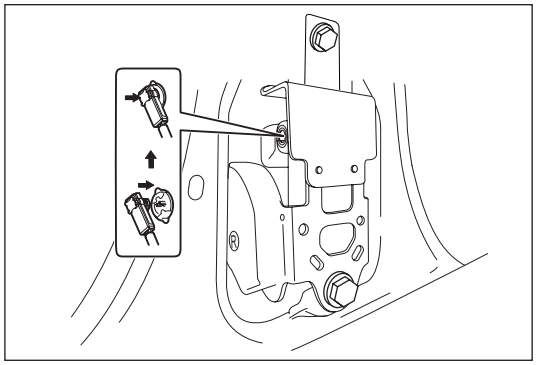
Removing

1. **Removing the bolts of the lower fixed points of the front-row seat belts**

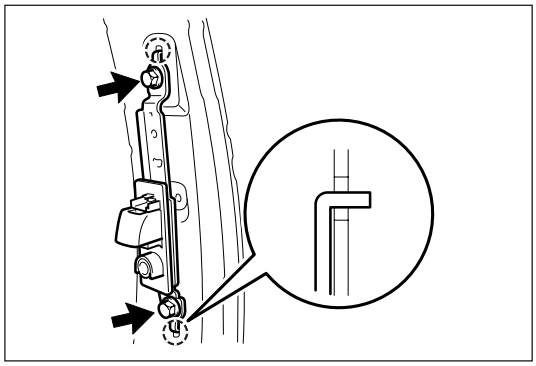
2. **Removing the lower guard board of Pillar B**
   (a) Remove the seal strip.
   (b) Remove the door sills.
   (c) Remove the lower guard board of Pillar B



3. **Removing the covers of the high-mounted adjusters.**
4. **Removing the bolts of the upper fixed points of the front-row seat belts**



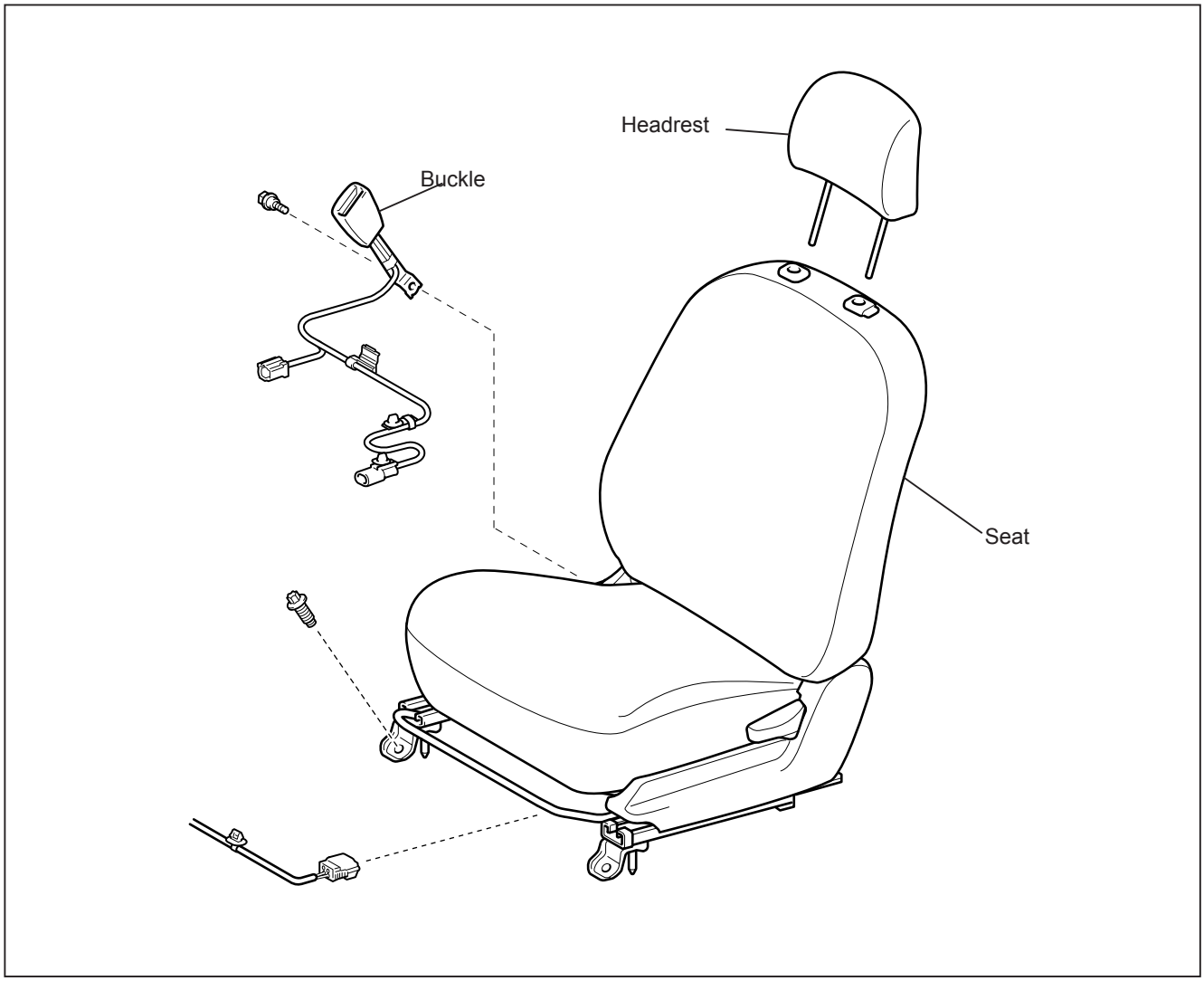
5. **Disconnecting the connectors of the pretensioners.**
6. **Removing the bolts of the fixed points of the retractors**



7. **Removing the upper guard board of Pillar B**
8. **Removing the high-mounted adjusters**

ELECTRONIC CONTROLLING LOCK WITH BUCKLE

Location Diagram

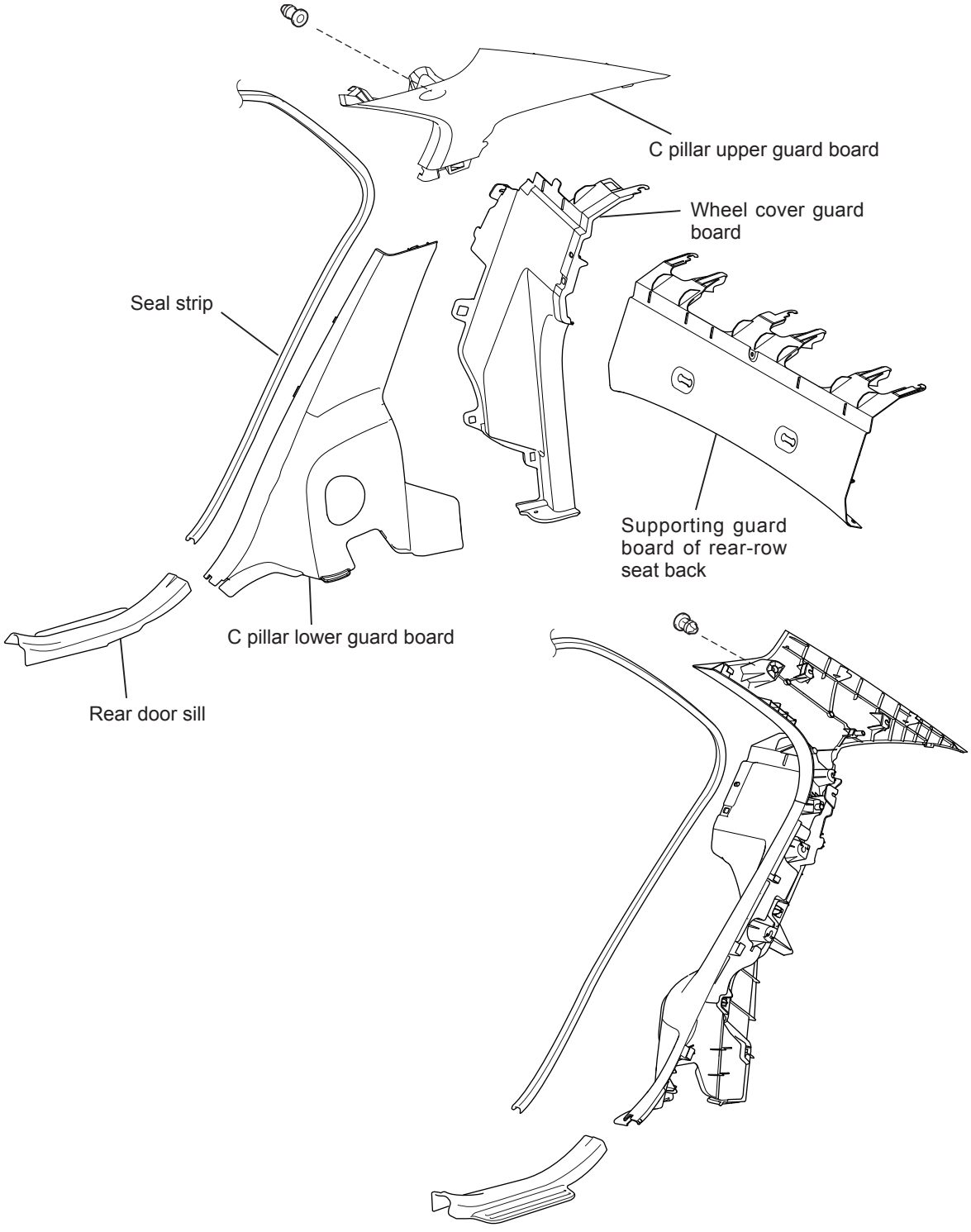


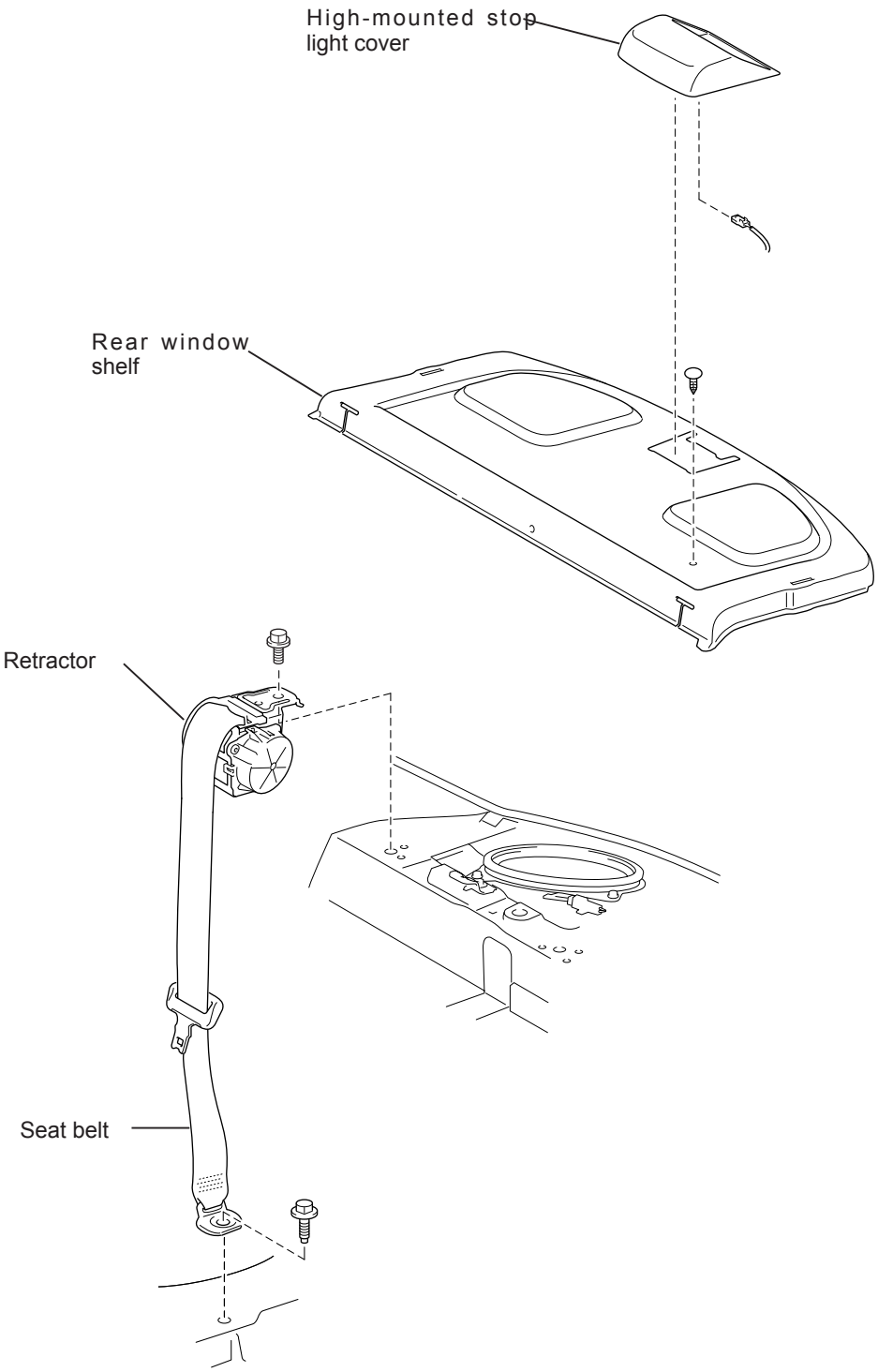
Removing

1. **Removing the front-row seats**
2. **Removing the electronic controlling lock with buckle**

REAR-ROW SEAT BELT (BOTH SIDES)

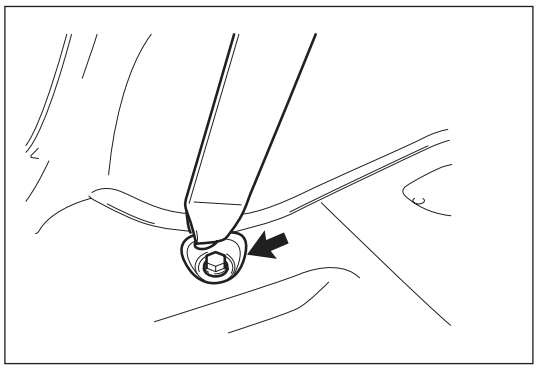
Structure Diagram



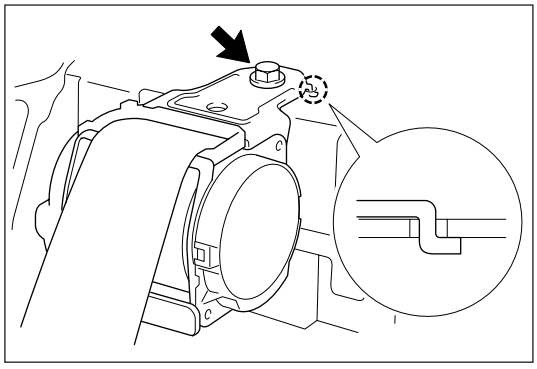

High-mounted stop light cover
Rear window shelf
Retractor
Seat belt

Removing

1. Removing the rear door sill guard board
2. Removing the rear door seal strip
3. Removing the rear-row seats
4. Removing the bolts of the lower fixed points of the rear-row seat belts

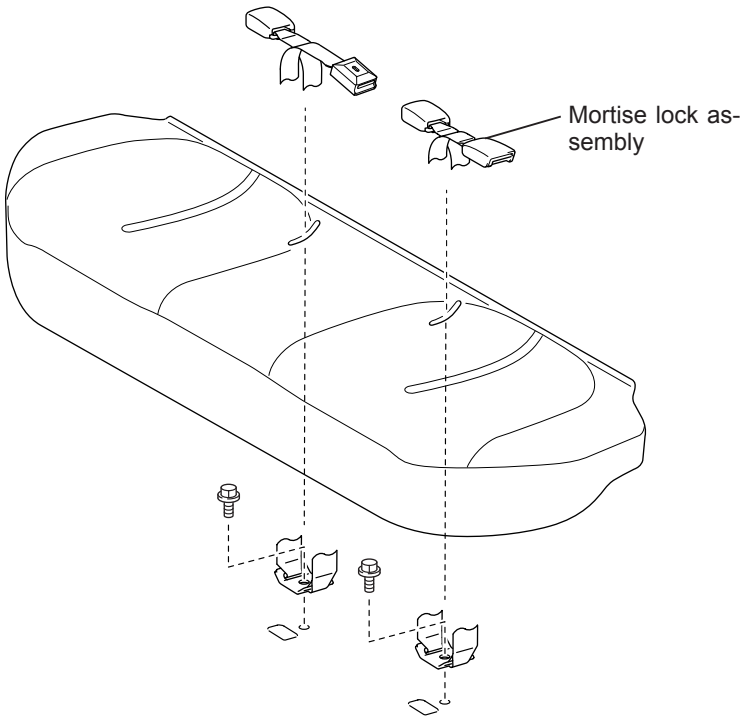


5. Removing the lower guard board of Pillar C
6. Removing the upper guard board of Pillar C
7. Removing the supporting guard board of the rear-row seat back
8. Removing the rear wheel cover guard board
9. Removing the high-mounted stop light assembly
10. Removing the rear window shelf assembly
11. Removing the bolts of the retractors of the rear-row seat belts



REAR-ROW MORTISE LOCK ASSEMBLY

Location Diagram



Removing

1. **Removing the seat cushion**
2. **Removing the fixed bolts of the mortise lock assembly**

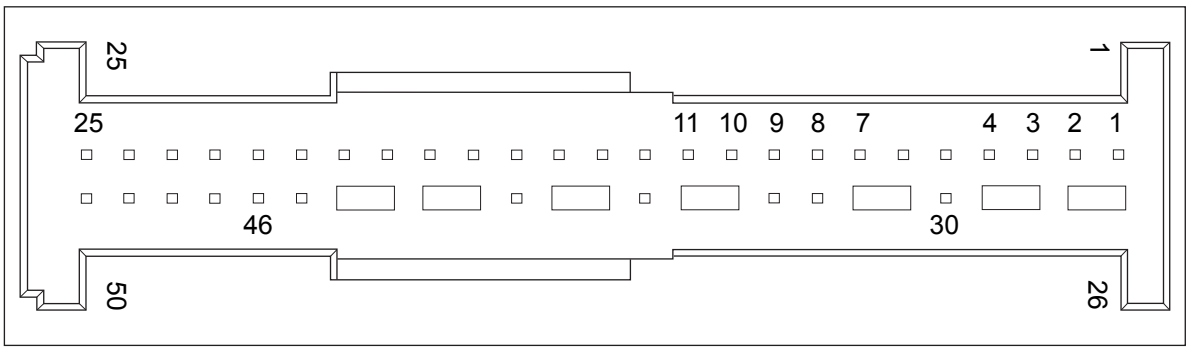
AIRBAG

ATTENTIONS

For safe operation, please read the following instructions for maintenance before operating.

1. **When having your airbag maintained, operate in accordance with the orders and instructions described this chapter.**
2. **Be sure to use the experimental apparatus and special tools described this chapter to operate.**
3. **To maintain any following part, be sure to replace it if it has any defect.**
   - Airbag control unit (SRS-ECU)
   - Clock spring module
   - Driver-side front air bag module
   - Passenger-side front air bag module
   - Driver-side front-row pretensioning seat belt
   - Passenger-side front-row pretensioning seat belt
   - Airbag Harness
4. **When performing the maintenance operation, disconnect the negative connection of the battery and wait for 90S. Also, wrap the removed negative pole with insulating tapes for insulation.**
   To deploy the airbag within some time, store a certain electrical energy in the capacitor inside the SRS-ECU after cutting-off the battery. If you perform the maintenance operation without waiting for a period of time, you can increase the chance of serious injury in an unexpected airbag deployment.
5. **In the spray-paint operation, take off the SRS-ECU, the airbag modules, the clock springs and other components to place in place if it is too hot (93 ℃ above).**
   Be sure to use a diagnostic scanner to eliminate the fault codes to enable the warning light to work properly after the completion of the maintenance for the air bag system.

Airbag Electronic Control Interface and Lead Definitions



No	Name	Description
1	DRV A/B+	Driver-side front airbag, upper
2	DRV A/B-	Driver-side front airbag, lower
3	PSG A/B+	Front passenger-side front airbag, upper
4	PSG A/B-	Front passenger-side front airbag, lower
7	PSG PRETENSIONER-	Front passenger's belt pre-tension, lower
8	DRV PRETENSIONER+	Driver safety belt pre-tension, upper
9	DRV PRETENSIONER-	Driver safety belt pre-tension, lower
10	WARNING LAMP	Fault warning light
11	GND	Ground wire
25	BPT Hi	Battery voltage
30	PSG PRETENSIONER-	Front passenger's belt pre-tension, upper
46	K-LINE	Diagnostic serial data I/O (K line)

TROUBLESHOOTING

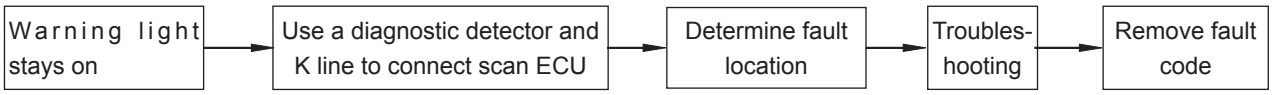
Basic Diagnostic Flow

The SRS-ECU fault type can be classified as the current fault and the historical fault by time, and can also be classified as the outer fault and inner fault by nature.

The fault codes of the existing faults can co-exist with those of the historical faults. The fault codes of the outer faults can be eliminated by using a diagnostic detector. However, the fault codes of the inner faults cannot be removed until the SRS-ECU has been replaced.

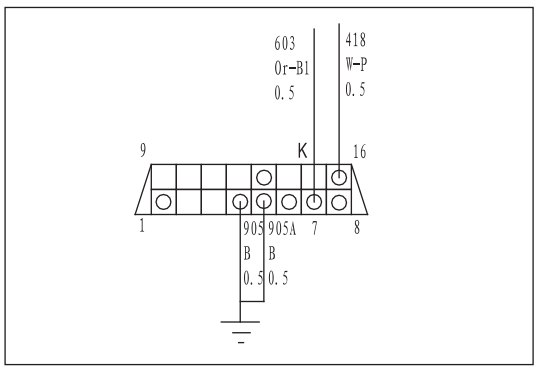
Note:

After installing the electronic control module of the new airbag system, the warning light of the airbag system will glitter for 6~7 seconds before going out with the ignition switch ON, this means that the airbag system is working properly. There is no need to examine and repair the system only in this condition.



Checking the airbag warning light

1. **Let the ignition switch ON to check whether the SRS warning light will glitter for 6-7 seconds.**
2. **If the SRS warning light goes out after 6-7 seconds, this means the airbag system is working properly.**
3. **Perform other diagnostic inspections in addition the above.**



System Diagnostics

The SRS-ECU will perform a series of cyclic diagnostic tests to check whether the airbag system can provide ready-prepared functions. This test can prevent the restraint system from exploding by mistake and ensure the restraint system to explode necessarily in a severe frontal collision. If detecting any fault, The SRS-ECU will store a proper fault code and let the warning light come on to indicate a fault state so as to have the airbag system maintained.

Trouble Determination

1. Fault records (fault code storage)

After the ECU using the cyclic diagnostic test to determine any fault, the SRS-ECU will store the corresponding fault code, the first determination time, the last determination time and the number of occurrences in the EEPROM.

The SRS-ECU can store up to 16 faults.

Serial number	Fault description
1	Leakage of electricity into the positive pole from the right-side pretensioning seat belt
2	Leakage of electricity into the positive pole from the left-side pretensioning seat belt
3	Leakage of electricity into the positive pole from the driver's airbag module
4	Leakage of electricity into the positive pole from the passenger-side airbag
9	Leakage of electricity into the positive pole from the airbag module on the right side of the seat
10	Leakage of electricity into the positive pole from the Line 10
11	Leakage of electricity into the positive pole from the Line 11
12	Leakage of electricity into the positive pole from the airbag module on the left side of the seat
25	Leakage of electricity into the ground from the right-side pretensioning belt.
26	Leakage of electricity into the ground from the left-side pretensioning belt.
27	Leakage of electricity into the ground from the driver's airbag module
28	Leakage of electricity into the ground from the passenger-side airbag
33	Leakage of electricity into the ground from the airbag module on the right side of the seat
34	Leakage of electricity into the ground from the Line 10
35	Leakage of electricity into the ground from the Line 11
36	Leakage of electricity into the ground from the airbag module on the left side of the seat
49	Right side pretensioning belt open-circuited
50	Left side pretensioning belt open-circuited
51	Driver's airbag module open-circuited
52	Passenger-side airbag open-circuited
57	Right side airbag of the seat open-circuited.
58	Line 10 open-circuited
59	Line 11 open-circuited
60	Left side airbag of the seat open-circuited.
73	Right side pretensioning belt short-circuited
74	Left side pretensioning belt short-circuited
75	Driver's airbag module short-circuited
76	Passenger-side airbag short-circuited
81	Right side airbag module of the seat short-circuited
82	Line 10 short-circuited
83	Line 11 short-circuited
84	Left side airbag module of the seat short-circuited
97	Inner fault: Capacitor charge error
99	Inner fault: Capacitor error
105	Battery voltage exceeded
106	Toddler seat line open-circuited
108	Toddler seat position undefined
109	Toddler seat configuration mistaken
110	Inner fault: Stack spillover
112	Leakage of electricity into the positive pole from the warning light
113	Leakage of electricity into the positive pole from the limiting light
114	Leakage of electricity into the ground from the warning light
115	Leakage of electricity into the ground from the limiting light

117	Line laying mistaken
118	Leakage of electricity into the ground from the toddler seat
119	Leakage of electricity into the positive pole from the toddler seat
120	Inner fault: toddler seat driver out of order
121	Toddler seat fault
129	Low-order transistor 1 error
130	Low-order transistor 2 error
131	Low-order transistor 3error
132	Low-order transistor 4 error
137	Low-order transistor 9 error
138	Low-order transistor 10 error
139	Low-order transistor 11 error
140	Low-order transistor 12 error
153	High-order transistor 1 error
154	High-order transistor 2 error
155	High-order transistor 3 error
156	High-order transistor 4 error
161	High-order transistor 9 error
162	High-order transistor 10 error
163	High-order transistor 11 error
164	High-order transistor 12 error
177	Inner fault: Protective data damaged
178	Inner fault: CPU fault software error
179	Inner fault: EEPROM storage (R/W) failed
180	Inner fault: EEPROM not programmed
181	Inner fault: EEPROM checkout and poor
182	Inner fault: EEPROM executed out of order
183	Inner fault: calibration parameter damaged
184	Inner fault: EEPROM calibration parameter damaged
185	Inner fault: accelerometer offset compensation failure
186	Inner fault: outer watchdog
187	Inner fault: inner watchdog
188	Inspect the lighting
189	Inner fault: modular converter failed
190	Inner fault: allowable ignition line failed
192	Over-long determination time of collision
193	Inner fault: charge out of order
194	Inner fault: X accelerometer error
195	Inner fault: Y accelerometer error
196	Inner fault: X safety sensor error
199	Inner fault: collision detecting data damaged
202	Accelerometer saturation error
205	Airbag module allocation error
206	Left-side airbag sensor error
207	Right-side airbag sensor error
208	Poor left-side airbag sensor communicating
209	Poor right-side airbag sensor communicating
212	Left-side airbag sensor not supplied
213	Right-side airbag sensor not supplied
214	Side airbag saturation error

The fault code transmission should be completed by the SRS-ECU. The SRS-ECU should export the fault codes to the specified diagnostic detector, such as the X-431 diagnostic detector through the serial data of the maintenance procedure.

X-431 Diagnostic Detector

This diagnostic detector is designed to check the system fault of the airbag system and to the remove the fault code of the ECU.

2. Inner fault

This micro-controller can detect the following terms in both the starting test and the cyclic diagnostic test.

(a) Ignition circuit triggering transistors: The high-order transistor can be detected in both the starting test and the cyclic diagnostic test. However, the low-order transistor can only be detected in the starting test for it has been switched on in the case of the fault of the power-supply short-circuited. This can avoid any unexpected explosion.

(b) The ignition voltage is applied by the booster converter.

(c) The acceleration sensor is self-checking when starting the test.

(d) The range of offset of the acceleration sensor is allowed in the cyclic diagnostic test.

(e) Micro-controller includes the AD converter, ROM, RAM, etc.

(f) The safety sensor state.

Note:

There is a short-circuit rod built in the connector of the electro-explosive tube circuit. The positive terminal (+) and the negative terminal (-) of the electro-explosive tube circuit has been short circuited when the connector is unconnected, so as to prevent any unexpected deployment caused by static electricity and other factors.The failure phenomenon can not be eliminated even if the short circuit rod has been connected but with poor contact connector.

3. Removing fault codes

Method:

When the ECU receives the order of “Removing fault codes” coming over through the serial interface from the X-431 diagnostic detector, the fault codes inside the ECU will be eliminated. However, if one inner fault code has been recorded or one collision has been recorded, the ECU will refuse this order.

(a) Fault state display

After the working voltage has been supplied to the SRS-ECU through the battery, the SRS-ECU will switch on the warning light in order to check the bulb. At the initial stage, the warning light will glitter for 6~7 seconds. To remind you of any existing fault, the warning light stays on after the working voltage being applied. If there is no fault arising in the system, the warning light will go out automatically after the ignition on for 6~7 seconds.

(b) Fault indicator

When there is any fault arising in the system, the warning light will stay on.

A displaying fault or a historical fault can only be reset by a specially-trained technician. A SRS-ECU inner fault or “collision record” fault cannot be reset. Under such case, the SRS-ECU has to be replaced.

(c) Microcontroller-Individual warning light on

This controller provides a self-diagnostic test function. If there is any fault arising inside the controller, the warning light will stay on.

Following diagnostic steps are examples to be explained:

If you find that the airbag warning light stays on, check it according to the following steps. In terms of any fault, first of all, use a scanner to check its fault location, and then perform the check following the methods and steps applied to the corresponding location.

(1) If the scanned result indicates an inner fault or if the airbag has been exploded, it is necessary to replace the SRS-ECU immediately.

(2) Troubleshooting

4. Trouble detection and removal

When the ignition key is at the position ON and the airbag warning indicator light stays on, perform a simple detection with the following methods.

The principle of trouble detection is to determine the fault location by measuring the loop resistance. Determine which component has any inner fault by replacing the driver's air bag assembly, the front passenger's air bag assembly, the driver's seat belt and the front passenger's seat belt, respectively.

1. Airbag detection for double-airbag configuration

(a) After pulling out the vehicle key for 90s, remove the driver's airbag before pulling out the airbag plug-ins. Use a resistance of 2.5 Ohm around to replace the driver's airbag, and connect this resistance to the wiring harness ends.

(b) Insert the key into the ignition switch and turn it to the position ON, observing the glittering state of the airbag warning indicator light. If the indicator light comes on and stays on for 6s, and then goes out, this means that this component has a certain fault, and it is necessary to replace the component. If the indicator light stays on, this means that this component has no fault. Go on for next step.

(c) Pull out the ignition key, and disconnect the replacement resistance after 90s. Assemble the driver' s airbag in place and disconnect the wiring harness plug-ins of the front passenger's airbag. Use the resistance to replace the front passenger's airbag as the same method above-mentioned.

(d) Repeat step (b).

(e) Pull out the ignition key, and disconnect the replacement resistance after 90s. Assemble the front passenger's airbag in place and remove the lower guard boar of Pillar B on the driver's side.P u l l out the belt pretensioning plug-ins. Use the resistance to replace the belt bomb trigger as the same method above-mentioned.

(f) Repeat step (b).

(g) Pull out the ignition key, and disconnect the replacement resistance after 90s. Connect the belt harness on the driver's side in place. Remove the lower guard board of Pillar B on the front-passenger's side. Pull out the belt pretensioning plug-ins. Use the resistance to replace the belt bomb trigger as the same method above-mentioned.

(h) Repeat step (b).

(i) Until now, if you still cannot find out any faulty component, this means that there may be some short circuit or open circuit in the wiring harness, please check the wiring harness for fault.

(j) If there is no fault in the line, it is necessary to replace the airbag ECU.

This method is relatively simple to detect the airbag system fault. Especially, it is more applicable if there is no available detector. Be sure to replace the faulty airbag system components. No repair or maintenance to such components is permitted.

2. Airbag detection for single-airbag configuration

The method for detection is the same as the above-mentioned one. For the single-airbag configuration has only two loops of the master airbag, its detection is easier. Ask the technician of the specialized factory to check the airbag ECU except the airbag module trouble and the harness trouble.

DIAGNOSIS OF COLLISION

Whether its airbags have deployed or not, check and maintain the crashed vehicle as follows.

1. Checking the SRS-ECU diagnostic signals

(a) Connect the diagnostic connector of the X-431 diagnostic detector.

(b) Use the X-431 diagnostic detector to read the diagnostic results.

2. Repair sequence

(a) If the airbags have been deployed, replace the following parts.

- Passenger-side airbag module
- SRS-ECU
- Driver's airbag module
- Driver's and passenger-side front-row pretensioning belts

(b) Check any following part for abnormity, if necessary, replace it.

- Clock spring
- Steering wheel, steering column and steering lower shaft unit

(c) Check the mounting state for the driver-side airbag module relative to the steering wheel.

- Check the steering wheel for abnormal noise, good action and normal clearance.
- Check the harness connectors for damage and the terminals for deformation.

3. SRS-ECU

(a) Check the SRS-ECU housing and bracket for concavity, crack, deformation and other.

(b) Check the connectors for damage and the terminals for deformation.

(c) Check the SRS-ECU bracket's mounting state.

(1) Check the housing cover for concavity, crack, deformation and other.

(2) Check the connectors for damage, the terminals for deformation and the harness for clinching.

(3) Check the gas generator housing for concavity, crack and deformation.

(4) Check whether the arrow direction represents the vehicle front direction.

(d) Check the airbag module's mounting state.

4. Driver-side airbag module

5. Clock spring

(a) Check the connector and protective tube for damage and the terminals for deformation.

(b) Check the housing for deformation.

6. Steering wheel, steering column and steering lower shaft unit

(a) Check the driver-side airbag module's mounting state.

(b) Check the steering wheel for abnormal noise and the clearance for normality.

7. Checking the harness and connectors(for the instrument harness)

Check the harness for secure installation, the connectors for damage and the terminals for deformation.

Warning Marks

There are warning labels on the driver's airbag, the clock springs, the SRS-ECU and the front passenger-side airbag. The notices on such labels are explained with graphic symbols. When using the airbags and maintaining them, you should operate in accordance with the conditions as recorded by the labels. In addition, if you see any damage to any label or dirt on any label, replace it.

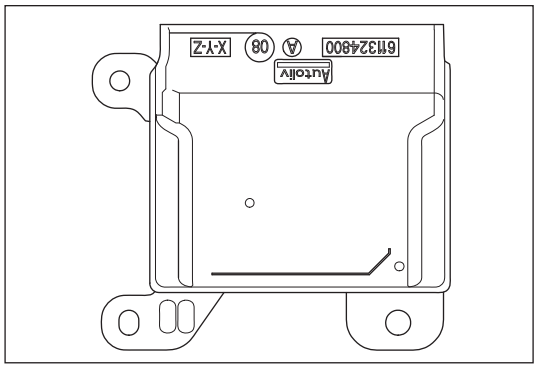
AIRBAG ECU

Attentions

- No disassembly or repair of the SRS-ECU is permitted. Replace it if you find any fault.
- Do not subject the SRS-ECU to impact or vibration. Be sure to replace it if you can see any concavity, crack or deformation.
- Be sure to replace the SRS-ECU once the airbag has been deployed.
- Be careful not to touch the SRS-ECU when removing or maintaining the parts surrounding the SRS - ECU.

Removing

1. **Setting the ignition switch at the position OFF**
2. **Disconnecting the negative pole (-)of the battery, and putting it at the proper place or wrapping it well with adhesive tape**
   Note:
   Do either of these jobs after 90s.
3. **Removing the pedestal of the instrument panel**
4. **Removing the plug-ins connecting with the airbag ECU**
5. **Removing the SRS-ECU**



Checking

1. **Check the SRS-ECU for concavity, crack or deformation.**
2. **Check the connectors for damage and deformation.**
   Note:
   Replace the SRS-ECU if you find any concavity, crack or deformation.

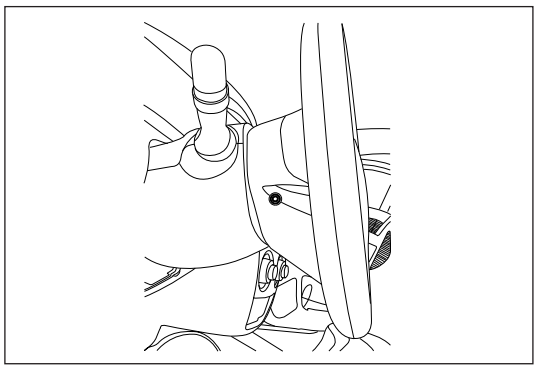
Installing

1. **Installing the SRS-ECU**
   Note:
   Only accurate and correct installation of the SRS-ECU can enable the airbags to act normally.
2. **Installing the plug-ins connecting with the airbag ECU**
3. **Installing the auxiliary instrument panel**
4. **Connecting the negative pole(-)of the battery**
5. **Checking after installation**
   - Set the ignition switch at the position ON.
   - The SRS warning light comes on and stays on for 6s, and then goes out.
   - Perform trouble check and removal if the warning light stays on.

DRIVER AND PASSENGER SIDE AIRBAG MODULE (DAB, PAB)

Attentions

- Remove the negative pole(-) of the battery and wait for 90s before operating. Wrap the removed the negative pole(-) with adhesive tape for insulation.
- No disassembly or repair of the airbag module is permitted. Replace it if you find any fault.
- Do not drop the airbag module onto ground or into water or oil. Replace it if you find any concavity, crack or deformation.
- When deploying the airbag module, let the deployment surface upward and place it at level site for storage. Do not put any other object onto it.
- Do not store the airbag module at the place with a temperature more than 93ºC.
- Replace it if you have deployed the airbag module.
- Be sure to wear gloves and goggles when operating the deployed airbag.
- To discard the unused airbag, be sure to deploy it before discarding.
- When removing, to prevent the static electricity and unexpected explosion, first of all, remove the plug-ins from the harness of the DAB and PAB module. And then, remove the plug-ins from other harness. When installing, do in reverse.



Removal of the Master Airbag

1. **Taking out the ignition switch after the steering wheel and the front wheels being in the straight and forward direction**
2. **Removing the negative pole (-) of the battery and putting it at the proper site or using adhesive tape to wrap it well**

   Note:

   Operate after 90s.
3. **Loosening the screws on both sides**
4. **Taking up the airbag module gently**
5. **Disconnecting the harness plug-ins and horn from the airbag module**
6. **Removing the drive-side front airbag module**

   Note:

   Use an electro-apparatus to diagnose the air-bag module circuit instead of disassembling it.

   Do not put the underside of the removed driver-side airbag module upward. Place it at the clean and dry site for storage.

CHECKING

Check the following items. Replace the airbag module unit if you find any defect. Deploy the old one as required sequence before discarding.

(a) Check the housing cover for concavity, crack or deformation.

(b) Check the harness connectors for damage and the terminals for deformation.

(c) Check the gas generator housing for concavity, crack or deformation.

(d) Check the airbag module's mounting state.

Note:

It is impossible for you to determine the circuit resistance of the airbag module (electro-explosive tube) even if you use the specified checking device. If you use an experimental device to determine the resistance, there will be some current flowing in the electro-explosive tube. Sometimes, unexpected deployment caused by static electricity increases the chance of serious injury in determining the resistance.

Installing

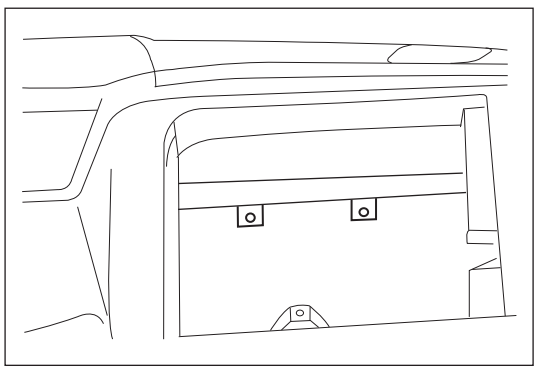
1. **Installing the horn harness**
2. **Installing the harness of the bomb-trigger (gas generator) of the airbag module**

   Note:

   Do not seize up the clock spring harness when installing the steering wheel and the airbag module unit.
3. **Laying down the airbag module correctly onto the mounting position of the steering wheel(Do not strike it vigorously when placing the airbag module)**
4. **Tightening the fixing bolts of the airbag module**
5. **Connecting the battery's negative (-) terminal**
6. **Checking after installing**
   (a) Turn the steering wheel right and left gently to verify there is any abnormity or noise.
   (b) Set the ignition switch at the position ON.
   (c) The SRS warning light comes on and stays on for 6s, and then goes out.
   (d) If the warning light stays on after going out after 6s (or stays on all the time), perform troubleshooting.

Removal of the Auxiliary Airbag

1. **Removing the glove compartment**
2. **Pulling out the plug-ins from the instrument panel harness and the auxiliary airbag harness**
3. **Removing the fixing bolts of the airbag**
4. **Removing the upper instrument panel**
5. **Pressing down the bayonet fastener and removing the auxiliary airbag module**



Installing

The installation order is reverse to the removal order.

Note:

Be sure not to place any object at the position of the auxiliary airbag in order to prevent any accident when the airbag deploying.

CLOCK SPRING

Attentions

- Remove the negative pole (-) of the battery and wait for 90s before operating. Wrap the removed the negative pole (-) with adhesive tape for insulation.
- No disassembly or repair of the clock spring is permitted. Replace it if you find any fault.
- Do not drop the clock spring onto ground or into water or oil. Replace it if you find any concavity, crack or deformation.
- Place the removed clock spring at the clean and dry site for storage.

Removing

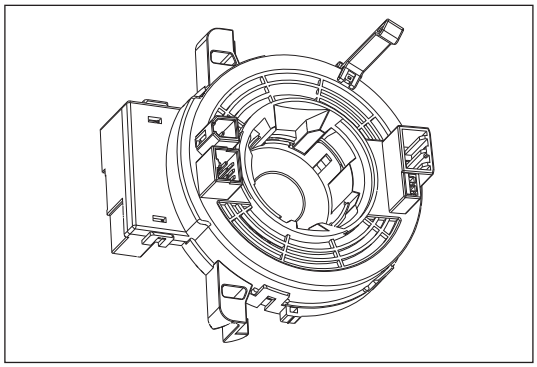
1. **Loosening the screws on both sides of the steering wheel**
2. **Taking up the airbag module gently**
3. **Disconnecting the harness plug-ins from the airbag module**
4. **Removing the driver-side front airbag module**
5. **Removing the fixing nuts of the steering wheel from the steering column**
6. **Removing the steering wheel**

   Note:

   It is difficult for the steering wheel to release from the steering column due to the tight sticking between the spline and the column. Be sure not to remove the steering wheel forcedly. Screw the nut on the column for several turns downward, and then draw the steering wheel upward to avoid damage to the clock spring.
7. **Opening the upper/lower shield of the combination switch**
8. **Disconnecting the harness plug-ins of the lower instrument**
9. **Removing the clock spring**

   Note:

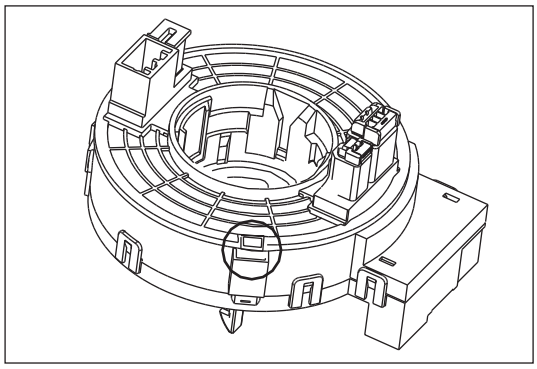
   Put the removed clock spring at the clean and dry place for storage.



Checking

Check the following items. Replace the clock spring if you find any defect.

- Check the connector and protective tube for damage and the terminals for deformation.
- Check the housing body for damage.
- Check the clock spring's upper terminals and lower corresponding terminals for conduction.



Clock spring center alignment:

Turn the clock spring clockwise to the end. And then rotate 3.5 turns reversely to the alignment position of the locating pin's limiting ledge and spacing hole. Moreover, you can see yellow trolleys through the peep hole.

Note:

If you cannot align the clock spring center, you will not enable the steering wheel to rotate at midway, or this will be adverse to the clock spring line, impeding the normal work-

Installing

Check whether the front wheels are in the position of straight forward travel direction before installing. Otherwise, return the front wheels in place first.

1. **Installing the clock spring onto the steering column**
2. **Seizing the clock spring up the steering column securely**
3. **Installing the harness plug-ins of the lower instrument panel of the clock spring**
4. **Installing the shield of the combination switch**
5. **Pulling out the locating pin of the clock spring**
6. **Installing the steering wheel and pulling the upper wires of the clock spring through the hole on the steering wheel body**
7. **Tightening the fixing nuts of the steering wheel**

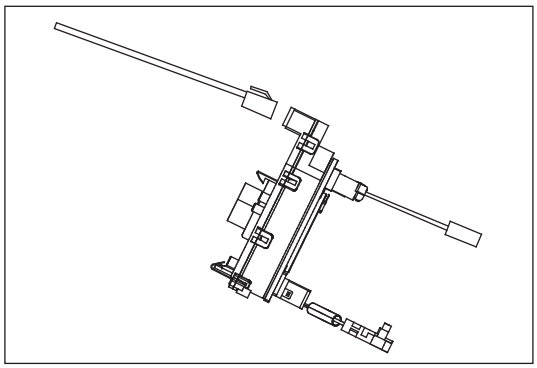
Checking After Installing

(a) Turn the steering wheel right and left gently and verify whether there is any abnormity or noise.
(b) Set the ignition switch at the position ON.
(c) The SRS warning light glitters for 6~7 seconds and then goes out.
(d) After 6~7 seconds, if the warning light stays on or indicates other states, perform troubleshooting.
(e) Check the clock spring airbag line for open circuit. If the clock spring airbag line is open-circuited, replace the clock spring airbag line.
(f) Otherwise, check other lines.

AIRBAG MODULE REPEAL

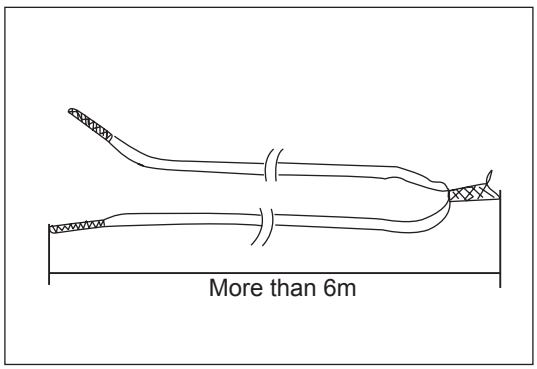
Attentions

1. **Deploy the SRS airbag first before repealing the SRS airbag.**
2. **Deploy the airbag outside when replacing the airbag module.**
3. **Deploy the airbag with a gas detector nearby to detect the chemical gas emitting.**
4. **Ask the people nearby to block their ears when deploying the airbag because deploying the airbag can generate unbearable sound. Avoid deploying the airbag at residential areas whenever possible.**

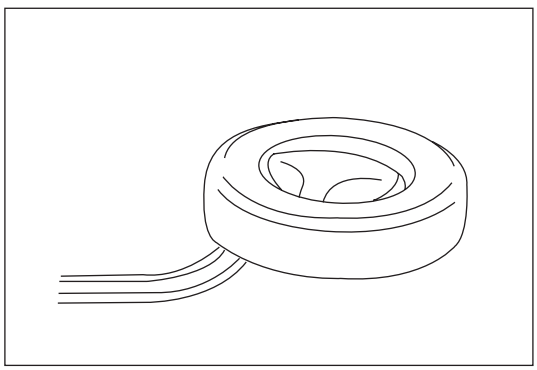


Deployment of Airbag

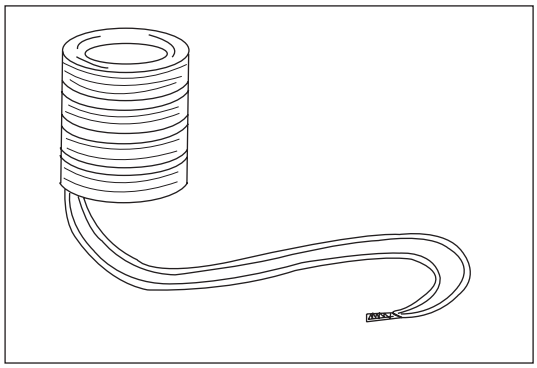
1. **Park the car at the level place.**
2. **Disconnect the positive terminal and the negative terminal of the battery. Remove the battery from the car.**
   Note:
   The operator should avoid wearing clothing subject to frictional electricity.
   After disconnecting the positive terminal and the negative terminal of the battery, wait for 90s before operating.
3. **Remove the airbag module according to the correct flow required by removing the driver-side airbag.**



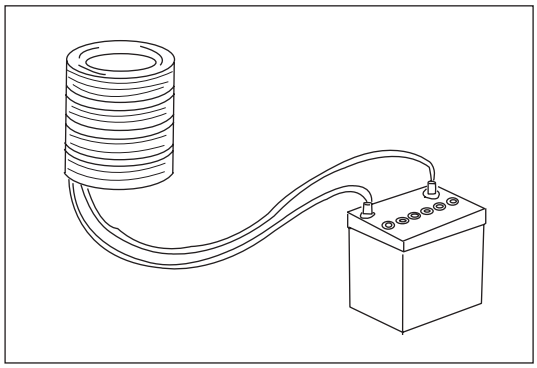
4. **Remove the No. 2 plug-in from the clock spring to make a deployment harness.**
   Prepare two deployment harnesses of 6m above and connect the other end one another(short circuit).
   Note:
   Keep a distance of more than 6m away from any barrier or person when deploying the airbag. Deploy the airbag at a wide and flat place. Avoid any strong wind when deploying the airbag module outdoor. Light a fire against



5. **Insert the airbag deployment harness into the airbag detonating device.**
6. **Install the unused bolts in place in respect of the inside bolts of the driver-side airbag module. Tie the wheel hub with thick wires used to fix the wheel hub.**
7. **Connect the deployment harness connected with the driver-side airbag module with the lower of the old tire with wheel hub. Use the wires connected to the bolts and other to fix the driver-side airbag module upward (see the left figure).**



8. **Place three old tires without wheel hub onto the tire which is used to fix the driver-side airbag module (see the left figure).**



9. **Keep the deployment site away from the car as far as possible. Cut off the connection of the deployment harness of the driver-side airbag module. Connect the deployment harness with the both terminals of the battery removed from the car to make the driver-side airbag module deploy (see the left figure).**
   Note:
   It is necessary to confirm that there is no one near the driver-side airbag module before deploying. After deploying the driver-side airbag module, the gas generator is still in a high temperature state. It is necessary to leave the gas generator there for 30min to cool off before re-using it.
10. **Repeal the deployed driver-side airbag module as required.**

BODY

ENGINE HOOD

ENGINE HOOD....2
ENGINE HOOD LOCK CABLE....5

DOORS

DOOR HINGES....6
DOOR CHECKS....7
FRONT DOOR....8
REAR DOOR....16
LUGGAGE-COMPARTMENT LID....23

BUMPER

FRONT BUMPER....27
REAR BUMPER....29

TRIM STRIP

TOP-CAP TRIM STRIP....31

FUEL TANK FILLER

FUEL TANK FILLER CAP CABLE....32

ENGINE HOOD

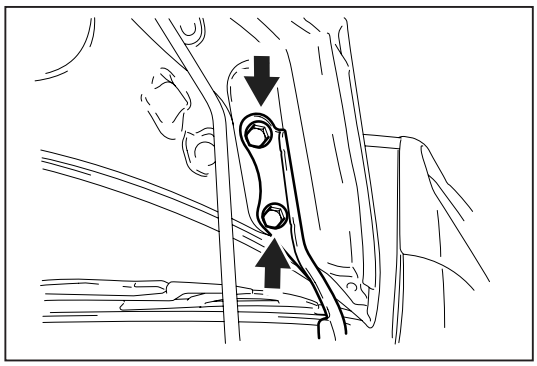
ENGINE HOOD

Removal

Note:

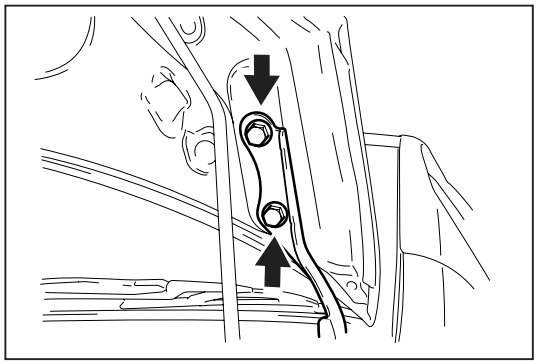
Put a pad on the fender and the front windshield glass respectively so as to avoid damage to paint, glass and molded parts during removal and installation of the engine hood.

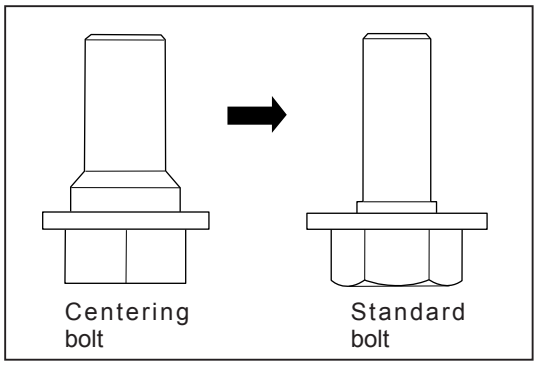
1. **Lift and support the engine hood.**
2. **Mark locations of the hinges on the engine hood for positioning at reinstallation.**
3. **Remove the bolts securing the engine hood to the 2 hinges.**
4. **With the help of a technician, remove the engine hood from the hinges**



Installation

1. **With the help of a technician, align the engine hood with the marks made at removal.**
   Note:
   If different metals contact directly with each other, corrosion will be aggravated. Be sure to use the right fasteners so as to avoid early corrosion.
2. **Install the bolts securing the engine hood to the hinges.**
   Tightening torque: 27 N•m
3. **Check the engine hood for accurate positioning.**

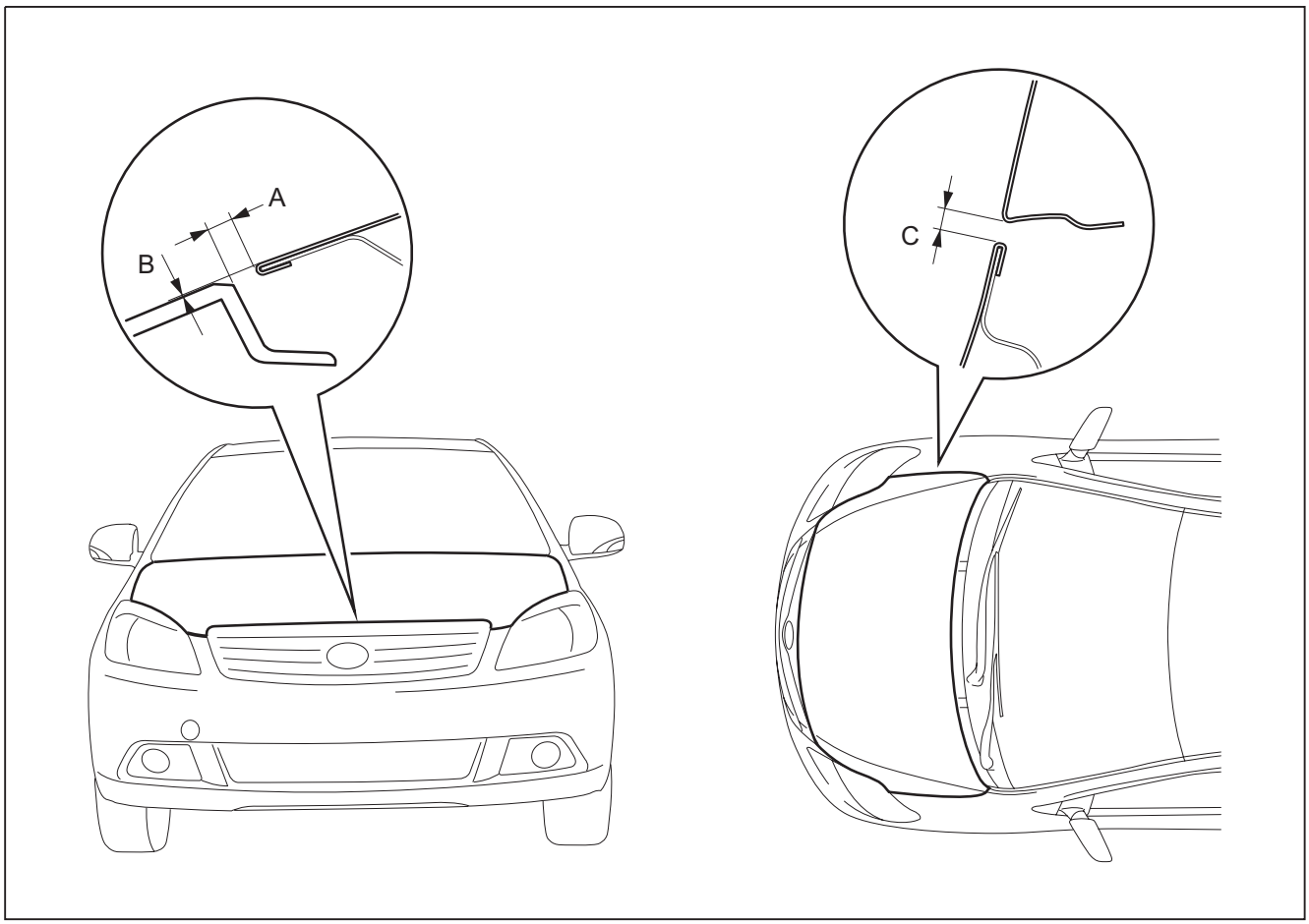




Adjustment

Tip:

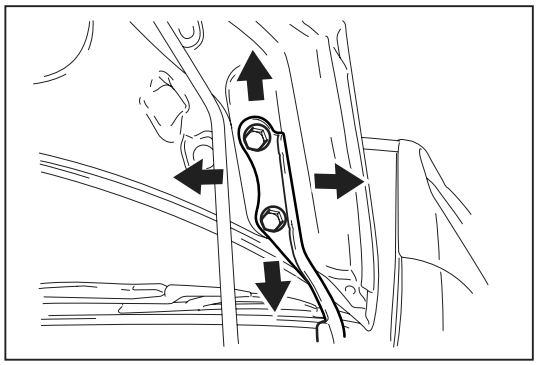
The centering bolts are used to install the hood hinges and the hood lock. When Installation centering bolts, you can not adjust the engine hood and the hood lock. When adjusting, you can replace the centering bolts with standard bolts (with washer).



Standard:

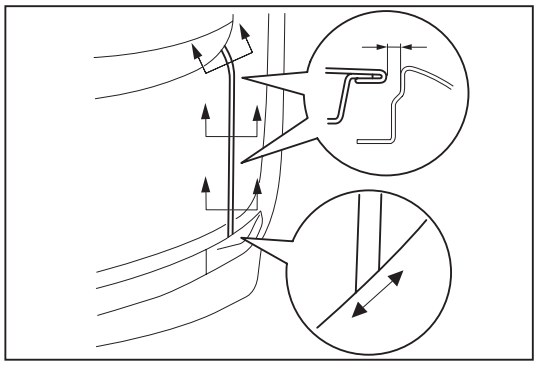
Part	Measured value mm
A	5.5±1.5 mm
B	0±1 mm
C	4±1.5 mm

1. Checking hood gap



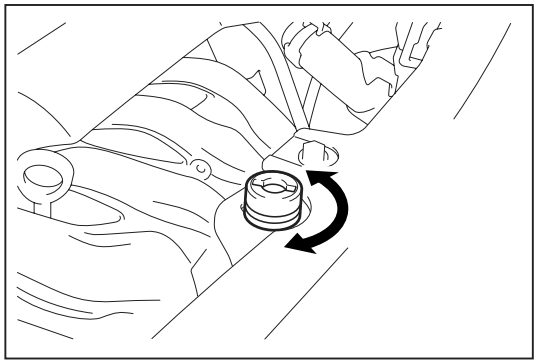
2. Vertical/horizontal gap adjustment

(a) Loosen the 4 hinge bolts on both sides of the engine hood.



(b) Adjust the gap by moving the engine hood until it is within the standard range.
Standard range (A): 4.0 mm

(c) After the adjustment, tighten the engine hood side hinge bolts.
Torque: 23 N•m



3. Front-end height adjustment

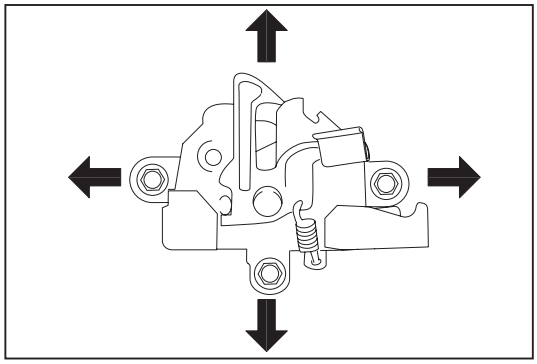
(a) Turn the adjusting block to align the engine hold with the fender.

Tip:

Move the adjusting block up and down by turning it.

(b) Adjust the hood lock.

(c) Remove the clips and the grille.

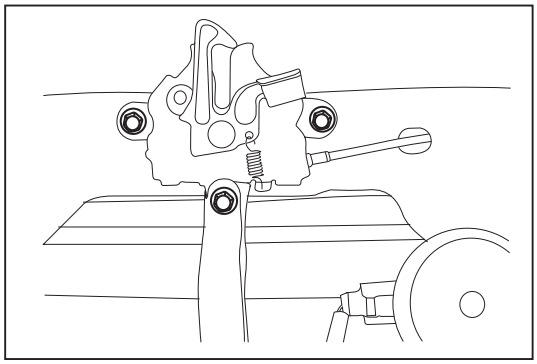


(d) Adjust the position of the hood lock so that the latch can enter smoothly.

(e) After the adjustment, tighten the hood lock bolt.
Torque: 7.0 N•m

ENGINE HOOD LOCK CABLE

Removal



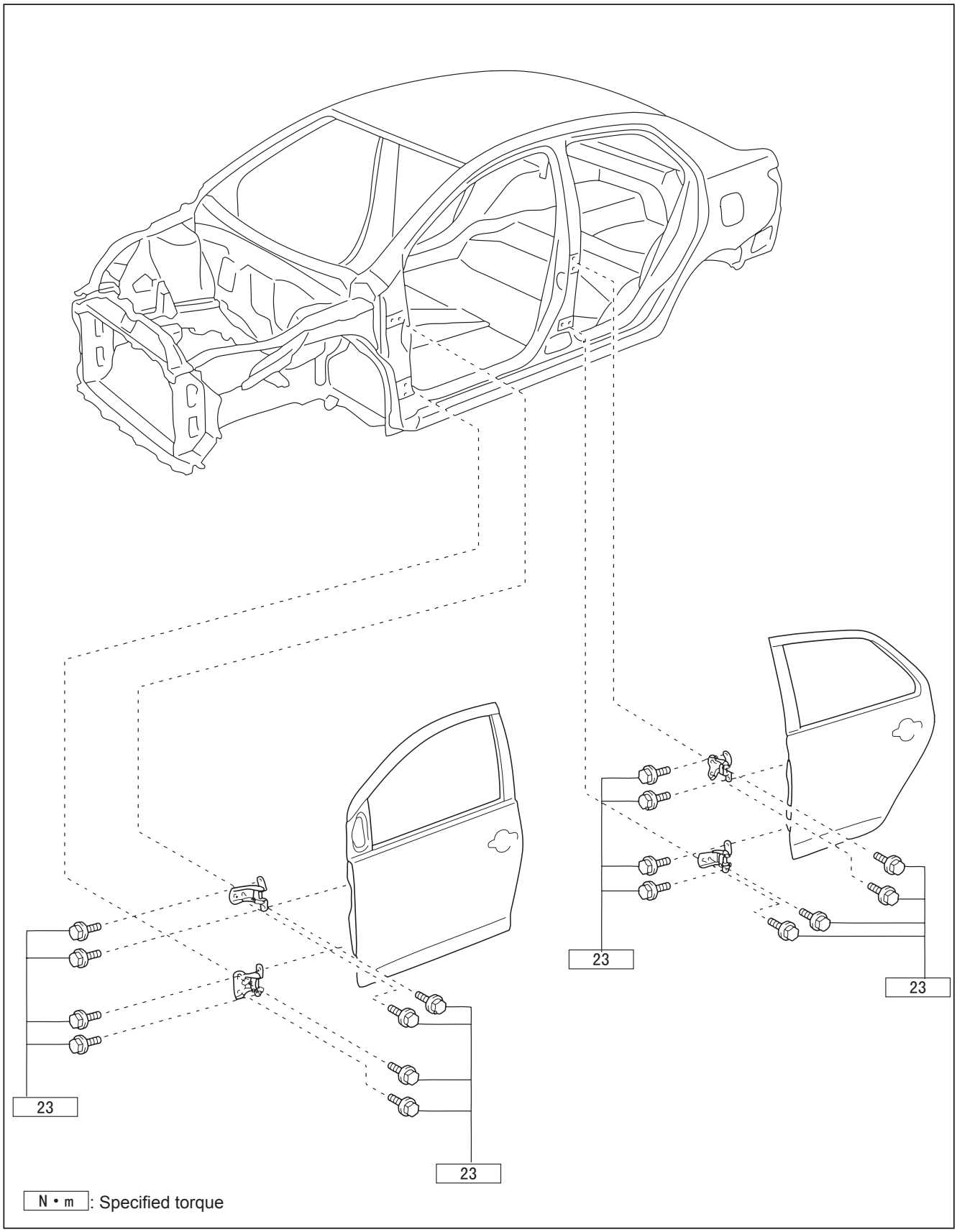
1. **Remove hood lock cable.**
   (a) Open the engine hood.
   (b) Remove the hood lock lever from the instrument panel.
   (c) Remove the cable from the hood lock lever.
   (d) Remove the bolts and the hood latch mechanism assembly.
   (e) Remove the cable from the hood latch mechanism assembly.
2. **Install hood lock cable.**
   Tip:
   If different metals contact directly with each other, corrosion will be aggravated. Be sure to use the right fasteners so as to avoid early corrosion.
   (a) Install the cable to the hood latch mechanism assembly.
   (b) Install the hood latch mechanism assembly using bolts.
   (c) Install the cable to the hood lock lever.
   (d) Install the hood lock lever to the instrument panel.
   (e) Shut down the engine.

DOORS

DOOR HINGES

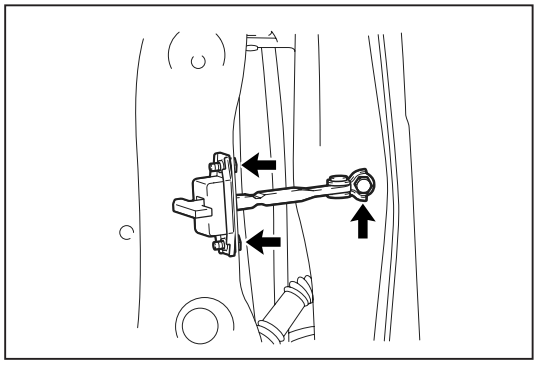
Removal

With the help of a technician, remove the bolts and hinges from the doors and the body.



DOOR CHECKS

Removal



Tip:

Rear door operations are the same as front door operations.

1. Remove left front door check.

(a) Remove the 3 bolts and the door check.

Tip:

Remove the door check through the manhole.

2. Install left front door check.

(a) Apply general-purpose grease to the sliding area of the door check.

(b) Using 2 bolts, install the door check onto the door panel.

Torque: 5.5 N•m

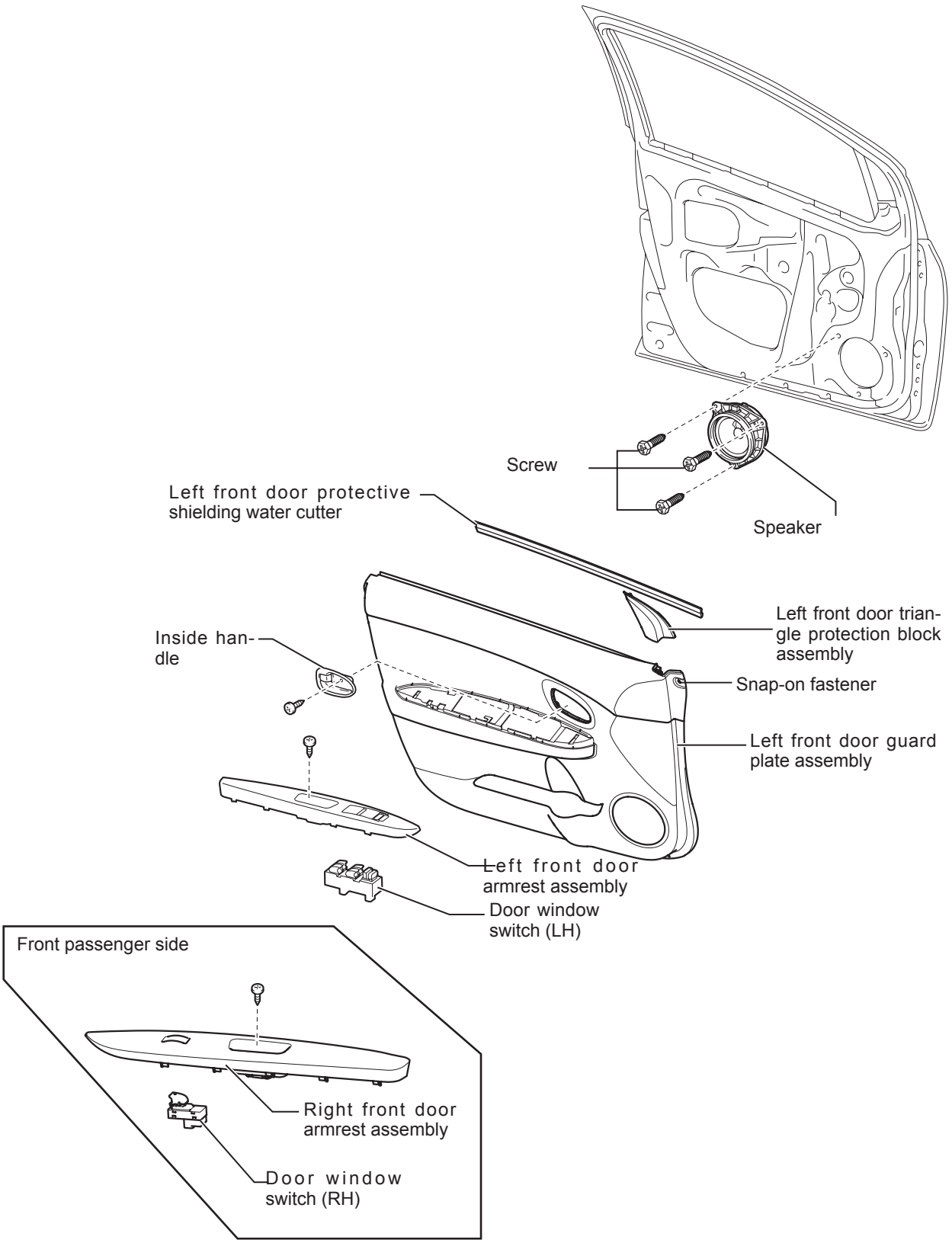
(c) Apply adhesive to threads of each bolt.

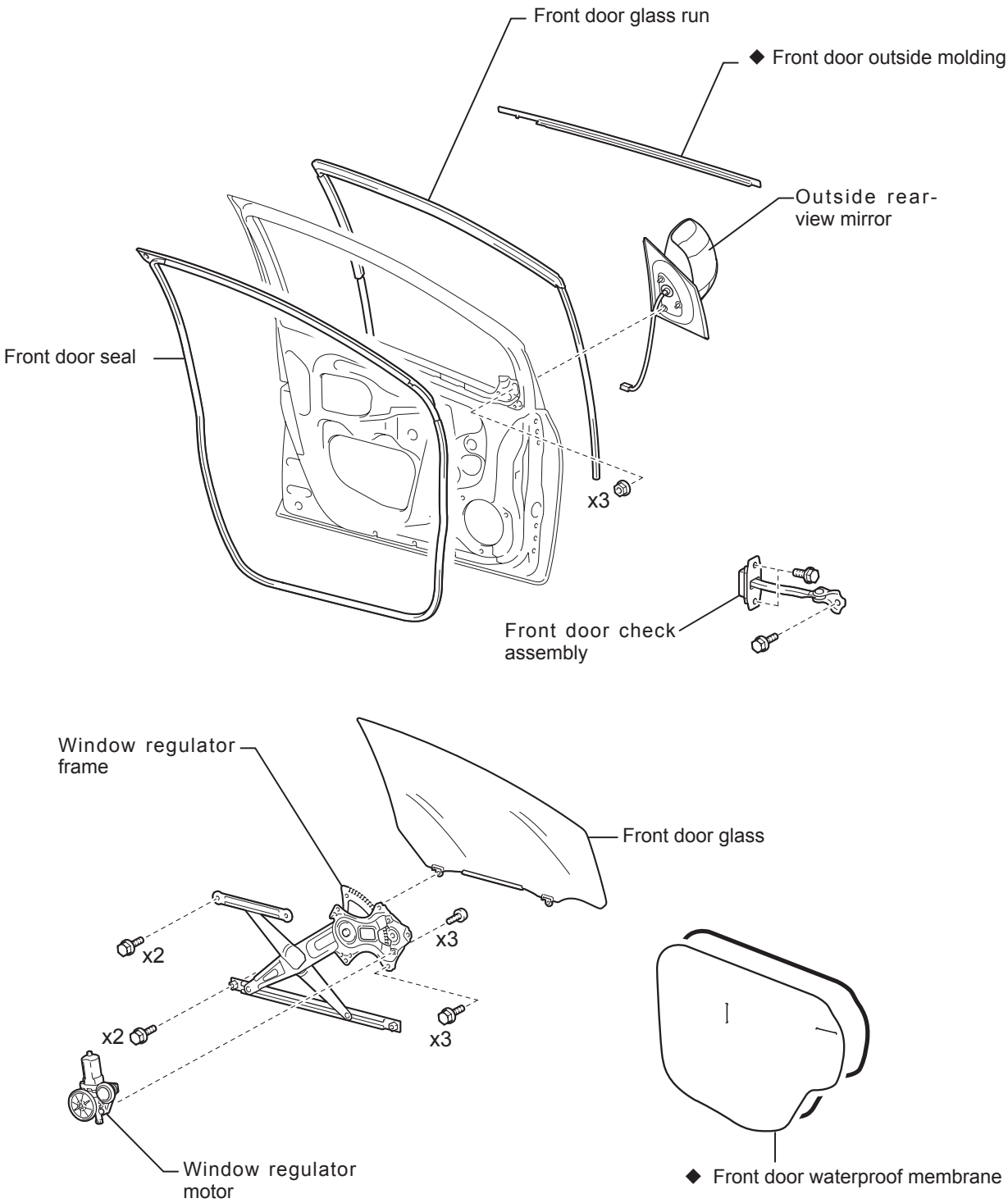
(d) Using the bolts, install the door check onto the body panel.

Torque: 23 N•m

FRONT DOOR

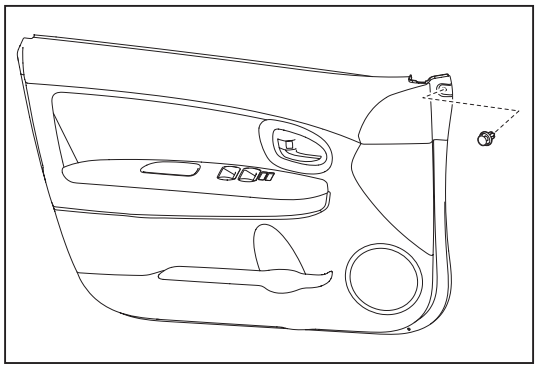
Structure Diagram





N • m : Specified torque

◆ Non-reusable component



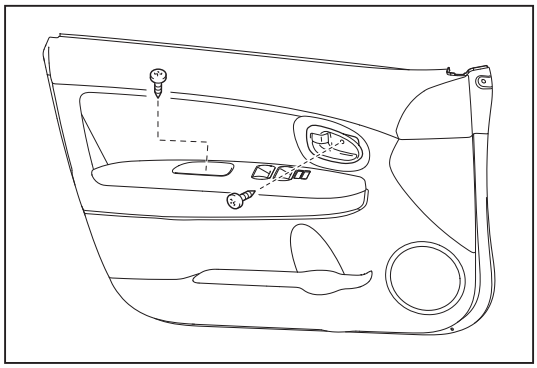
Front door shield

Tip:

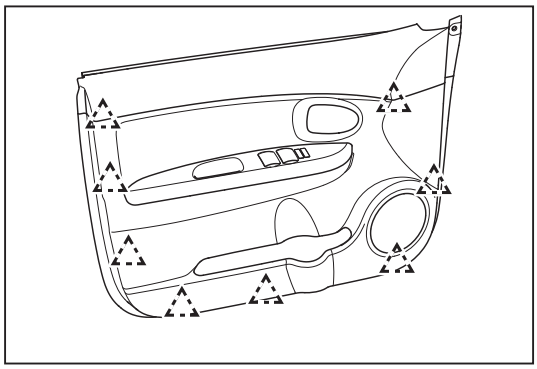
The methods for removal of left front and right front door shields are the same.

Removal

1. **Remove the snap-on fastener on the front end of the door guard board**



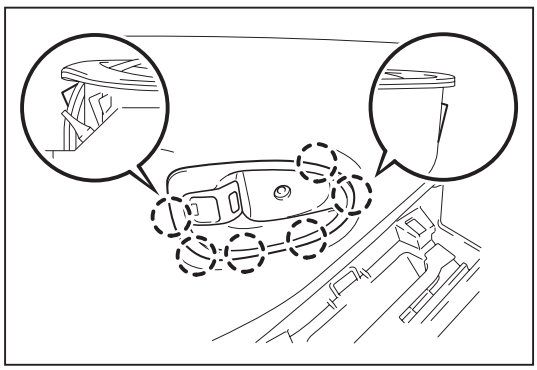
2. **Remove the screw from the armrest and that from the inside handle.**



3. **Insert a flat head screwdriver into the gap between the door trim and the door to pry the door shield until the 8 clips get loose.**

   Note:

   Before using the screwdriver, be sure to wrap its head with tape.



4. **Remove inside handle from front door inner shield.**
   Loosen the 6 claws and then remove the inside handle.

5. **Unplug the electric switch harness connector, and dismount the front door shield.**

Installation

1. **Install the inside handles and plug the electric switch harness connector.**
2. **Install the door shield onto the door.**
   Note:
   Door shield clips must be aligned with their respective mounting holes.
3. **Installation the armrest screw, the internal handle screw, the front door snap-on fastener on the front end of the door guard board**

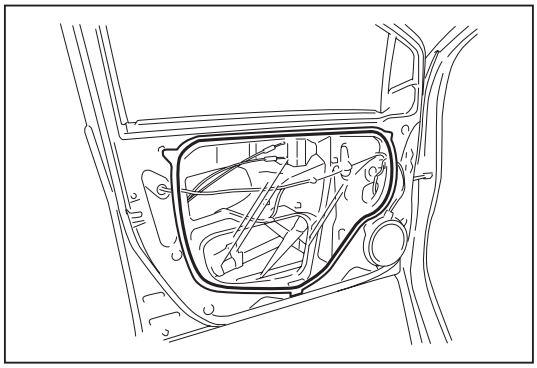
Front door window regulator and glass

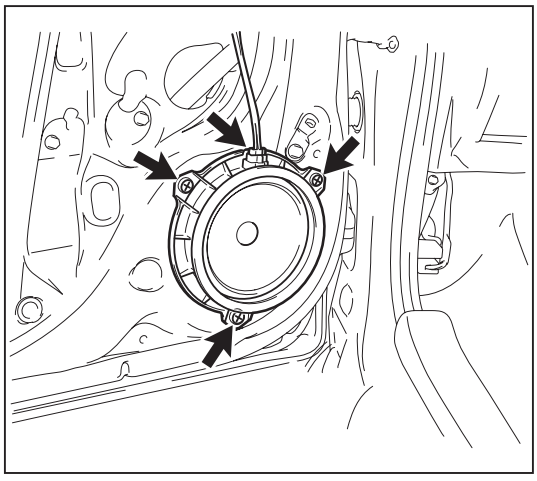
Tip:

The methods for removal of the window regulators at LH and RH sides are the same.

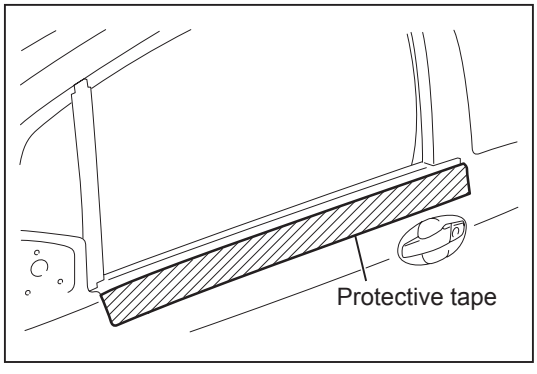
Removal

1. **Remove the front door shield. (Refer to "Removal" of "Front door shield" in this section.)**
2. **Remove the outside rear-view mirror assembly.**
3. **Remove the front door waterproof membrane.**

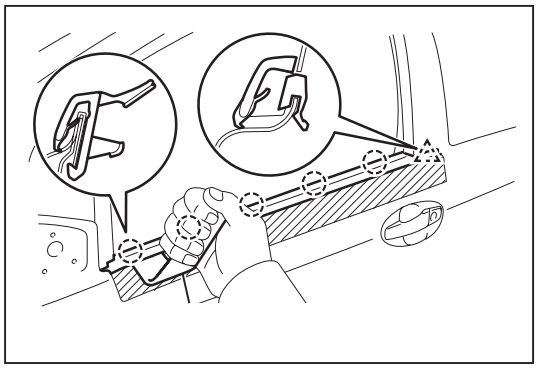




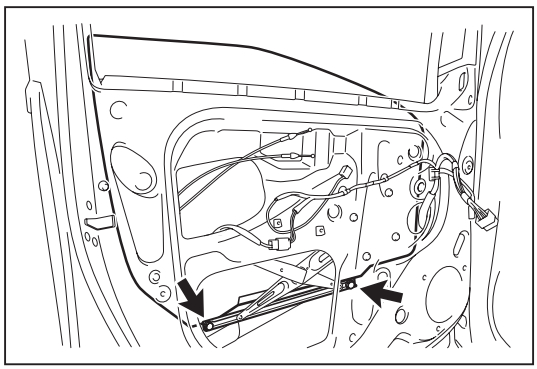
4. **Remove front door speaker.**
   (a) Disconnect the speaker from its harness connector.
   (b) Remove the 3 screws and then dismount the speaker.



5. **Remove the front door outside molding.**
   (a) Protect the area around the front door outside molding with a protecting band.



(b) Use a plastic tool to loosen the 5 claws and the clip and then remove the outside molding.



6. Remove front door glass.

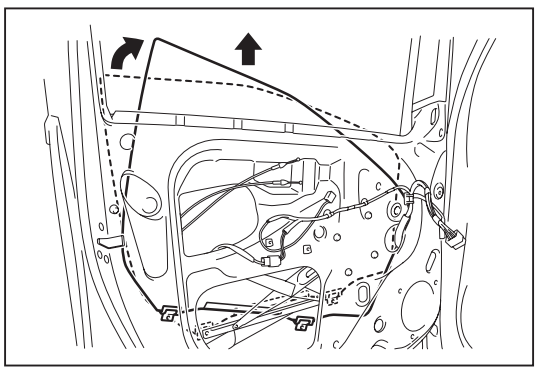
(a) Temporarily install the door window switches (LH and RH).

(b) Adjust the front door glass to such a height that the 2 fixing bolts can be removed through the manhole.

(c) Remove the 2 bolts.

Note:

When removing the bolts, do not damage the glass.

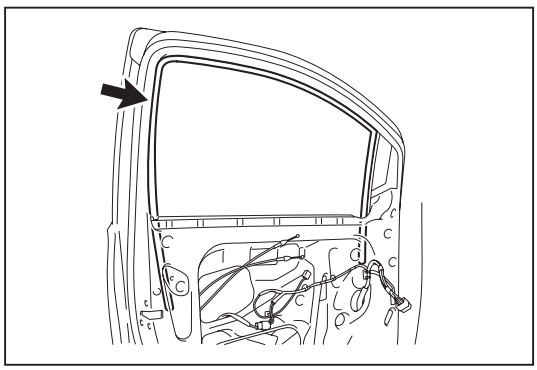


(d) Remove the front door glass in the direction of the arrow in the figure.

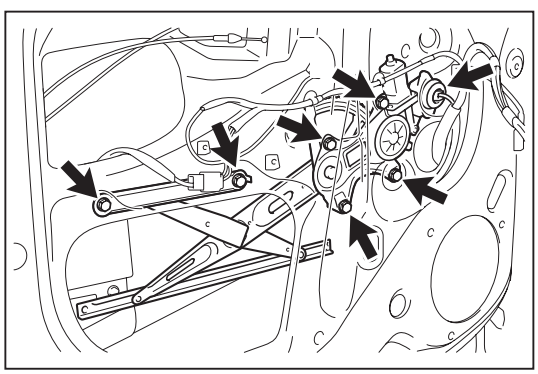
Note:

Do not damage the glass.

(e) Remove the door window switches (LH and RH).



7. Remove the front door glass run.



8. Remove front door window regulator assembly.

(a) Disconnect the window regulator connector.

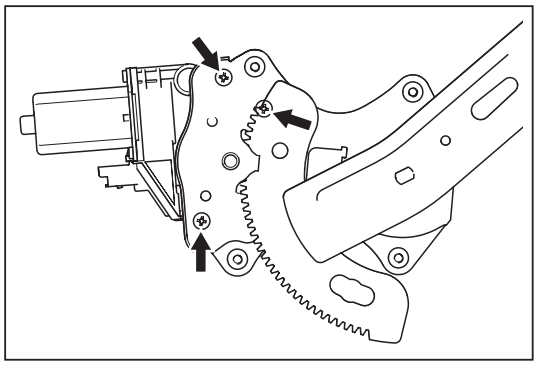
(b) Remove the 6 bolts and then dismount the window regulator assembly.

Note:

When Removal bolts, you must be careful to prevent the window regulator from dropping which will cause damage to the unit.

Tip:

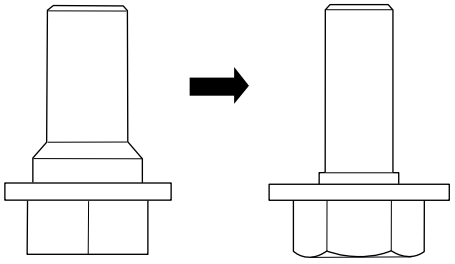
Take out the window regulator through the manhole.



9. Remove window regulator motor.
Using a cross screwdriver, remove the 3 screws and then dismount the motor.

Installation

Install in the reverse order of removal.

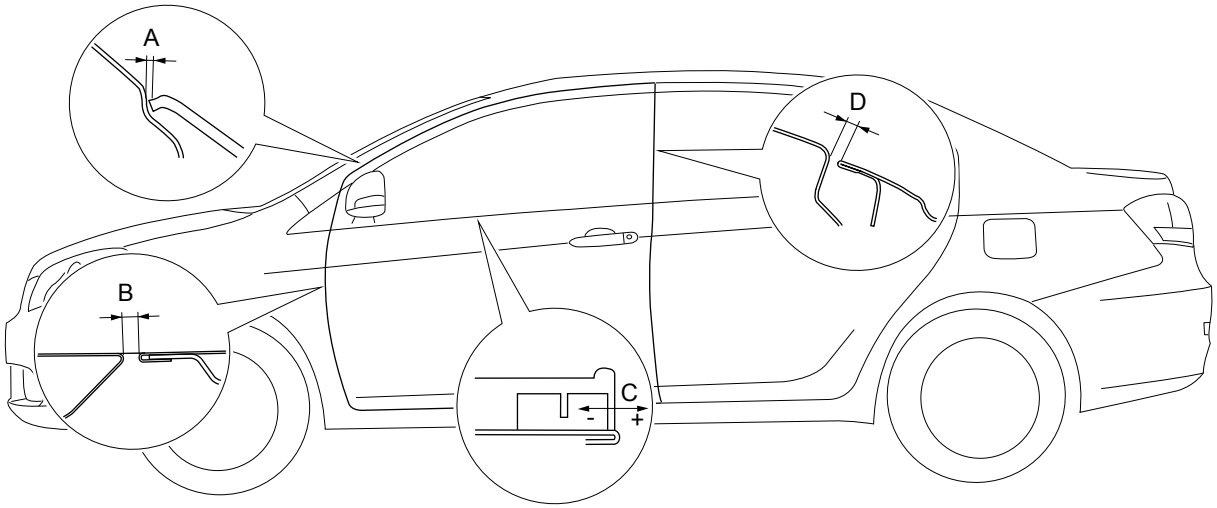


Adjustment

Tip:

The operation procedure for RH side is the same as that for LH side.

The centering bolts are used to install the door hinges onto the body and the doors. When Installation centering bolts, you can not adjust any door. When adjusting, you can replace the centering bolts with standard bolts (with washer).

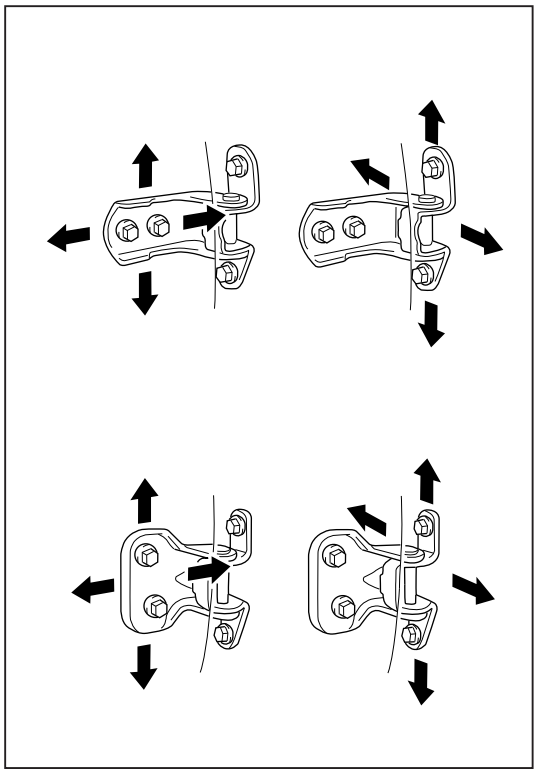


Standard:

Part	Measured value mm
A	0.65 mm
B	3.8 mm
C	-0.85 mm
D	4.3 mm

1. **Checking left front door panel subassembly**

   Check that the clearances are within their respective standard ranges.

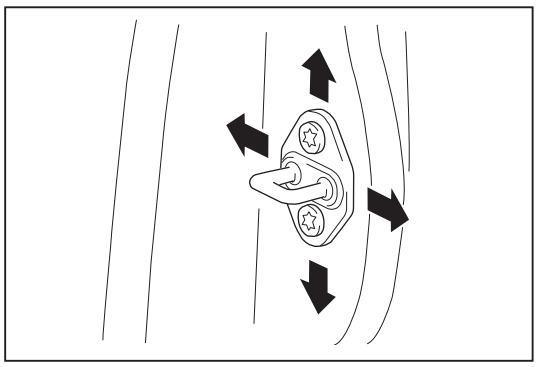


2. Adjusting left front door panel subassembly

(a) Using the SST, loosen the upper and lower hinge bolts on the door side in order to adjust the door in horizontal and vertical directions.

(b) After the adjustment, tighten the door side hinge bolts.

Torque: 23 N•m



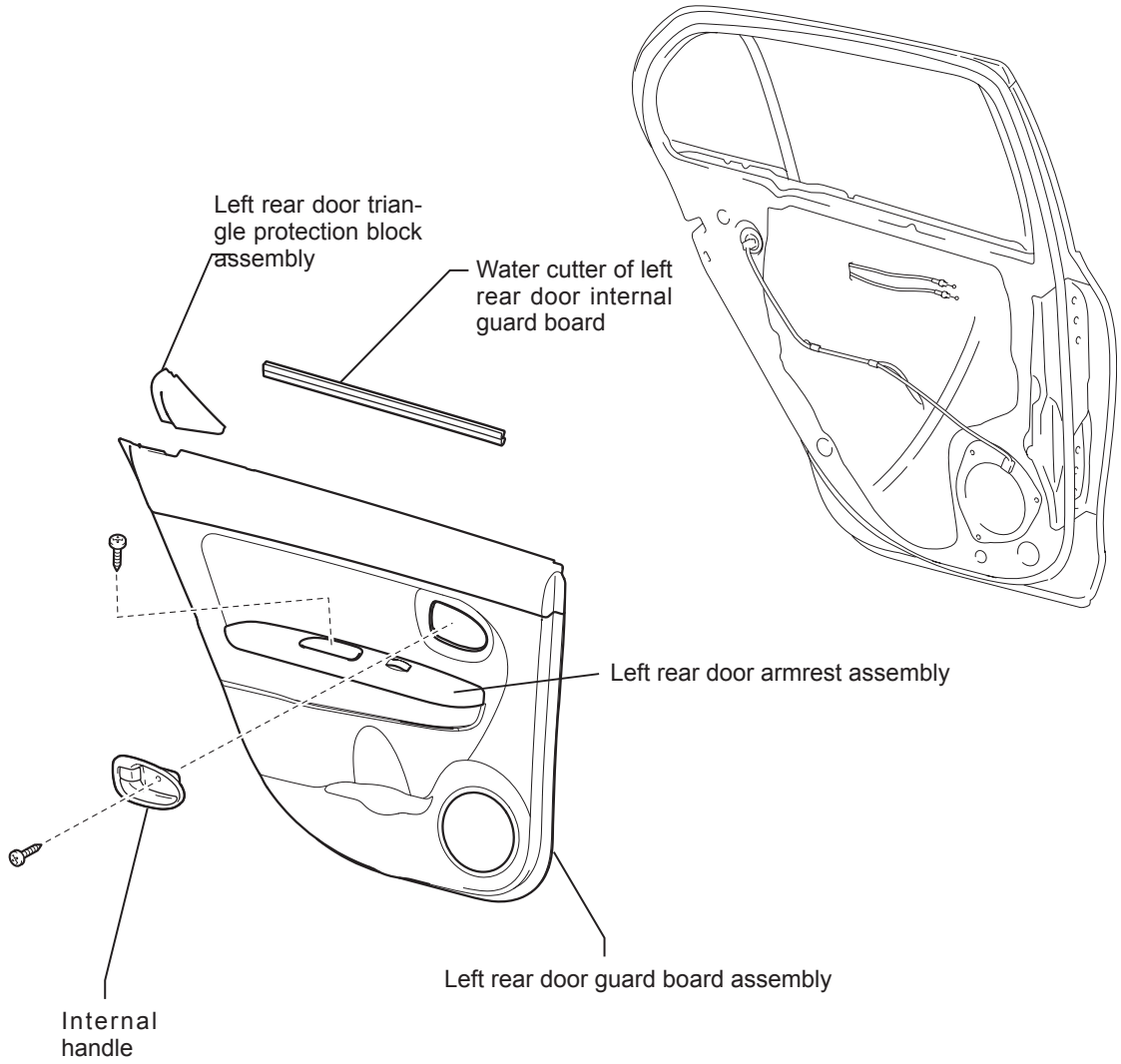
(c) Slightly loosen the mounting screws of the latch and then tap on the latter with a plastic hammer in order to adjust its position.

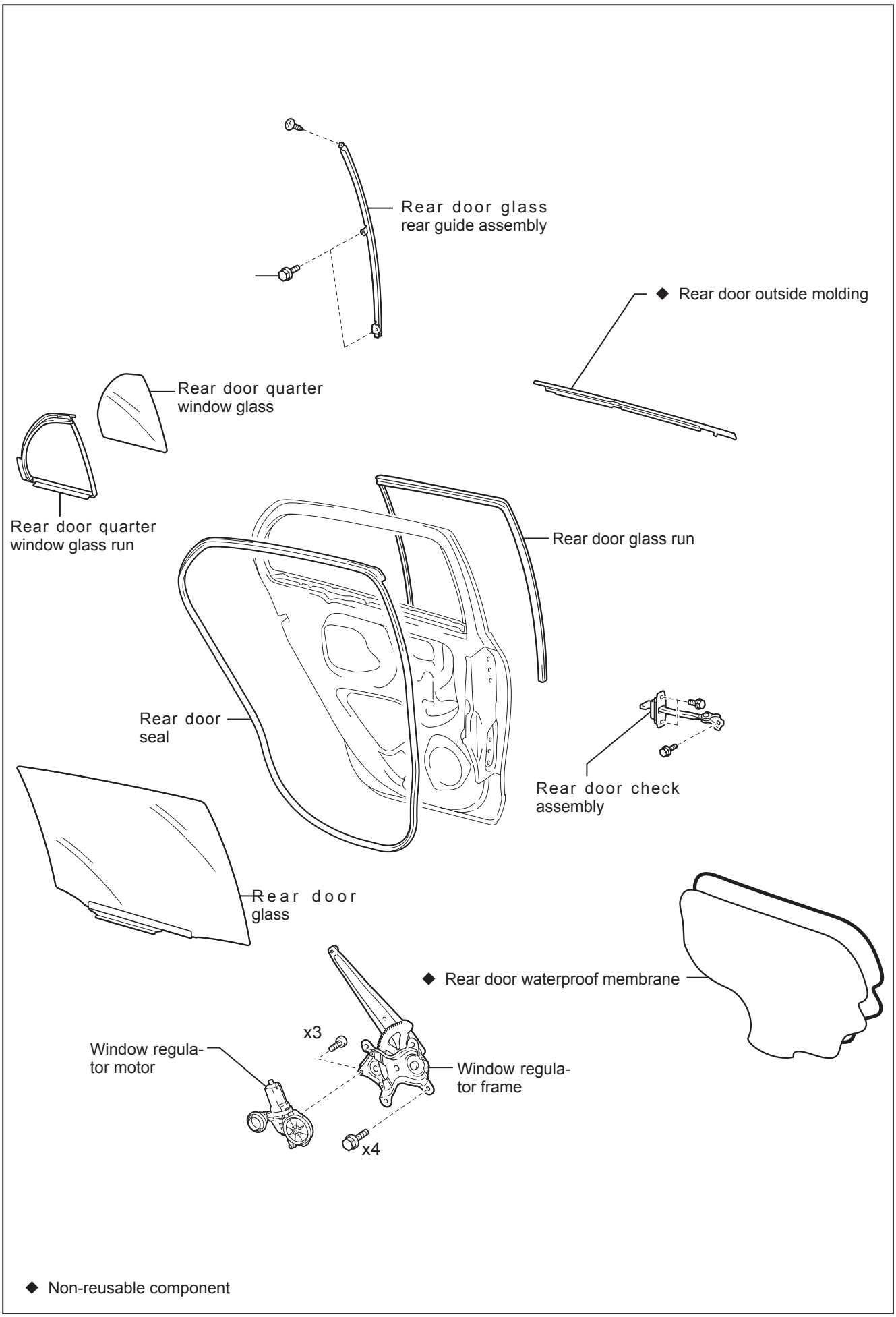
(d) After the adjustment, tighten the mounting screws of the latch.

Torque: 23 N•m

REAR DOOR

Structure Diagram





◆ Non-reusable component

Rear Door Shield

Removal

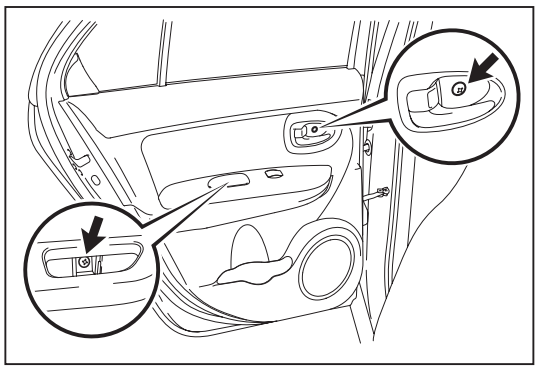
Tip:

Remove the shields (LH and RH) in the same way.

The method for removal of rear door left shied is described below.

1. **Disconnect the battery negative cable.**
2. **Remove rear door shield.**

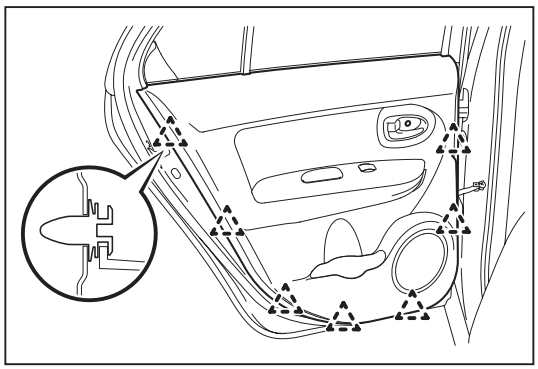
(a) Remove the screw from the armrest and that from the inside handle.



(b) Insert a flat-tip screwdriver into the gap between the door guard board and the sheet-metal, prying the door guard board to loosen the 7 Clips.

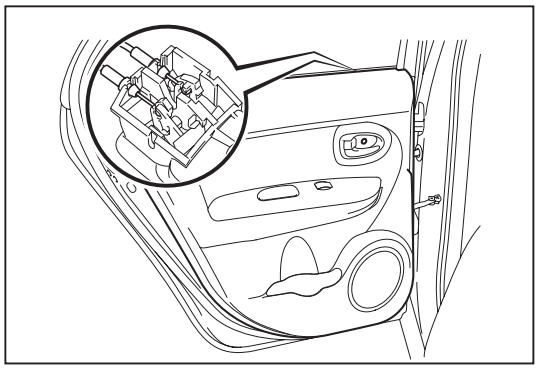
Note:

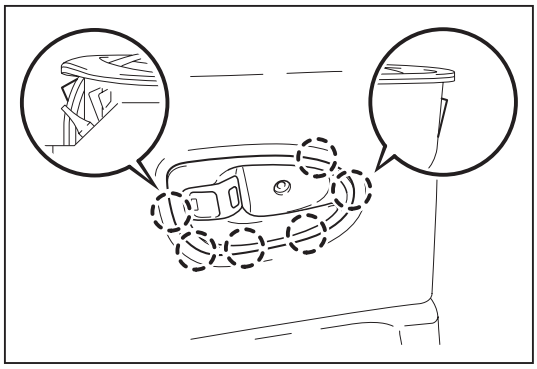
Before using the screwdriver, be sure to wrap its head with tape.



(c) Disconnect the connector.

(d) Disconnect the inside handles from its cable, and then dismount the rear door shield.





3. **Remove inside handle.**
   Disengage the 6 claws, and then remove the inside handle from the rear door shield.

Installation

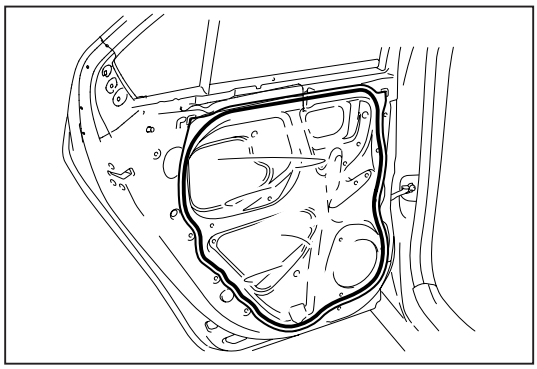
Install in the reverse order of removal.

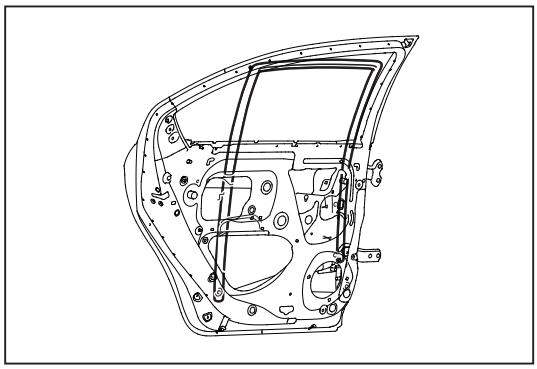
Rear door window regulator and glass

Removal

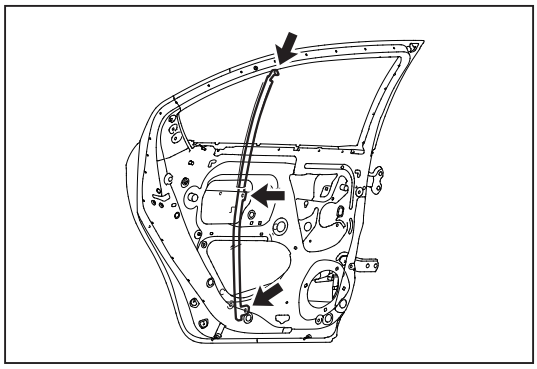
Tip:
Remove the window regulators (LH and RH) in the same way.
The method for removal of rear door left window regulator is described below.

1. **Disconnect the battery negative cable.**
2. **Remove the left rear door shield. (Refer to "Removal" of "Rear door shield" in this section.)**
3. **Remove the rear door waterproof membrane.**

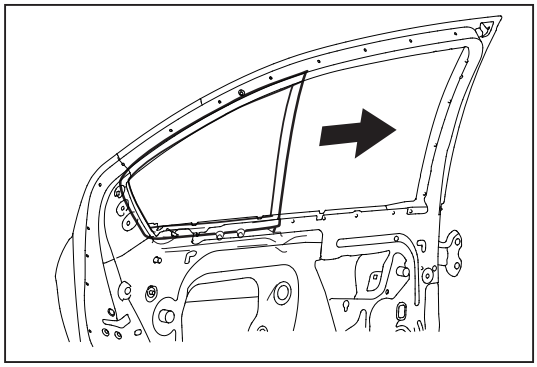




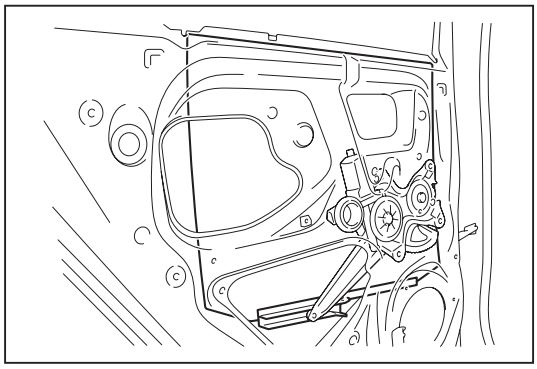
4. **Remove the rear door glass run.**



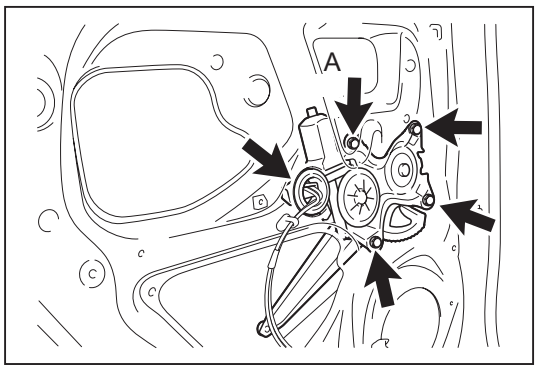
5. Remove rear door glass rear guide assembly.
Remove the 2 bolts and the screw, and then dismount the rear door glass rear guide assembly.



6. Remove rear door quarter window glass.
(a) Draw out the quarter window glass run in the direction of the arrow in the figure.
(b) Remove the quarter window glass from the quarter window glass run.



7. Remove rear door glass.
Separate the rear door glass from the window regulator, and then take out the rear door glass.



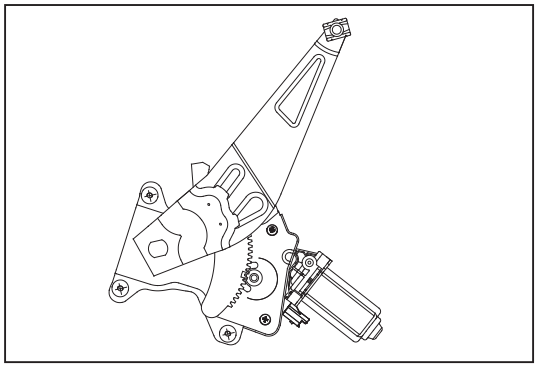
8. Remove rear door window regulator assembly.
(a) Disconnect the connector.
(b) Loosen the bolt at “A”.
(c) Remove the 3 bolts and then dismount the rear door window regulator assembly.

Note:

When removing bolts, hold the window regulator with your hands in order to prevent it from dropping which will cause damage to the unit.

Tip:

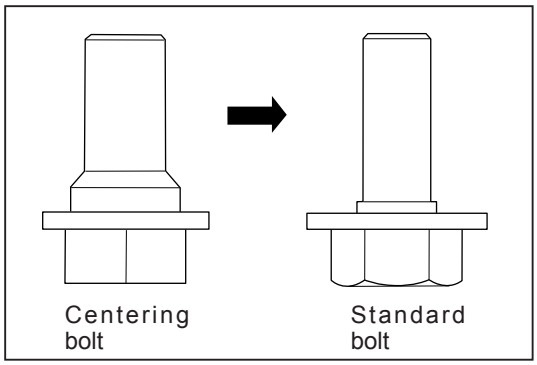
Take out the window regulator assembly through the manhole.



9. Remove the window regulator motor.

Installation

Install in the reverse order of removal.

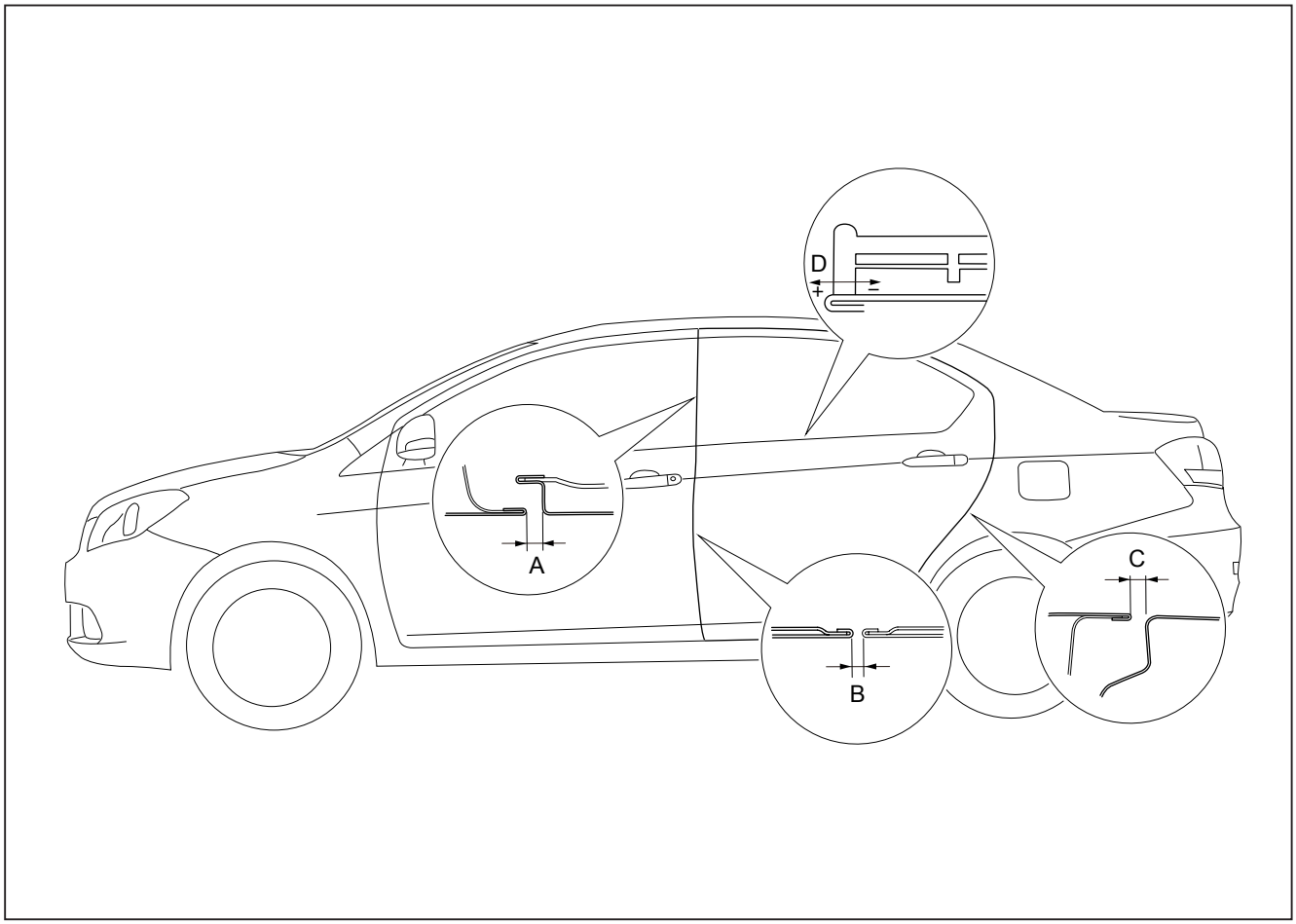


Adjustment

Tip:

The operation procedure for RH side is the same as that for LH side.

Use the centering bolts to secure the door hinges to the body and the doors. When Installation centering bolts, you can not adjust any door. When adjusting, you can replace the centering bolts with standard bolts (with washer).

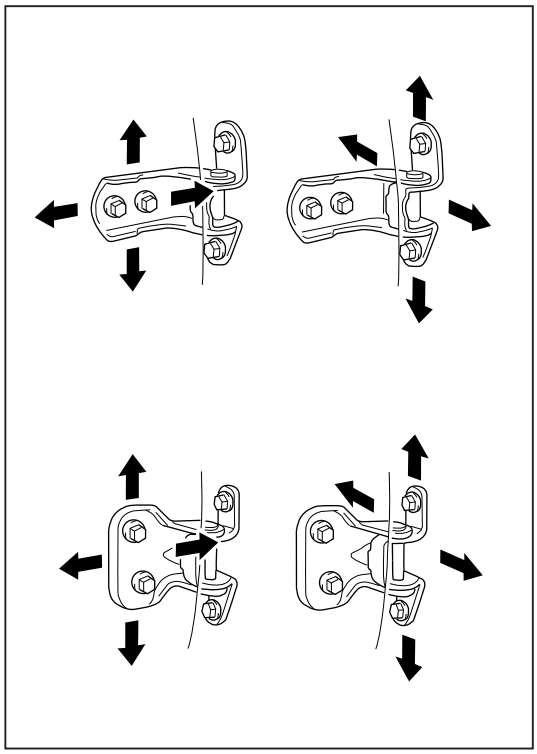


Standard:

Part	Measured value mm
A	3.8 mm
B	3.8 mm
C	3.8 mm
D	-0.85 mm

1. **Checking tailgate panel subassembly**

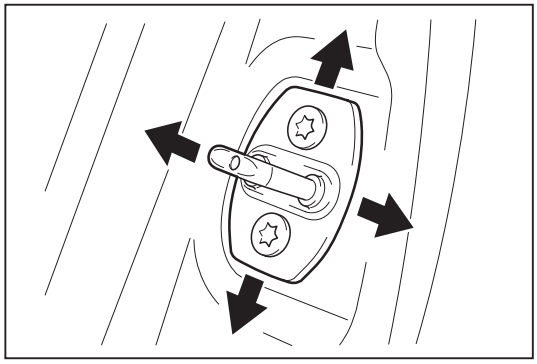
   Check that the clearances are within their respective standard ranges.



2. Adjusting left rear door panel subassembly

(a) Using the SST, loosen the upper and lower hinge bolts on the door side in order to adjust the door in horizontal and vertical directions.

(b) After the adjustment, tighten the door side hinge bolts.
Torque: 23 N•m

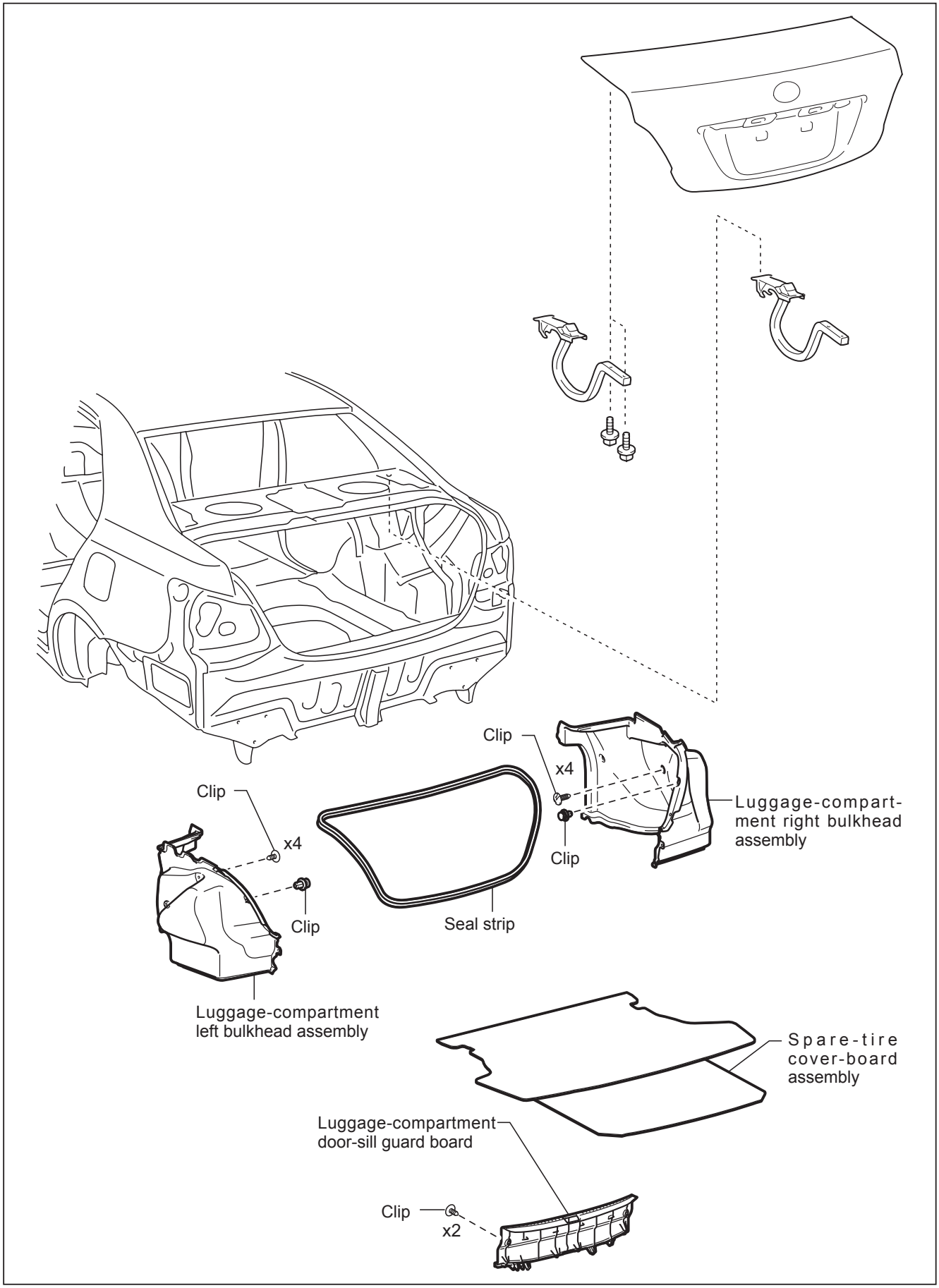


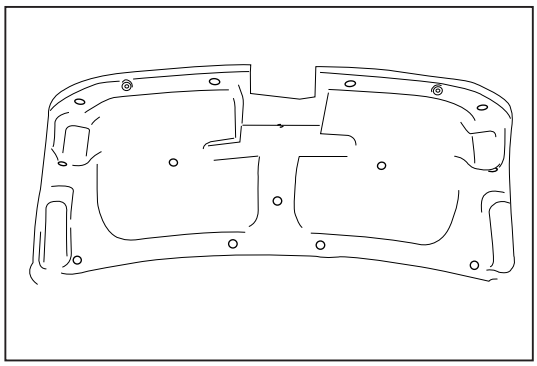
(c) Slightly loosen the mounting screws of the latch and then tap on the latter with a plastic hammer in order to adjust its position.

(d) After the adjustment, tighten the mounting screws of the latch.
Torque: 23 N•m

LUGGAGE-COMPARTMENT LID

Structure Diagram





Luggage-compartment Lid Cable

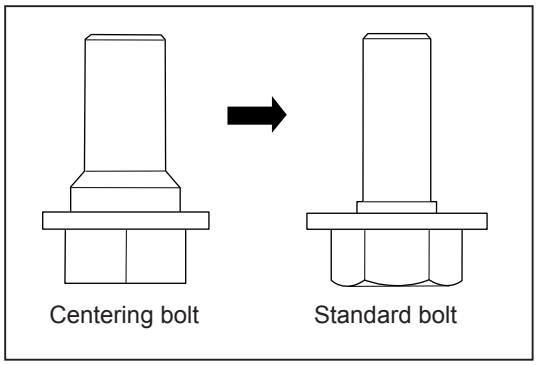
Removal

1. Opening the luggage-compartment lid
2. Remove the external trim board of the luggage-compartment
3. Dismantling the bulkhead body of the luggage-compartment lid
4. Dismantling the bulkhead of the luggage-compartment lid
5. Remove the mounting Clips of the luggage-compartment lid lock cable from the body
6. Remove the luggage-compartment lid cable from the buckle clamp of the fuel-filler
7. Remove the luggage-compartment cable from the body

Luggage-compartment Lid Lock

Removal

1. Opening the luggage-compartment lid
2. Remove the external trim board of the luggage-compartment lid
3. Dismantling the bulkhead body of the luggage-compartment lid
4. Pulling out the plug-ins of the luggage-compartment lock
5. Opening the plastic housing of the luggage-compartment lock
6. Remove the two screws of the luggage-compartment
7. Remove the luggage-compartment lock

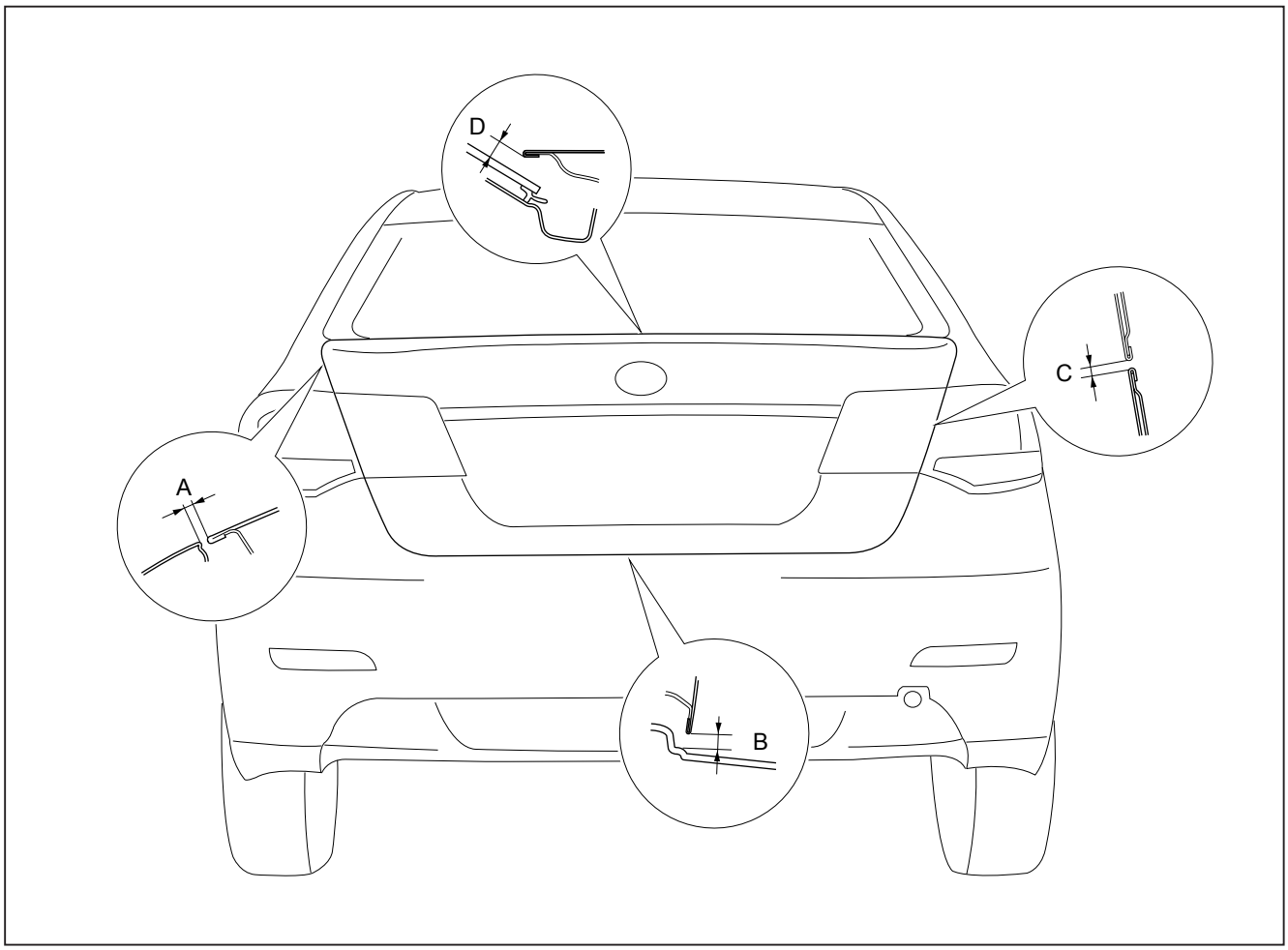


Adjustment

Tip:

The operation procedure of right-side is the same as that of the left-side.

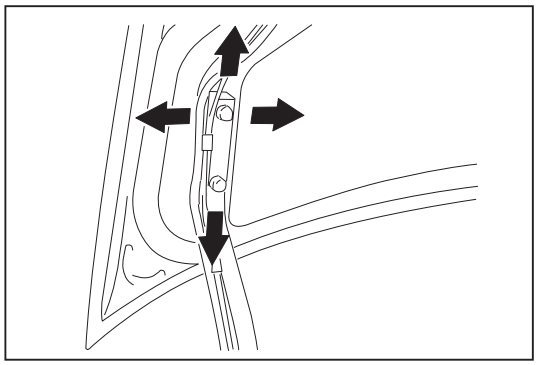
Use the centering bolt to fix the door hinge onto the body and door. When Installation the centering bolt, do not adjust the door. When adjusting the door, use the standard bolt(with washer) to replace the centering bolt.



Standard:

Part	Measured value
A	3.8 mm
B	7.3 mm
C	1.15 mm
D	9.15 mm

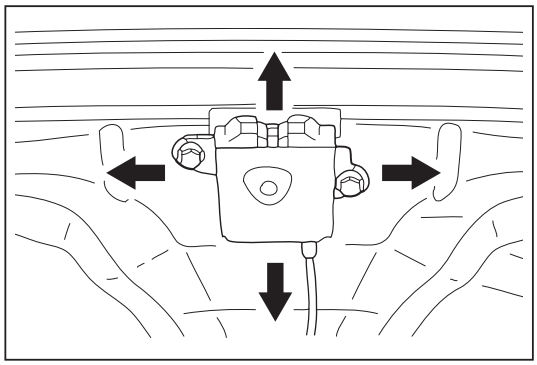
1. **Checking the luggage-compartment lid subassembly**
   Check and confirm the gap is within the range of standard value.



2. Adjusting the luggage-compartment lid subassembly

(a) Loosening the side hinge bolt of the luggage compartment.

(b) As shown in the figure, adjust the gap to ensure it to be within the standard value.



(c) Adjust the door position to enable the door lock to enter smoothly.

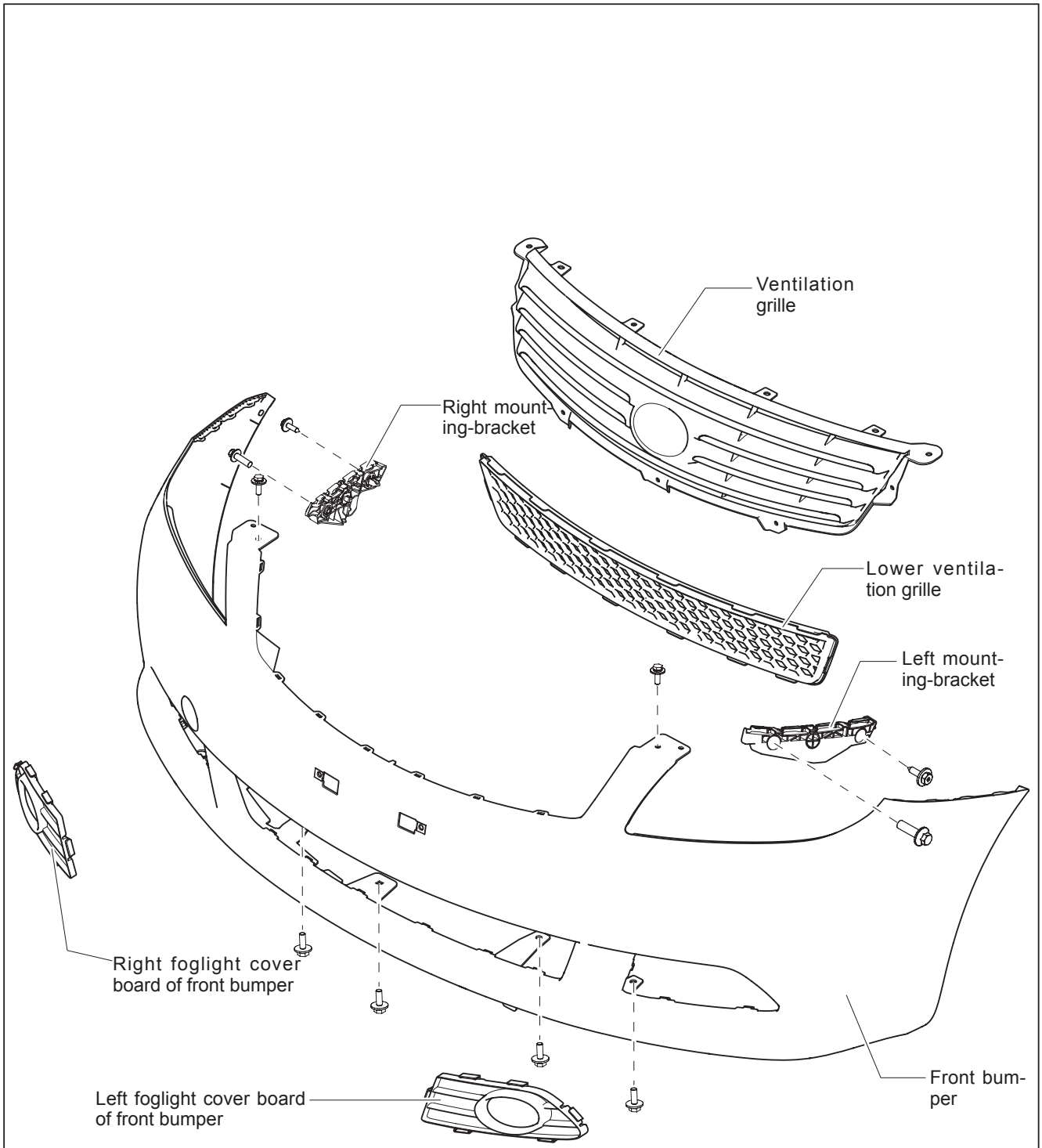
(d) After adjusting, tighten the side hinge bolt of the door.

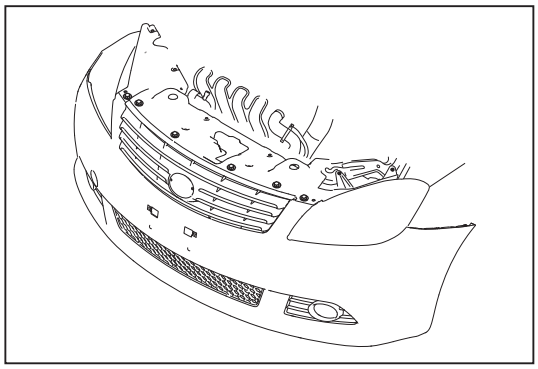
Torque:23 N•m

BUMPER

FRONT BUMPER

Structure Diagram



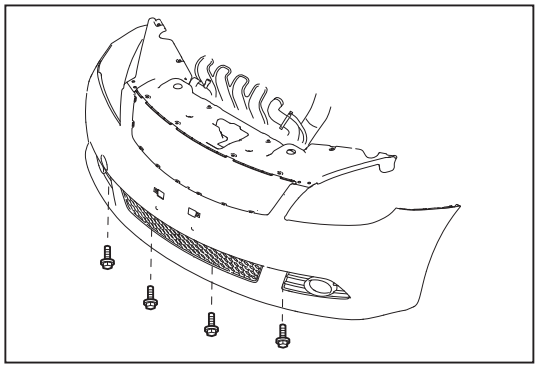


Removal

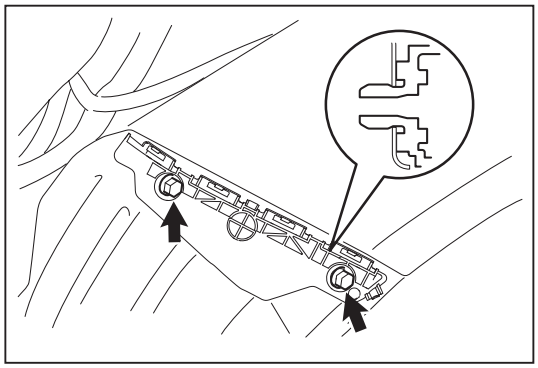
Tip:

the Installation order is reverse to the removing order.

1. **Remove the four snap-on fasteners used to fix the ventilation grille and the body**
2. **Remove the two fixed bolts from the upper bumper and the body**



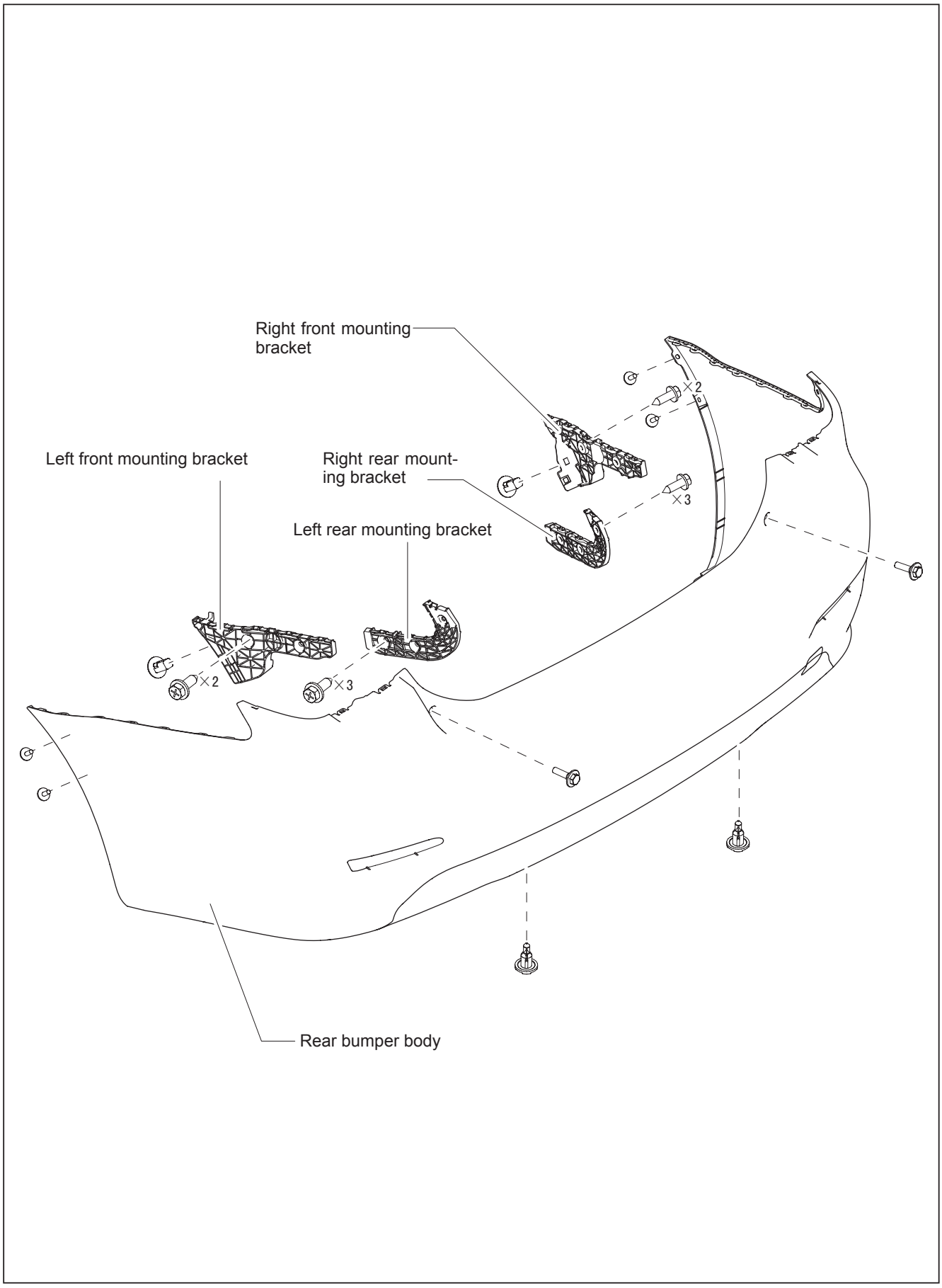
3. **Remove the three fixed bolts from the lower bumper and the body**
4. **Remove the seven fixed screws between the front bumper and the deflecting plate and the splash-proof pad.**
5. **Disconnecting the foglight harness**
6. **Remove the front bumper**

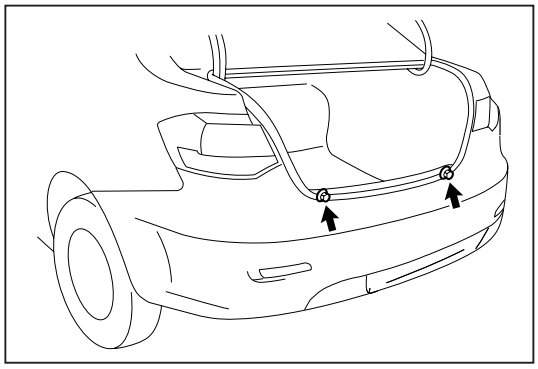


7. **Removethe fixed screws between the front bumper and the left mounting bracket**
8. **Remove the fixed screws between the front bumper and the right mounting bracket**

REAR BUMPER

Structure Diagram

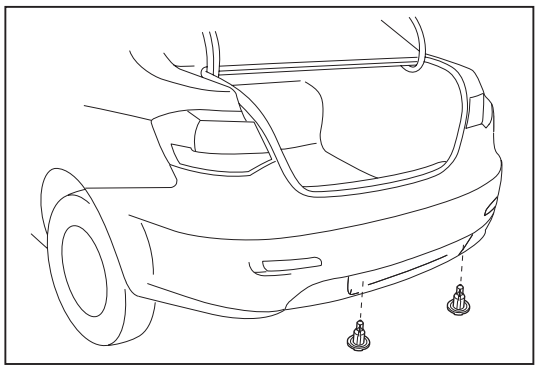




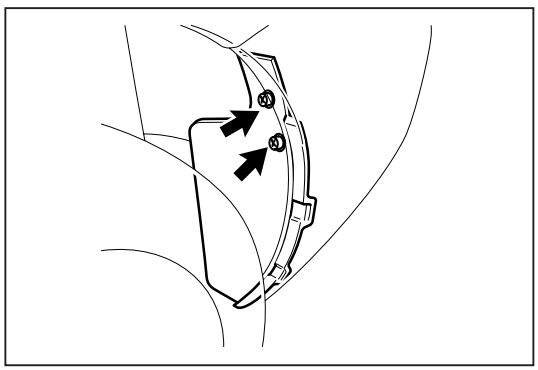
Removal

Tip: the Installation order is reverse to the removing order.

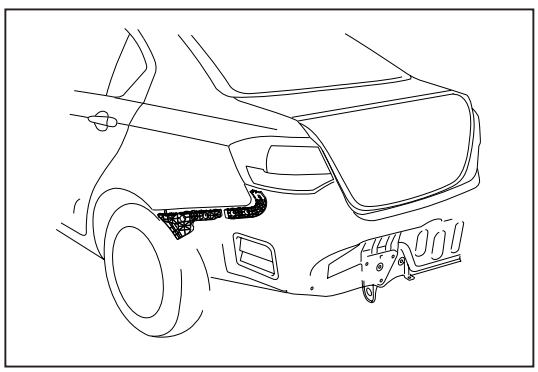
1. **Remove the 2 fixed bolts between the upper rear bumper and the body**



2. **Remove the 2 fixed snap-on fasteners between the lower rear bumper and the body, and the 2 fixed snap-on fasteners between the bumper and rear fender**



3. **Remove the 2 fixed screws between the rear bumper side and the bumper bracket**
   2 screws on left side and 2 screws on right side.
4. **Remove the rear bumper from the body**

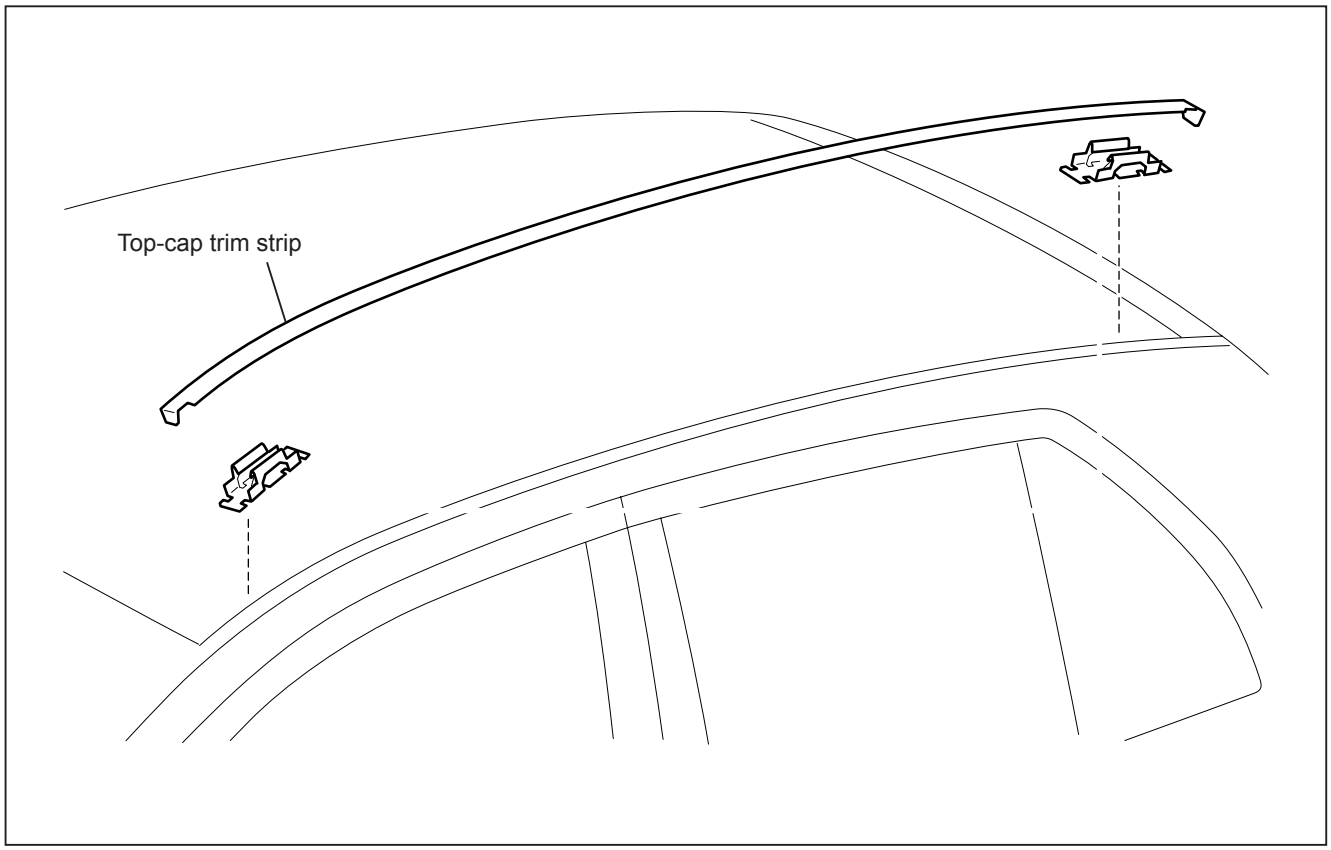


5. **Remove of the rear bumper bracket**
   (a) Remove the fixed snap-on fasteners between the front mounting bracket of the rear bumper and the body.
   1 screw on left side and 1 screw on right side.
   (b) Remove the 2 fixing bolts of the front mounting bracket of the rear bumper.
   2 screws on left side and 2 screws on right side.
   (c) Remove the 3 fixed bolts of the rear mounting bracket of the rear bumper.
   3 screws on left side and 3 screws on right side.
   (d) Remove the front mounting bracket and the rear mounting bracket of the rear bumper from the body.

TRIM STRIP

TOP-CAP TRIM STRIP

Location Diagram

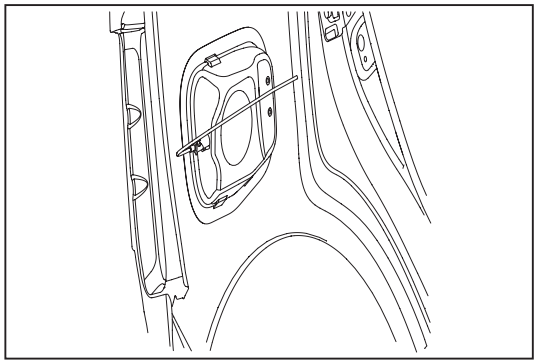


Note:

Coat seam glue when Installation.

FUEL TANK FILLER

FUEL TANK FILLER CAP CABLE



Removal

1. **Open the luggage compartment.**
2. **Remove the luggage compartment trim.**
3. **Disconnect the cable from the filler cap.**
4. **Remove the B-pillar lower seat belt bolt and anchorage.**
5. **Remove the clip from the filler cap cable.**
6. **Remove the bolt from the filler cap cable handle.**
7. **Disconnect the cable from the handle.**
8. **Remove the driver's seat.**
9. **Remove the left front and left rear door shields and the left B-pillar lower trim panel.**
10. **Move the carpet on the LH side away.**
11. **Remove the cable.**

Installation

1. **Slip the cable into the passenger compartment from the luggage compartment first.**
2. **Put the carpet on the LH side back.**
3. **Install the left front and left rear door shields and the left B-pillar lower trim panel.**
4. **Install the driver's seat.**
5. **Connect the cable to the handle.**
   Note:
   If different metals contact directly with each other, corrosion will be aggravated. Be sure to use the right fasteners so as to avoid early corrosion.
6. **Install the bolt on the filler cap cable handle.**
7. **Install the clip on the filler cap cable.**
8. **Using bolt, install the B-pillar lower seat belt anchorage.**
   Tighten the B-pillar lower seat belt anchorage bolt.
   Torque: 38 N•m
9. **Connect the cable to the filler cap.**
10. **Install the luggage compartment trim.**
11. **Close the luggage compartment.**

INTERIOR TRIMS

AUDIO/VIDEO

LEFT FRONT DOOR SPEAKER ASSEMBLY....2
LEFT TWEETER ASSEMBLY....2
REAR WINDOW SHELF SPEAKER ASSEMBLY....3
CD PLAYER....6
ANTENNA....8
DVD PLAYER +GPS NAVIGATION....9

DOOR LOCK SYSTEM

POWER DOOR LOCK....13
REMOTE CONTROL DOOR LOCK....14
FRONT DOOR LOCK....16
REAR DOOR LOCK....19

SEATS

FRONT-ROW SEATS....22
REAR-ROW SEATS....27

INSTRUMENT PANEL AND DRIVER INFORMATION

INSTRUMENT PANEL....35
AUXILIARY INSTRUMENT PANEL....37
COMBINATION METER....42
AUXILIARY COMBINATION INSTRUMENT....45

ANTITHEFT SYSTEM

STRUCTURE DIAGRAM....46
BRIEF INTRODUCTION....47
FAULT DIAGNOSIS....48
TROUBLESHOOTING....49
MATCHING OF ANTITHEFT SYSTEM....52
TRANSMITTER....53

ROOF

STRUCTURE DIAGRAM....56
REPLACEMENT....59

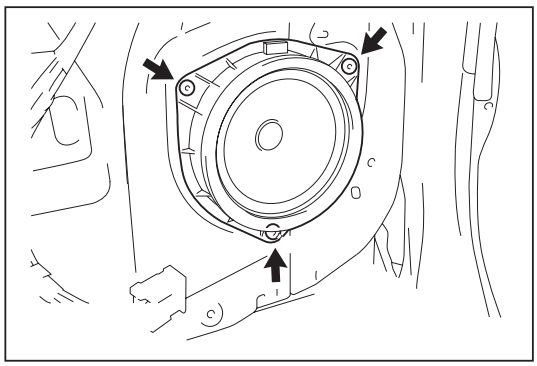
AUDIO/VIDEO

LEFT FRONT DOOR SPEAKER ASSEMBLY

Tip:
Service speakers (LH and RH) in the same way.

Removal

1. **Remove the left front door inner triangle.**
2. **Remove the left front door window main switch assembly.**
3. **Remove the left front door panel assembly.**
4. **Remove left front door speaker assembly.**
   (a) Remove the 3 screws and the 3 bayonets.
   (b) Remove the speaker assembly.
   (c) Disconnect the speaker connector.



Installation

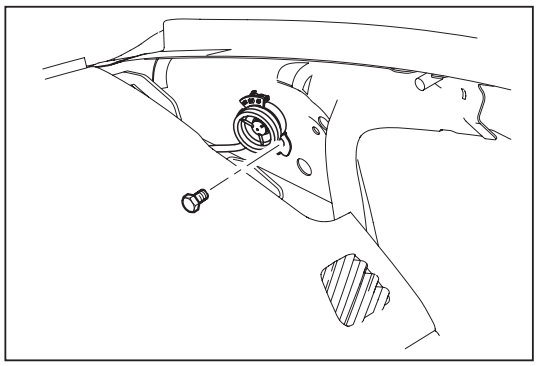
Installation is the reverse order of removal.

LEFT TWEETER ASSEMBLY

Tip:
Service speakers (LH and RH) in the same way.

Removal

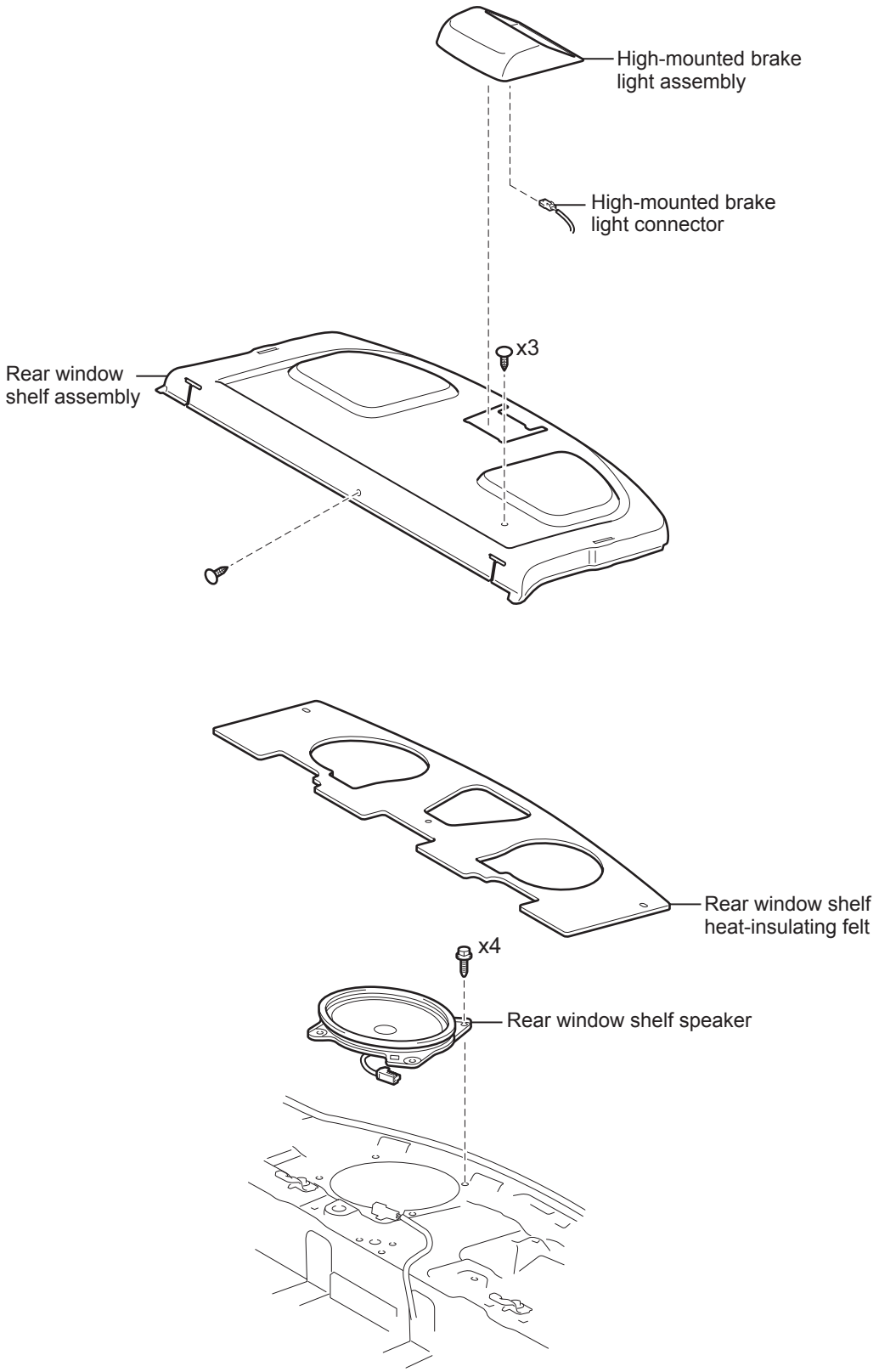
1. **Remove the left front door seal.**
2. **Remove the A-pillar panel (LH).**
3. **Remove tweeter assembly (LH).**
   (a) Disconnect the harness plug from the speaker.
   (b) Remove the tweeter assembly (LH).



Installation

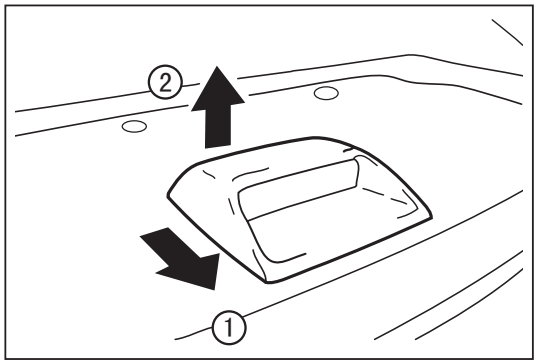
1. **Install tweeter assembly (LH).**
   (a) Connect the plug for connection with the harness.
   (b) Secure the plug firmly.
   (c) Install the speaker assembly properly.
2. **Install the A-pillar panel.**
3. **Install the seal properly.**

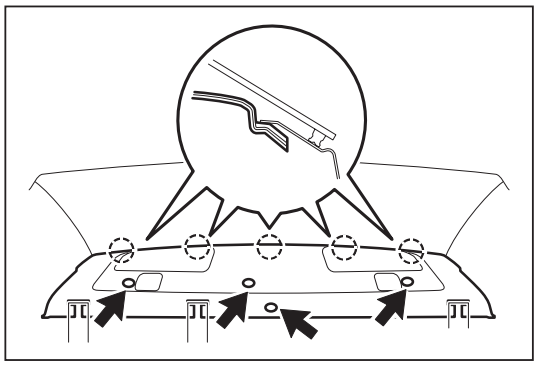
REAR WINDOW SHELF SPEAKER ASSEMBLY



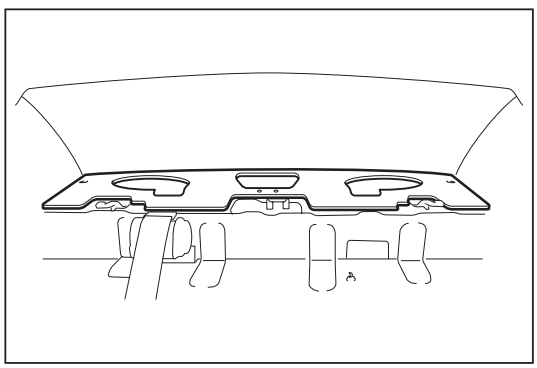
Removal

1. **Remove the right rear door-sill guard board**
2. **Remove the left rear door-sill guard board**
3. **Remove the right rear door seal strip**
4. **Remove the left rear door seal strip**
5. **Remove the rear-row seat bolster assembly**
6. **Remove the rear-row seat back assembly**
7. **Remove the lower guard board of the right Pillar C**
   Refer to the “Canopy” of this chapter
8. **Remove the lower guard board of the left Pillar C**
   Refer to the “Canopy” of this chapter.
9. **Remove the upper guard board of the right Pillar C**
   Refer to the “Canopy” of this chapter.
10. **Remove the upper guard board of the left Pillar C**
    Refer to the “Canopy” of this chapter.
11. **Remove the rear window shelf assembly**
    (a) Remove the high-mounted brake light assembly

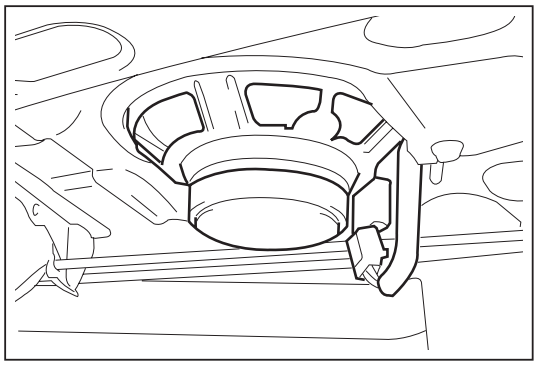




(b) Remove the 4 Clips.
(c) Release the 5 Clawes, and then remove the rear window shelf.

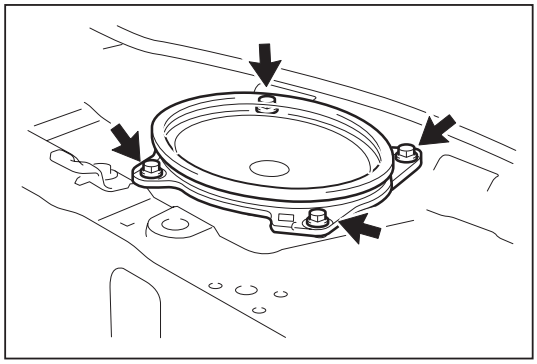


12. **Remove the heat insulting felt of the rear window shelf**
    Remove the 3 Clips from the upper heat insulting felt of the rear window shelf and take off the heat insulting felt of the rear window shelf.



13. Remove the rear window shelf speaker

(a) Remove the rear window shelf speaker



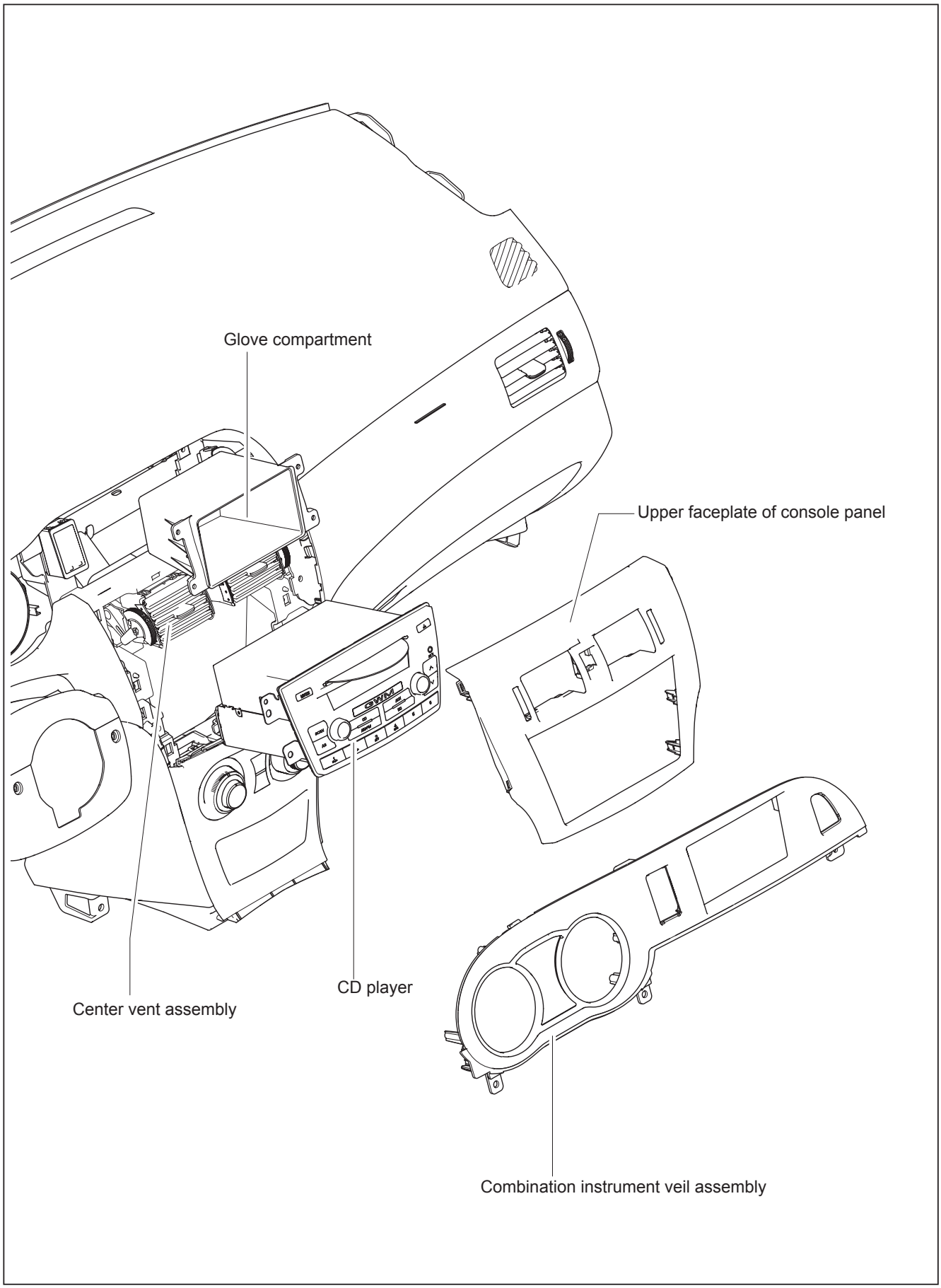
(b) Remove the 4 screws used to fix the speaker and take off the speaker assembly.

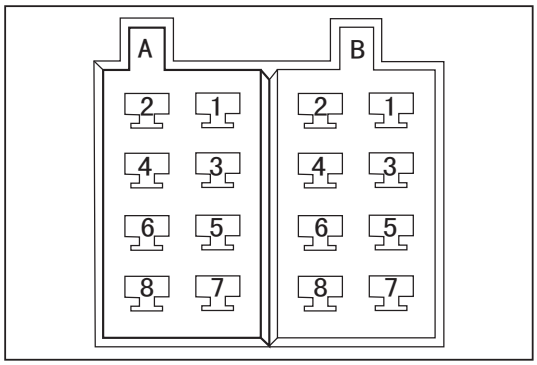
Installation

The Installation order is reverse to the Removing order.

CD PLAYER

Structure Diagram





Lead definition

Connector A

Lead	Definition	Lead	Definition
1	Keying ground	5	Radio antenna power control
2	Mute detection	6	Headlight testing
3	Key input A	7	Main power supply
4	Ignition testing	8	Ground wire

Connector B

Lead	Definition	Lead	Definition
1	Rear left audio output(-)	5	Front right audio output(-)
2	Rear left audio output(+)	6	Front right audio output(+)
3	Front left audio output(-)	7	Rear right audio output(-)
4	Front left audio output(+)	8	Rear right audio output(+)

Removal

1. Remove the CD player

(a) Remove the left trim strip of the instrument panel. Refer to the “Combination instrument” of this chapter.

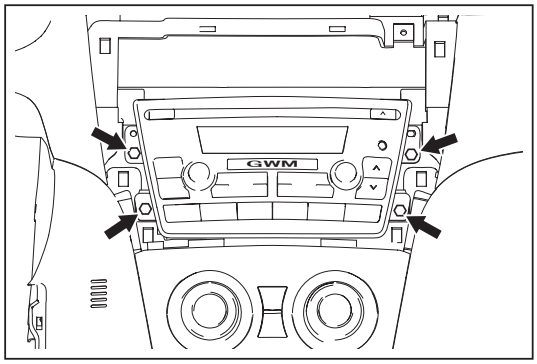
(b) Remove the right trim strip of the instrument panel. Refer to the “Combination instrument” of this chapter.

(c) Remove the upper faceplate of the console panel. Refer to the “Combination instrument” of this chapter.

(d) Remove the 4 bolts used to fix the CD player.

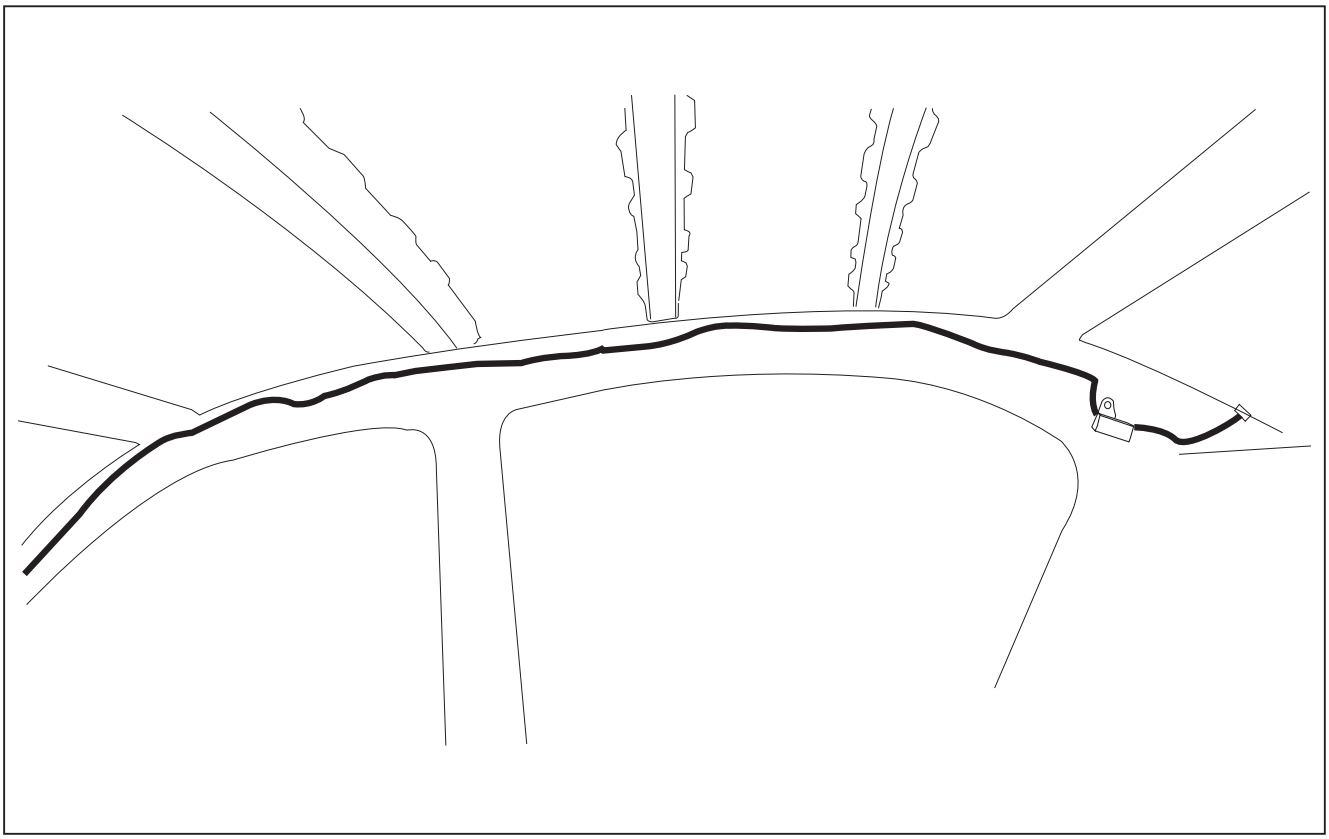
(e) Disconnect the antenna and wiring harness connector of the CD player.

(f) Remove the CD player with bracket assembly.



ANTENNA

Location diagram



Removal

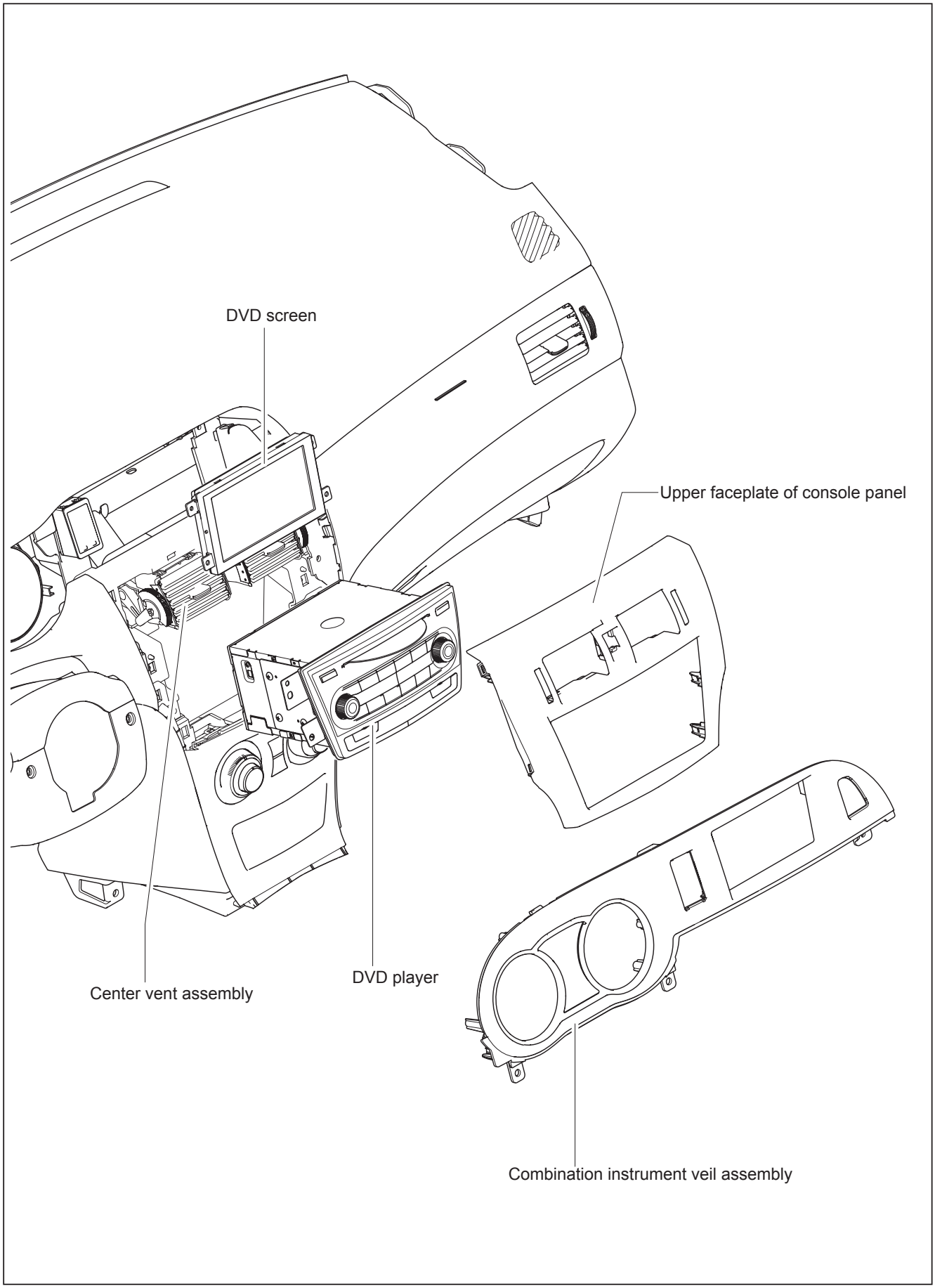
1. **Remove the upper guard board of right Pillar A, the upper guard board of right Pillar B and the upper guard board of right Pillar C.**
   Refer to the “Canopy” of this chapter.
2. **Remove the upper instrument assembly**
   Refer to the “Combination instrument” of this chapter.
3. **Remove the canopy**
   Refer to the “Canopy” of this chapter.
4. **Disconnecting the connecting plug-ins of the antenna and power supply, the radio and the glass**
5. **Remove the hex head bolt used to fix the antenna amplifier**
6. **Remove the antenna**
   Remove the related clamps.

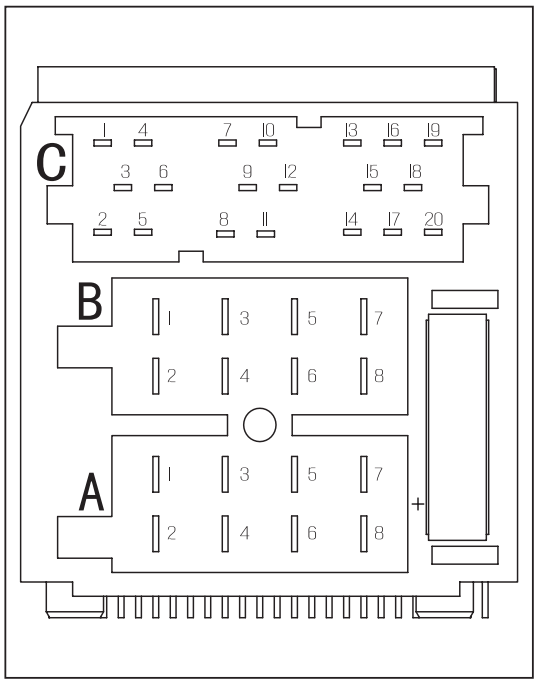
Installation

The Installation order is reverse to the removing order.

DVD PLAYER +GPS NAVIGATION

Structure Diagram





DVD lead Definition

Connector A

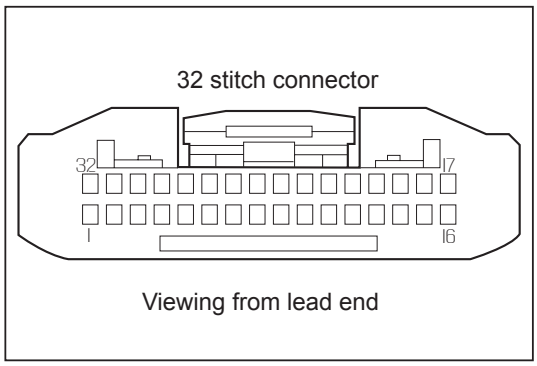
Lead	Definition	Max.DC
1	Keying ground	0.5A
2	Mute control	0.2A
3	Key input A	0.5A
4	Ignition testing	0.3A
5	Radio antenna power control	0.5A
6	Panel lighting wire	0.3A
7	Power supply+	10A
8	Power supply ground wire	10A

Connector B

Lead	Definition	Lead	Definition
1	Rear right audio output(+)	5	Front left audio output(+)
2	Rear right audio output(-)	6	Front left audio output(-)
3	Front right audio output(+)	7	Rear left audio output(+)
4	Front right audio output(-)	8	Rear left audio output(-)

Connector C

Lead	Definition	Lead	Definition
1	----	11	Reverse testing
2	----	12	----
3	----	13	----
4	----	14	----
5	----	15	----
6	Vehicle velocity signal line	16	----
7	----	17	----
8	----	18	----
9	----	19	----
10	----	20	----



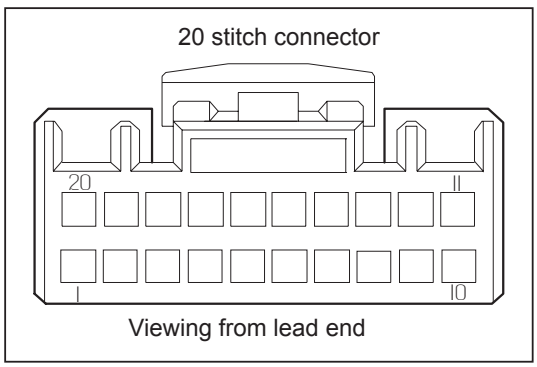
32 stitch connector

Lead	Definition	Line number
1	Main screen GND	#20
2	Video TFT-CVBS	#26
3	Video GND	#26
4	Touch Screen X-	#26
5	Touch screen Y-	#26
6	Main screen communications-TXD	#26
7	Main screen reset DISPLAY-RESET	#22
8	GPS row & field GPS-VSY	#26
9	GPS row & field signal GND	#26

Lead	Definition	Line number
10	GPS row & field GPS-HSY	#26
11	Reserved	NC
12	Reserved	NC
13	Reserved	NC
14	Reserved	NC
15	Reverse GND	NC
16	MIC IN audio signal MIC-	#26
17	MIC IN audio signal MIC+	#26
18	Reverse video power RADAR-POWER	NC
19	Reverse video signal M-V	NC
20	Reverse video ground GND	NC
21	Reserved	NC
22	Reserved	NC
23	GPS-RGB signal GND	#26
24	GPS-B signal TFTV-B	#26
25	GPS-B signal TFTV-R	#26
26	GPS-B signal TFTV-G	#26
27	Main screen communication-RXD	#26
28	Touch screen Y+	#26
29	Touch screen X+	#26
30	HGND	#22
31	Main screen SYS-5V	#20
32	Main screen 12V-HG	#22

DVD display screen definition

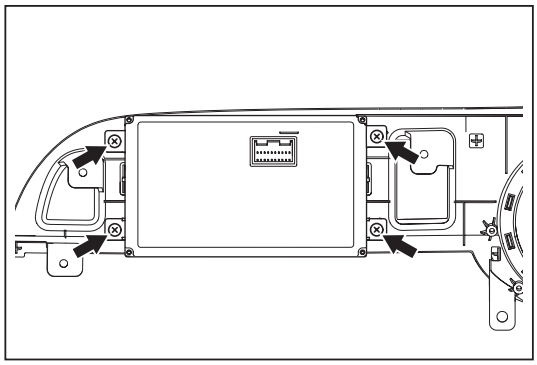
20 stitch connector



Lead	Definition	Corresponding relationship with 32 stitch connector
1	Main screen GND	1
2	Main screen reset-RESET	7
3	GPS-RGB signal GND	23
4	GPS row & field GPS-VSY	8
5	GPS row & field GPS-HSY	10
6	GPS row & field signal GND	9
7	Main screen communication-TXD	6
8	Touch screen Y +	28
9	Touch screen X +	29
10	HGND	30
11	Main screen 12V-HG	31
12	Touch Screen X-	25
13	Touch screen Y-	26
14	Main screen communication-RXD	24
15	Video GND	2
16	Video TFT-CVBS	3
17	GPS-B signal TFTV-B	27
18	GGPS-B signal TFTV-G	5
19	GPS-B signal TFTV-R	4
20	Main screen SYS-5V	32

Removal

1. **Remove the DVD player**
   (a) Remove the left trim strip of the instrument panel.
   Refer to the “Combination instrument” of this chapter.
   (b) Remove the right trim strip of the instrument panel.
   Refer to the “Combination instrument” of this chapter.
   (c) Remove the upper faceplate of the console panel.
   Refer to the “Combination instrument” of this chapter.
   (d) Remove the 4 bolts used to fix the CD player.
   (e) Disconnect the antenna and wiring harness connector of the CD player.
   (f) Remove the CD player with bracket assembly.
2. **Removal the DVD display screen**
   (a) Remove the auxiliary instrument panel and the warning light of the front-passenger seat belt unbelted.
   Refer to the “Combination instrument” of this chapter.
   (b) Remove the combination instrument veil.
   Refer to the “Combination instrument” of this chapter.
   (c) Remove the DVD display screen.
   Disconnect the connectors, removethe 4 screws, and remove the DVD display screen from the combination instrument veil.



DOOR LOCK SYSTEM

POWER DOOR LOCK

Operation

1. **To unlock, turn the key towards the vehicle front; to lock, turn the key towards the vehicle rear.**
2. **When you lock or unlock the left front door, other doors will be locked or unlocked at the same time.**
3. **Locking without using the key**
   (a) Left front door
   You can not lock the left front door outside the vehicle if you have not got the key handy. This is to prevent locking doors accidentally with the key left inside the vehicle.
   (b) Other doors
   To lock outside the vehicle without using the key, depress the inside lock pull button to LOCK position and then close the door.
4. **Automatic door locking**
   (a) All doors will be locked automatically again by the automatic door locking system if you do not open any door within the specified time (30S) after unlocking by means of remote control.
5. **"Child safety" locks on rear door**
   The child safety lock can prevent accidental opening of a door, especially when a young child is seated in the rear seat. There is a lock rod on each of the rear doors.
   (a) If the lock rod is set to “LOCK” position, the door can not be opened by using the inside handle. If you need to open the door with the child safety lock employed, please use the outside handle.
   (b) If the lock rod is set to “RELEASE” position, the child safety lock mechanism will be inoperative.
6. **Luggage compartment**
   (a) Opening the luggage compartment
   Press down the luggage release button of the remote control. Press down the switch button of the luggage release device within 60s and draw the luggage compartment upward. (Note: the switch button is in the middle of the two license plate lamps.)
   (b) Closing the luggage compartment
   Push the luggage compartment downward to close it fully.

Lighting check

1. **Checking door unlocking illumination**
   Tip:
   “All doors” refer to left front door, right front door, left rear door, right rear door, and tailgate.
   (a) Press LOCK key on the remote controller once after doors are closed properly, then the light will flash once and all doors will be locked.
   (b) Press UNLOCK key on the remote controller once with doors locked, then the light will flash twice and all doors will be unlocked.
2. **Checking on-vehicle illumination**
   Tip:
   “All doors” refer to left front door, right front door, left rear door, right rear door, and tailgate. “Any door” refers to any of above doors.
   (a) Set ceiling light switch to DOOR position.
   (b) If you open a door and then close it again, then the light will light up for 10s. If it is detected that the vehicle key is reinserted into the ignition switch or the door is closed, the ceiling light will die down.
   (c) If the vehicle key is pulled out from the ignition switch, then the ceiling light will come on. If the key is reinserted into the ignition switch or the door is closed, the ceiling light will go out; if no operation is performed, the ceiling light will die down after 1 minute.
   (d) When the vehicle key is in the ignition switch, then the ceiling light will not come on whether a door is opened or closed.

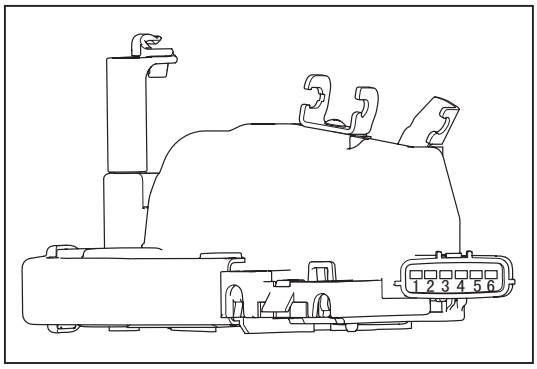
REMOTE CONTROL DOOR LOCK

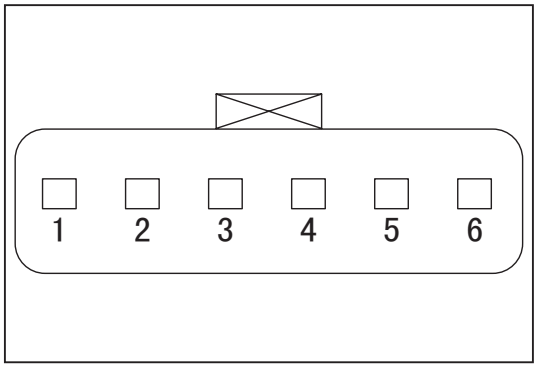
Attentions

1. **Power door locking/unlocking function:**
   The remote control function can be activated only when all the 3 conditions below are met.
   (a) No key is inserted into the ignition switch.
   (b) The power door lock system operates properly.
   (c) Battery voltage is above 10V.
   Tip:
   The unlocking function can be activated with a door opened.
2. **Remote control function**
   The remote controller can function only when the key is not in the ignition switch.
3. **The working range under the control of the remote control door lock varies with condition.**
   (a) The working range varies with the user and the mode of the handheld transmitter.
   (b) In specific areas, the remote control function can be activated only in part of the working range as the range is reduced due to effects of the body shape and the surrounding environment.
   (c) Since the transmitter uses weak radio waves, its working range will be reduced by interference of the strong radio waves or noises within the frequency range it uses and the remote controller may not work.
   (d) In the case of low battery level, the working range will be reduced or the remote controller may not work.
   Tip:
   If the door control transmitter is put to a place where is exposed to direct sunlight (e.g. on instrument panel), battery level will drop or other related malfunctions will result.

Functional Description

1. **Locking function**
2. **Unlocking function**
3. **Vehicle tracing function**
   Press LOCK key on the remote controller once with doors locked, the light will flash 10 times rapidly. To exit the vehicle tracing mode, press UNLOCK key.
4. **Automatic dropback function**
   When you depress UNLOCK key on the remote controller to unlock with doors locked, automatic locking function will be activated after 30s if no door is opened.
5. **Automatic window closing function**
   (a) After LOCK key on the remote controller is depressed, a 10s side window closing negative output is present. (The function is available on anti-pinch window regulators.)
   (b) After the key is pulled out, a 60s sun roof closing negative output is present (applicable for vehicles with sun roof).
6. **Remote control function suspension**
   When the vehicle key is inserted into the ignition switch, the remote controller will not function, but the main unit operates properly.
7. **Remote controller clearing, registering and learning functions**
   (a) Under normal circumstances, open the left front door (please do not close it), insert the original vehicle key into the ignition switch, turn the vehicle key for 5 cycles (ON-LOCK) within 5s with the 5th cycle ended in ON. Then the buzzer will make a sound and the light will flash once to indicate that the remote controller has entered learning mode.
   (b) Press any key on the remote controller within 10s, the buzzer will sound twice and the light will flash twice to indicate that the first remote controller has learned successfully. Then depress any key on the second remote controller, the buzzer will sound twice and the light will flash twice to indicate that the second remote controller has learned successfully. (At last learning of 2 remote controllers is completed.)
   (c) After successful learning is completed, turn the key OFF to exit learning mode. If no key on the remote controller is pressed within 10s, the system will exit learning mode with the original remote control state unchanged.





Checking lock actuator

1. Checking door lock actuator

(a) Apply battery voltage to the lock actuator terminals to check operation of the door lock motor.

Standard:

Measurement conditions	Specified mode
Battery positive (+) → terminal 1 Battery negative (-) → terminal 2	Locking (door locks on LH side) Unlocking (door locks on RH side)
Battery positive (+) → terminal 2 Battery negative (-) → terminal 1	Unlocking (door locks on LH side) Locking (door locks on RH side)

If you get out-of-specification results, replace the door lock assembly.

2. Pin definitions

(a) For left front door, 4 pins: pins 1 and 2 are motor pins; pins 3 and 4 are door lock status pins.

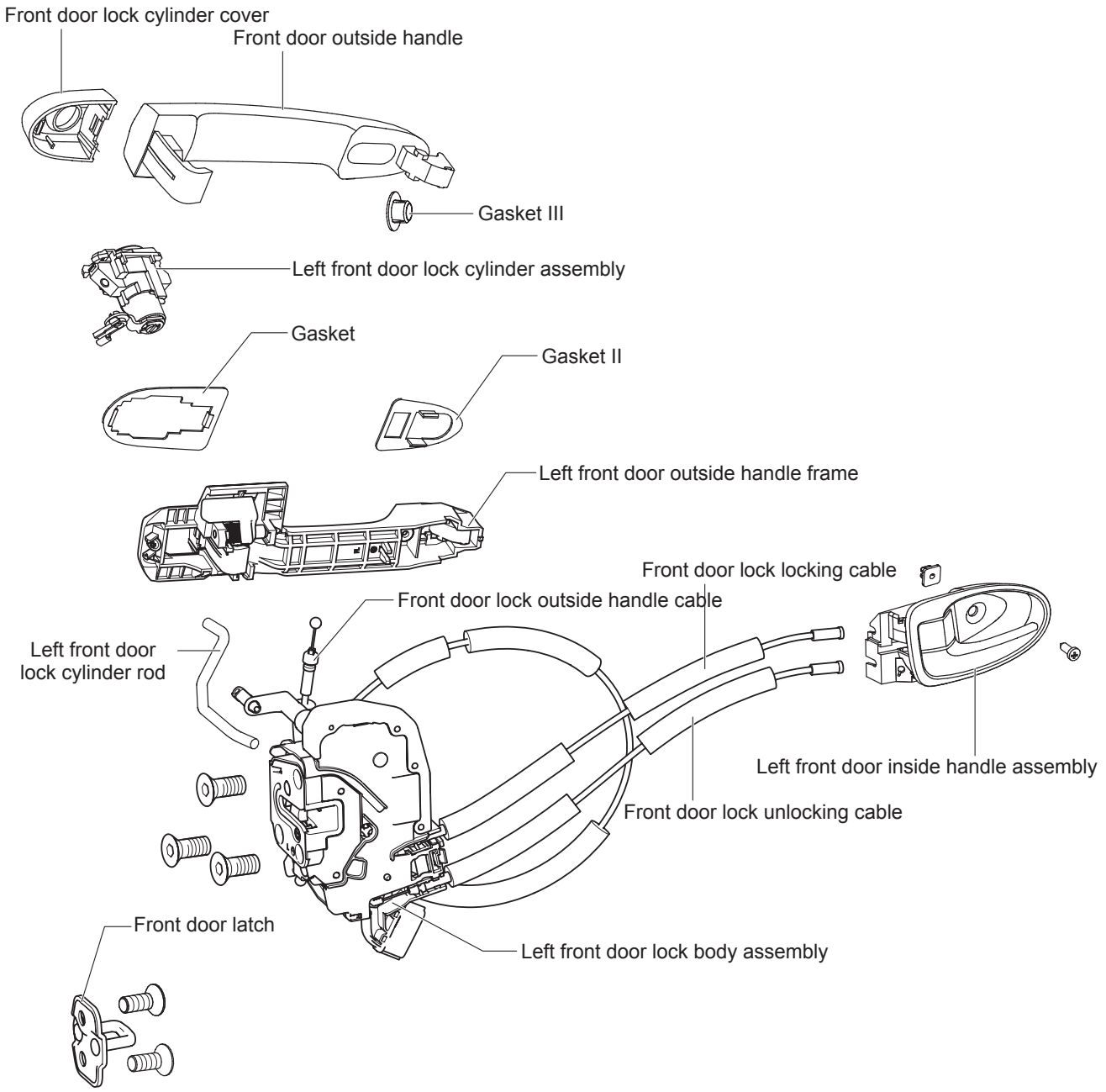
(b) For right front, left rear and right rear door locks, only pins 1 and 2 are available, without pins 3 and 4.

Tip:

Among all the 4 door locks, only the left front door lock is detectable. When the left front door is in unlocking position, the central control unit will enter all doors unlocking mode by default and send out unlocking signals simultaneously. When the left front door is in locking position, the central control unit will enter all doors locking mode by default and send out locking signals simultaneously.

FRONT DOOR LOCK

Structure Diagram

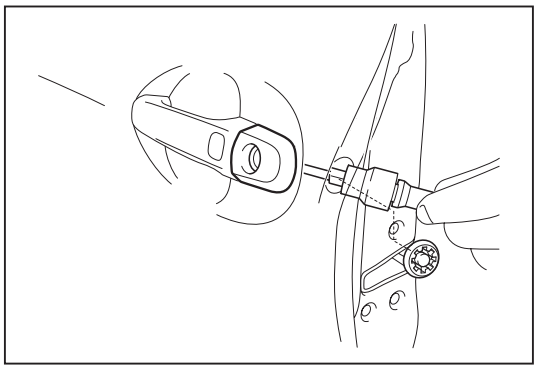


Removal

Tip:

Remove left front and right front door locks in the same way.

1. **Disconnect the battery negative cable.**
2. **Remove the left front door shield. (Refer to "Removal" of "Front door shield" in this section.)**
3. **Remove the window regulator and glass. (Refer to "Removal" of "Front door window regulator and glass" in this section.)**
4. **Remove left front door outside handle frame.**
   (a) Remove the cover from the service port.
   (b) Insert a hexagon socket screwdriver into the service port and remove the set screws, disconnect the lock cylinder rod from the lock cylinder, and then remove the left front door lock cylinder.
   (c) Disconnect the front door lock outside handle cable from the front door outside handle frame.



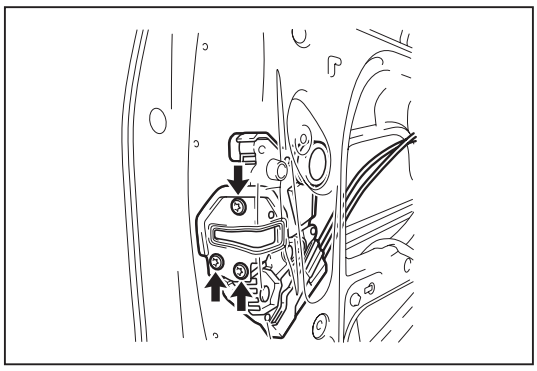
5. **Remove left front door lock body assembly.**
   (a) Remove the 3 set screws.
   ((b) Detach the clip securing the front door lock outside handle cable from the body sheet metal.
   (c) Disconnect the connector, and take out the left front door lock body assembly through the manhole.

   Note:

   When removing set screws, you should avoid dropping the lock body to result in its damage.

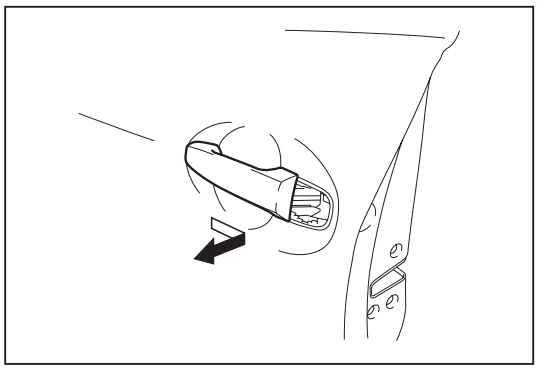
   Tip:

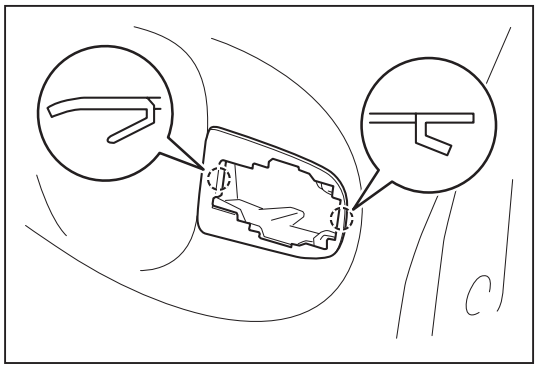
   Remove the parts through the manhole.
   (d) Disconnect the locking cable from the left front door lock body.
   (e) Disconnect the unlocking cable from the left front door lock body.



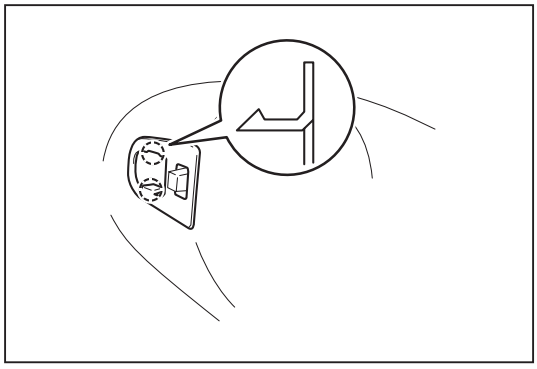
6. **Remove front door outside handle.**

   The front door outside handle can be removed simply by sliding it first in the direction of the arrow in the figure and then pulling it outward.

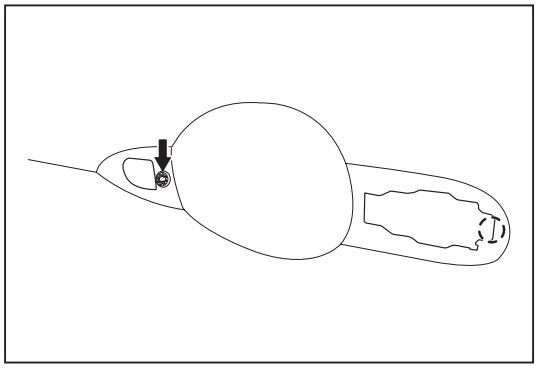




7. Remove gasket.
Loosen the 2 claws shown in the figure, and then remove the gasket.



8. Remove gasket II.
Loosen the 2 claws shown in the figure, and then remove the gasket II.



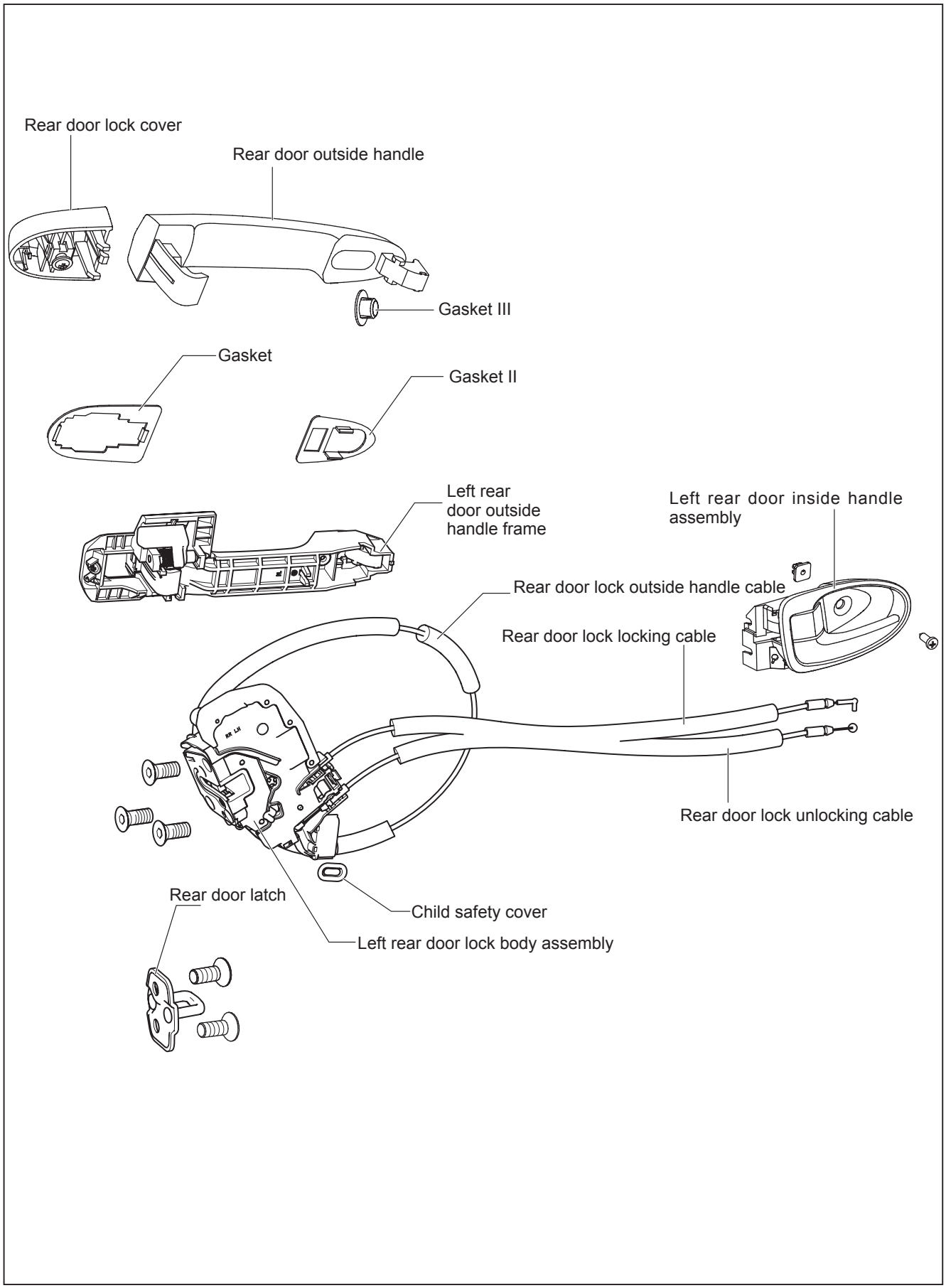
9. Left front door outside handle frame
As shown in the figure, remove a set screw using screwdriver and then disengage the claw to simply dismount the outside handle frame.

Installation

Install in the reverse order of removal.

REAR DOOR LOCK

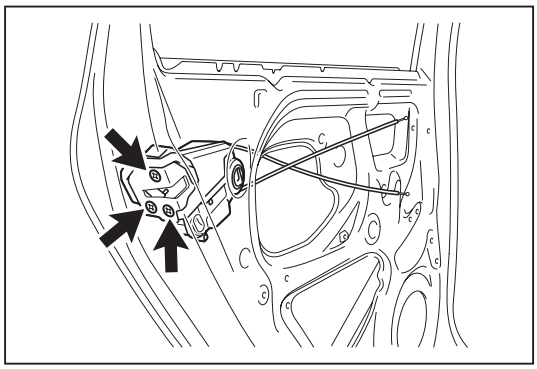
Structure Diagram



Removal

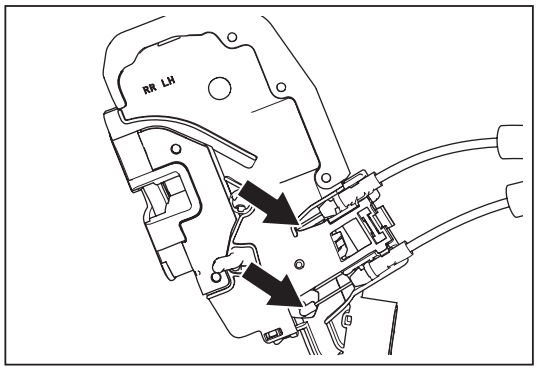
Tip:
Remove left rear and right rear door locks in the same way.

1. **Disconnect the battery negative cable.**
2. **Remove the left rear door shield. (Refer to "Removal" of "Rear door shield" in this section.)**
3. **Remove the window regulator and glass. (Refer to "Removal" of "Rear door window regulator and glass" in this section.)**
4. **Remove left rear door lock body assembly.**

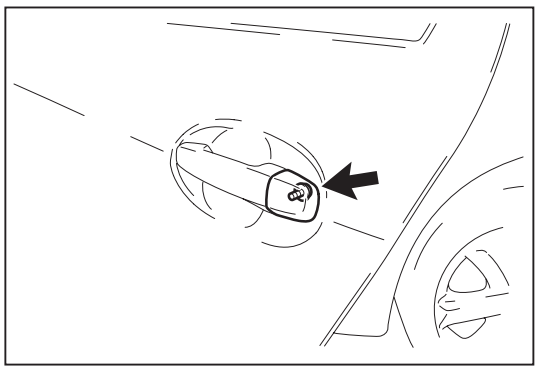


(a) Remove the 3 set screws.
(b) Detach the clip securing the rear door lock outside handle cable from the body sheet metal.
(c) Disconnect the rear door lock outside handle cable from the rear door outside handle frame.
(d) Disconnect the connector, and take out the left rear door lock body assembly through the manhole.

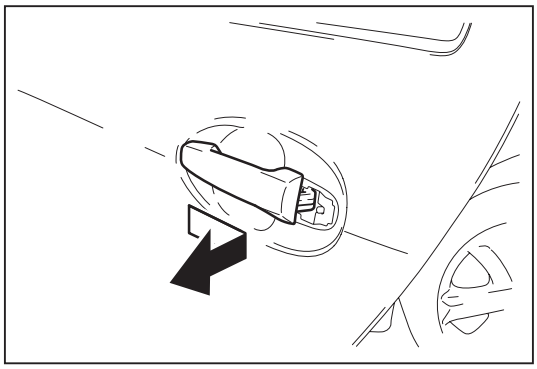
Note:
When removing set screws, you should avoid dropping the lock body to result in its damage.
Tip:
Remove the parts through the manhole.



(e) Disconnect the locking cable from the left rear door lock body.
(f) Disconnect the unlocking cable from the left rear door lock body.

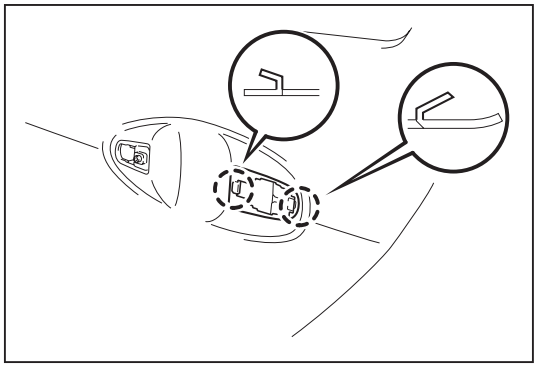


5. **Remove left rear door lock cover.**
As shown in the figure, remove the set screw, and then remove the door lock cover.



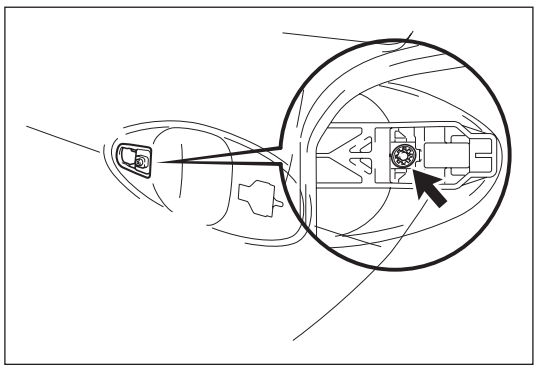
6. Remove rear door outside handle.

The rear door outside handle can be removed simply by sliding it first in the direction of the arrow in the figure and then pulling it outward.



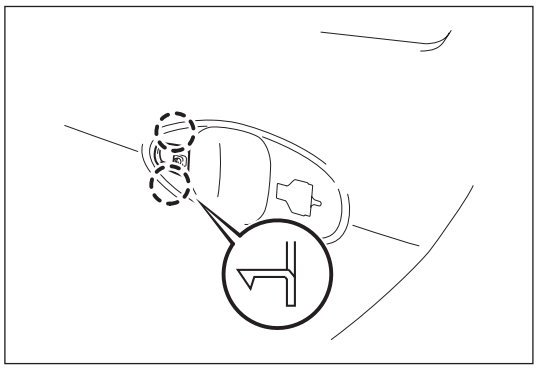
7. Remove gasket.

Loosen the 2 claws shown in the figure, and then remove the gasket.



8. Remove gasket II.

(a) Loosen the screw shown in the figure with a screwdriver.



(b) Loosen the 2 claws shown in the figure, and then remove the gasket II.

9. Remove left rear door outside handle frame.

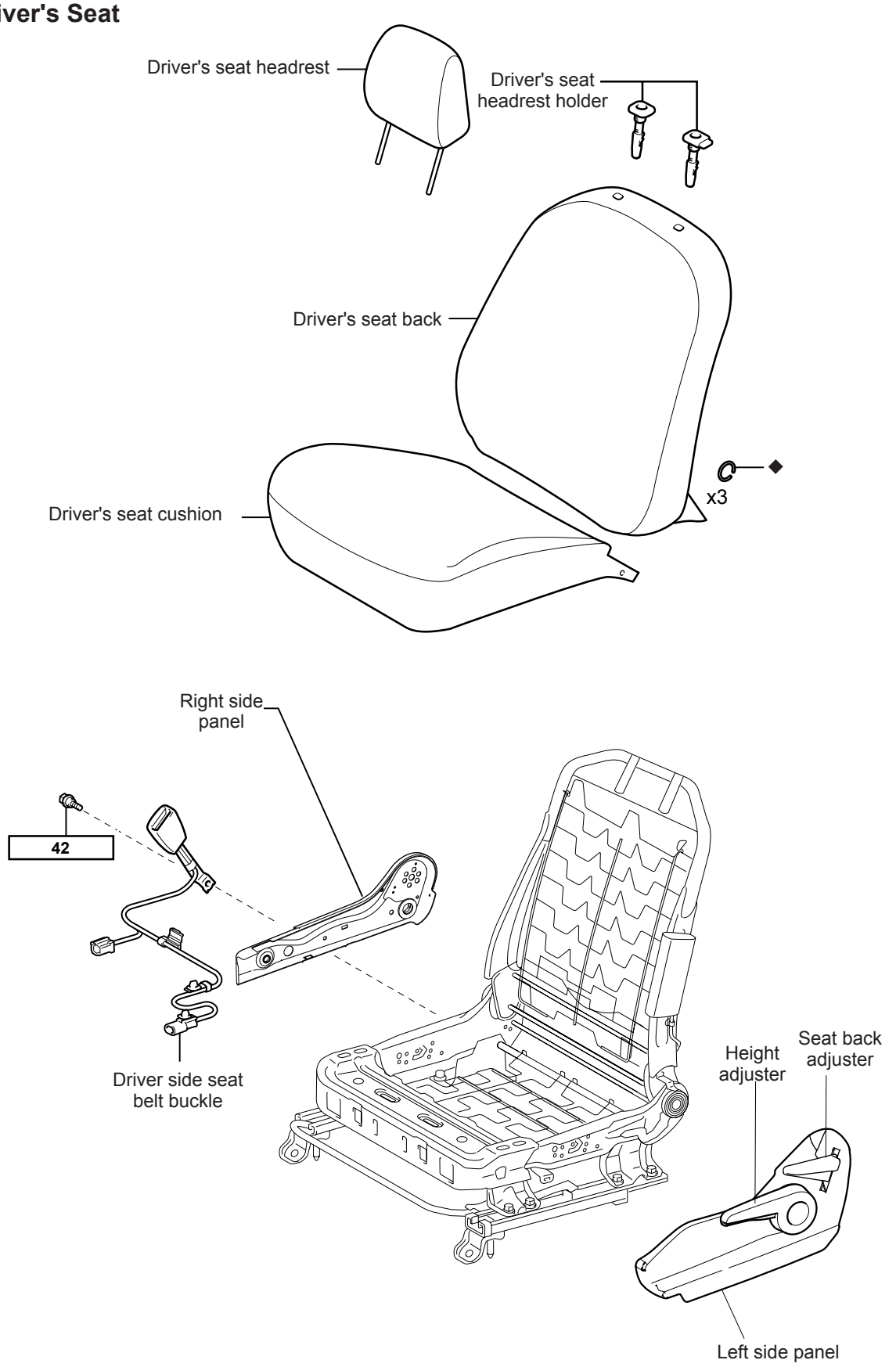
Installation

Install in the reverse order of removal.

SEATS

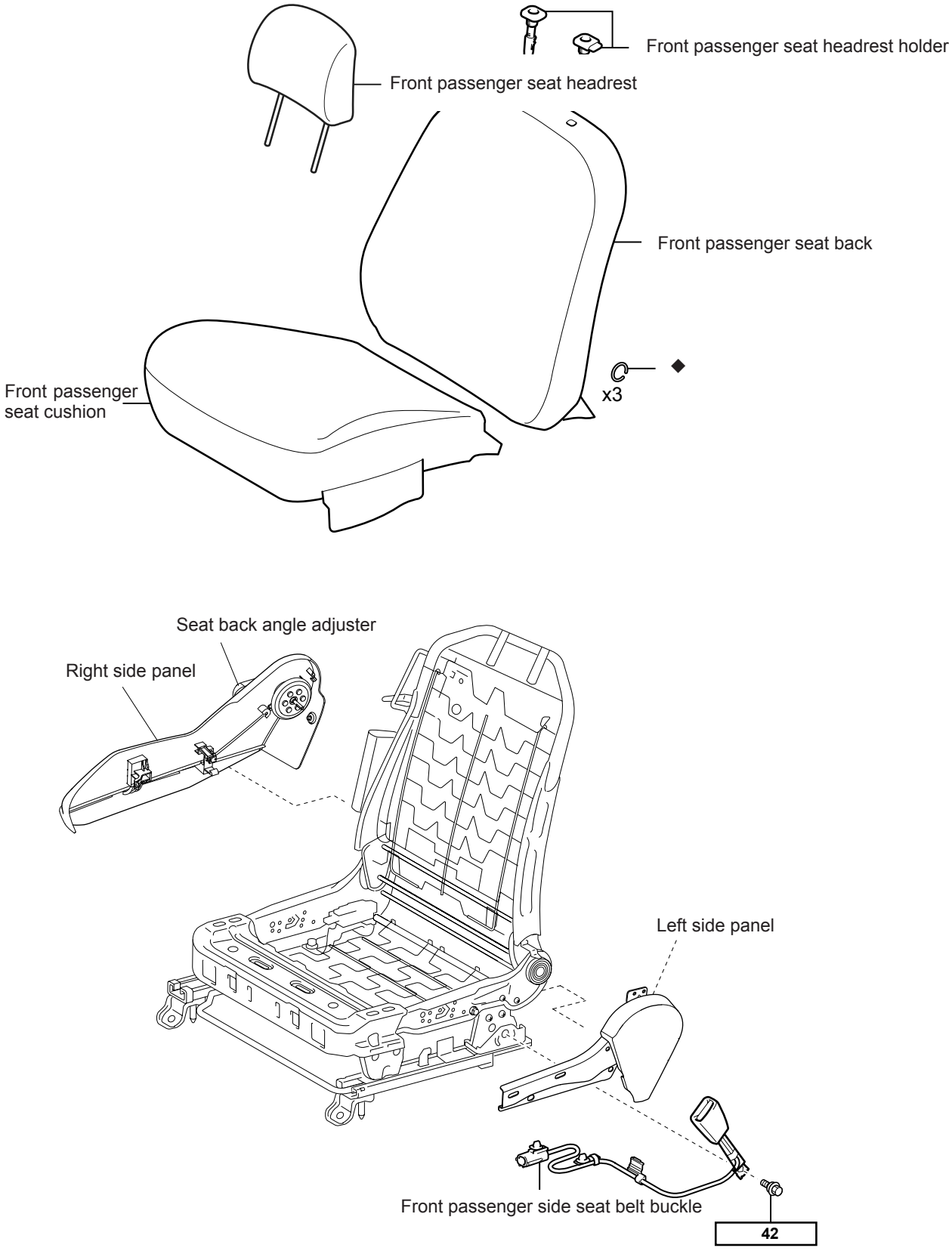
FRONT-ROW SEATS

Driver's Seat



◆ Non-reusable component

Front Passenger Seat



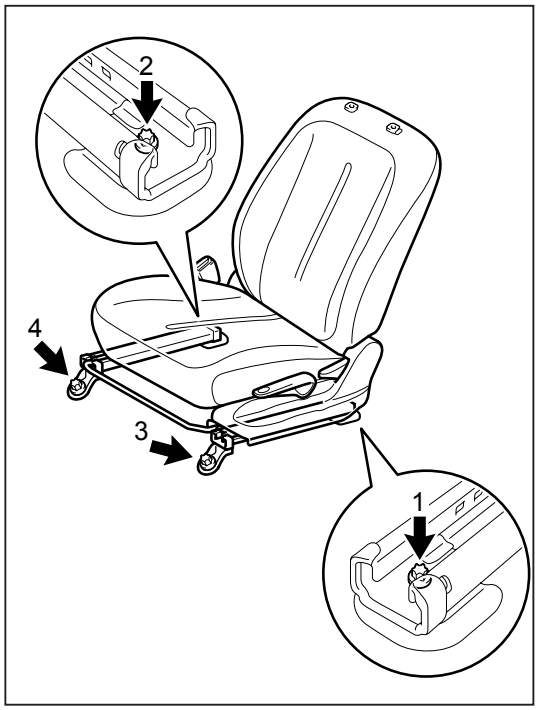
◆ Non-reusable component

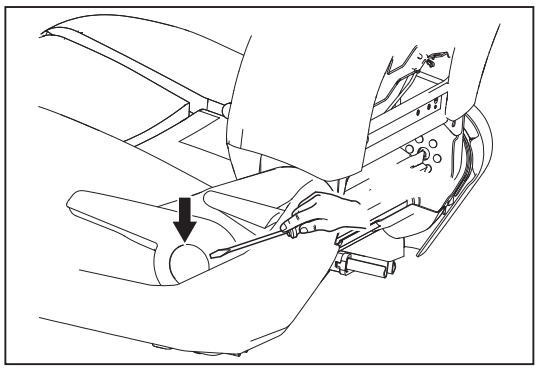
Driver's Seat

Removal

Tip:
Before starting removal operation, please disconnect the battery negative cable from the battery and wait more than 90s.

1. **Disconnect the seat belt connector at the bottom of the seat.**
2. **Remove the rear anchor bolts.**
3. **Remove the front anchor bolts.**
4. **Remove the seat from the body.**

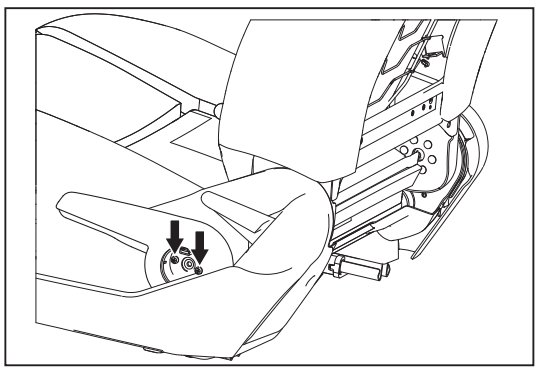




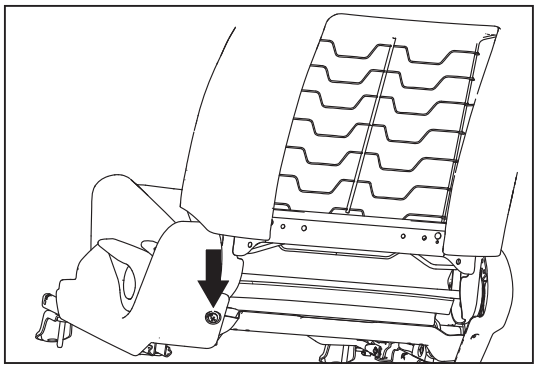
5. **Remove the height adjuster and the seat back adjuster.**
   (a) Pry up the ornament cover with a flat head screwdriver (as shown in the figure).

   Note:

   Before using the screwdriver, please wrap its head with tape.

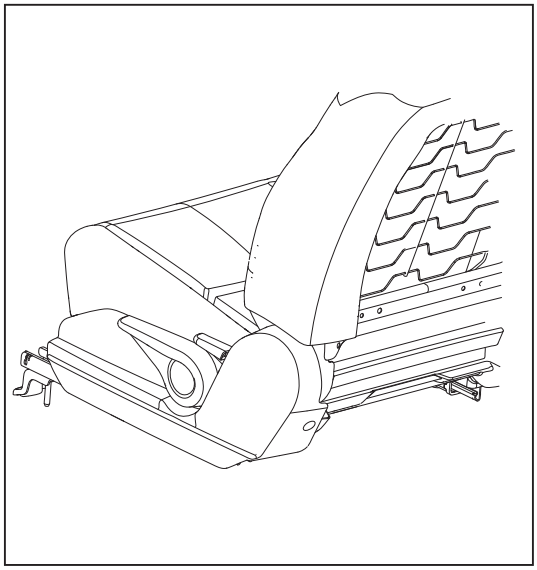


   (b) Simply remove the seat back angle adjuster by hand. (The angle adjuster and the shaft are riveted. The former can be taken down directly after the small cap is removed.) To dismount the height adjuster, you should remove the screws securing the height adjuster with a cross screwdriver.



6. Remove side panels.

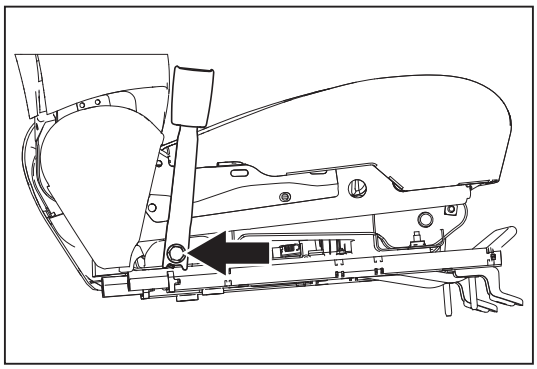
(a) Remove the set screw with a screwdriver (as shown in the figure).



(b) To remove the side panel, pry up the 4 clips connecting the side panel with the sheet metal using a flat head screwdriver.

Note:

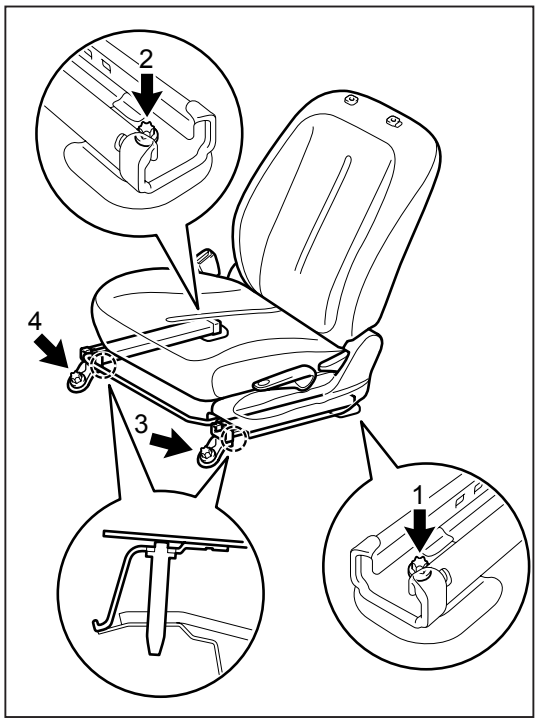
Before using the screwdriver, please wrap its head with tape.



7. Remove seat belt buckle.

(a) To dismount the seat belt latch, remove the bolt simply with a 17# wrench or socket.

(b) Disconnect the seat bottom harness from the seat using tool.



Installation

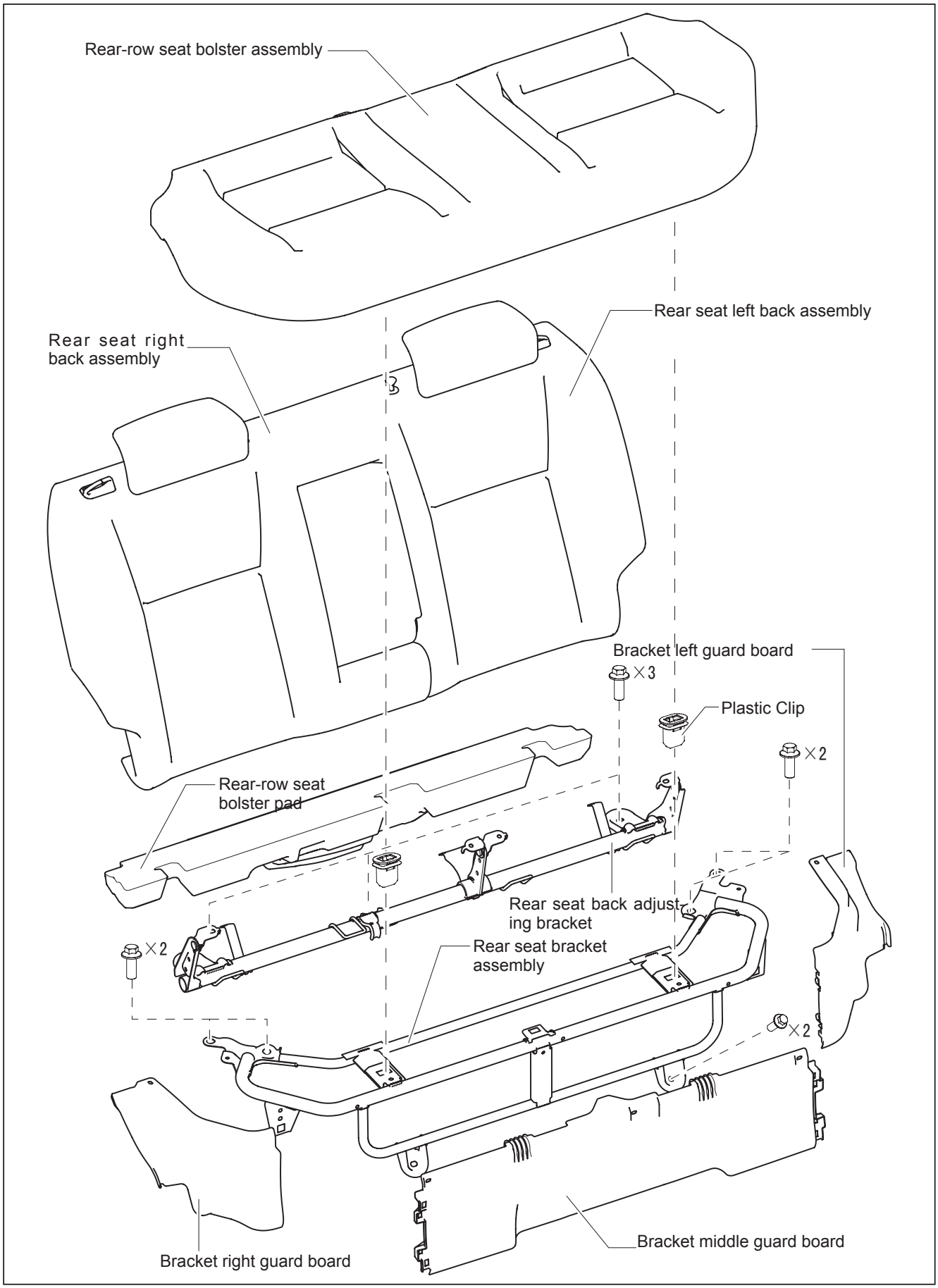
1. Install the seat belt latch.
2. Install the seat side panels.
3. Install the seat back adjuster and the height adjuster.
4. Return the seat into the vehicle and align the dowel pin of the front anchor of the seat with the locating hole on the floor.
5. Pull up the control handle under the seat to move the seat forward to its frontmost/rearmost position, and then release the handle.
6. Install the 2 rear anchor bolts of the seat.
7. Pull up the control handle under the seat to move the seat backward to its frontmost/rearmost position, and then release the handle.
8. Install the 2 front anchor bolts of the seat.
9. Connect the seat belt connector.

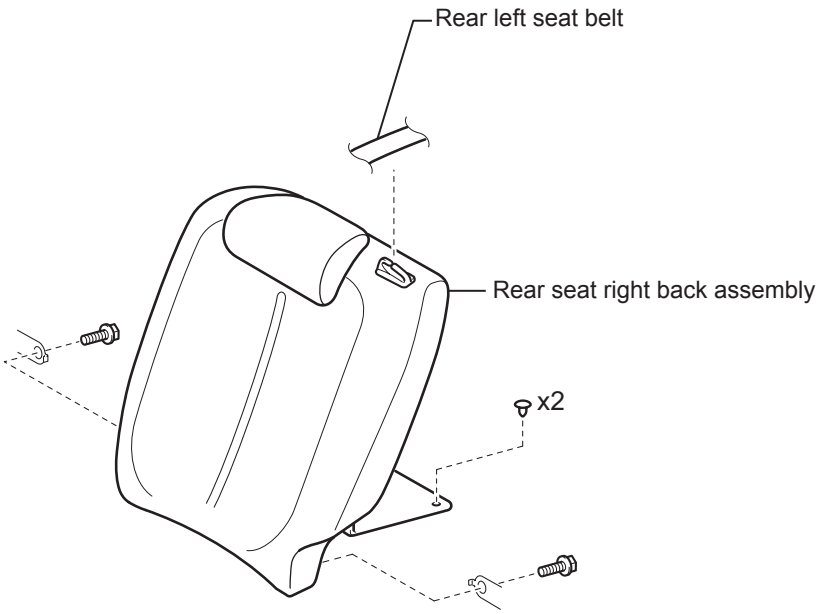
   Remarks:

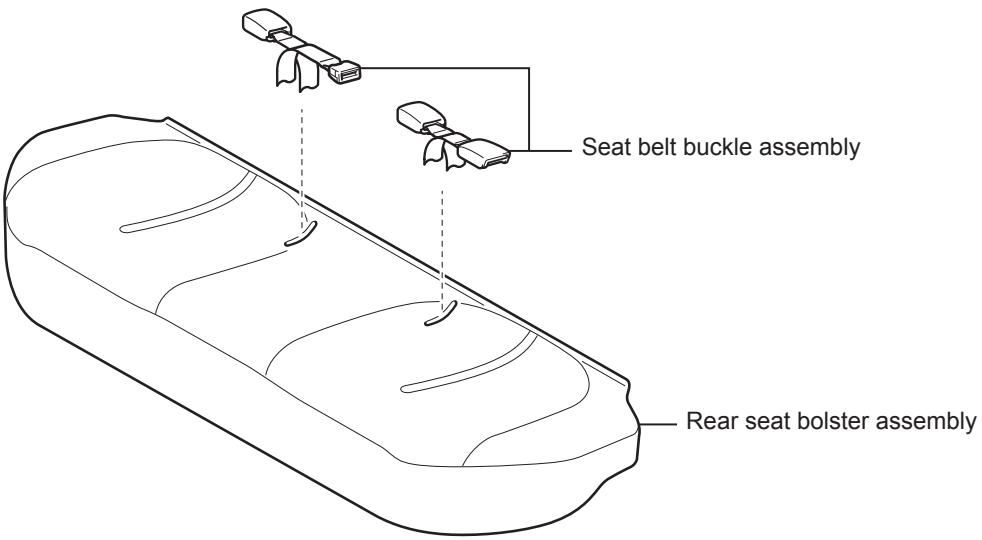
   Remove/install driver's seat and front passenger seat in the same way.

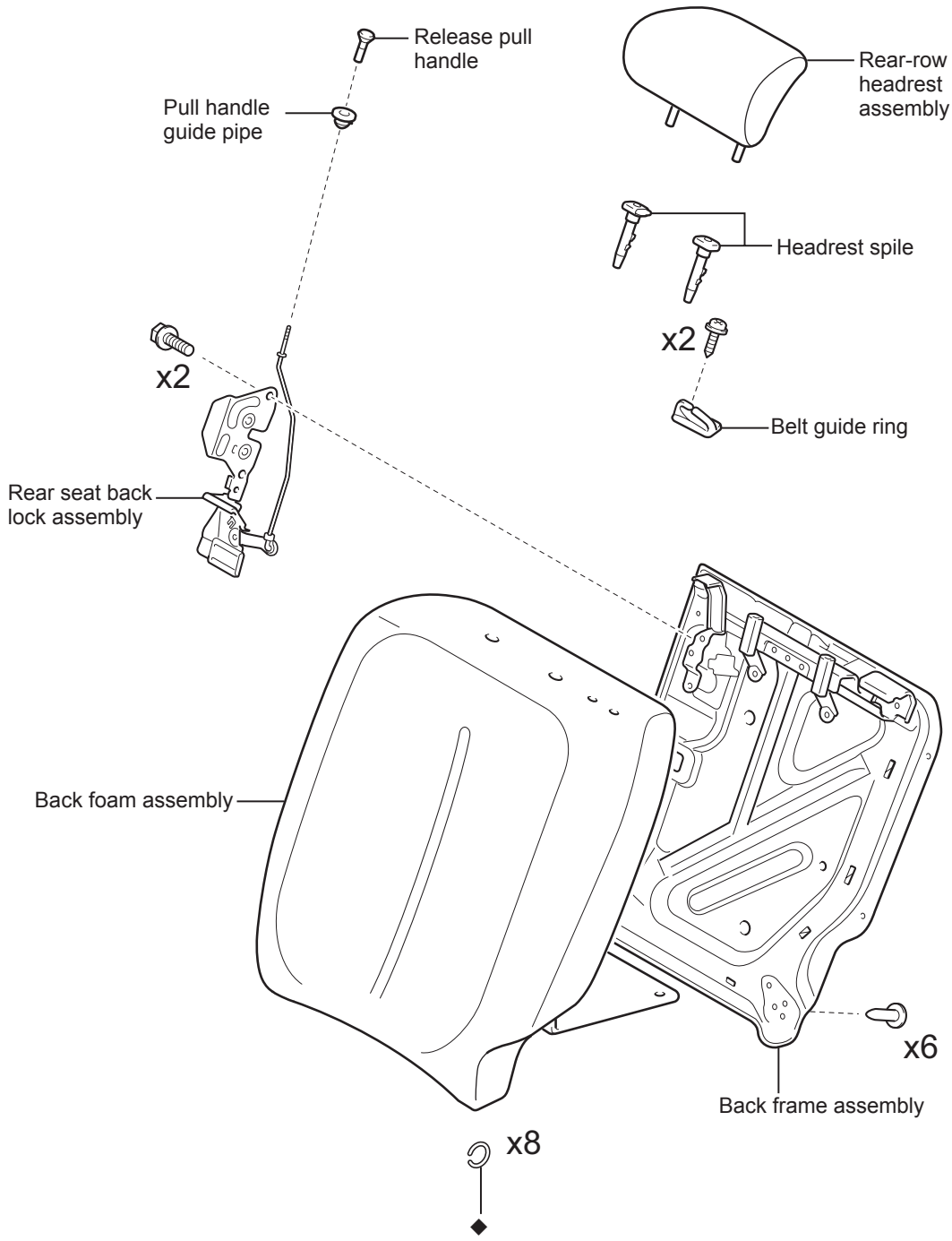
REAR-ROW SEATS

Structure Diagram

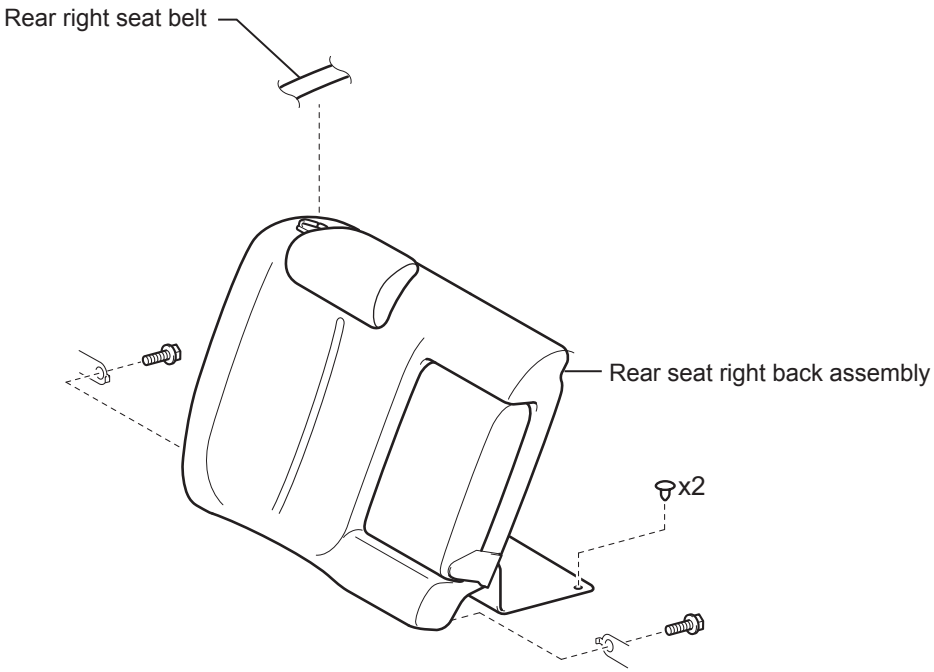


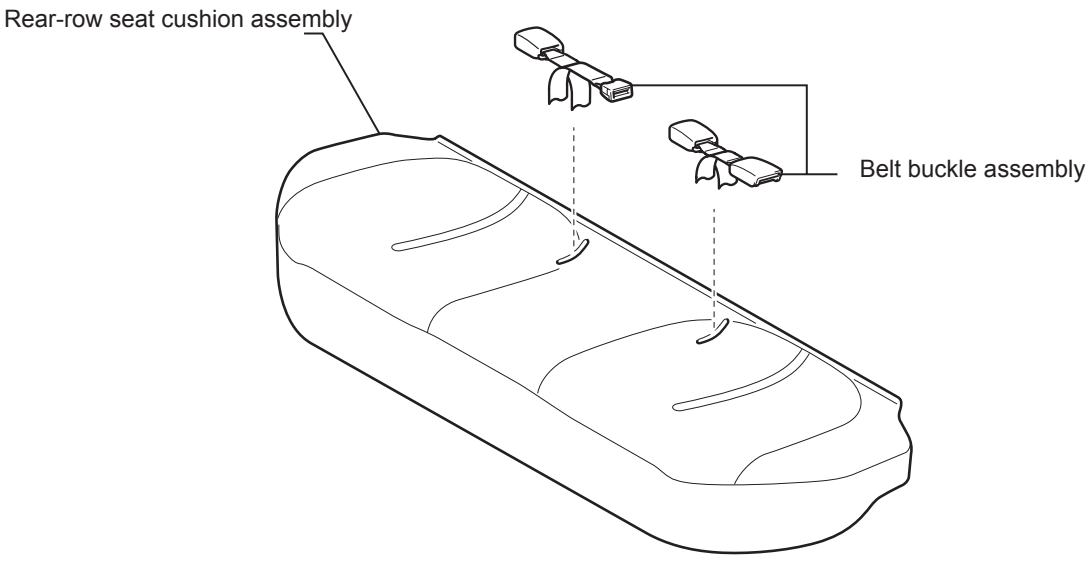

Rear left seat belt
Rear seat right back assembly
x2

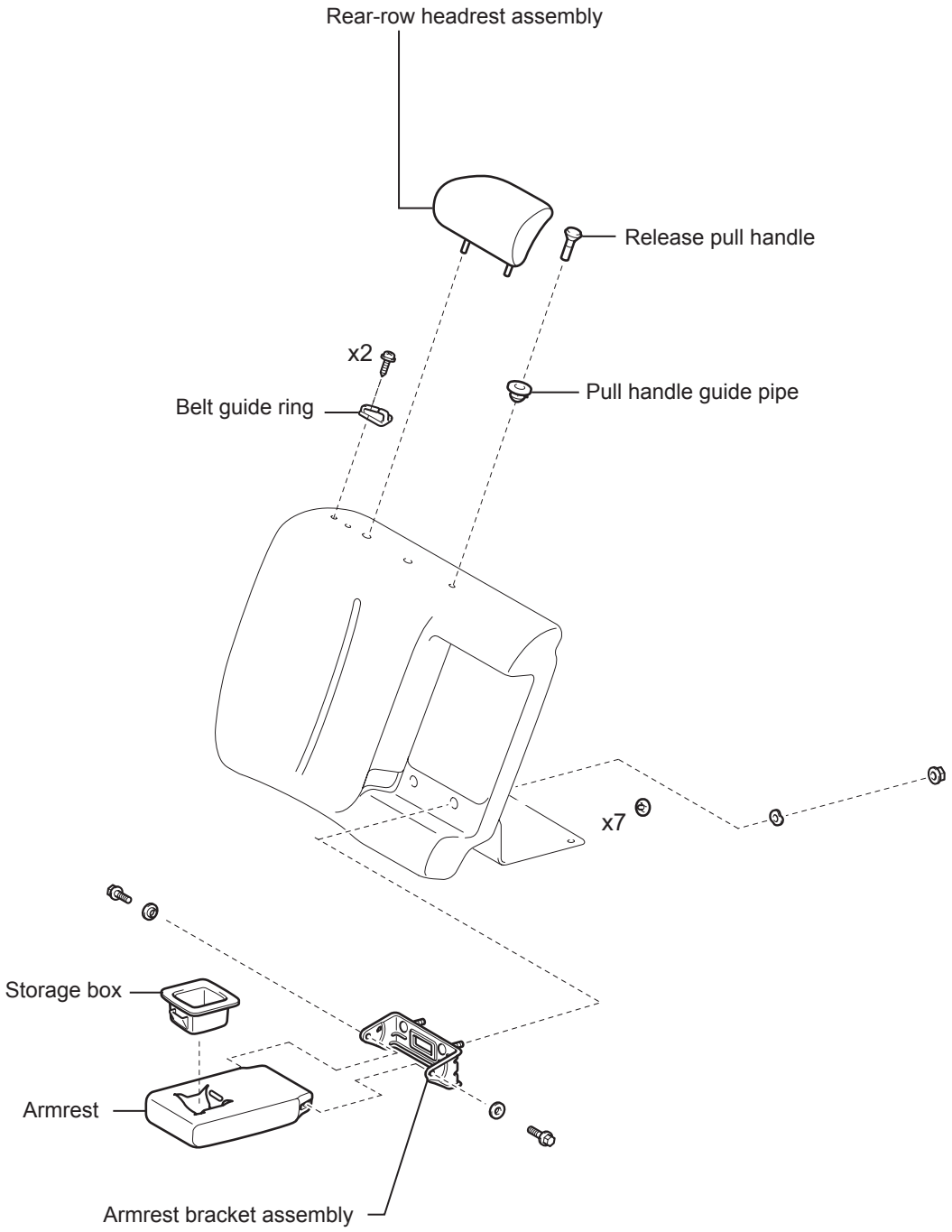

Seat belt buckle assembly
Rear seat bolster assembly

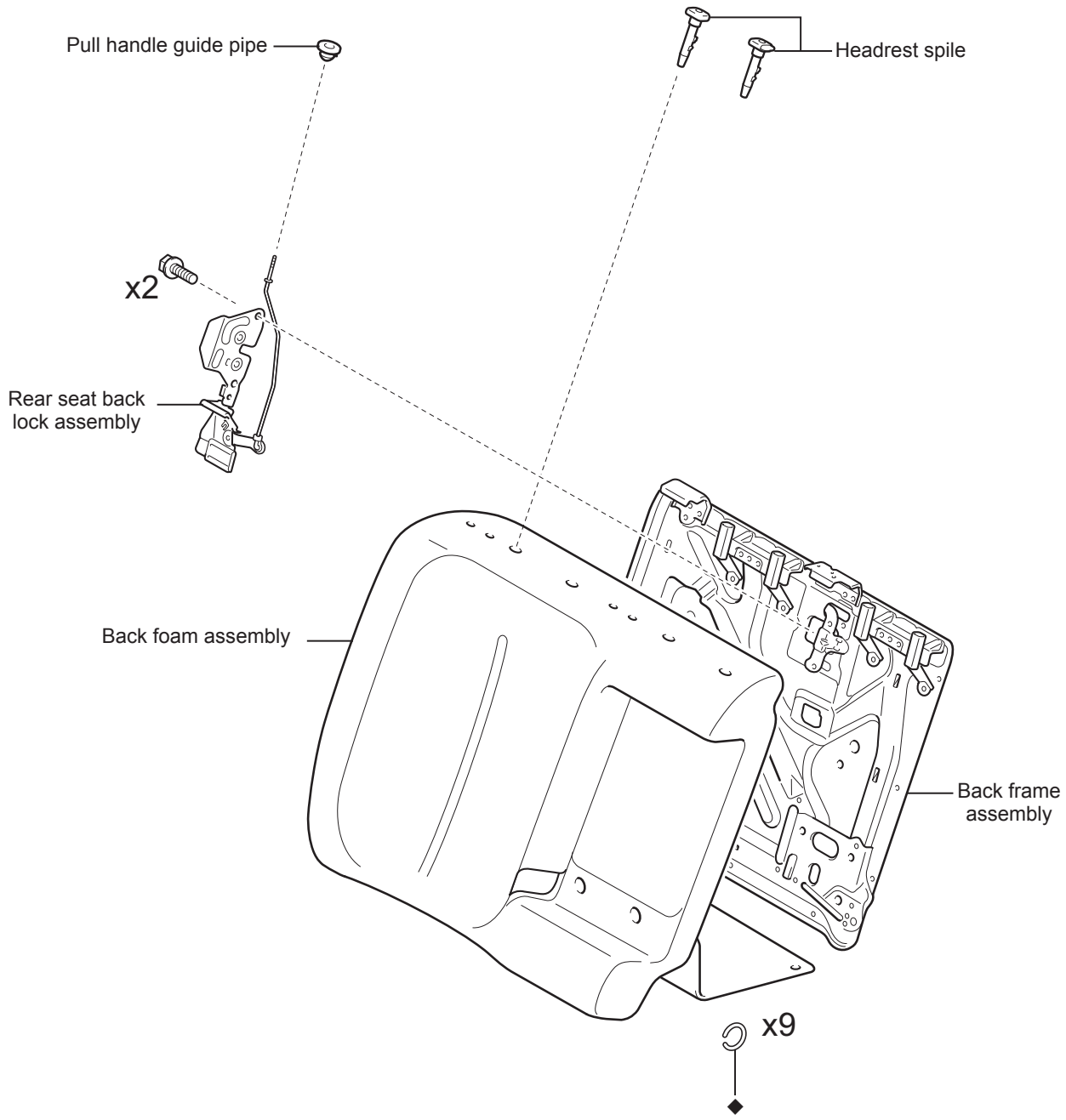


◆ Non-reusable

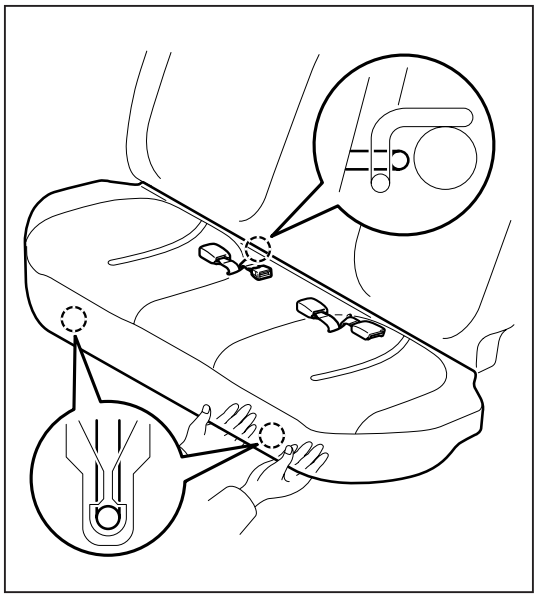

Rear right seat belt
Rear seat right back assembly
x2


Rear-row seat cushion assembly
Belt buckle assembly


Rear-row headrest assembly
Release pull handle
x2
Belt guide ring
Pull handle guide pipe
x7
Storage box
Armrest
Armrest bracket assembly



◆ Non-reusable

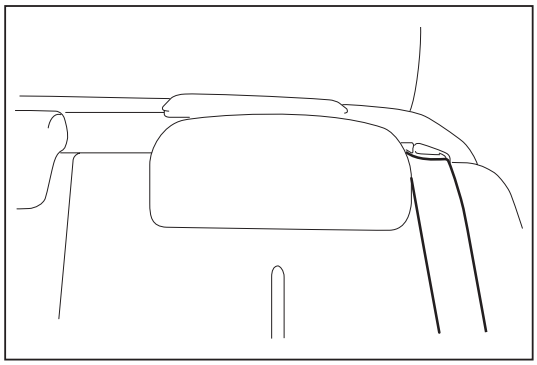


Removal

1. Remove seat cushion.

(a) Lift up front end of the seat cushion to remove the cushion from its fixing bracket. (The cushion and its bracket are connected through clips.)

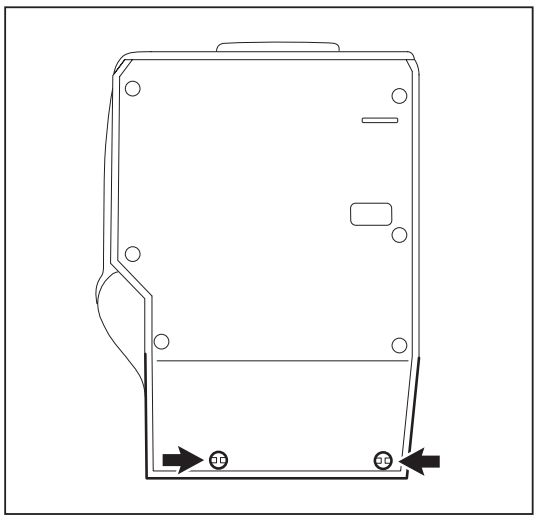
(b) Press the seat cushion hook down to remove the cushion from the beam hook (as shown in the left figure).



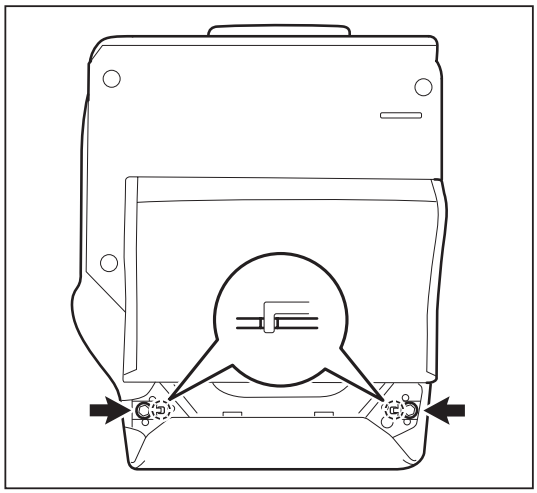
2. Remove the left back of the rear seat

(a) Take out the left belt of the rear-row seat from the gap of the belt guide ring.

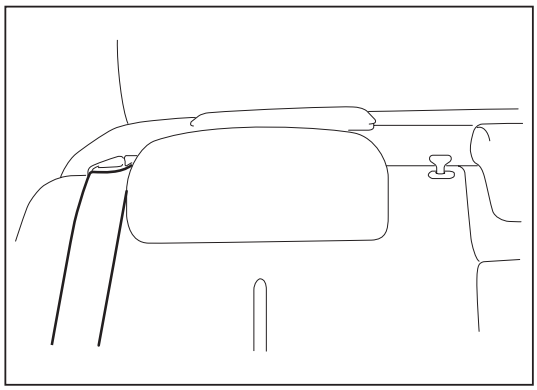
(b) Draw the release pull handle upward, and then topple the rear seat back forward.



(c) Use the tool to remove the 2 Clips from the back of the rear seat backrest.



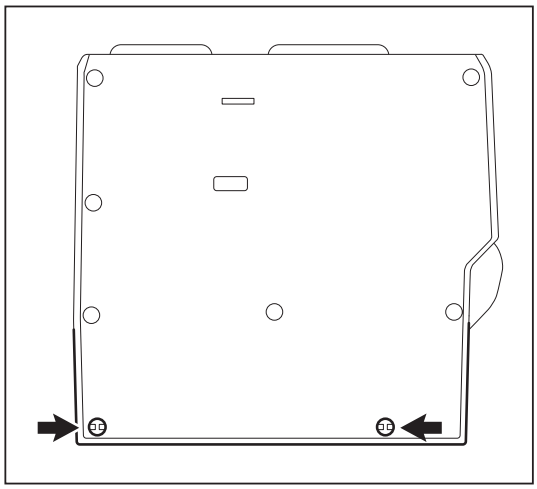
(d) Remove the 2 fixing bolts and take off the rear seat left backrest.



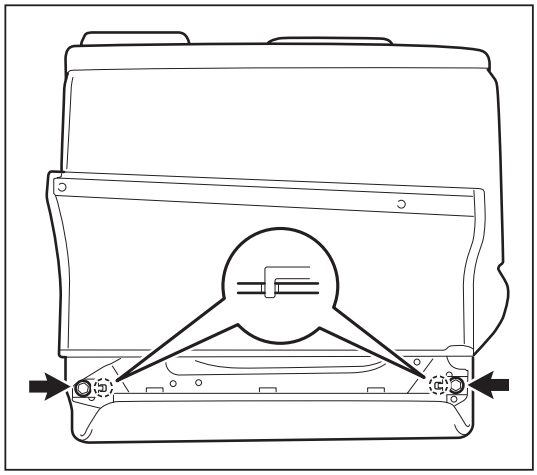
3. Remove the right back of the rear seat

(a) Take out the right belt of the rear-row seat from the gap of the belt guide ring.

(b) Draw the release pull handle upward, and then topple the rear seat back forward.



(c) Use the tool to remove the 2 Clips from the back of the rear seat backrest.



(d) Remove the 2 fixing bolts and take off the rear seat right backrest.

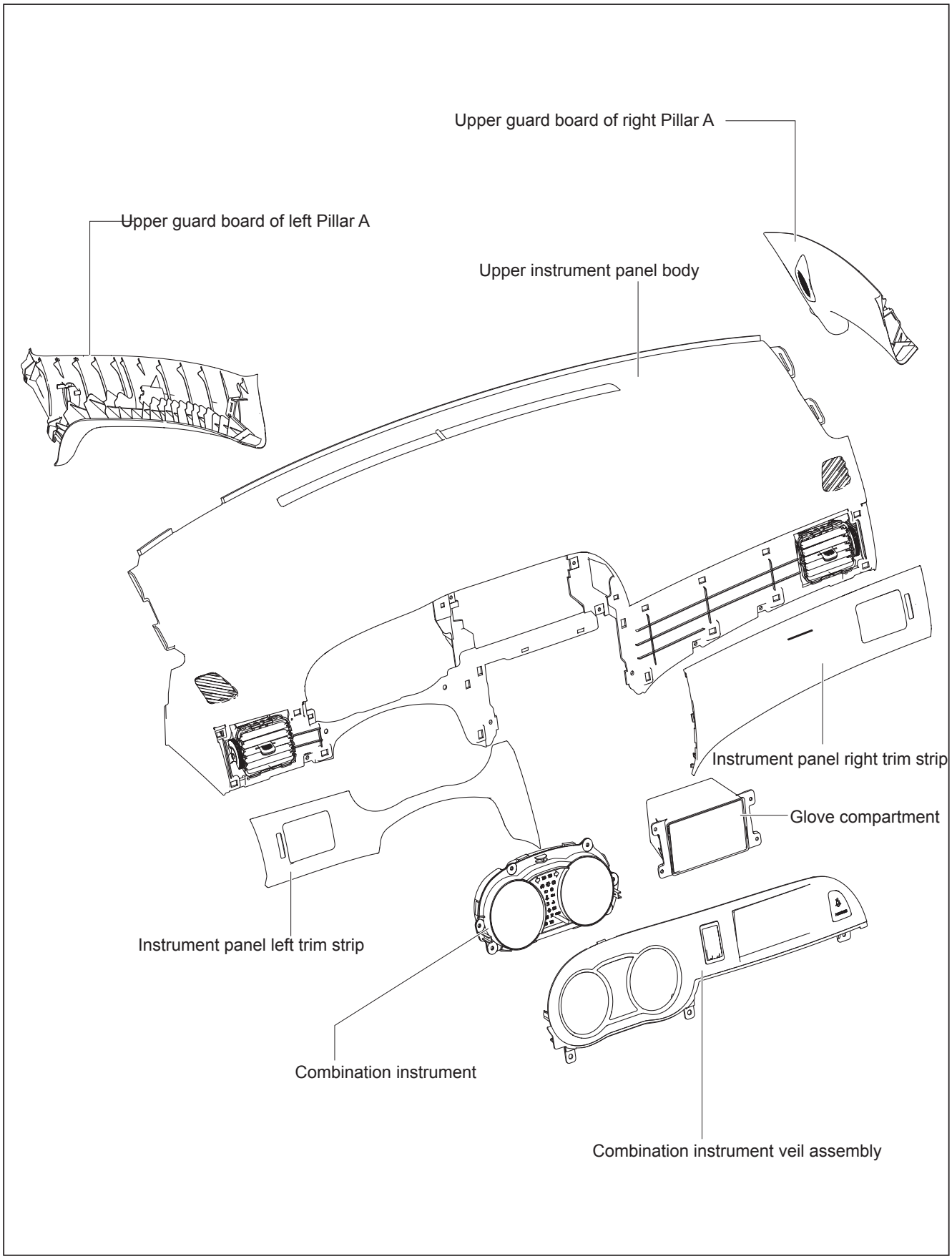
Installation

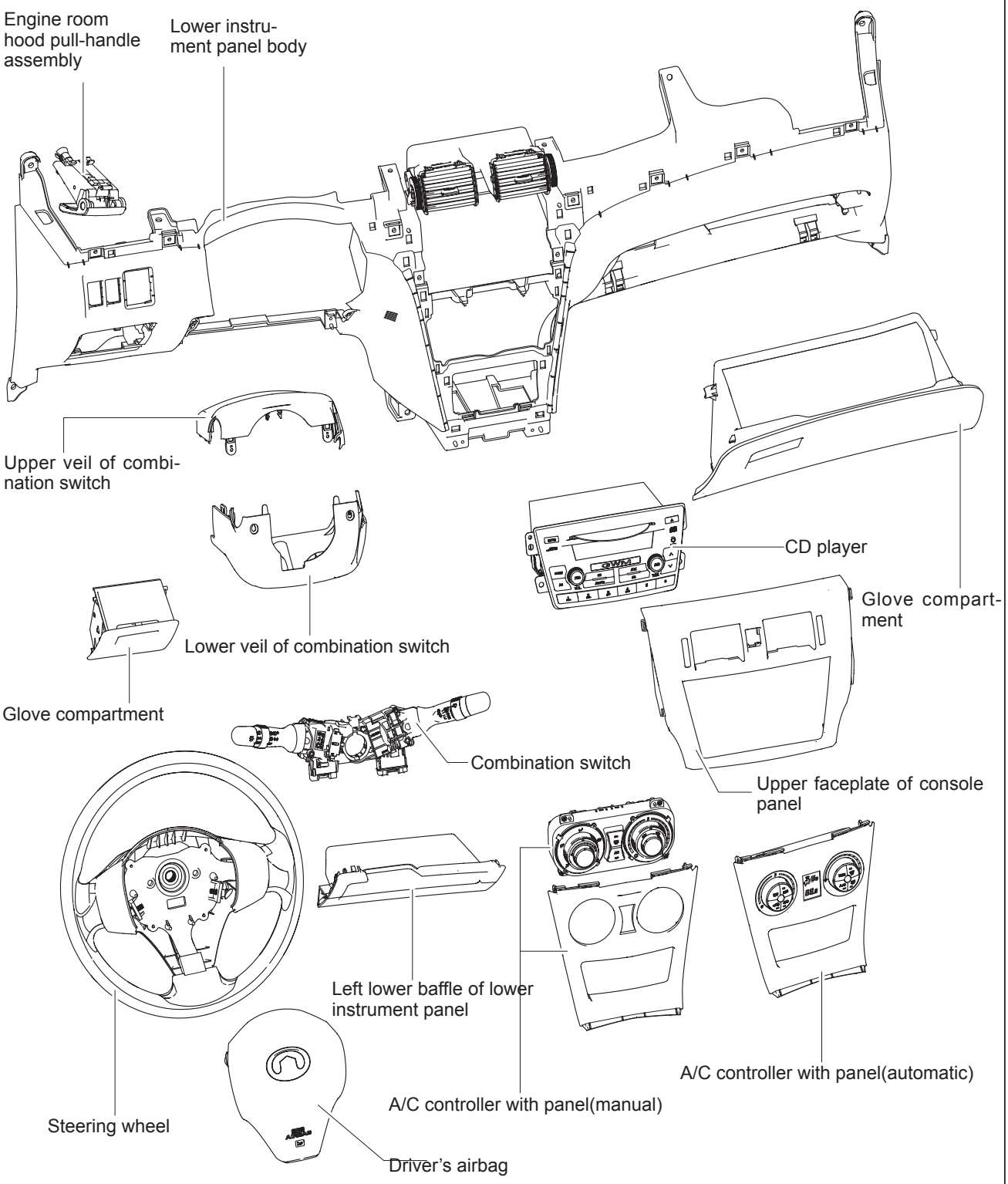
The Installation order is reverse to the removing order.

INSTRUMENT PANEL AND DRIVER INFORMATION

INSTRUMENT PANEL

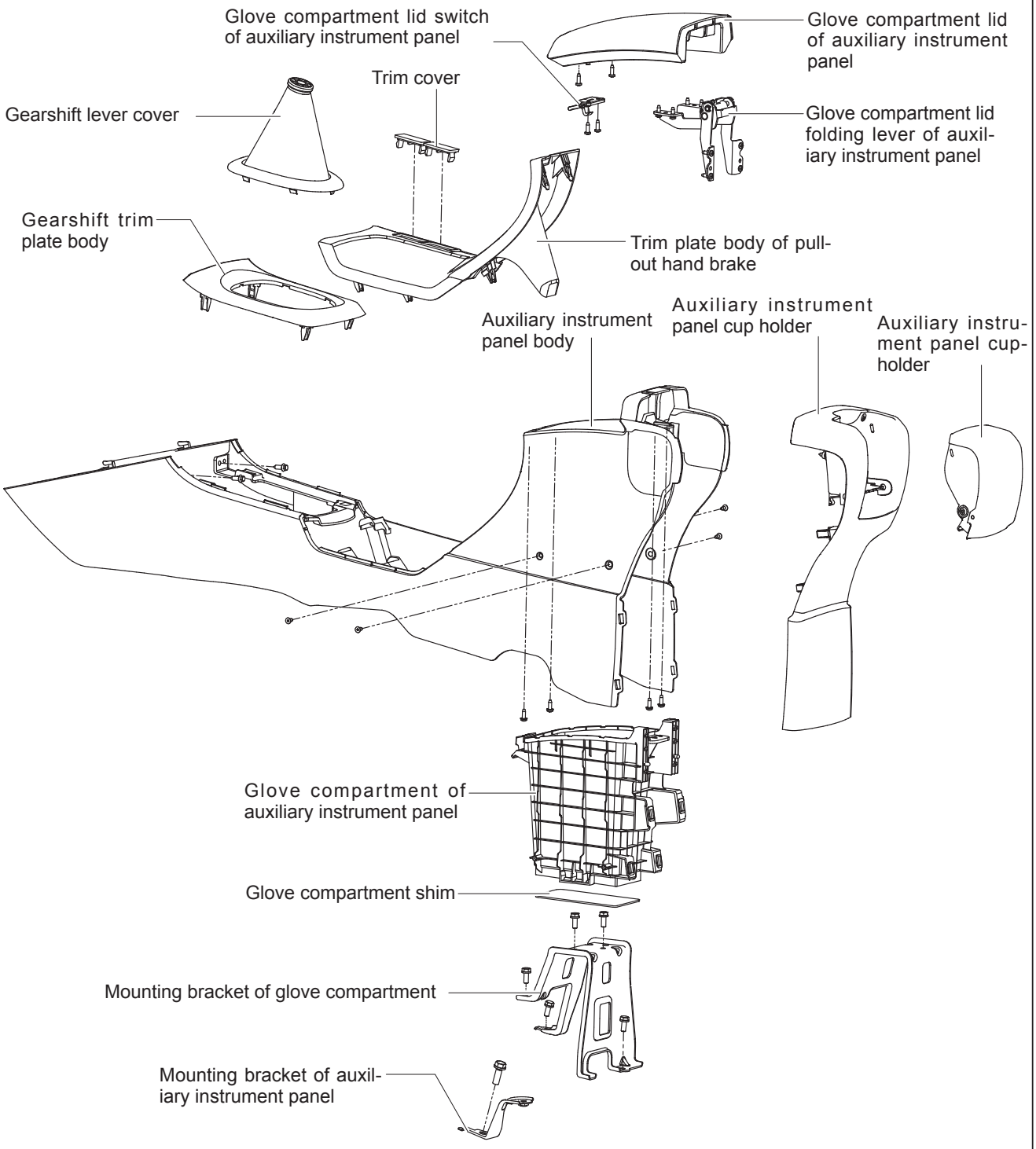
Structure Diagram




Engine room hood pull-handle assembly
Lower instrument panel body
Upper veil of combination switch
Lower veil of combination switch
Glove compartment
CD player
Glove compartment
Combination switch
Upper faceplate of console panel
Left lower baffle of lower instrument panel
A/C controller with panel(manual)
A/C controller with panel(automatic)
Steering wheel
Driver's airbag

AUXILIARY INSTRUMENT PANEL

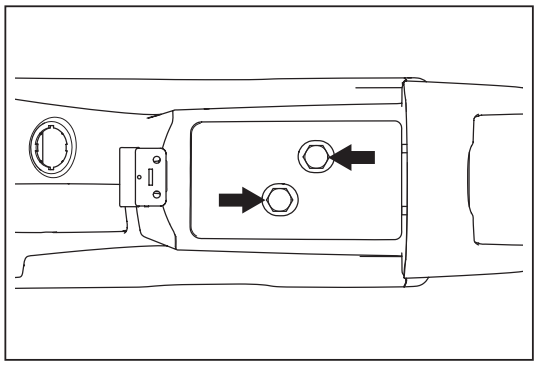
Structure Diagram

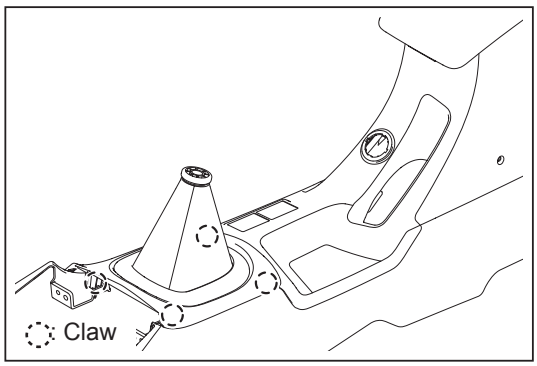


Removal

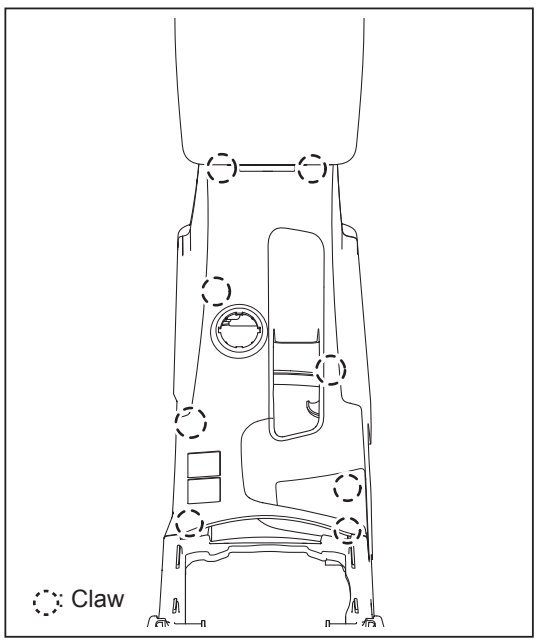
Tip: Disconnect the negative terminal of the battery.

1. **Remove the right trim strip and the left trim strip of the instrument panel**
   Refer to the “Combination instrument” of this chapter.
2. **Remove the upper faceplate of the console panel**
   Refer to the “Combination instrument” of this chapter.
3. **Remove the A/C control panel**
   Refer to the “A/C controller with panel assembly” of the chapter of “Air-conditioning system”.
4. **Remove the auxiliary instrument panel**
   (a) Take off the glove compartment shim.
   (b) Remove the two bolts.

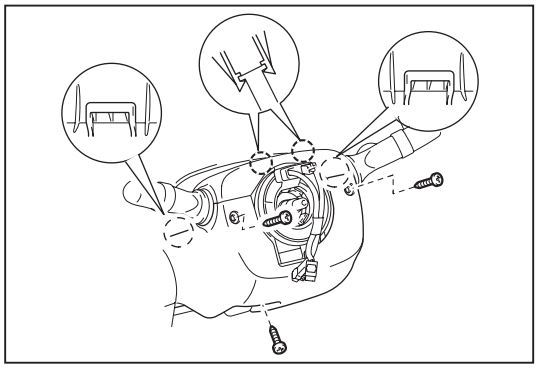




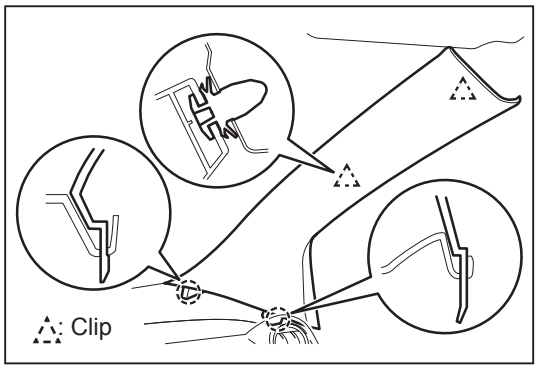
(c) Remove the gearshift handball and remove the gearshift trim plate body and the gearshift lever cover.



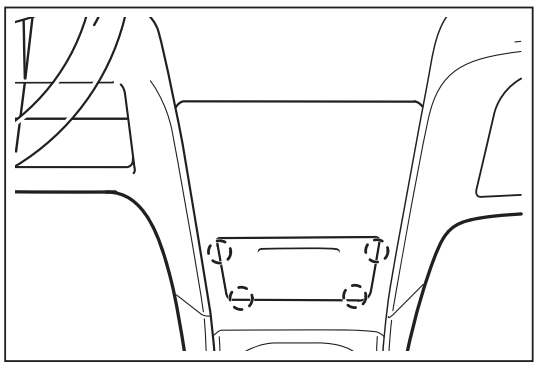
(d) Remove the trim plate body of the pull-out hand brake.
Disconnect the connector of the stand-by power supply. Disconnect the connector of the seat heating switch, remove the trim plate of the pull-out hand brake.
(e) Remove the auxiliary instrument panel.



5. **Remove the steering wheel**
6. **Remove the upper veil and the lower veil of the combination switch**
   (a) Remove the 3 screws as shown in the figure.
   (b) Remove the upper veil of the combination switch.
   (c) Remove the lower veil of the combination switch.
7. **Remove the combination switch**
8. **Remove the combination instrument veil and the combination instrument**
   Refer to the “Combination instrument” of this chapter.

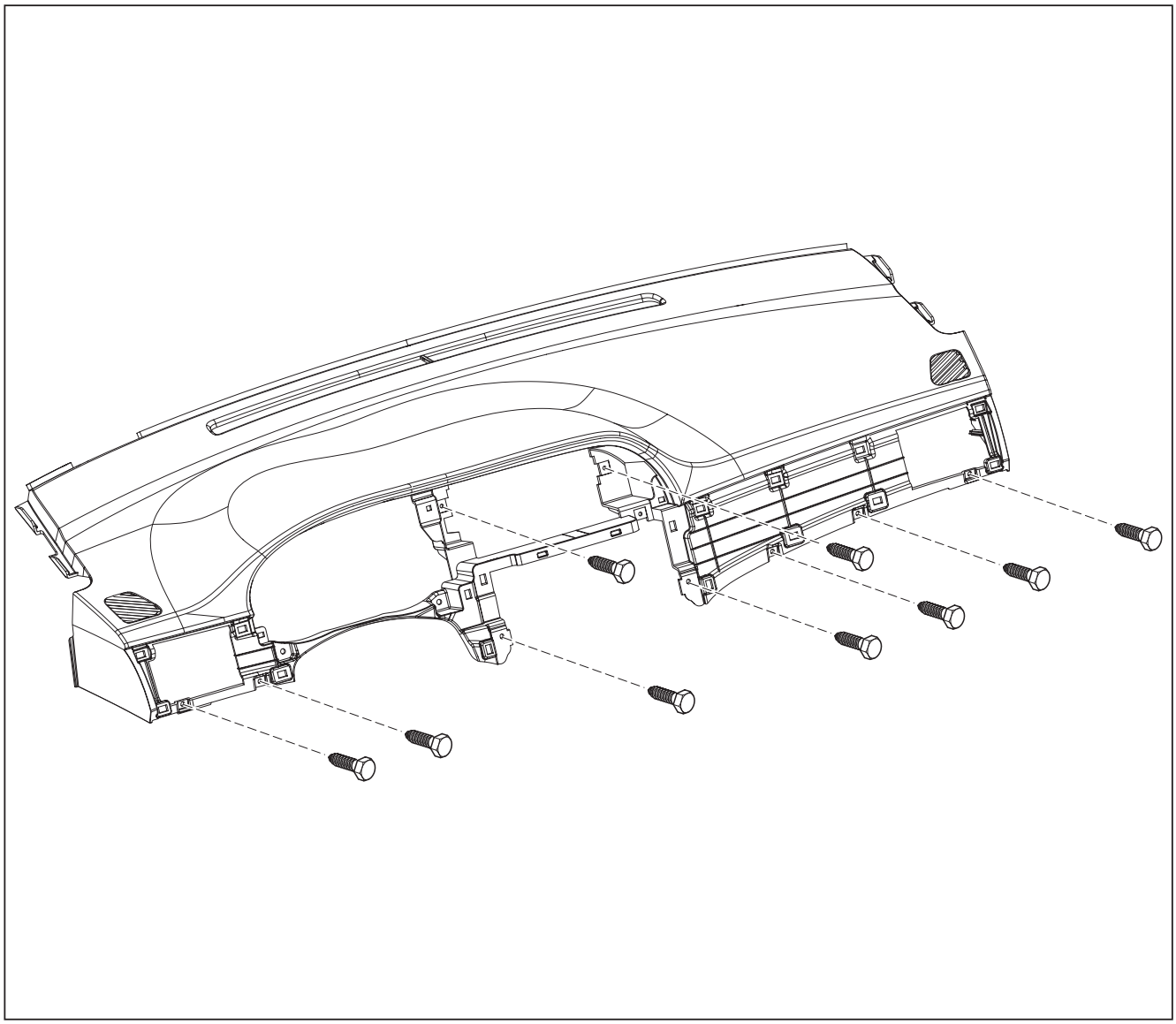


9. **Remove the upper guard board of left Pillar A and the upper guard board of right Pillar A**
   Remove the 2 Clawes and the 2 Clips from the body, taking off the guard board of Pillar A.
10. **Remove the CD player**
    Refer to the “CD machine” of this chapter.



11. **Remove the ashtray assembly**
    (a) Remove the ashtray assembly.
    (b) Remove the connecting harness of the cigarette lighter.
    (c) Take off the ashtray.

12. **Remove the right larger glove compartment assembly of the instrument panel**
13. **Remove the left smaller glove compartment assembly of the instrument panel**
14. **Remove the left lower baffle of the lower instrument panel**



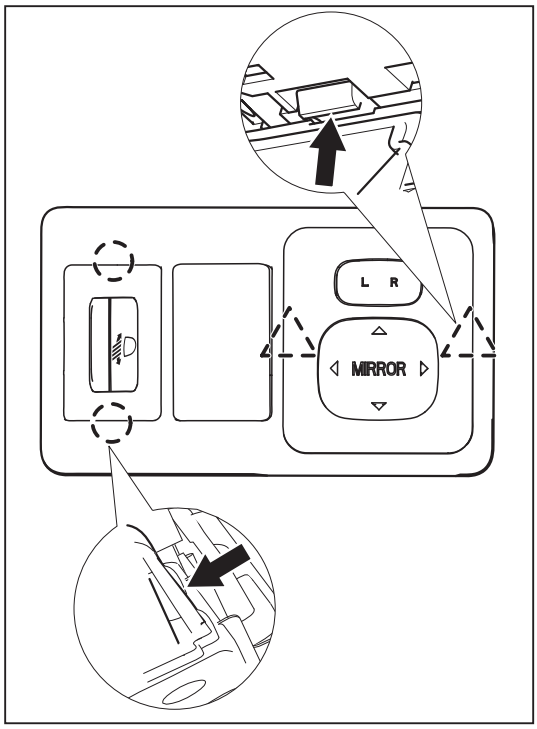
15. Remove the upper body of the instrument panel

(a) Remove the connecting screws between the upper body and the lower body of the instrument panel.

(b) Disconnect the Claw used to connect the upper body and the lower body of the instrument panel.

(c) Take off the upper body of the instrument panel.

16. Disconnect the connection between the engine room lid cable and the pull-out hand

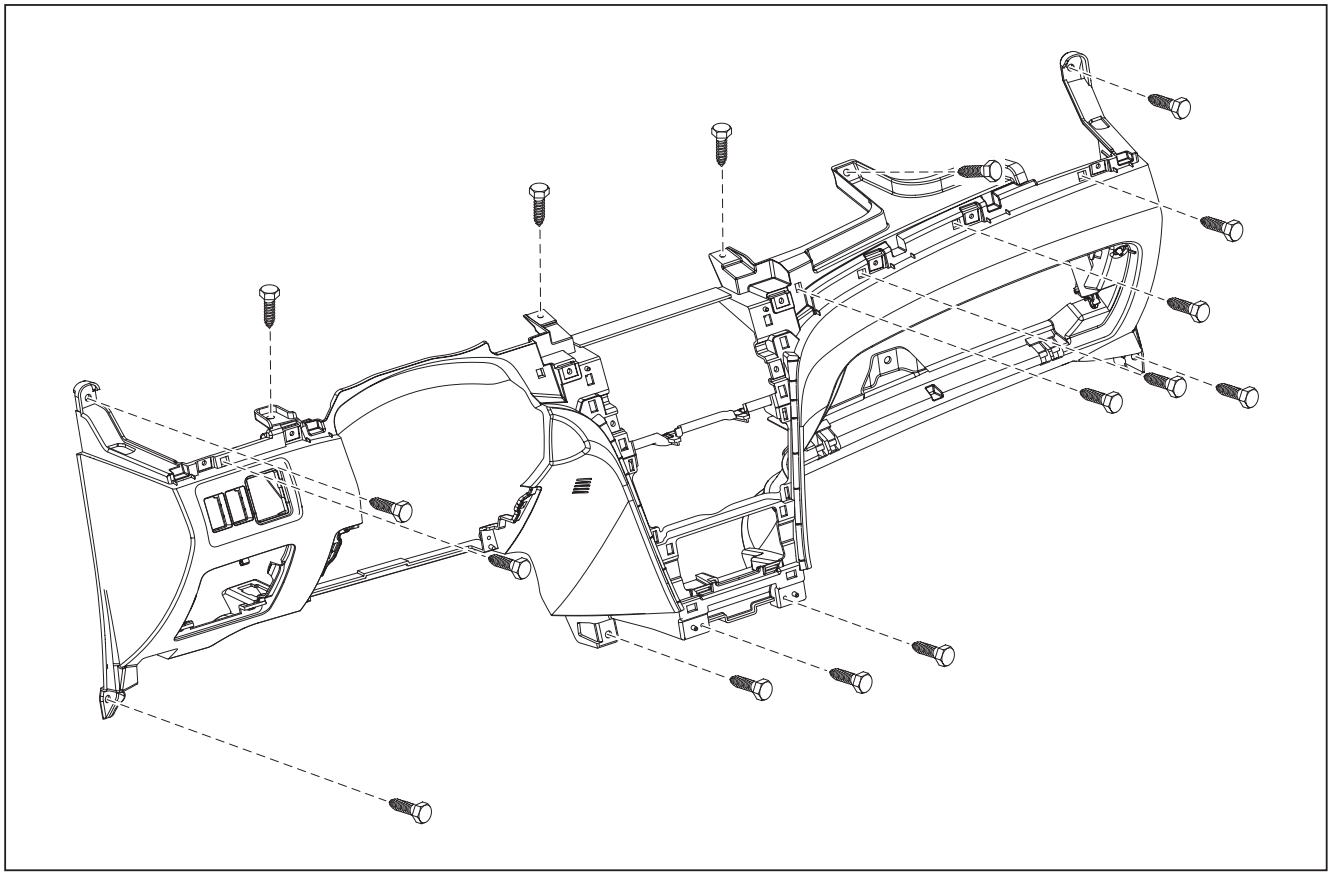


17. Remove the adjusting button of the external rear mirrors

Disconnect the connector of the adjusting switch of the external rear mirror, releasing the connection between the Claw and the instrument panel.

18. Remove the headlight adjusting switch

Disconnect the connector of the adjusting switch of the headlight, releasing the connection between the Claw and the instrument panel.



19. Remove the lower body of the instrument panel

(a) Remove the connecting bolts and screws between the lower body of the instrument panel and the reinforced beam of the instrument panel.

(b) Remove the lower body of the instrument panel.

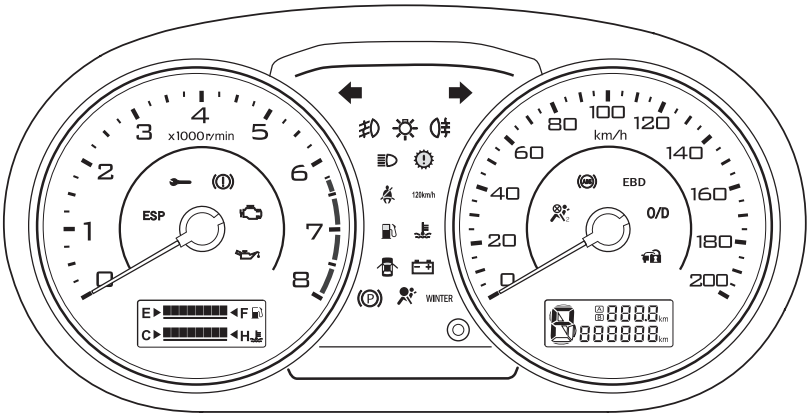
Installation

The Installation order of the instrument panel is reverse to the Removal order.

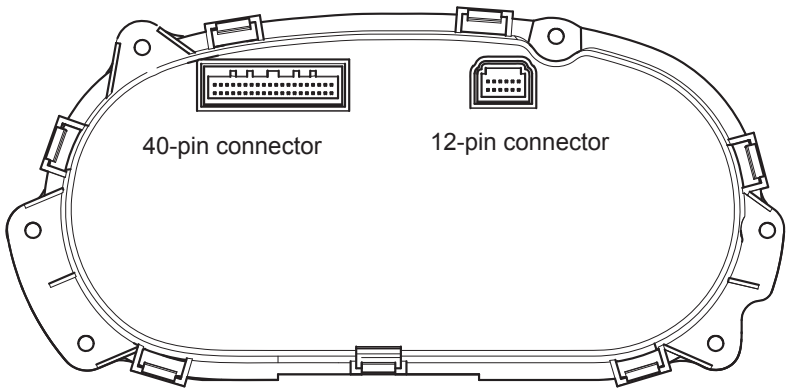
COMBINATION METER

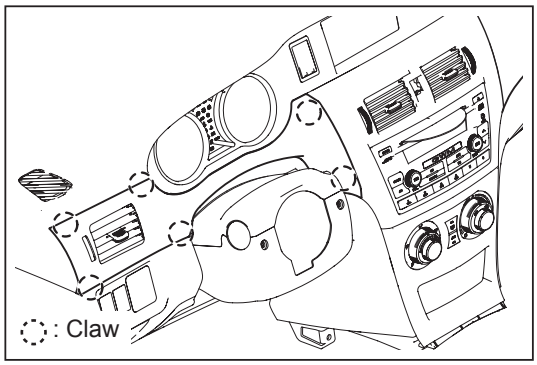
Structure Diagram

Front



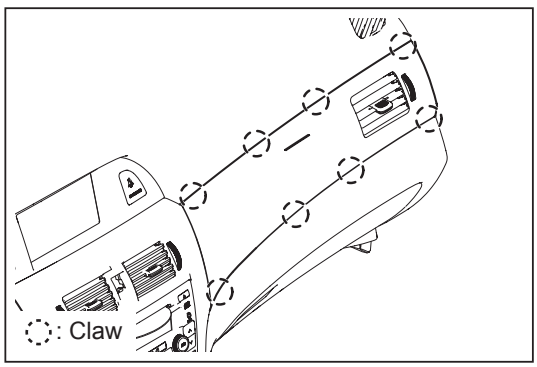
Back



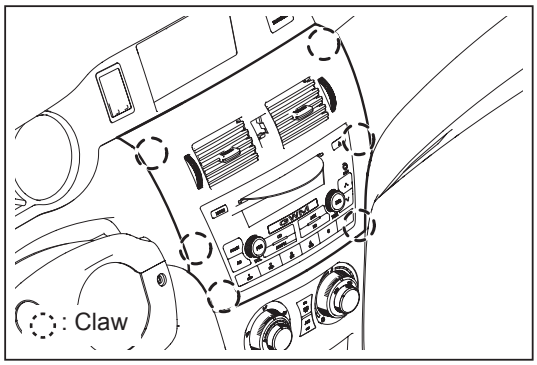


Removal

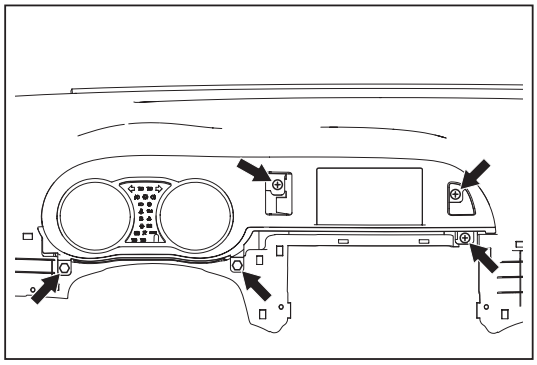
1. **Remove the left trim strip from the instrument panel**



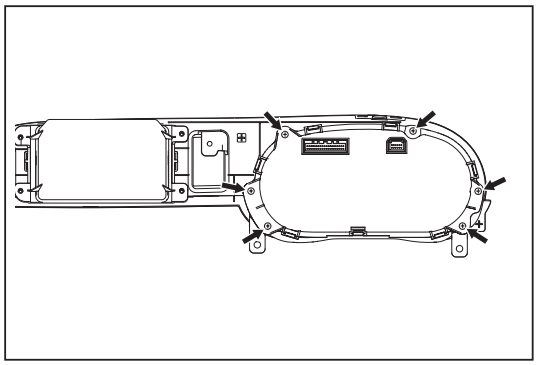
2. **Remove the right trim strip from the instrument panel**



3. **Remove the upper faceplate of the console panel**
4. **Remove the auxiliary instrument panel and the warning lamp of the front-passenger belt un-belted**
   (a) Push out the auxiliary instrument panel from back.
   (b) Use your fingers to push out the warning lamp of the front-passenger belt un-belted.



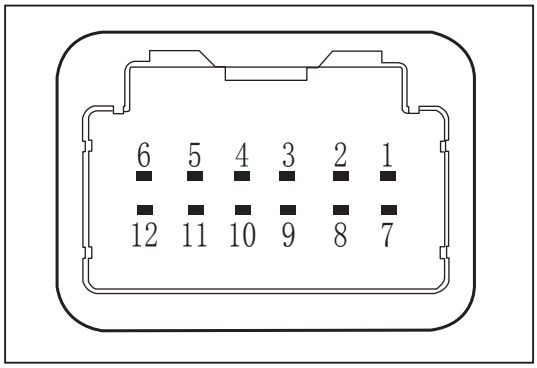
5. **Remove the combination instrument panel veil**
   Use the three self-drilling screws and the two hexagon head bolts to fix the veil and then pull out the plug-ins of the combination instrument.



6. **Remove the combination instrument from the veil**
   Use the six self-drilling screws to fix.

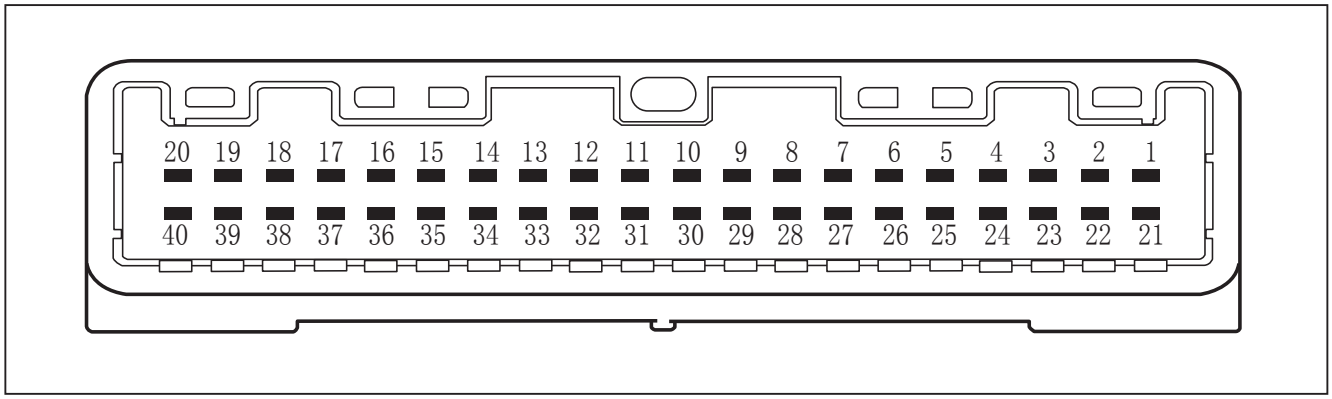
Lead Pin Definition

12-Lead Connector



Pin	Definition	Pin	Definition
1	Anti-theft	**7**	Braking fault
2	Auxiliary airbag lock	**8**	Signal input of engine fault indicator light concerning exhaust
3	Charging indicator	**9**	Signal input of oil pressure alarm indicator light
4	Left turning	**10**	CAN low
5	Battery supply	**11**	CAN high
6	Sensor ground input	**12**	Body floor

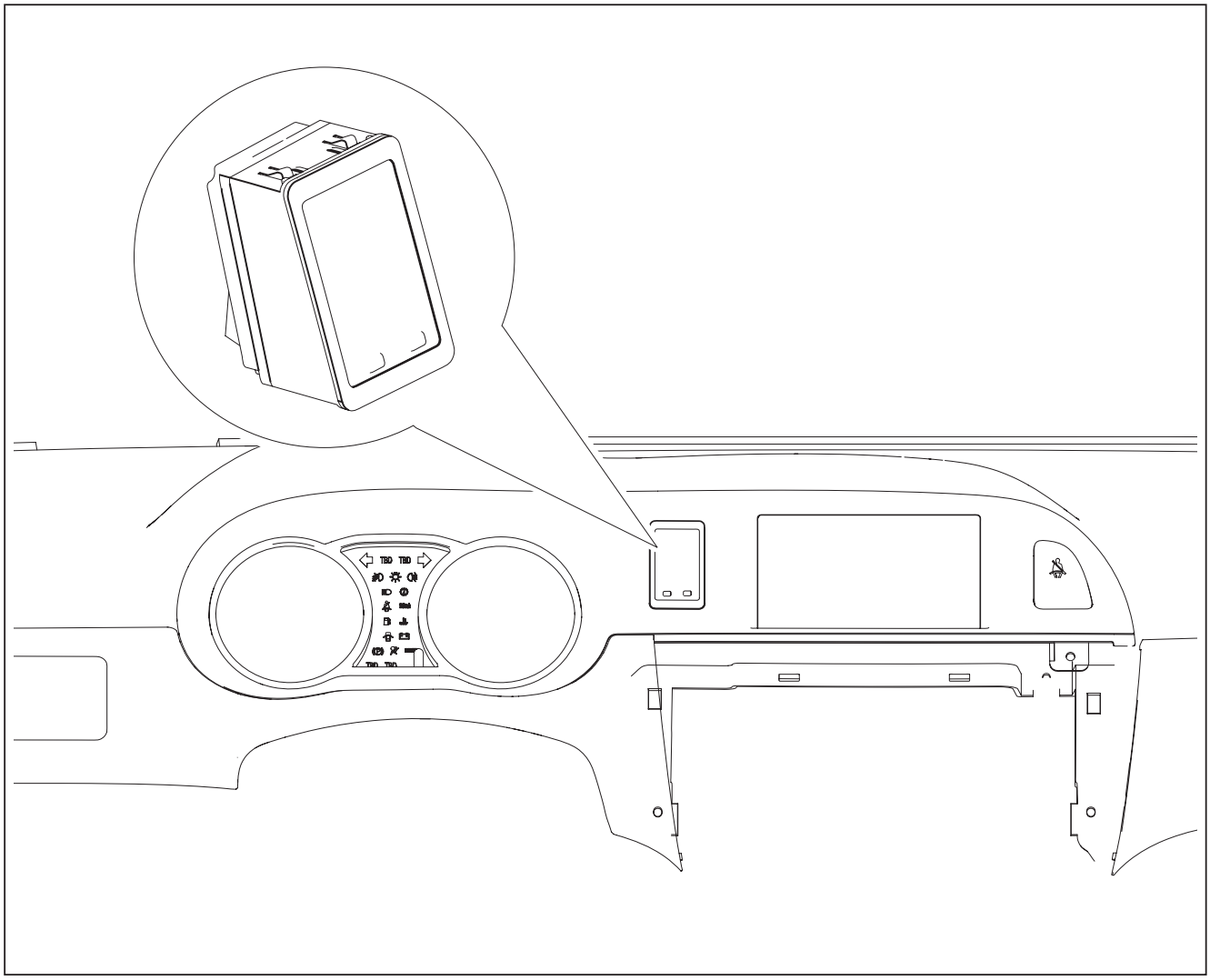
40-Lead Connector



Pin	Definition	Pin	Definition
Pin 1	Signal input of gearbox fault indicator light	Pin 2	Signal input of right-turning indicator light
Pin 3	Signal input of rear foglight indicator light	Pin 4	N/C
Pin 5	Signal input of assistant driver's gravity sensor	Pin 6	Signal input of front foglight indicator light
Pin 7	N/C	Pin 8	Signal input of high beam indicator light
Pin 9	Signal input of indicator light of driver's belt un-belted	Pin 10	Signal input of main switch indicator light
Pin 11	N/C	Pin 12	N/C
Pin 13	N/C	Pin 14	Instrument internal communication
Pin 15	N/C	Pin 16	N/C
Pin 17	ESP	Pin 18	N/C
Pin 19	Signal input of O/D indicator light	Pin 20	Ignition
Pin 21	Signal input of coolant temperature	Pin 22	Signal input of fuel
Pin 23	Signal input of lighting	Pin 24	Signal input of rotating-speed
Pin 25	Signal input of vehicle velocity	Pin 26	N/C
Pin 27	N/C	Pin 28	Signal output of vehicle velocity
Pin 29	Signal output of central door locking	Pin 30	N/C
Pin 31	Alarm output of passenger belt un-belted	Pin 32	Input of passenger belt un-belted
Pin 33	Signal input of engine system fault indicator light	Pin 34	Signal input of un-closed door indicator light
Pin 35	Signal input of braking indicator light	Pin 36	Signal input of airbag indicator light
Pin 37	N/C	Pin 38	N/C
Pin 39	Signal input of ABS alarm indicator light	Pin 40	Signal input of EBD alarm indicator light

AUXILIARY COMBINATION INSTRUMENT

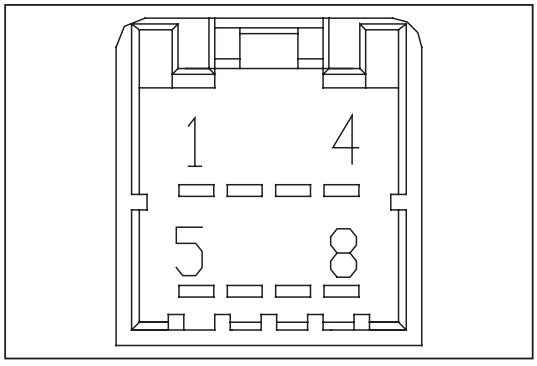
Structure Diagram



Removal

Tip: The Installation order is reverse to the Removing order.

1. **Remove the upper faceplate of the console panel and push it out from back**
2. **Pull out the plug-ins, Remove the auxiliary instrument**

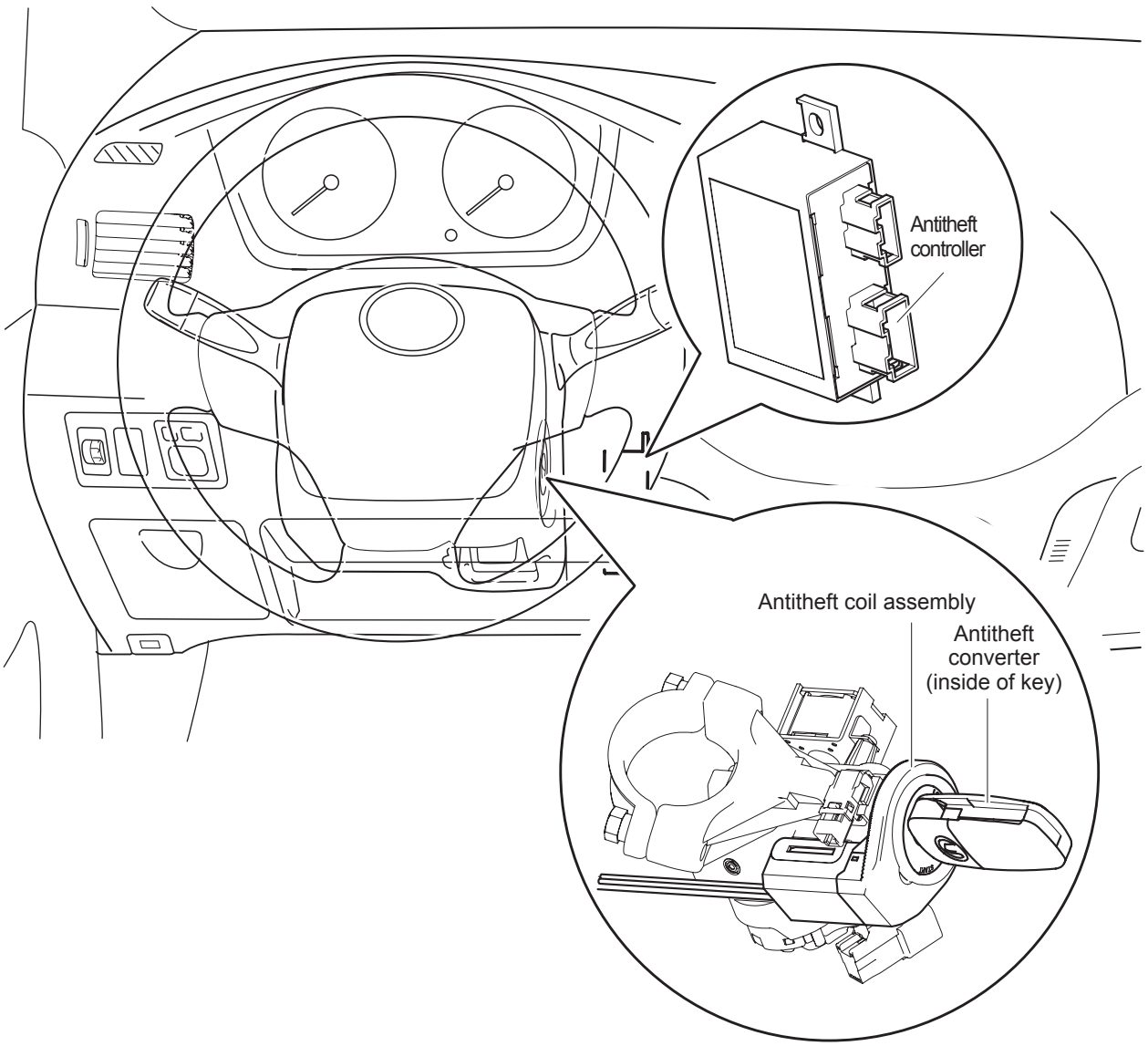


Pin Definition

Pin	Definition	Pin	Definition
1	ACC+	**5**	Battery +
2	Ignition+	**6**	Reserved
3	Later defrosting(positive control)	**7**	4WD(negative control)
4	Tire pressure testing(positive control)	**8**	Battery ground-

ANTITHEFT SYSTEM

STRUCTURE DIAGRAM



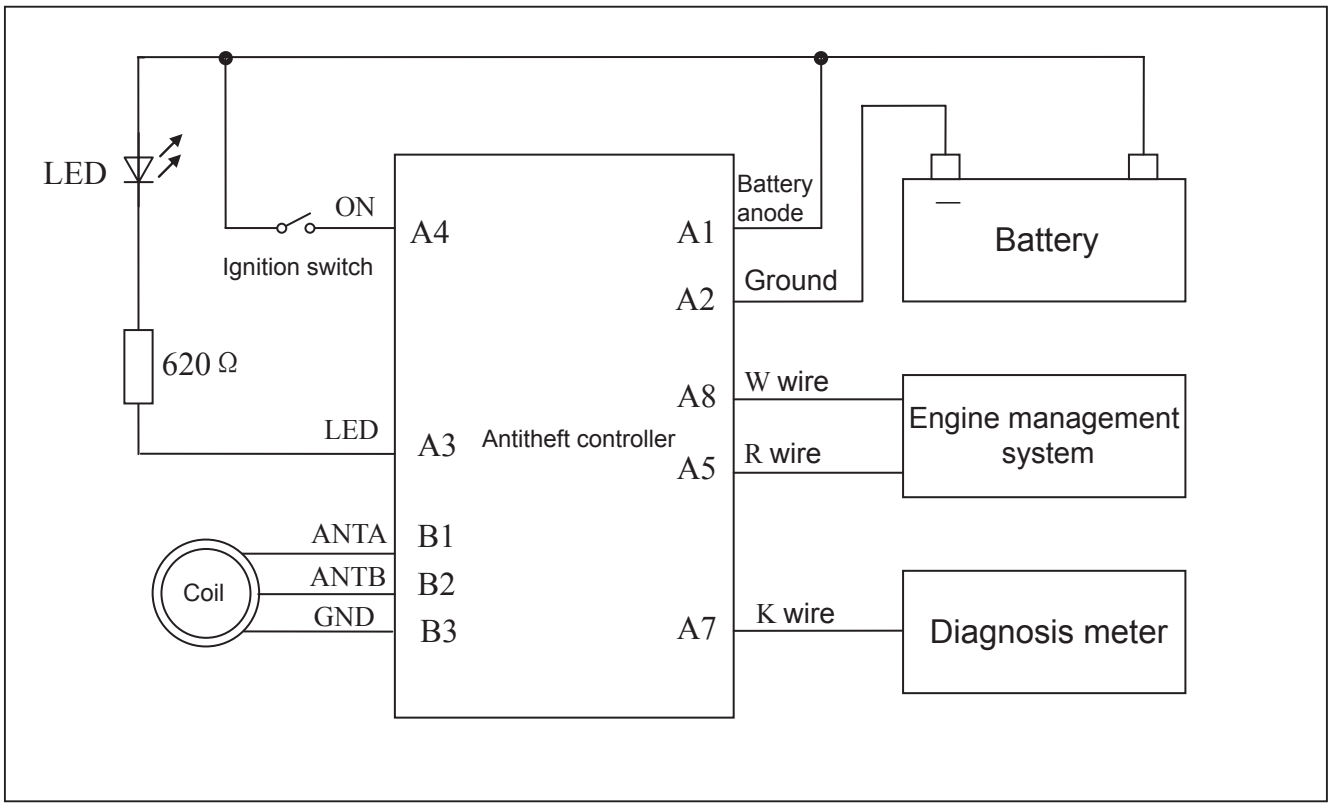
BRIEF INTRODUCTION

Composition of Antitheft System

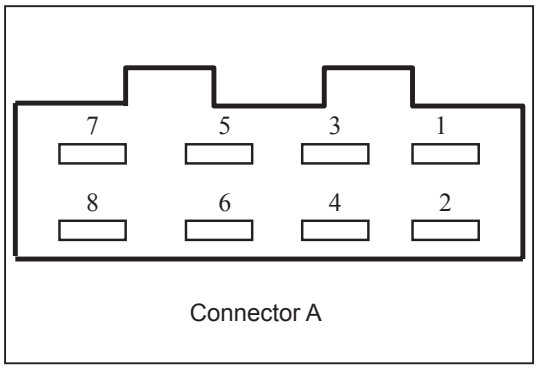
One set of electronic antitheft system is composed of one antitheft controller, one piece of coil and two converters. The coil covers on the head of ignition lock cylinder, and another side of it is inserted and connected with antitheft conctroller; the converter is assembled inside of the plastic handle of the key.

1. **Antitheft controller**
   Antitheft controller is composed of microprocessor and peripheral elements and it is used to realize the communication between converter and engine management system. Through W wire, the antitheft controller communicates with engine management system, but communicate with converter wirelessly. When the ignition key is turned to ON, if the converter is certified successfully with specified time, the engine will be released by the engine management system, so the vehicle will be started. The K wire of antitheft controller can be connected with diagnosis meter, and through diagnosis meter, the antitheft system can be matched, monitored and diagnosed.
2. **Coil**
   The coil is assembled on the ignition lock cylinder, and the connector is connected with antitheft controller. The coil generates inductive electromagnetic field making the communication happen between controller and converter.
3. **Converter**
   Converter is assembled inside of key handle. It is not with power supply and it is small with long service lift. It should be excited inside of electromagnetic field to get power and transmit the signal to realize the communication between antitheft controller.

Wiring Diagram



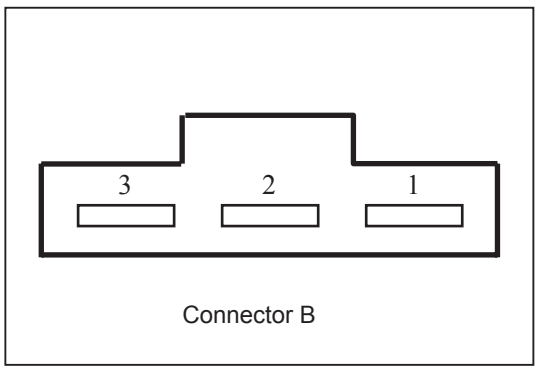
Definition of Lead Pin on Anti-Theft Controller



Connector A

Connector A

Lead pin number	Definition of lead pin	Rated operational voltage	Operating current
A1	Connect with accumulator (+)	12V	<200mA
A2	Grounded	0V	<200mA
A3	Not connected	---	---
A4	Connect with ON end	12V	<50mA
A5	Connect with R line	12V	<50mA
A6	Not connected	---	---
A7	Connect with k line	12V	<100mA
A8	Connect with W line	12V	<100mA
Note: A1 means the No.1 lead pin of connector A, the rest can be deduce accordingly			



Connector B

Connector B

Lead pin number	Definition of lead pin	Standard
B1	A end of coil terminal	Resistance between No.1 end and No.2 end is from 5 to 20Ω; and the resistances between No.1 end, No.2 end and 3 end are infinite.
B2	B end of coil terminal	
B3	GND	
Note: B1 means the No.1 lead pin of connector B, the rest can be deduce accordingly		

FAULT DIAGNOSIS

The fault of antitheft system will cause the engine management system is locked and the engine can not be started, but we can not say that the engine can not be started is the problem of antitheft system; the reasons that the engine can not be started are a lot, including fuel, air, fire, electric and wire factors. When the engine can not be started, first to check whether the antitheft system works properly or not, and check the other related parts if it works properly; remove the fault of antitheft system if it does not work properly. The diagnosis meter can be used to check whether the antitheft system works properly but the precondition is that the diagnosis meter must not communicate with antitheft controller.

If the Communication Can Not Be Set

The following factors can be considered:

1. Check if the voltage of battery is bigger than 9V;
2. If the plug of diagnosis meter is connected with vehicle socket properly;
3. Use multimeter to check if the No. 7 pin of OBD - II plug (diagnosis plug) is connected with No. 7 pin of antitheft controller;
4. Check if the power supply of antitheft controller is correct (use multimeter to measure if the power between pin A1 and A2 of controller socket is bigger than 9V);
5. Then use replacement method to replace the antitheft controller by another one to verify if the antitheft is failed;
   - Replace the antitheft controller if it is failed and rematch it;
   - Take off the electronic controller connected with antitheft K wire, like ABS controller, engine electronic control injector and air bag controller etc. to find out if the malfunction of the communication is related with wire connected with antitheft controller K wire.

If the Communication Is Set

Connect the diagnosis meter to the diagnosis interface of the vehicle, insert the key and turn to ON; on diagnosis meter menue select “antitheft device”→“read system state”→“working state of antitheft device” to check the working state of antitheft system.
If the following information is displayed:

Get electronic injection request	Y
Key verification	Y
Electronic injection verification	Y

The antitheft verification is passed and the antitheft system works properly; there is other reasons that the vheicle can not be started;

- If only one item “get electronic injection request” is N, “key verification” and “electronic injection verification” are Y, and there is no malfunction information inside of “electronic injection malfunction feedback”, it means the antitheft verification is passed and the vehicle should be started if there is no other failures.
- If there is one or two items in “key verification" and "electronic injection verification” is N, then antitheft system can not work properly and the vehicle can not be started.

TROUBLESHOOTING

When the antitheft system is doubted to be failed, first to measure the voltage of the battery if it is bigger than 9V, then connect the diagnosis meter to vehicle diagnosis interface, insert the key to steering lock and turn to ON; select the menue of “antitheft device”→“read the fault” to check the fault code; if one or some of the following fault codes are found, the verification will not pass:

Fault code	Defination of fault code
9000	Problem of antitheft coil or antitheft controller
B040	Communication between electronic injector and antitheft device is not realized
B042	W wire is in short circuit to ground
B043	W wire is in short circuit to power supply
B055	Key is not detected
B056	There is no any information about the key in antitheft device
B057	Saftey code is not written into antitheft device
B060	State of front key is not correct
B061	Key can not be verified or the communication is disturbed

Fault Code: 9000

Code meaning: malfunction inside of antitheft device
Fault reasons: antitheft coil is in open circuit or short circuit; inside malfunction of antitheft controller.
Troubleshooting method:

a) Check if the antitheft coil is connected with the plug of antitheft controller correctly;
b) Check if the wire of antitheft coil plug is falling off or touched;
c) Take off the coil plug of antitheft to check the resistance between pins of B1 and B2, and normally the value should be between 5Ω~30Ω; if the value reaches to 0 it means the coil is in short circuit; if the value is infinite it means the coil is in open circuit; check the resistance between pins of B1 and B3, B2 and B3, and normally the value should be infinite; it means the coil is in short circuit or there is electrictity leak if there is resistance value;
d) If there is no problem of the coil, then check antitheft controller: use replacement method to replace the antitheft controller by new one or reset one, then insert the key into steering lock and turn to ON to read the fault code; if the fault code 9000 is not appeared again, it means the replaced controller has problem; rematch the new replaced controller.

Fault Code: B040

Code meaning: W wire problem and there is no response of the electronic injection

Fault reasons: antitheft controller sends out communication request but does not get the response from electronic injection controller.

Troubleshooting method:

a) First to check if the faults B043 or B042 are existed at the same time; if they are, clear these two faults first;

b) Check the core No. 8 of antitheft controller if it is inserted correctly; check the wire No. A8 pin of No. 8 core (W wire) if it is connected with electronic injector correctly; check the wire of electronic injector and connector if they are connected correctly;

c) Replace the antitheft device and check if the above faults are existed; if there are not, we can say it is the problem of antitheft device;

d) Replace the electronic injector and check if the above faults are continue existed; if there ar not, we can say it is the problem of electronic injector.

Fault Code: B042

Code meaning: W wire is in short ciruict to ground

Fault reasons: W wire is in short circuit to ground.

Troubleshooting method:

a) Check if the plug wire of No. 8 core of antitheft controller is touched;

b) Check the wire of No. A8 pin of No. 8 core (W wire) connected with electronic injector if it is in short circuit to ground;

c) Replace antitheft device and check if the above faults are existed; if there are not, we can say it is the problem of antitheft device;

d) Replace the electronic injector and check if the above faults are continue existed; if there ar not, we can say it is the problem of electronic injector.

Fault Code: B043

Code meaning: W wire is in short ciruict to power supply

Fault reasons: W wire (A8 pin) is in short circuit to battery.

Troubleshooting method:

a) Check if the plug wire of No. 8 core of antitheft controller is touched;

b) Check the wire of No. A8 pin of No. 8 core (W wire) connected with electronic injector if it is in short circuit to battery anode;

c) Replace antitheft device and check if the above faults are existed; if there are not, we can say it is the problem of antitheft device;

d) Replace the electronic injector and check if the above faults are continue existed; if there ar not, we can say it is the problem of electronic injector.

Fault Code: B045

(The vehicle without antitheft indicator will display this fault code but it will not influence the verification of antitheft system)

Code meaning: LED is in short circuit or open circuit to ground

Fault reasons: wire connected with antitheft indicator (LED) (A3 pin) is in short circuit to ground; wire connected with antitheft indicator (LED) (A3 pin) is in open circuit.

Troubleshooting method:

a) Check if the plug wire of No. 8 core of antitheft controller is touched;

b) Check the wire of No. A3 pin of No. 8 core connected with antitheft indicator if it is in short circuit to ground;

c) Check the wire of No. A3 pin of No. 8 core connected with antitheft indicator if it is in open circuit

Fault Code: B048

Code meaning: LED is in short circuit to power supply

Fault reasons: wire connected with antitheft indicator (LED) (A3 pin) is in short circuit to battery.

Troubleshooting method:

a) Check if the plug wire of No. 8 core of antitheft controller is touched;

b) Check the wire of No. A3 pin of No. 8 core connected with antitheft indicator if it is in short circuit to battery anode

Fault Code: B055

Code meaning: the key is not found

Fault reasons: there is no converter inside of key or the converter is damaged, antitheft coil is damaged and result in the antitheft controller can not receive the response signal.

Troubleshooting method:

a) Check if the converter is included in the key;
b) Check if the antitheft coil is correctly accroding to clause 1;
c) Replace the converter.

Fault Code: B056

Code meaning: antitheft device does not store any key

Fault reasons: antitheft device is not matched before or it does not match a key, so there is no any converter identification code stored inside of antitheft controller.

Troubleshooting method:

Learn the key again.

Fault Code: B057

Code meaning: safety code is not set

Fault reasons: antitheft controller is brand new or it is reset.

Troubleshooting method:

Set the safety code and rematch antitheft controller.

Fault Code: B059

Code meaning: do not get request from electronic injection controller;

Fault reasons: antitheft controller does not get the request for communication from electronic injection controller.

Troubleshooting method:

a) Check if the plug wire of No. 8 core of antitheft controller is connected correctly;
b) Check the wire of A5 pin of No. 8 core plug (R wire) connected with electronic injector if it is connected properly without open circuit or bad contact;
c) Replace antitheft device and check if the above faults are existed; if there are not, we can say it is the problem of antitheft device;
d) Replace the electronic injector and check if the above faults are continue existed; if there ar not, we can say it is the problem of electronic injector.

Fault Code: B060

Code meaning: current key is not stored inside of antitheft device;

Fault reasons: there is no any converter identification code stored inside of antitheft controller.

Troubleshooting method:

Use diagnosis meter to carry out “learn key” function.

Fault Code: B061

Code meaning: key can not be verified or the communication is disturbed

Fault reasons: the communication between converter and antitheft controller can not be set or the communication is disturbed, the communication data is not correct, or the pin code of electronic injector and converter is disaccorded.

Troubleshooting method:

a) Check if the antitheft coil is correctly accroding to clause 1;
b) Check if the convert is brand new and not matched; rematch it if it is not matched before;
c) If the converter is matched before, then make sure if the converter is replaced before, if electronic injector is replaced before or if it is reset before;
    - If the converter is replaced before, then it can not be used anymore; a new converter must be used and it should be rematche;
    - If the converter is not replaced before, and only the electronic injector is reset, then just reset it;
    - If the converter is not replaced before and only the electronic injector is replaced, then make sure the current electronic injector is brand new or reset; if the current electronic injector was matched before and not reset, a brand new or reset electronic injector must be used and rematched.

MATCHING OF ANTITHEFT SYSTEM

System match means to make all the independent parts inside of antitheft system-antitheft contrller, converter, engine management system to be one organic antitheft control system by corresponding matching device or diagnosis meter. The antitheft system can work properly only after it is matched, and the engine can be started.

When one part inside of the antitheft system is failed, the failed part should be replaced, and the system needs to be matched again after the replacement.

1. **Only the coil is replaced**

   The antitheft system needs not to be rematched.

2. **Only the key is replaced (converter)**
   (a) Read VIN code and apply to get PIN code;
   (b) Connect the diagnosis plug;
   (c) Insert the key to be copied into the igntion lock and turn it to ON;
   (d) Select the menu “antitheft device”→“read the system state”→“key inspection” to check if the key is legal or if it is matched before; it needs to change to another key if it is illegal or matched before;
   (e) Select menue “antitheft device” “match of antitheft device” “input the code” “input the safety code” by diagnosis meter and input the safety code/PIN code;
   (f) Select the menue of “wipe the key” order to delete the information of damaged or lost key;
   (g) Select the menue of “learn the key” order to learn the key;
   (h) If another key needs to be matched, insert the key and reset the diagnosis meter to carry out the steps of (c), (d), (e) and (g).

   Note:

   The key must be legal and unmatched before key learning, otherwise the matching of antitheft system will not be finished, or even the diagnosis meter indicates the match is finished but it can not pass the verification of electronic injection.

3. **Only the antitheft controller is replaced**
   (a) Read VIN code and apply to get PIN code;
   (b) Turn off the ignition switch to replace the unmatched new or reset antitheft controller;
   (c) Insert the key into the igntion lock and turn it to ON;
   (d) Use the selection menue of the diagnosis meter of “antitheft device”→“input the code”→“set the safety code” to set the safety code;
   (e) Select the menue of “antitheft device”→“ match of antitheft device”→“read the EMS to antitheft device” to finish the match between electronic injection and antitheft device;
   (f) There are no VIN code and original key infornation stored inside of antitheft device because the antitheft device is new, so the VIN code needs to be input; original keys need to be matched one by one, otherwise the orignal key can not be used.

   Note:

   - **It is a must to replace the new or reset antitheft controller, otherwise the match of antitheft system can not be finished.**
   - **It is a must to select the menue of “read EMS to antitheft device” but not “read antitheft device to EMS”, otherwise the converter will be scrapped.**

4. **Only the electronic injection (EMS) controller is replaced**
   (a) Read VIN code and apply to get PIN code;
   (b) Turn off the ignition switch to replace the unmatched new or reset antitheft controller;
   (c) Insert the key into the igntion lock and turn it to ON;
   (d) Select menue of “antitheft device”→“input the code”→“input the safety code” to input the safety code;
   (e) Select the menue of “antitheft device”, “ match of antitheft device”, “read antitheft device to EMS” to finish the match between electronic injection and antitheft device;

   Note:

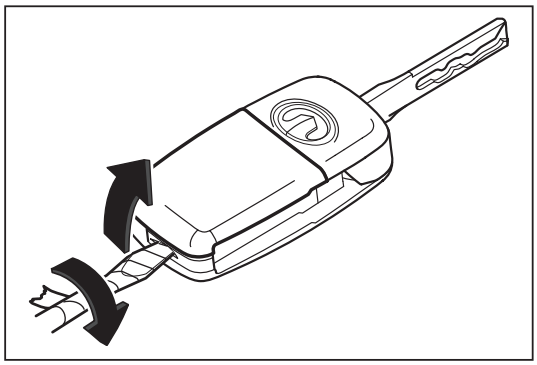
   - **It is a must to replace the new or reset EMS controller, otherwise the match of antitheft system can not be finished.**
   - **It is a must to select the menue of “read antitheft device to EMS” but not “read EMS to antitheft device”, otherwise the converter will be scrapped.**

5. **Antitheft device and EMS controller are replaced at the same time.**
   If antitheft device and EMS controller need to be replaced at the same time, the matched converter must be replace together with them, otherwise the match of antitheft system can not be finished. The antitheft system needs to be rematched after the replacement.

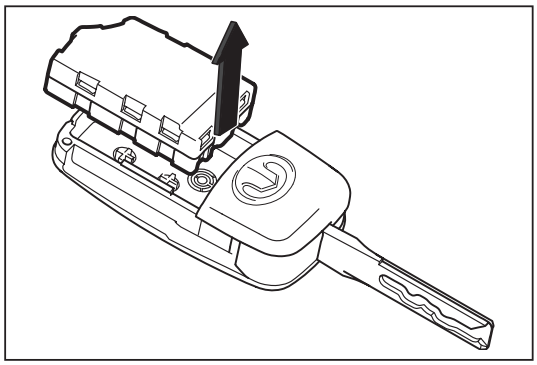
TRANSMITTER

Replace Battery of Transmitter

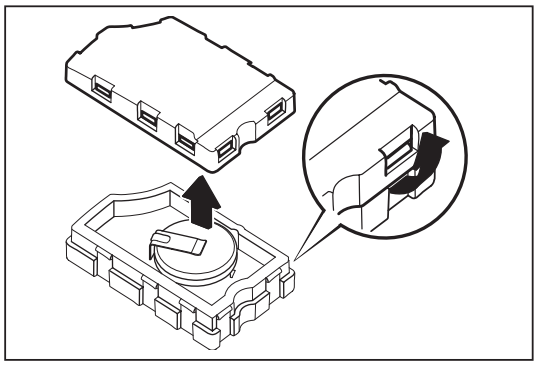
1. **Remove battery of transmitter**
   Note:
   For all parts are precise electronic units, they shall be handled with great care.
   (a) Use the flat tip screwdriver of which the header is wrapped with the protecting adhesive tape to unclench the key cover.



(b) Take out the micro module.

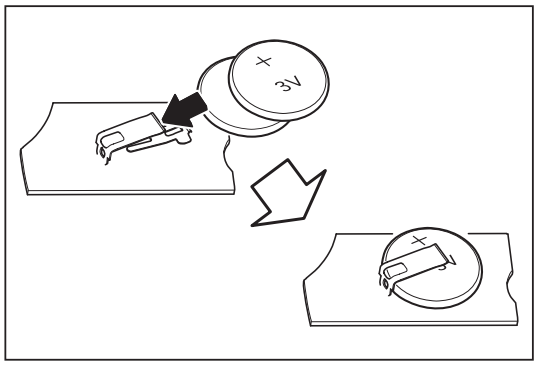


(c) Remove the battery (lithium cell).
Remove the battery cover of the micro module and take out the battery.



Note:

- Never use finger to push terminal.
- The terminal may be distorted if the battery (lithium cell) was prized by force.
- Do not use wet hand to touch the battery.The water may rust the battery.
- Do not touch or move the parts in the transmitter, for this operation may interfere with the normal operation.



2. Install battery of transmitter

(a) Install new battery as shown in the diagram, the positive pole (+) is upward (the model number of the battery is of CR1616).

Note:

- Make sure that the positive pole and negative pole of the battery of transmitter are matched correctly.
- Do not bend the battery of the transmitter when inserting the battery.
- Be careful not to contaminate the housing of the transmitter with the dust or oil.

(b) Install the battery cover of the micro module.

(c) Put the micro module into the key housing and install the key cover.

Inspect Transmitter

1. Inspect the transmitter for car door control

(a) Inspect the operating conditions of the transmitter.

(1) Remove the battery (lithium cell) from the transmitter.

(2) Install new battery (lithium cell) or the battery (lithium cell) which can operate normally.

(3) Align the key of the transmitter to the vehicle on a site from the vehicle for about 1m and press down the transmitter switch on the housing of the transmitter to inspect the operating conditions of the transmitter.

Standard:

The door lock can be operated via the remote controller.

Remark:

- The minimum operating distance will be different under different circumstance.
- For the transmitter only send out the weak electric wave, the noise or the strong electric wave on the frequency band used will shorten the operation distance.

(4) Install the battery of the transmitter (lithium cell).

(b) Inspect the electric quantity of the battery.

Remark:

- The electric quantity of the battery can only be determined after the battery was installed in the transmitter. The volt displayed on the inspection instrument is higher than 2.5V if the lithium cell is used on the transmitter, unless the electric quantity of the battery is exhausted or the battery is not installed. So the voltage of the battery shall be measured when the battery is installed on the transmitter when measuring the surplus energy of the battery (the resistance applied to the battery is of 1.2kΩ).
- The surplus energy of the battery may not be inspected correctly if the transmitter is at fault.

(1) Remove the battery of the transmitter (lithium cell).

(2) Connect the lead wire with the negative pole (-) terminal of the transmitter and install the battery.

(3) Connect the positive pole (+) probe of the inspection instrument with the positive pole (+) of the battery and connect the negative pole (-) probe of the inspection instrument with the lead wire respectively.

(4) Press down and hold any transmit switch on the transmitter for about 1 second.

(5) Push down the transmit switch on the transmitter again to inspect the voltage.

Standard:

2.2V or higher

Remark:

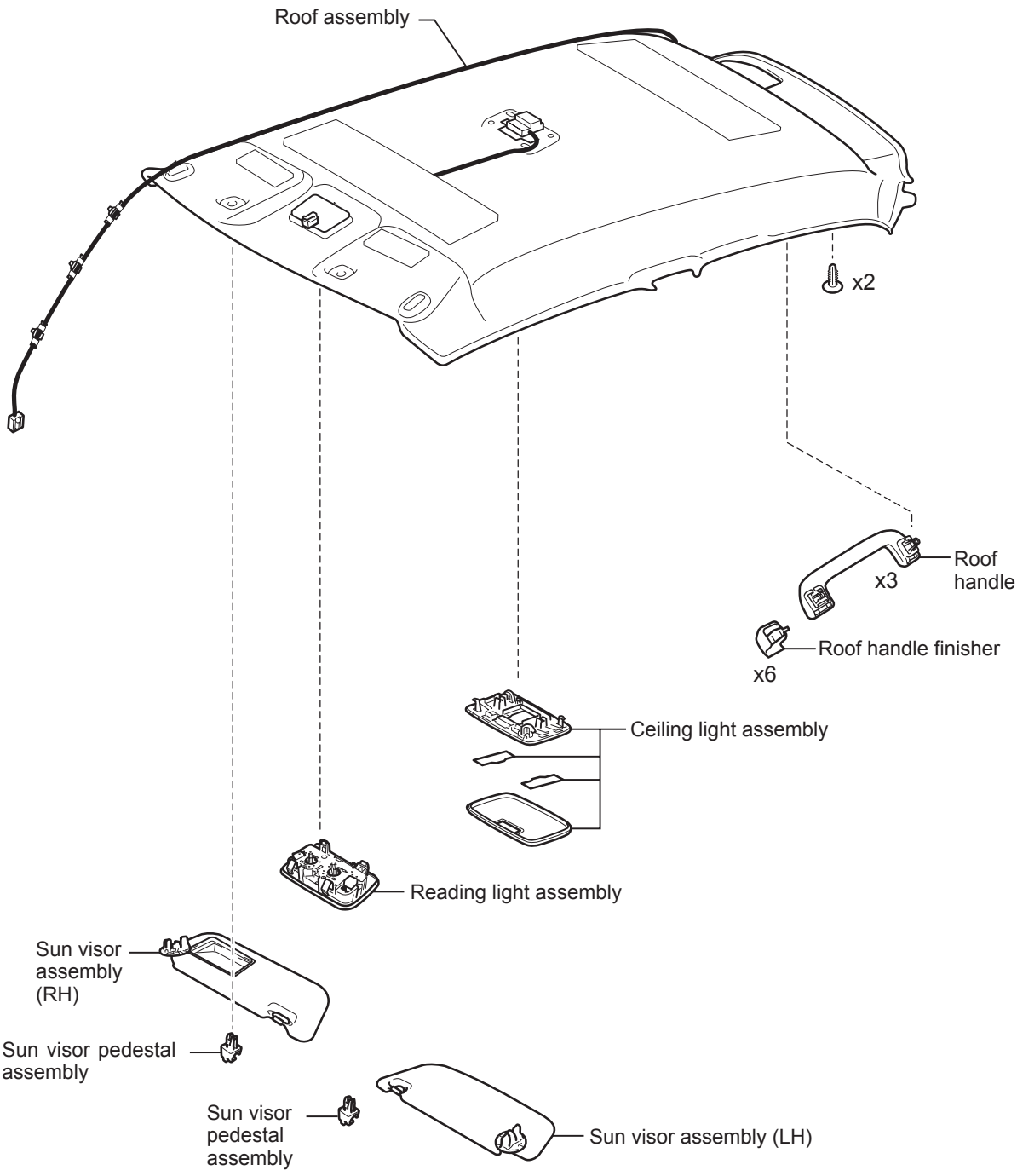
- The inspection may be inaccuracy when the temperature of the battery is too low.
- Put the battery in a circumstance of which the temperature is about 18°C for about 30 minutes or longer and carry out the inspection again when the test script test result is lower than 2.2V.
- The automatic power off function may lead to the battery voltage is of 2.5V or higher when press down the switch for about 0.8 second (the voltage of the battery on which the resistance is not applied). So make sure that the voltage is read immediately after the switch is pressed down.
- One time or two times of high voltage may be displayed after the temperature of the battery was resumed to the specified temperature, so the inspection shall be carried out after the switch was pressed down for at least 3 times and the voltage is displayed.

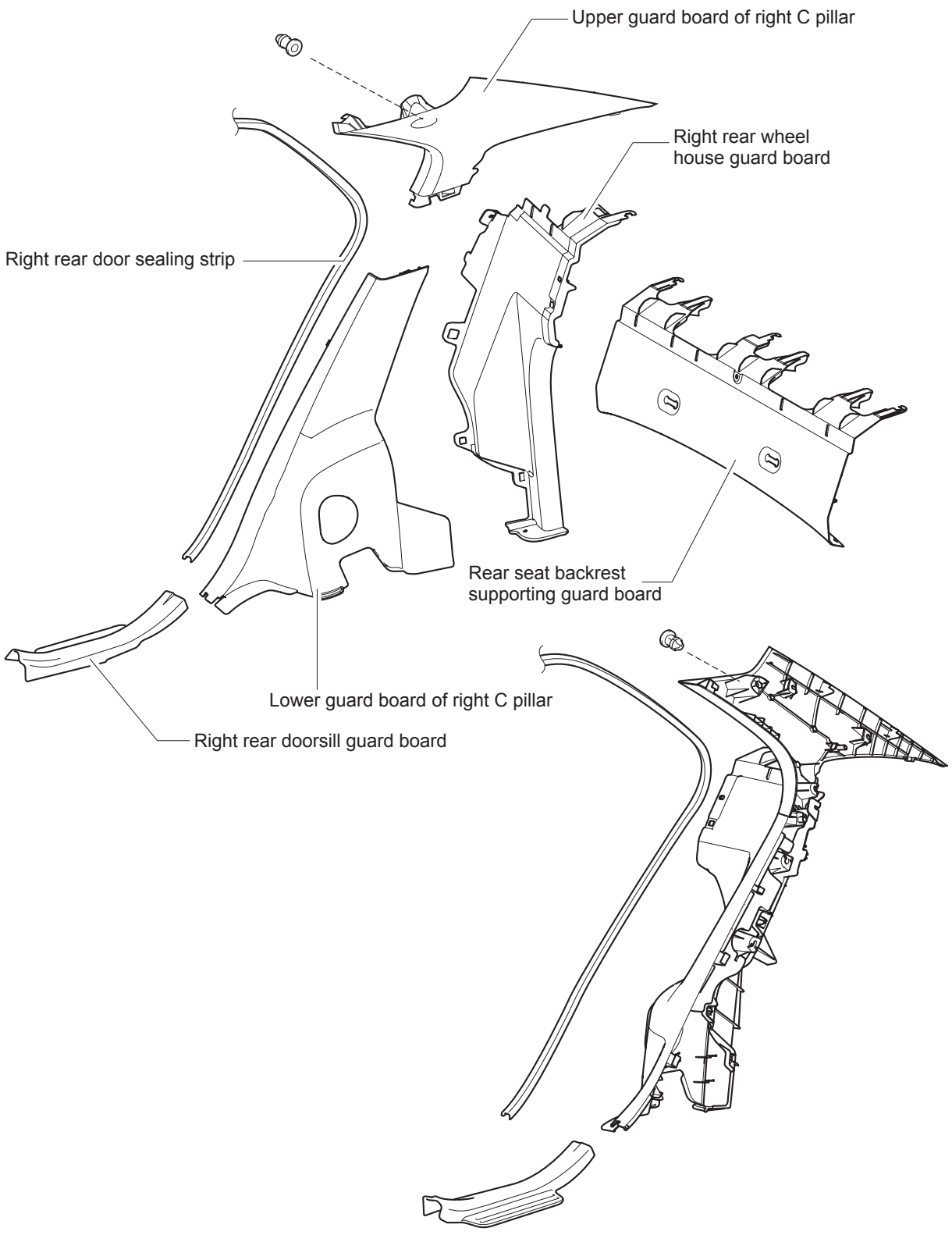
(6) Disconnect the lead wire.

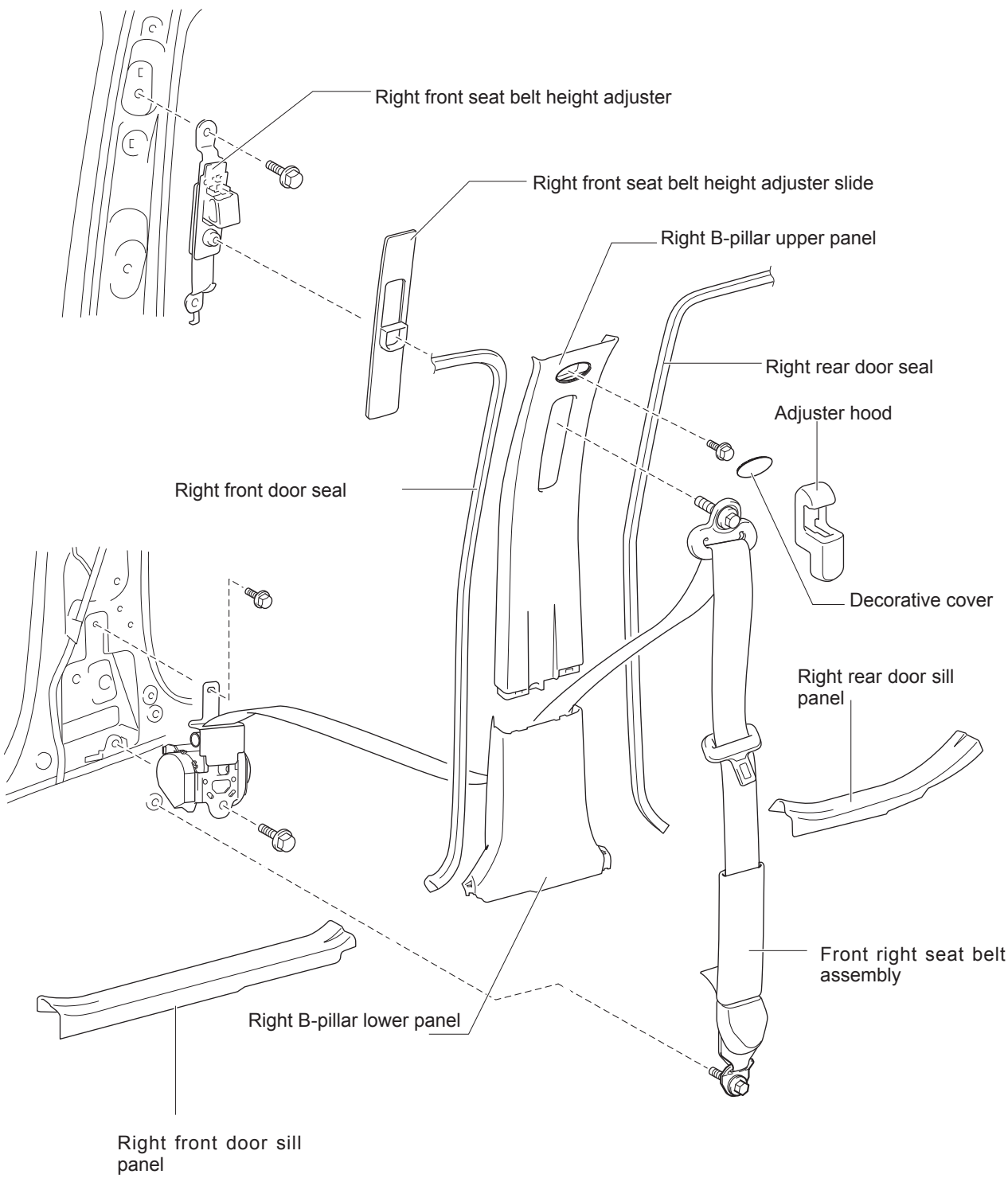
(7) Install the battery of the transmitter (lithium cell).

ROOF

STRUCTURE DIAGRAM




Upper guard board of right C pillar
Right rear wheel house guard board
Right rear door sealing strip
Rear seat backrest supporting guard board
Lower guard board of right C pillar
Right rear doorsill guard board

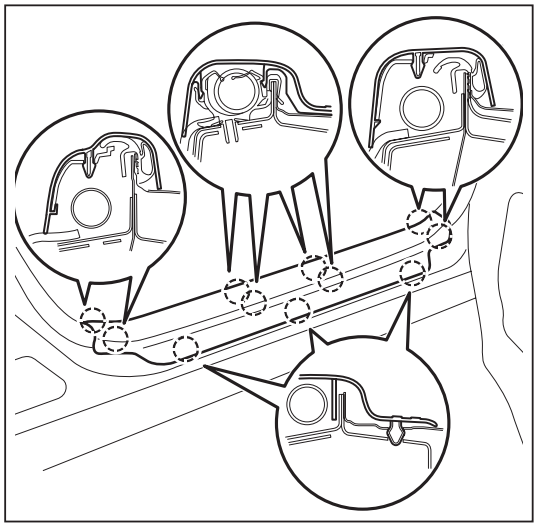

Right front seat belt height adjuster
Right front seat belt height adjuster slide
Right B-pillar upper panel
Right rear door seal
Adjuster hood
Right front door seal
Decorative cover
Right rear door sill panel
Front right seat belt assembly
Right B-pillar lower panel
Right front door sill panel

REPLACEMENT

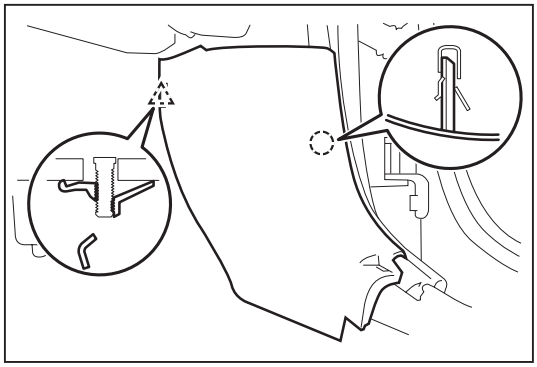
Removal

Note:

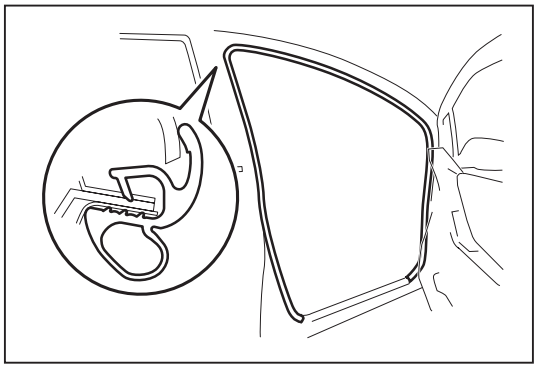
Before starting removal operation, disconnect battery negative (-) first and wait more than 90 seconds.



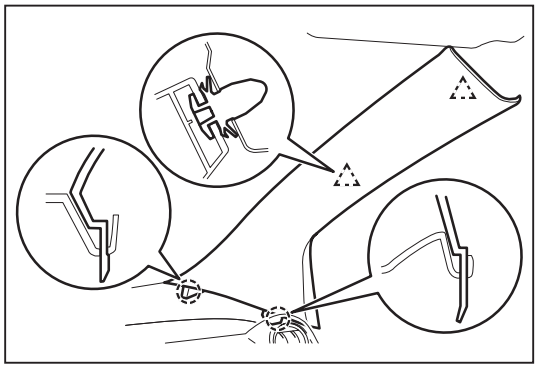
1. **Remove right front door doorsill guard board**
   Separate 11 claws on doorsill guard board
2. **Remove left front door doorsill guard board**
   Removal methods are the same as the right side.



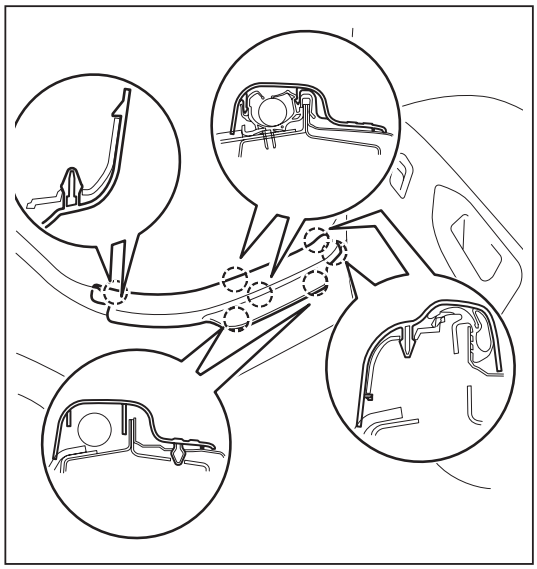
3. **Remove lower guard board of right A pillar**
   Separate 2 connecting clips of the lower guard board of right A pillar on the vehicle body and the lower guard board can be taken out.
4. **Remove lower guard board of left A pillar**
   Removal methods are the same as the right side.
5. **Remove the right front car door sealing strip**



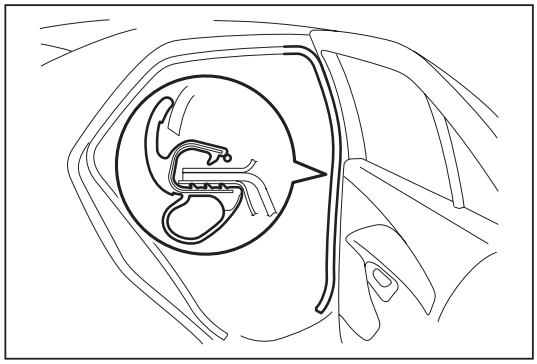
6. **Remove the left front car door sealing strip.**



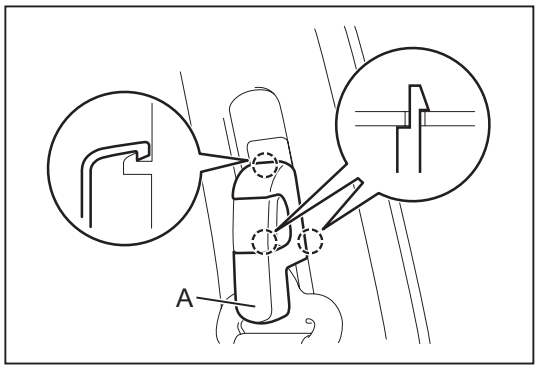
7. **Remove the upper guard board of the left A pillar and the upper guard board of the right A pillar.**
   Separate 2 claws and 2 clips from the vehicle body and take off the upper guard board of the A pillar.



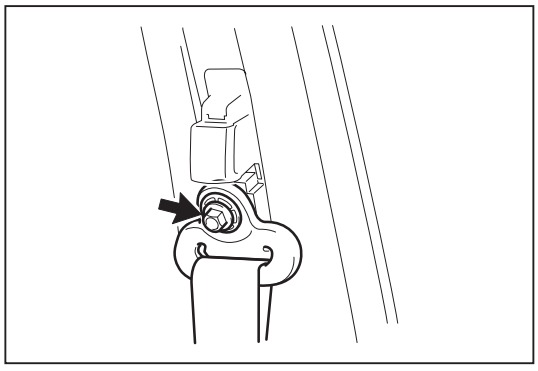
8. **Remove the doorsill guard board of the right rear door**
   Separate 8 claws on doorsill guard board.
9. **Remove the doorsill guard board of the left rear door**
   Removal methods are the same as the right side.



10. **Remove the right rear car door sealing strip**
11. **Remove the left rear car door sealing strip**



12. **Remove the regulator cover housing**
    Tip:
    The removal methods of the left and right regulator cover housing are the same.
    Pull the A position shown in the diagram outwards along the direction vertical to the line of the operator to disconnect the clips shown in the diagram and the regulator cover housing can be taken off.

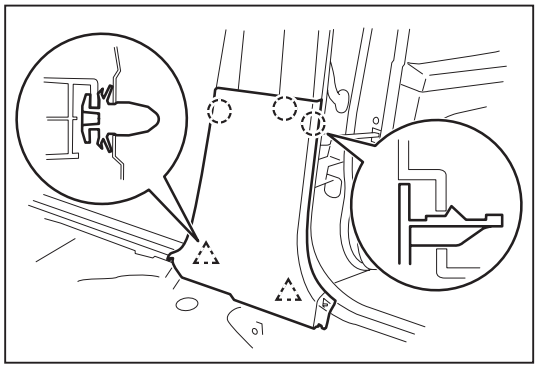


13. **Remove the bolt on the upper fixing point of the front right safety belt**
14. **Remove the bolt on the upper fixing point of the front left safety belt**
    Tip:
    Removal methods are the same as the right side.

15. **Remove the bolt on the lower fixing point of the front right safety belt**
16. **Remove the bolt on the lower fixing point of the front left safety belt**

Tip:

Removal methods are the same as the right side.



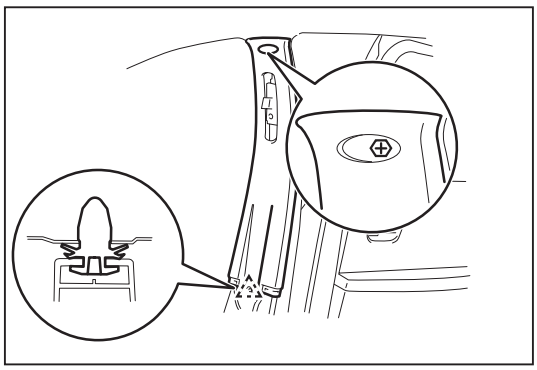
17. **Remove the lower guard board of the right side B pillar**

Remove 3 claws for connecting the lower guard board and the upper guard board of the B pillar, Remove 2 clips for connecting the lower guard board of the B pillar and the vehicle body.

18. **Remove the lower guard board of the left side B pillar**

Tip:

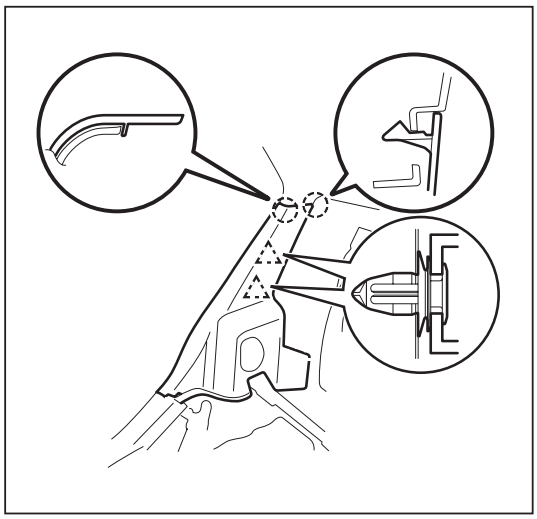
Removal methods are the same as the right side.



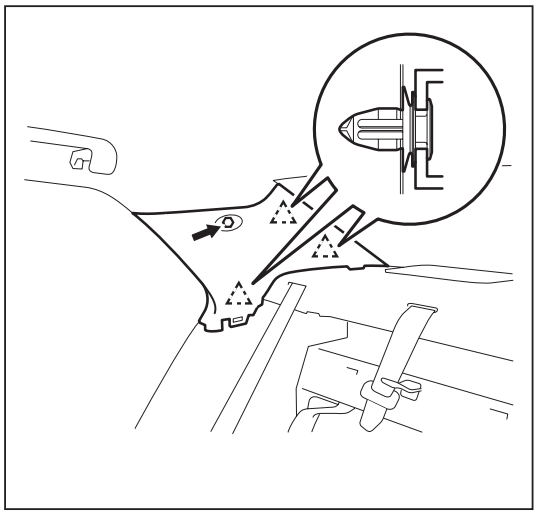
19. **Remove the upper guard board of the right side B pillar**
    (a) Take off the bolt decorating cover on the upper guard board of the B pillar.
    (b) Remove one bolt and one clip for connecting the upper guard board of the B pillar and the vehicle body and take off the upper guard board of the B pillar from the vehicle body.
20. **Remove the upper guard board of the left side B pillar**

Tip:

Removal methods are the same as the right side.



21. **Remove the lower guard board of the right side C pillar.**
    (a) Remove the rear seat.
    See "Rear seat" in this chapter.
    (b) Remove the rear seat bracket guard board.
    (c) Remove the rear seat cushion.
    (d) Remove two clips for connecting the lower guard board of the C pillar and the upper guard board of the C pillar.
    (e) Remove two clips for connecting the lower guard board of the C pillar and the vehicle body.
    (f) Take off the lower guard board of the C pillar.
22. **Remove the lower guard board of the left side C pillar**
    (a) Remove two clips for connecting the lower guard board of the C pillar and the upper guard board of the C pillar.
    (b) Remove two clips for connecting the lower guard board of the C pillar and the vehicle body.
    (c) Take off the lower guard board of the C pillar.



23. Remove the upper guard board of the right side C pillar

(a) Remove the upper guard board decorating cover of the C pillar.

(b) Remove one screw for connecting the upper guard board of the C pillar and the vehicle body and separate three clips for connecting the upper guard board of the C pillar and the vehicle body.

(c) Take off the upper guard board of the C pillar from the vehicle body.

24. Remove the upper guard board of the left side C pillar

Removal methods are the same as the right side.

25. Remove the right rear wheel house

(a) Remove the high position brake light cover and disconnect the connector.
See "Guard board loud speaker assembly" in this chapter.

(b) Remove the clip for connecting the rear guard board assembly and the metal sheet.
See "Guard board loud speaker assembly" in this chapter.

(c) Remove the rear seat backrest supporting guard board.

(d) Remove one clip for connecting the right rear wheel house and the metal sheet and remove one clip fixed on the clip seat through the lower part of the wheel house.

(e) Take off the right rear wheel house.

26. Remove the guard board of the left rear wheel house.

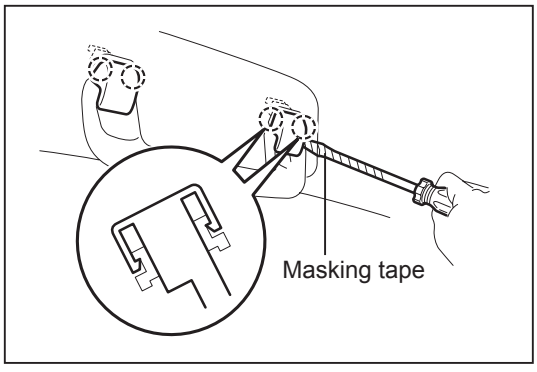
Removal methods are the same as the right side.

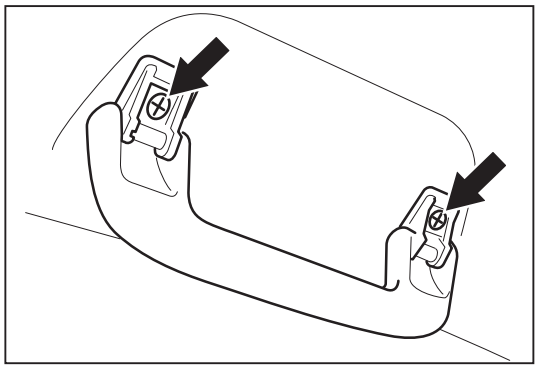
27. Remove the roof handle.

Tip:

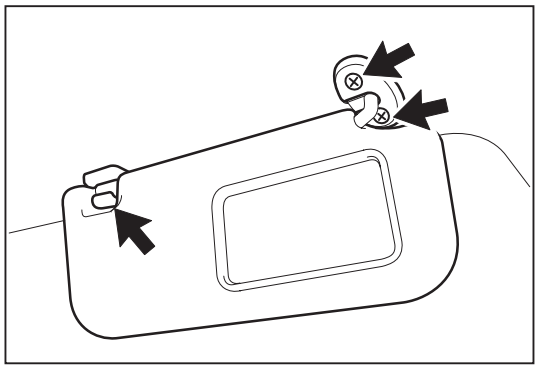
The removal methods of other roof handles are the same as herein.

(a) Use the flat tip screwdriver of which the header is wrapped with the protecting adhesive tape to unclench the decorating cover on the fixing bolt.





(b) Use the phillips screwdriver to remove two fixing screws and the roof handle can be removed.



28. Remove the right sun visor assembly

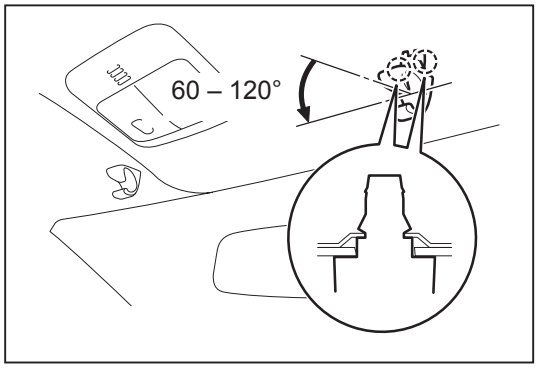
(a) Separate the sun visor assembly and the sun visor pedestal assembly.

(b) Remove two screws and the sun visor assembly can be removed.

29. Remove the left sun visor assembly.

Tip:

Removal method are the same as the right side.



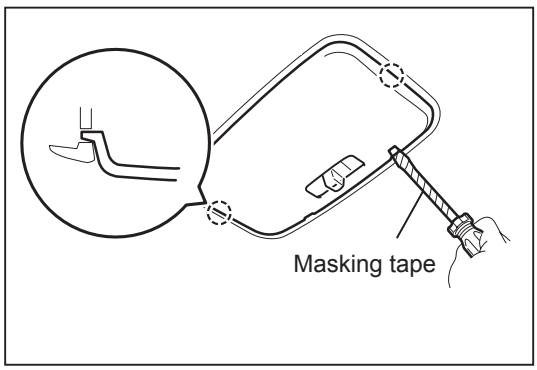
30. Remove the right sun visor pedestal assembly

Rotate the sun visor pedestal counter-clockwise within the range from 60° to 120° to separate two claws and remove the sun visor pedestal.

31. Remove the left sun visor pedestal assembly

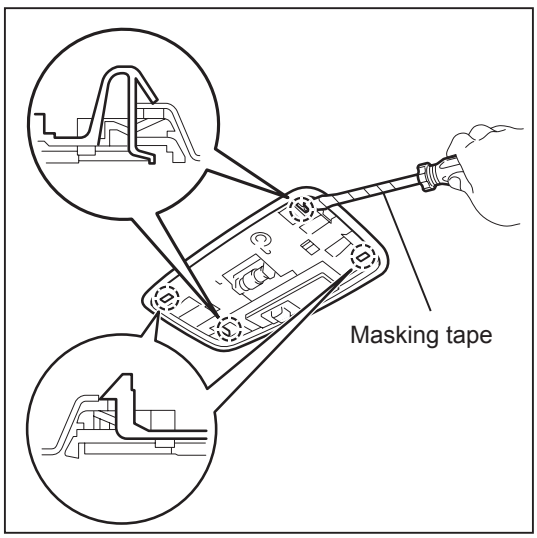
Tip:

Removal methods are the same as the right side.



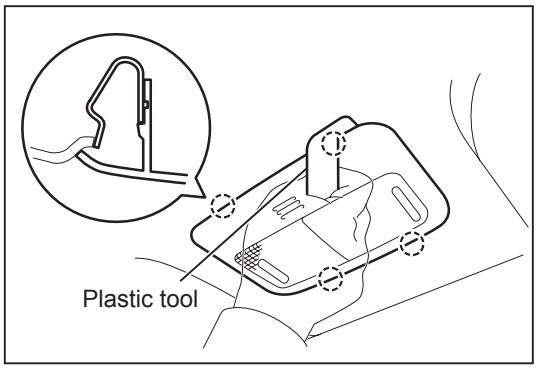
32. Remove the roof light assembly.

(a) Use the flat tip screwdriver of which the header is wrapped with the protecting adhesive tape to unclench four clips to remove the transparent cover of the roof light.



(b) Use the phillips screwdriver to remove two self tapping screws of the roof light body and take off the roof light body assembly.

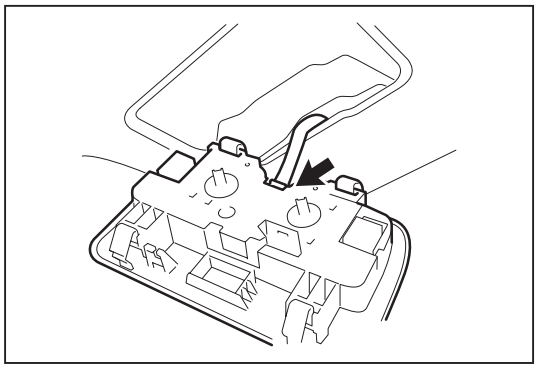
(c) Disconnect the connector of the roof light harness.



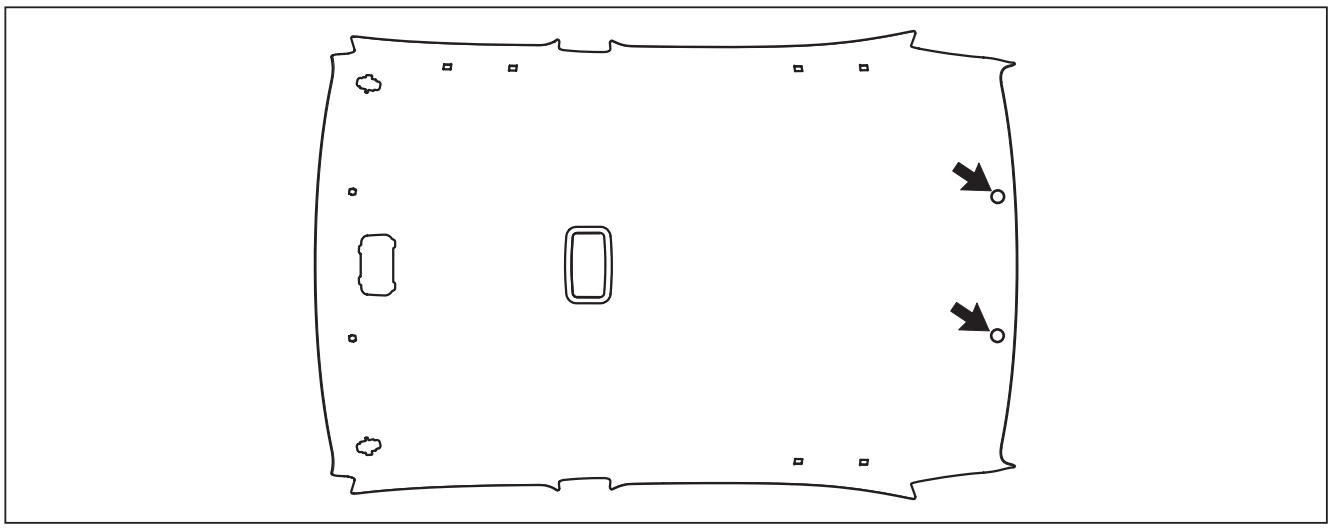
33. Remove reading light assembly.

(a) Use a flat head screwdriver wrapped with tape, pry up the 4 claws of the lampshade to remove the transparent cover of the reading light.

b) Use a cross screwdriver, remove the 2 tapping screws from the reading light body and then dismount the reading light body assembly.



(c) Disconnect the connector, and remove the reading light assembly.



34. Remove two clips after the roof

35. Take off the roof

Installation

The installation sequence is the reverse order of the remove sequence.

EXTERIOR TRIMS

WIPER AND CLEANING SYSTEM3

PART DIAGRAM 3
FAULT SYMPTOM TABLE 4
INSPECTION CARRIED OUT ON-LINE 5
WINDSHIELD WASHER 12

WINDSHIELD/WINDOW GLASS14

ON-VEHICLE INSPECTION 14
FRONT WINDSCREEN GLASS 17
REAR WINDSCREEN GLASS 21

REAR VIEW MIRROR24

CONTROL SYSTEM OF ELECTRIC REAR VIEW MIRROR 24
OUTSIDE REAR-VIEW MIRROR SWITCH 27
INSIDE REAR-VIEW MIRROR ASSEMBLY 29

HORNS31

LOCATIONS OF PARTS 31
FAULT SYMPTOM TABLE 32
INSPECTION 32

SLIDING SUNROOF33

FUNCTION INTRODUCTION 33
ROUTINE MAINTENANCE PROCEDURE 33
FAULT SYMPTOM TABLE 34
SUNROOF ASSEMBLING DRAWING 34
PARTS 35
REMOVE THE SUNROOF 36
INSTALL THE SUNROOF 38

LIGHTING SYSTEM41

ATTENTIONS 41
FAULT SYMPTOM TABLE 41
ON-VEHICLE INSPECTION 43
COMBINATION HEADLIGHT ASSEMBLY 48
FRONT FOG LIGHT ASSEMBLY 51
LEFT SIDE TURN SIGNAL LIGHT 52
REAR COMBINED LIGHT 53
REAR FOG LIGHT 54

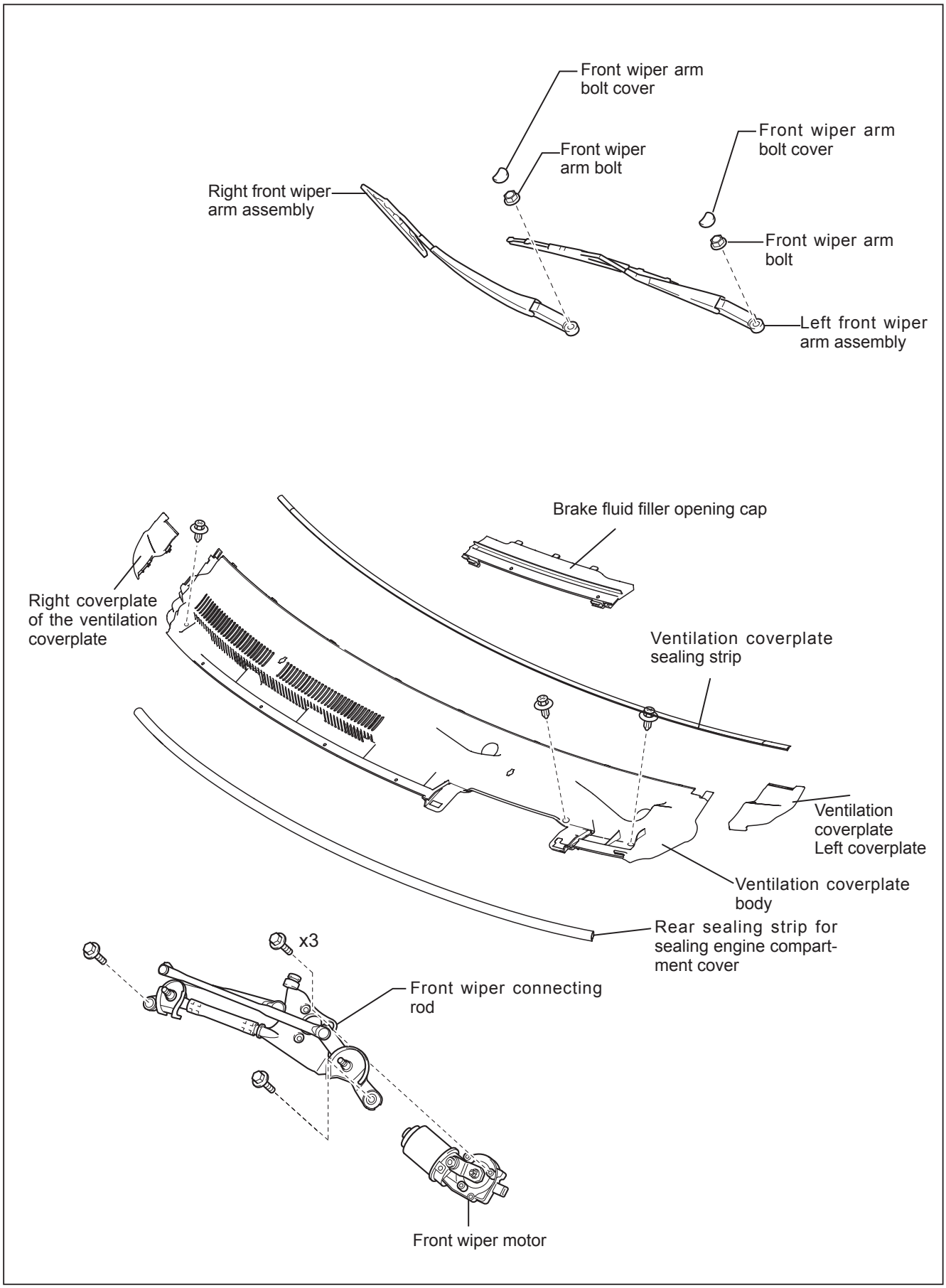
REAR REFLEX REFLECTOR....54
HIGH POSITION BRAKE LIGHT ASSEMBLY. 55
LICENSE LIGHT ASSEMBLY 55
LUGGAGE BOOT LIGHT....55
ROOF LIGHT ASSEMBLY 56
READING LIGHT ASSEMBLY 56
COMBINATION SWITCH....57
COURTESY SWITCH 57

REVERSING RADAR58

GENERAL INFORMATION 58
TROUBLESHOOTING....59
REVERSING RADAR ECU....60
REVERSING RADAR PROBE....60

WIPER AND CLEANING SYSTEM

PART DIAGRAM

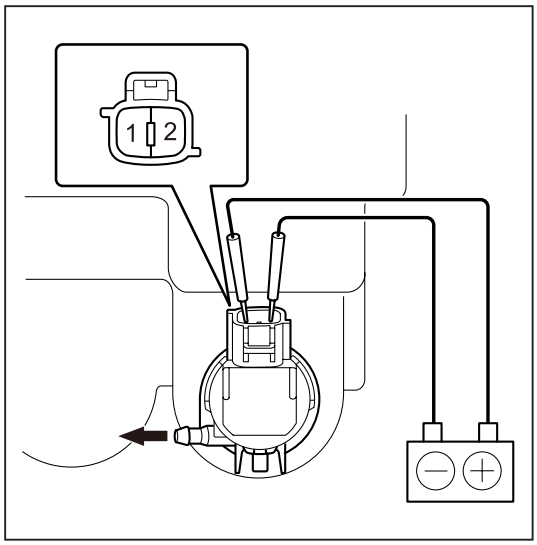


FAULT SYMPTOM TABLE

Tip:

The questionable location is listed in the following table according to the number sequence and it is used to determine the failure cause. Inspect, maintain or replace the parts according to the procedures listed in each page when necessary.

Symptom	Questionable location
The front wiper refuses to work	WIPER fuse
	Windshield wiper switch assembly
	Windshield wiper motor assembly
	Harness
The front wiper refuses to work on LO or HI position	Windshield wiper switch assembly
	Windshield wiper motor assembly
	Harness
The front wiper refuses to work on INT position	Windshield wiper switch assembly
	Windshield wiper motor assembly
	Harness
The motor of the front cleaning device refuses to work	WIPER fuse
	Windshield wiper switch assembly
	Motor of cleaning device
	Harness
The washing liquid does not flow	Hose and injector of the cleaning device
The wiper blade cannot retract or retract to a wrong position when the Wiper switch is set on OFF position. The wiper blade contacts the vehicle body.	Windshield wiper motor assembly (Wiper arm and the wiper blade component position)



INSPECTION CARRIED OUT ON-LINE

1. Inspect the windscreen washing motor and the washing pump assembly.

(a) Inspect the operating conditions of the front windscreen washing motor and the washing pump

(1) Fill the washing liquid into the syringe tank until the syringe tank is full.

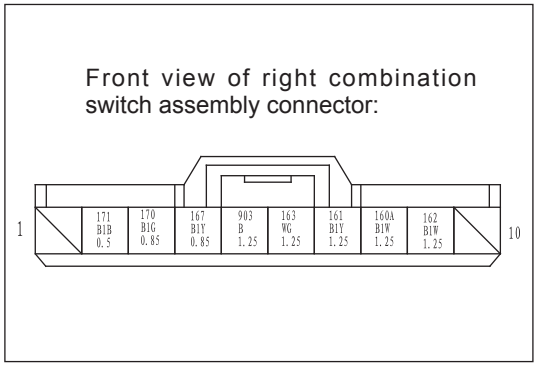
Tip:

This operate shall be done via the windscreen washing motor and the washing pump installed on the syringe tank.

(2) Connect the positive pole (+) lead wire of the accumulator with the terminal 2 of the windscreen washing motor and connect the negative pole (-) lead wire of accumulator with the terminal 1. Inspect the washing liquid to see if it flow out of the syringe tank or not.

Standard: The washing liquid flow out of the syringe tank.

The windscreen washing motor and the washing pump shall be replaced if the result is not consistent to the standard specification.



Inspection

1. Right combination switch assembly

(a) Continuity check

(1) Measure resistances according to the values listed in the following table.

Front wiper switch

Switch position	Detector connection	Specified status
MIST	7 - 8	< 1 Ω
OFF	7 - 8 - 9	≥ 10 kΩ
LO	7 - 8	< 1 Ω
HI	8 - 9	< 1 Ω

Front washer switch

Switch position	Detector connection	Specified status
OFF	4 - 5	≥ 10 kΩ
ON	4 - 5	小于 1 Ω

(b) Intermittent operation check

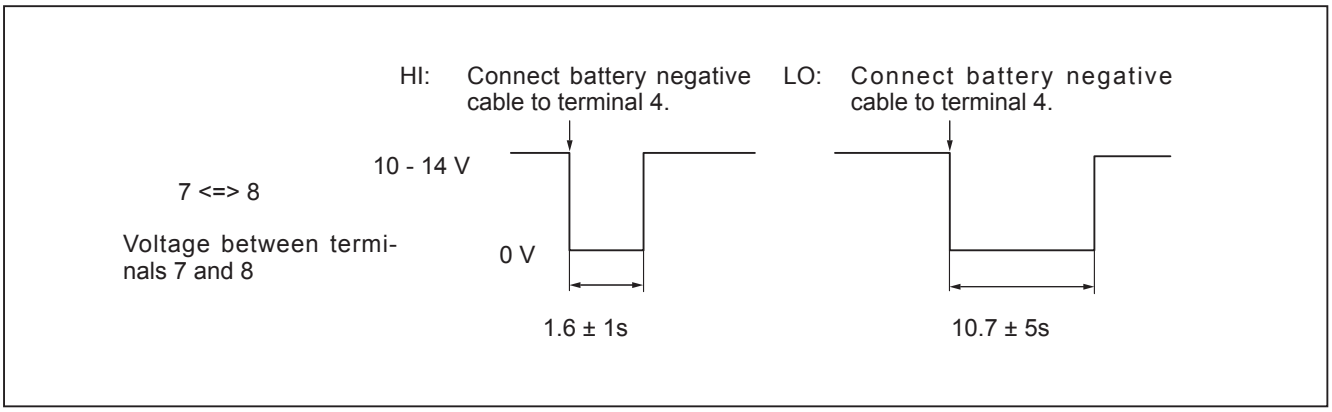
(1) Connect positive terminal of a voltmeter to terminal 8 of the connector and negative terminal to terminal 7.

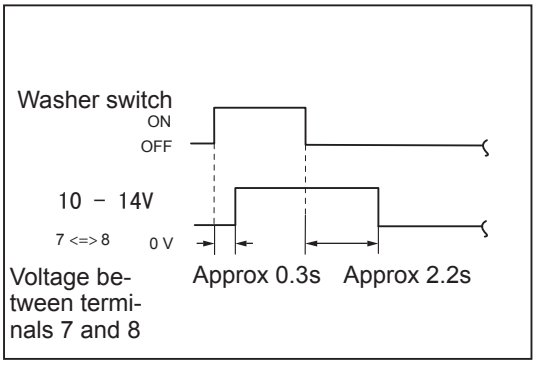
(2) Connect battery positive cable to terminal 8 of the connector and negative cable to terminal 7.

(3) Set wiper switch to INT position.

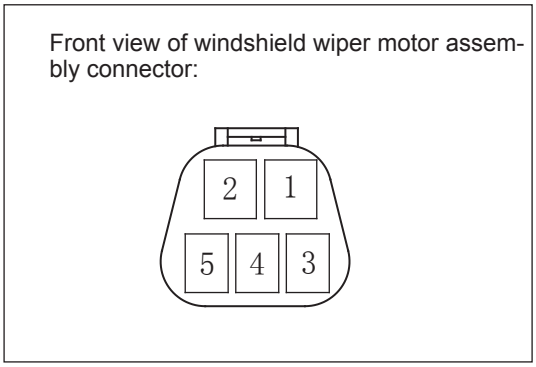
(4) Connect battery positive cable to terminal 8 of the connector and hold it there for 5 seconds.

(5) Connect battery negative cable to terminal 7 of the connector. Operate intermittent replay of wiper and check the voltage between terminals 8 and 7.





(c) Operation check (front washer)
(1) Turn off wiper switch.
(2) Connect battery positive cable to terminal 8 of the connector and negative cable to terminal 7.
(3) Connect positive terminal of a voltmeter to terminal 8 of the connector and negative terminal to terminal 7
(4) Turn on and off washer switch and check the voltage between terminals 8 and 7.



2. Windshield wiper motor assembly

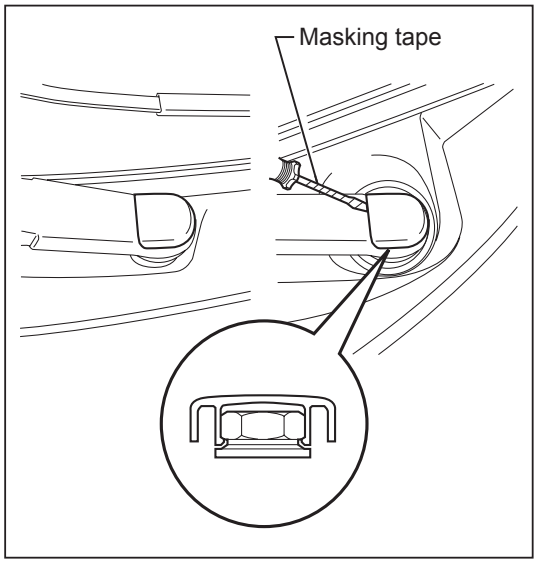
(a) LO operation check
Connect battery positive cable to terminal 1 of the connector and negative cable to terminal 2, and check that the motor operates in LO mode.

(b) HI operation check
Connect battery positive cable to terminal 3 of the connector and negative cable to terminal 2, and check that the motor operates in HI mode.

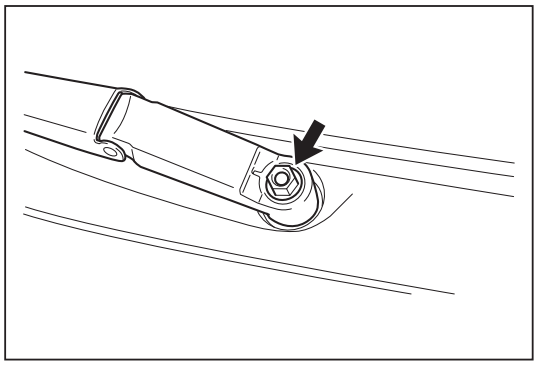
(c) Auto stop operation check
(1) Connect terminal 5 with battery positive cable and terminal 1 with terminal 4 to allow the motor to operate in LO mode again.
(2) Connect battery positive cable to terminal 1 of the connector and negative cable to terminal 2. With the motor running in LO mode, disconnect terminal 1 to allow the motor to stop at any place other than its auto stop position.

Windshield wiper motor assembly

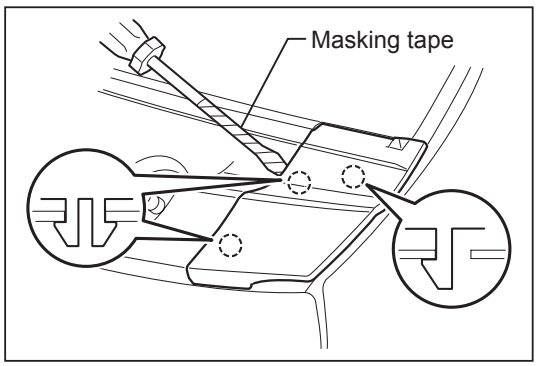
Replacement



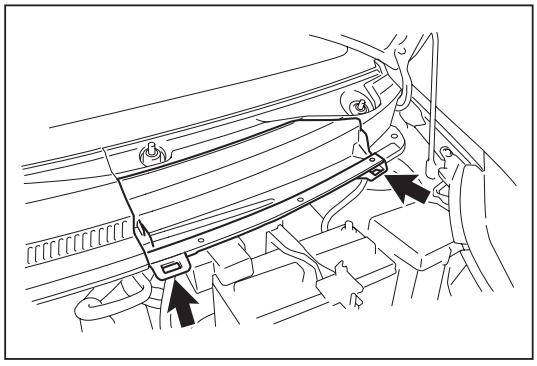
1. **Remove the windshield wiper arm bolt cover**



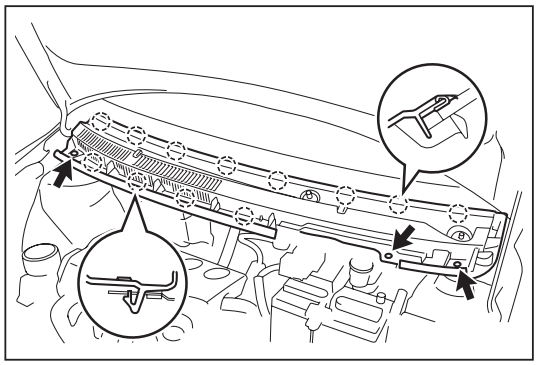
2. **Remove the right front wiper arm and blade assembly**
3. **Remove the left front wiper arm and blade assembly**



4. **Remove the left coverplate of the ventilation coverplate**
   Use the flathead screwdriver to unclench three clips for connecting the coverplate and take off the left coverplate.
   Tip:
   The header of the screwdriver shall be wrapped with the protecting adhesive tape.
5. **Remove the right coverplate of the ventilation coverplate**
   Tip:
   The removal methods are the same as the left side.

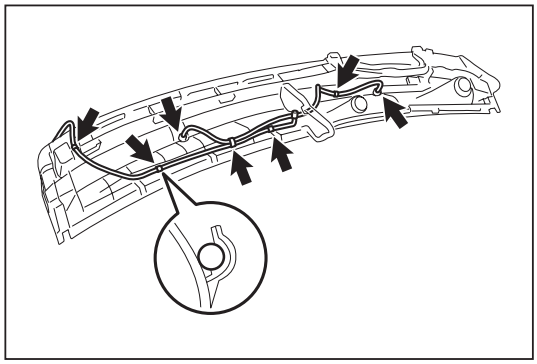


6. **Remove the brake fluid filling cover**
   Disconnect two claws and take off the brake fluid filling cover.



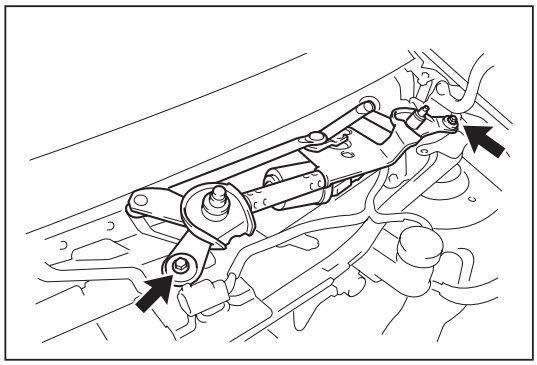
7. Remove the ventilation coverplate

Use the flathead screwdriver to remove three clips and disconnect 12 clips, and then take off the ventilation coverplate.



8. Remove the washing pipe

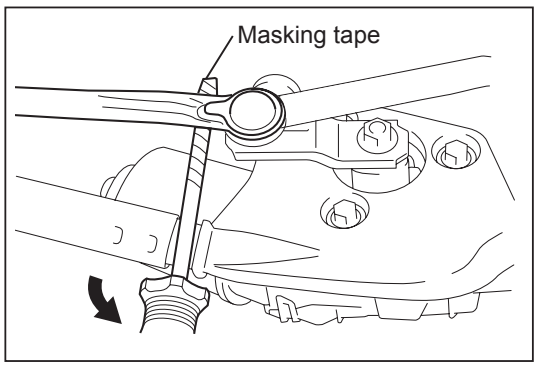
Separate the washing pipe and five clips and disconnect the water pipe and the injector and take off the washing pipe.



9. Remove the wiper connecting rod with the electrical motor assembly

(a) Disconnect the connector.

(b) Remove two bolts and take off the wiper connecting rod with the electrical motor assembly.

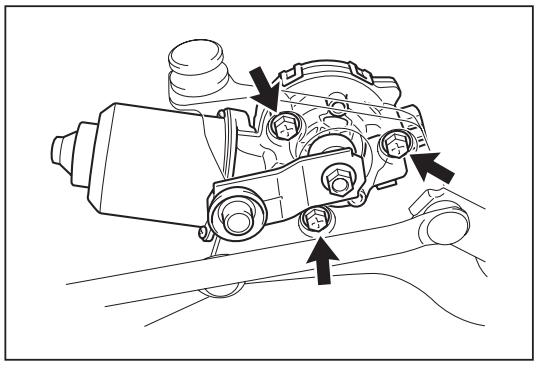


10. Remove the wiper electrical motor assembly

(a) Use the screwdriver to disconnect the wiper motor and the connecting rod.

Tip:

The header of the screwdriver shall be wrapped with the protecting adhesive tape.



(b) Remove three bolts and take off the wiper motor.

11. Install the wiper electrical motor assembly

Tip:

The installation sequence is the reverse order of the remove sequence.

12. Install the wiper connecting rod with the electrical motor assembly

Tip:

The installation sequence is the reverse order of the remove sequence.

13. Install the washing pipe

Tip:

The installation sequence is the reverse order of the remove sequence.

14. Install the ventilation coverplate

Tip:

The installation sequence is the reverse order of the remove sequence.

15. Install the brake fluid filling cover

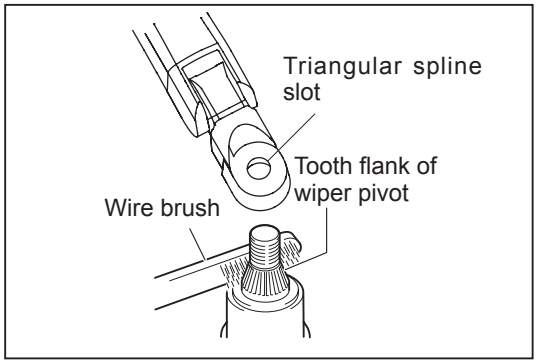
Tip:

The installation sequence is the reverse order of the remove sequence.

16. Install the left and right coverplates of the ventilation coverplate

Tip:

The installation sequence is the reverse order of the remove sequence.

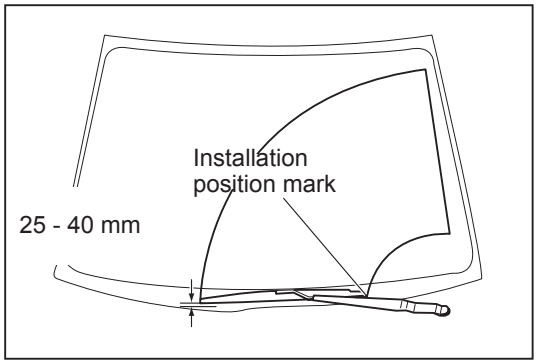


17. Install the left front wiper arm and the wiper blade assembly

(a) Operate the wiper and stop the windshield wiper motor assembly on the autostop position.

(b) Use the small triangular file or the hacksaw blade to clean the foreign matter in the triangular spline slot.

(c) Use the wire brush to clean the tooth flank of the wiper pivot.



(d) Install the left front wiper arm and the wiper blade assembly on the position shown in the diagram by using the nut.

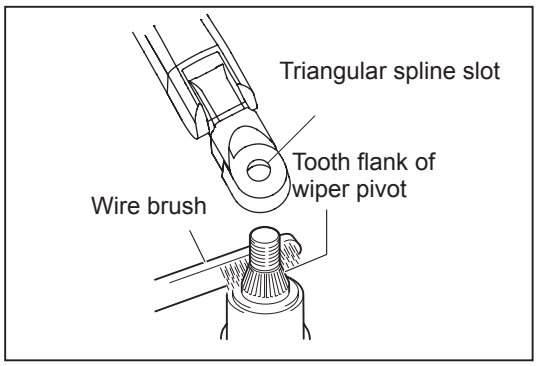
Torque: 20 N•m

Installation position mark: 25 - 40 mm

Tip:

Take hold of the wiper arm by hand to fasten the nut.

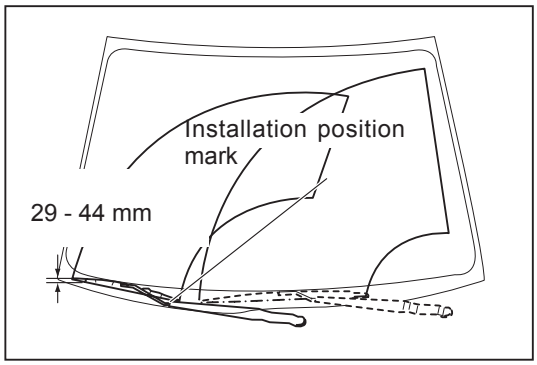
(e) Operate the wiper while spraying water or the washing liquid on the door window to inspect the wiping conditions and make sure that the wiper does not contact the vehicle body.



18. Install the right front wiper arm and the wiper blade assembly

(a) Use the small triangular file or the hacksaw blade to clean the foreign matter in the triangular spline slot.

(b) Use the wire brush to clean the tooth flank of the wiper pivot.



(c) Install the right front wiper arm and the wiper blade assembly on the position shown in the diagram by using the nut.
Torque: 20 N•m
Installation position mark: 29 - 44 mm

Tip:

Take hold of the arm hinge by hand to fasten the nut.

19. Install the bolt cover on the windshield wiper arm.

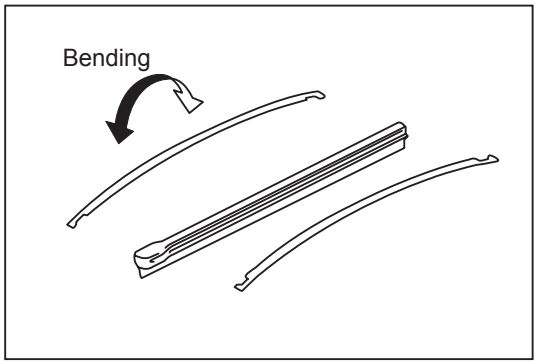
Rubber strip of left wiper

Replacement

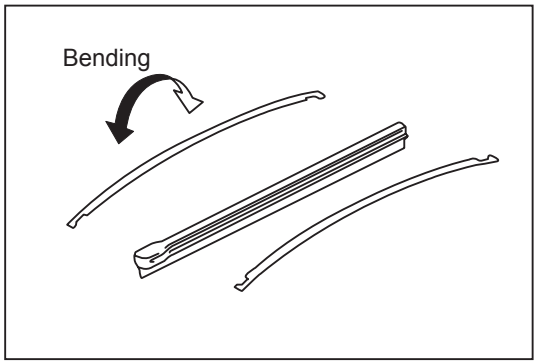
1. **Remove the left front wiper blade**
   (a) Remove the left front wiper blade from the left front wiper arm.

   Note:

   Do not fold the front wiper arm downwards when removing the front wiper blade from the front wiper arm.



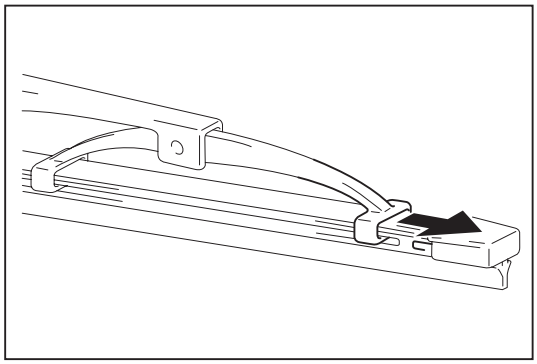
2. **Remove the rubber strip of the left wiper**
   (a) Remove the rubber strip of the wiper from the left front wiper blade.
   (b) Remove two pieces of rubber strip backboard of the wiper backboard from the rubber strip of the left wiper.



3. **Install the rubber strip of the left wiper**
   (a) Install two pieces of rubber strip backboard of the wiper backboard on the rubber strip of the left wiper.

   Caution:

   Make sure that the rubber strip backboard of the wiper backboard is installed along the correct direction.



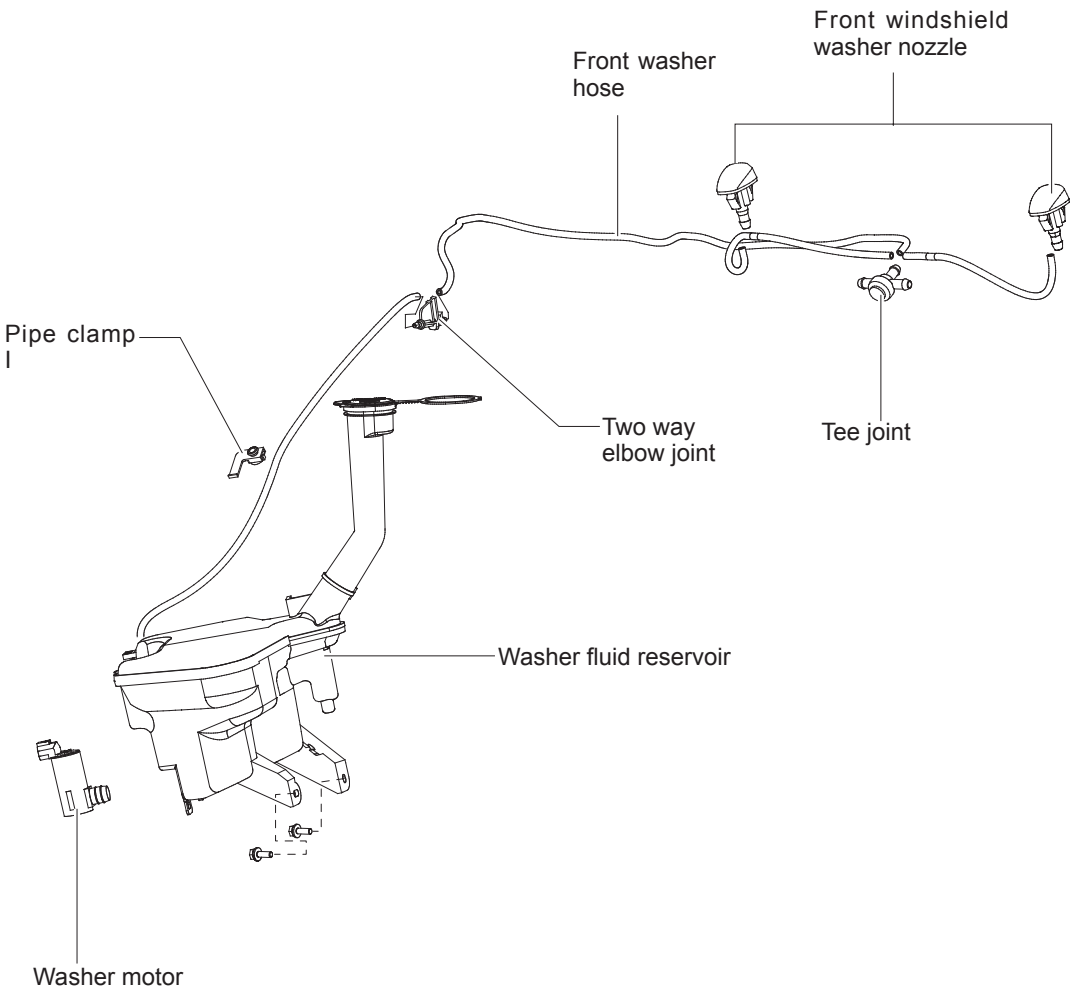
   (b) Install the rubber strip of the left wiper so that the header of the rubber strip of the wiper (longer side) is faced towards the arm shaft side.

   Caution:

   Push the front wiper blade into the slot on the rubber strip of the wiper to engage them completely.
   Return the vice driver side wiper arm at first, and then return the driver side wiper arm.

WINDSHIELD WASHER

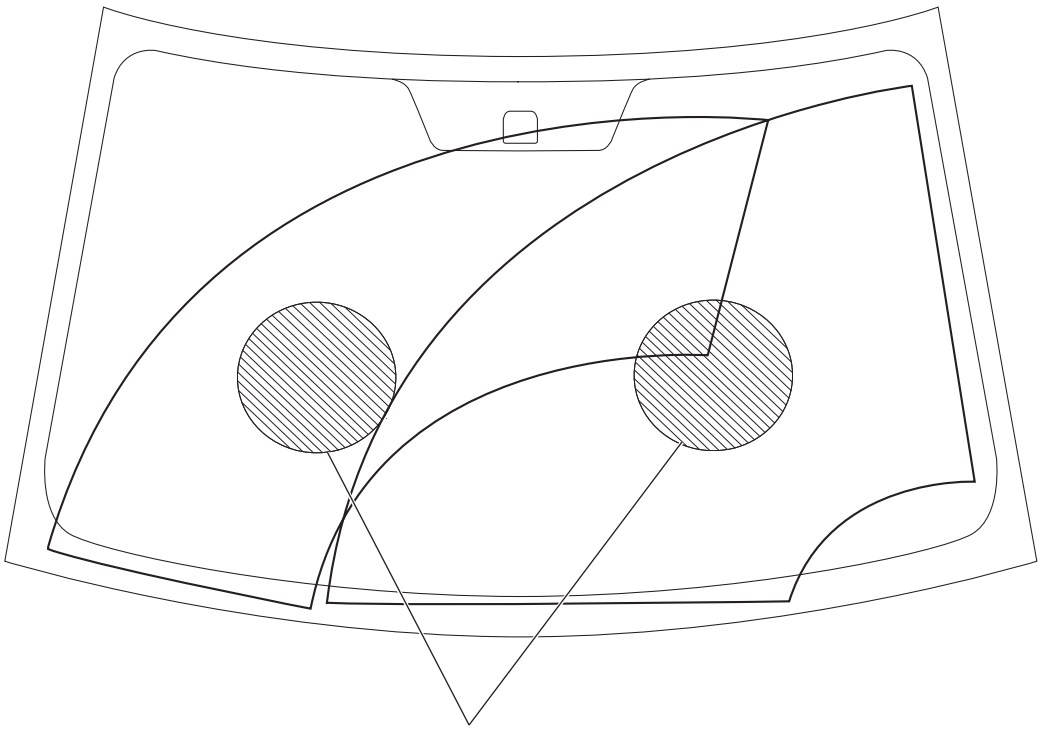
Part Diagram



Injector of the Cleaning Device

Inspection

Switch on the injector switch of the cleaning device when the engine is running, inspect and confirm that the washing liquid is sprayed within the range on the windshield shown in the diagram.



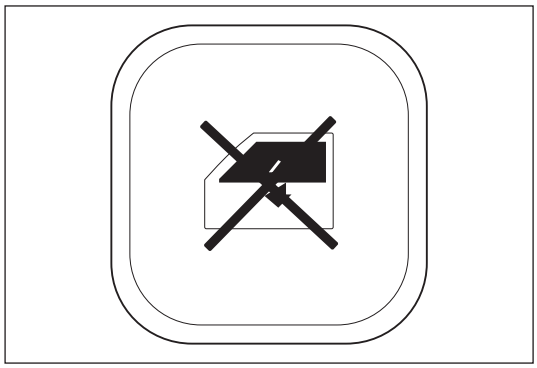
Position range of spray made by washer fluid nozzle

Replacement

1. **Remove front wiper arm head cap**
2. **Remove left front wiper arm and blade assembly**
3. **Remove right front wiper arm and blade assembly**
4. **Remove cowl top seal cover**
5. **Remove cowl top ventilation louvre assembly**
6. **Remove left cowl top ventilation louvre**
7. **Remove washer nozzle**
   (a) Disconnect the washer hose.
   (b) Detach the 2 claws and the front washer nozzle.
   Note:
   Do not reuse the washer nozzle.
8. **Install a new washer nozzle**
   (a) Install the front washer nozzle and the 2 claws.
   (b) Connect the washer hose.
9. **Install left cowl top ventilation louvre**
10. **Install cowl top ventilation louvre assembly**
11. **Remove cowl top seal cover**
12. **Install left front wiper arm and blade assembly**
13. **Install right front wiper arm and blade assembly**
14. **Install front wiper arm head cap**

WINDSHIELD/WINDOW GLASS

ON-VEHICLE INSPECTION



1. Checking window lock switch

(a) Check that the window switches of left rear, right front and right rear doors are inoperative when the window lock switch is depressed.

(b) Check that the window switches of left front, left rear, right front and right rear doors are operative when the window lock switch is depressed again.

2. Checking manual lift/fall function

(a) As shown below, check that window switches can operate corresponding power windows:

Standard:

Condition	Switch	Switch operation	Power window
Ignition switch is set to ON position. Window lock switch is set to OFF position.	Left front	Pull up	Lift
		Push down	Fall
	Right front	Pull up	Lift
		Push down	Fall
	Left rear	Pull up	Lift
		Push down	Fall
	Right rear	Pull up	Lift
		Push down	Fall

3. Checking lift/fall function by main switch

(a) As shown below, check that the main switch of left front door window can operate other power windows in addition to the left front one:

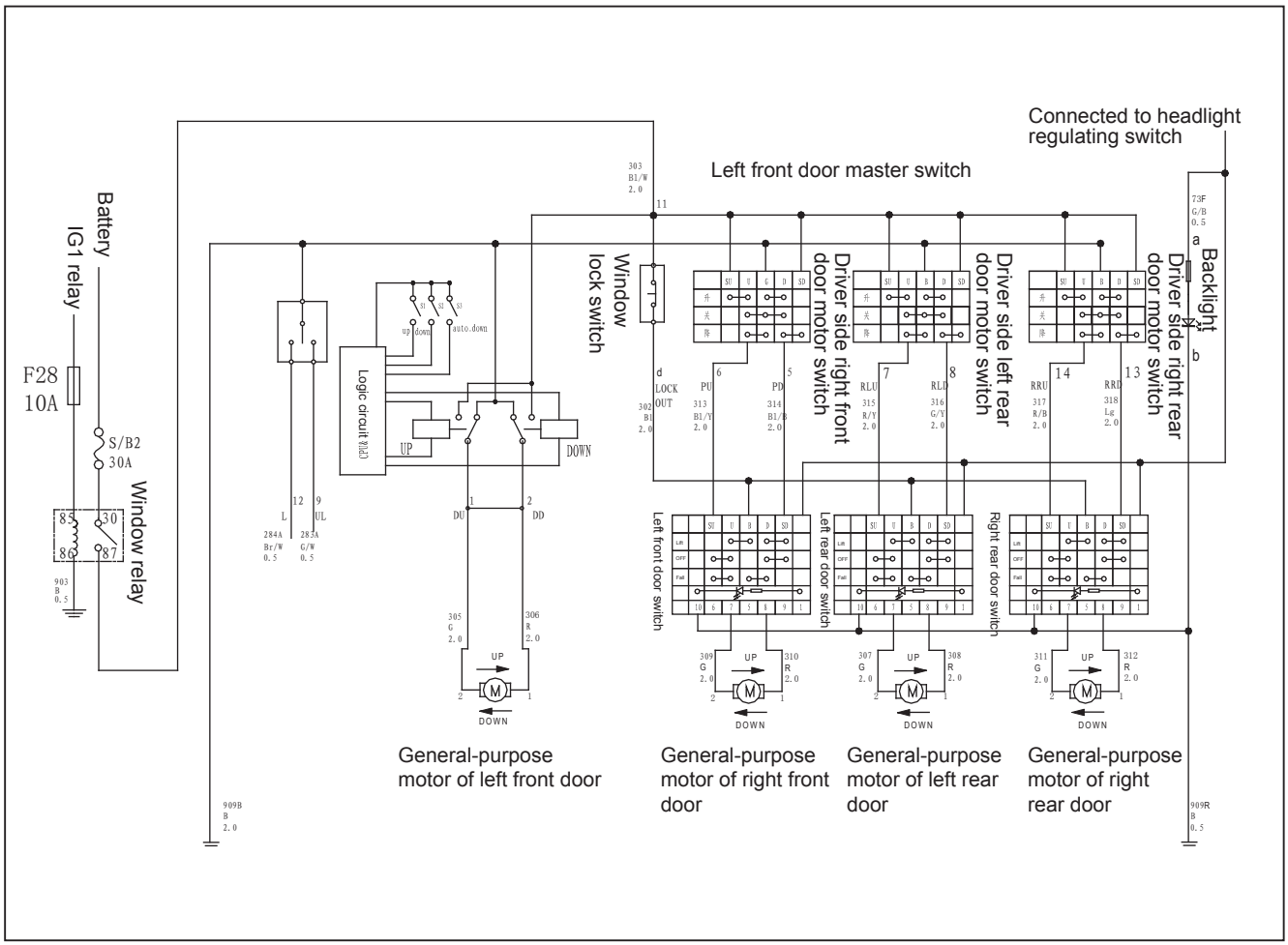
Standard:

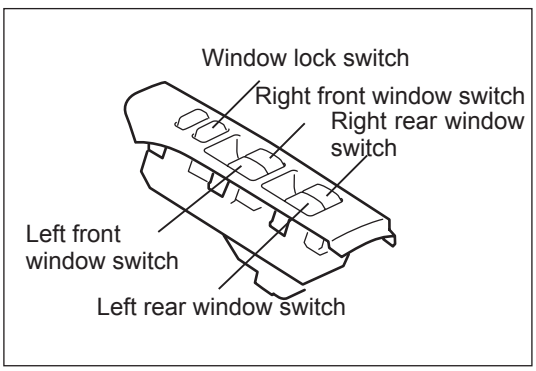
Condition	Switch	Switch operation	Power window
Ignition switch is set to ON position. Window lock switch is set to OFF position.	Right front	Pull up	Lift
		Push down	Fall
	Left rear	Pull up	Lift
		Push down	Fall
	Right rear	Pull up	Lift
		Push down	Fall

Fault Symptom Table

Symptom	Suspected area
None of power windows operates	1. Instrument fuse 2. Power relay 3. Ignition switch 4. Harness
Only one power window operates.	1. Left front door window main switch assembly 2. Window switch assembly 3. Window regulator motor assembly 4. Harness
Window locking system does not operate	1. Left front door window main switch assembly

Circuit Diagram of a Window Regulator System without Anti-Pinch Function





Inspection

1. **Checking left front door window main switch assembly**
   (a) Operate the switch to check resistance between terminals of the connector.

Standard:

Left front door motor switch

Status of window lock switch	Status of window switch	Detector connection	Specified status
OFF/ON	UP	1 - 11	< 1 W
	OFF	1 - 11	
		2 - 11	
	DOWN	2 - 11	

Right front door motor switch

Status of window lock switch	Status of window switch	Detector connection	Specified status
OFF/ON	UP	11 - 6	< 1 W
		10 - 5	
	OFF	10 - 5	
		10 - 6	
	DOWN	11 - 5	
		10 - 6	

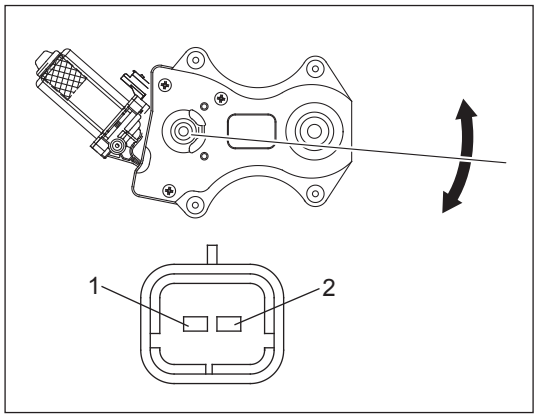
Left rear door motor switch

Status of window lock switch	Status of window switch	Detector connection	Specified status
OFF/ON	UP	11 - 7	< 1 W
		10 - 8	
	OFF	10 - 8	
		10 - 7	
	DOWN	11 - 8	
		10 - 7	

Right rear door motor switch

Status of window lock switch	Status of window switch	Detector connection	Specified status
OFF/ON	UP	11 - 14	< 1 W
		10 - 13	
	OFF	10 - 13	
		10 - 14	
	DOWN	11 - 13	
		10 - 14	

If unsatisfactory, replace the main switch assembly.



2. Checking left front window regulator motor assembly

(a) Apply battery voltage to motor terminals.

(b) Check that the motor runs smoothly

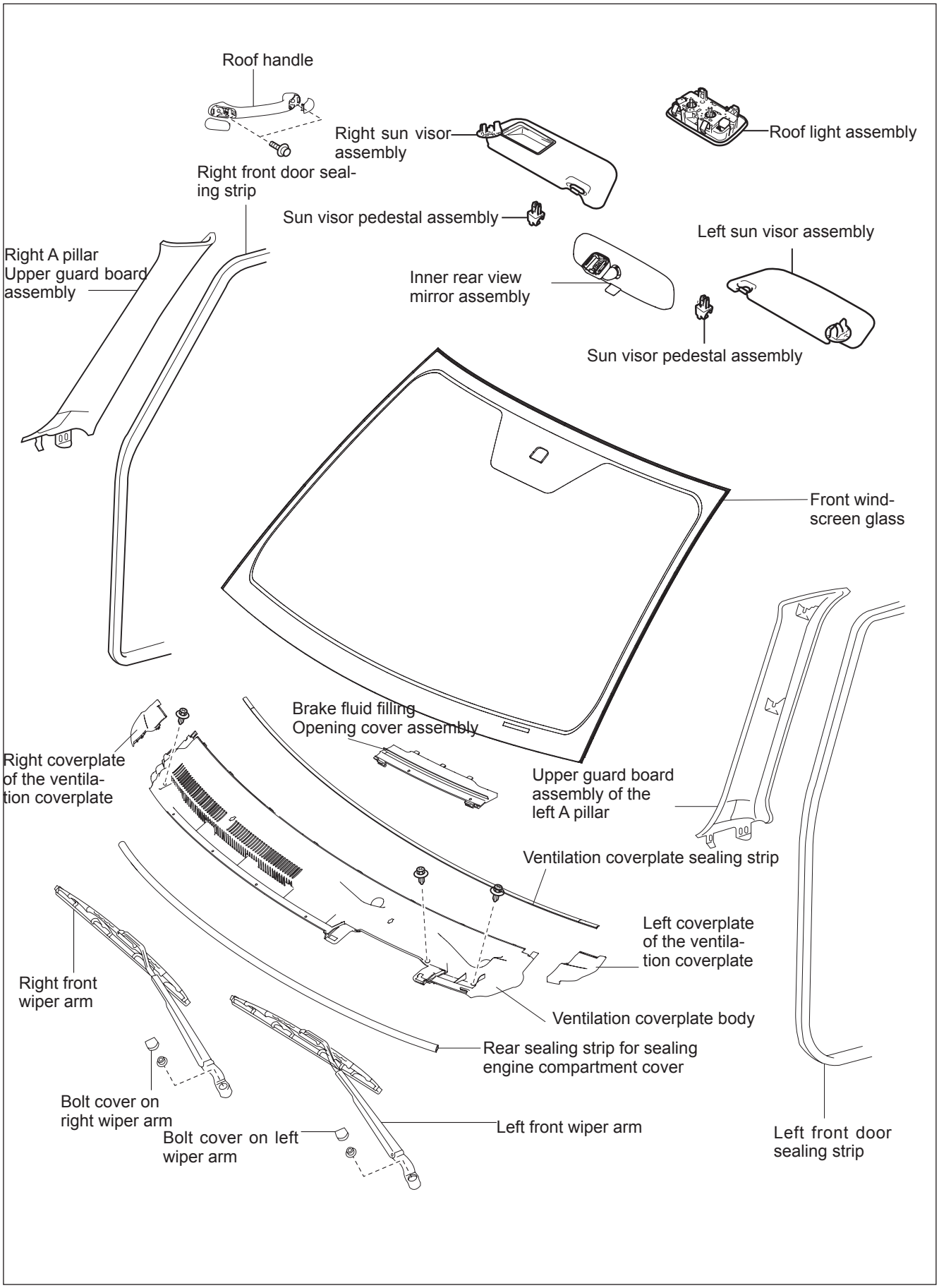
Standard

Measurement condition	Specified status
Battery positive (+) - 2 Battery negative (-) - 1	Motor gear rotates clockwise.
Battery positive (+) - 1 Battery negative (-) - 2	Motor gear rotates counterclockwise.

If unsatisfactory, replace the main switch assembly.

FRONT WINDSCREEN GLASS

Component



Replacement

Tip:

The installation sequence is the reverse order of the remove sequence. But only include installation procedure with additional information.

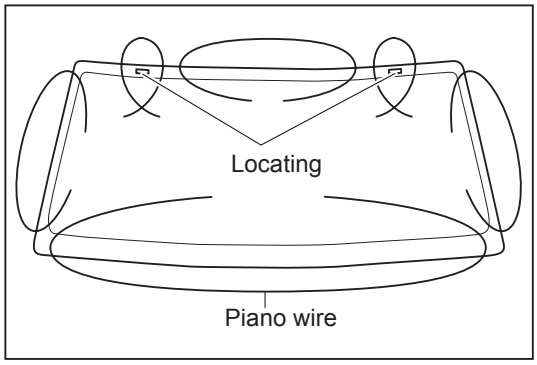
1. Remove the inner protective face of the roof

(a) Remove the left front and right front door sealing strip.
(b) Remove the left and right guard board assembly of A pillar.
(c) Remove the left sun visor assembly and the right sun visor assembly.
(d) Remove the roof handle assembly.
(e) Remove the sun visor pedestal assembly on main driving position and the sun visor pedestal assembly on vice driving position.
(f) Remove the roof light lens cover.
(g) Remove the roof light.
(h) Remove partial inner protective face of the roof to remove the windshield.

2. Remove the inner rear view mirror assembly

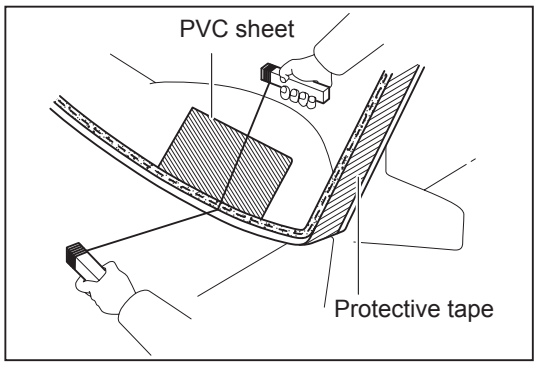
3. Remove the ventilation coverplate body

(a) Remove the left and right bolt covers of the wiper arm.
(b) Remove the left and right front wiper arm.
(c) Remove the front sealing strip of the ventilation coverplate.
(d) Remove the left coverplate of the ventilation coverplate and the right coverplate of the ventilation coverplate, and remove the ventilation coverplate body.



4. Remove windshield

(a) As shown in the figure, insert the piano wire into the gap between the body and the glass from inside.
(b) Tie an object that can serve as a handle (e.g. wood block) to each end of the piano wire.



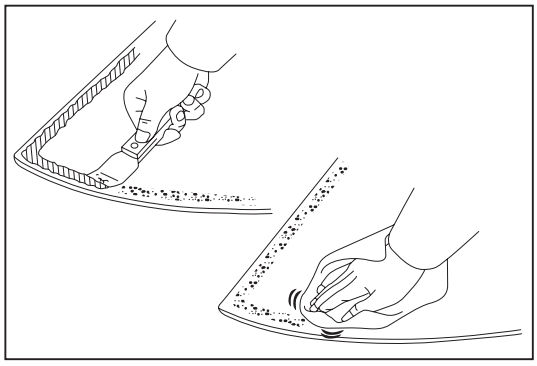
Tip:

To prevent body exterior surface from being scratched, a layer of protective tape should be applied to the surface.

Warning:

When separating the glass from the vehicle, be careful not to damage body paintwork or interior and exterior trims. When removing the glass, a PVC sheet must be put between the piano wire and the safety pad of the instrument panel in order to prevent the pad from being scratched.

(c) Pull the piano wire around the glass to cut the latter.
(d) Separate the locating piece.
(e) Remove the glass using a suction cup.

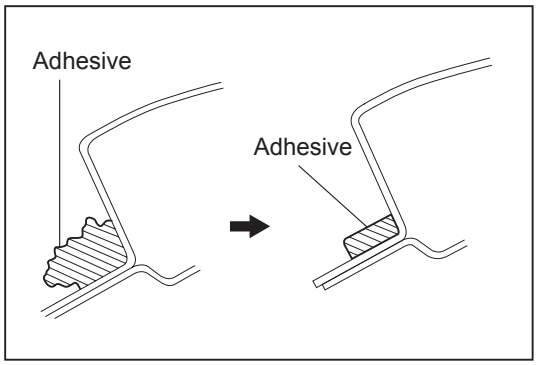


5. Clean windshield

(a) Using a scraper, remove damaged stoppers, seals and adhesive sticking to the glass.
(b) Clean periphery of the glass with white gasoline.

Note:

After cleaning, do not touch the glass surface. Be careful not to damage the glass. Even if a sheet of new glass is used, it must also be cleaned with white gasoline.



6. Install windshield.

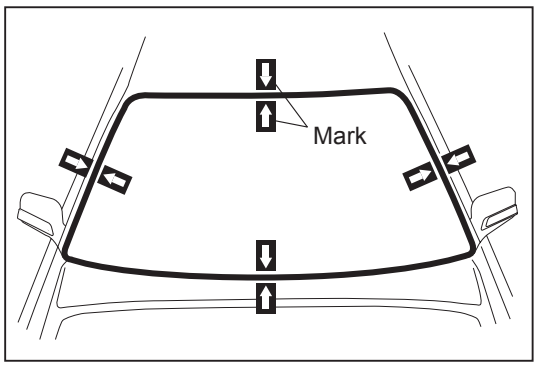
(a) Clean and dress the body contact surface.

(1) Using a knife, remove residual or unnecessary adhesive from the contact surface.

(2) Use a cleanser dipped shop cloth to clean the body contact surface.

Tip:

Continue cleaning the body even if all adhesive has been removed.



(b) Position glass.

(1) Use a suction cup to place the glass to correct position.

(2) Check that the whole contact surface on edge of the glass is smooth enough.

(3) Mark between the glass and the body.

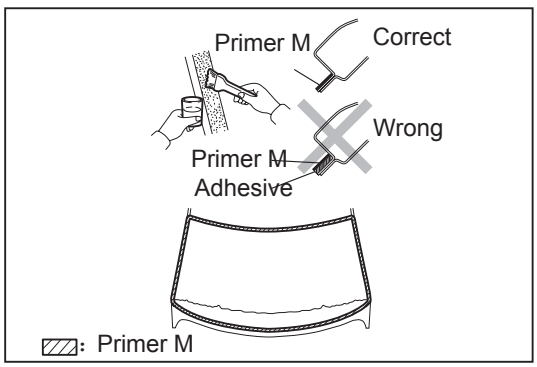
Note:

Check that the locating piece sticks to the body properly.

Tip:

When the glass is to be reused, check and correct locations of the reference marks.

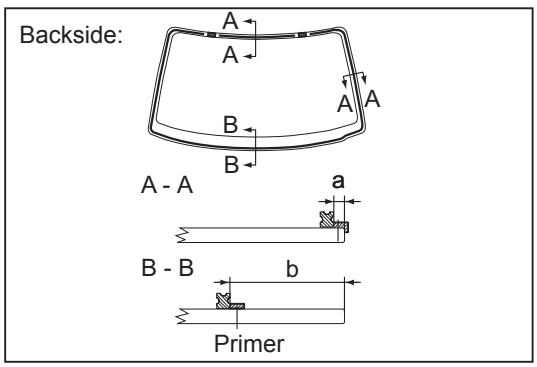
(4) Remove the glass.



(c) Apply primer M to the body side contact surface with a brush.

Note:

- **Dry the primer at least for 3 minutes.**
- **Do not apply primer M to the adhesive.**
- **Discard residual primer M**



(d) As shown in the figure, apply primer to edge and contact surface of the glass with a brush or sponge.

Specification:

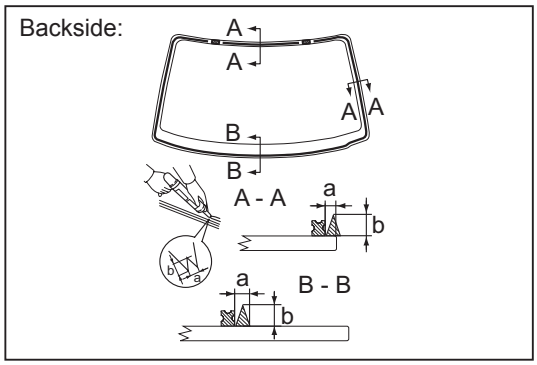
Part	Specified status
a	7.0 mm
b	23.5 mm

Tip:

If primer is applied to other parts of the vehicle inadvertently, wipe it with a clean shop cloth before it dries.

Note:

- **Dry the primer at least for 3 minutes.**
- **Do not apply primer to the adhesive.**
- **Discard residual primer.**



(e) Apply adhesive.

(1) As shown in the figure, cut off nozzle end of the adhesive tube.

Tip:

After the end is cut off, all adhesive should be used up within the time given in the following table.

Lifetime

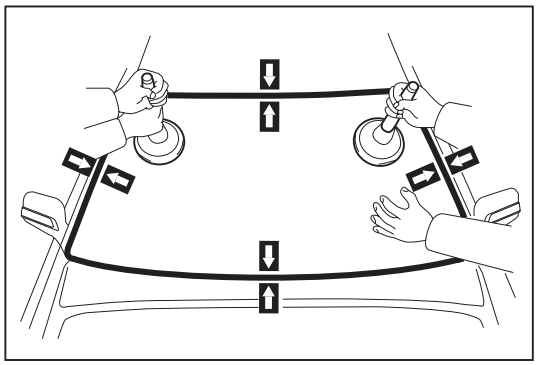
Temperature	Lifetime
35°C	15 min
20°C	1h 40 min
5°C	8 h

(2) Install the adhesive tube onto a glue gun.

(3) As shown in the figure, apply adhesive to the glass.

Specification

Part	Measured value
a	8.0 mm
b	12.0 mm



(f) Install glass

(1) Place the glass with a suction cup until the reference marks are aligned, and then press the glass gently along its edge.

Note:

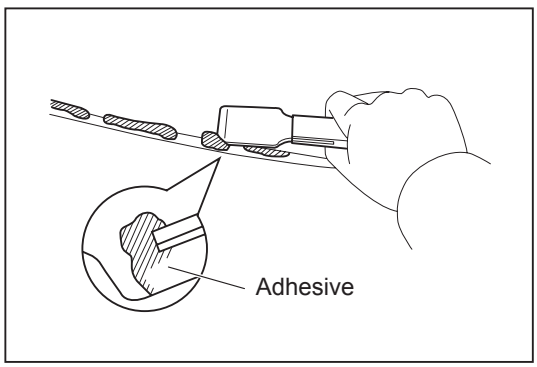
· Dry the primer at least for 3 minutes.

· Check that the stopper sticks to the body properly.

· Check the clearance between the body and the glass.

(2) Press front surface of the glass gently to ensure close fitting.

(3) Using a scraper, clear all redundant or projecting adhesive.



Tip:

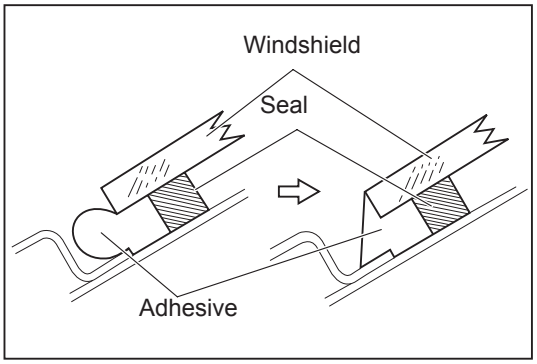
Apply adhesive to edge of the glass.

Note:

Remember not to drive your vehicle within the time given in the table below.

Shortest time:

Temperature	Shortest time before travel
35 °C	1.5 h
20 °C	5 h
5 °C	24 h



7. Check for leakage and service.

(a) After the adhesive completely cures, perform a leakage test

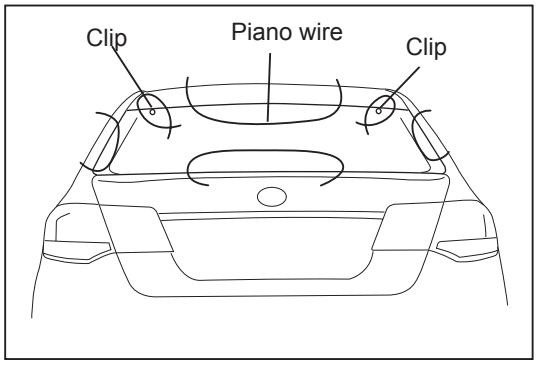
(b) Seal leaky parts with automotive glass sealant.

REAR WINDSCREEN GLASS

Replacement

Tip:

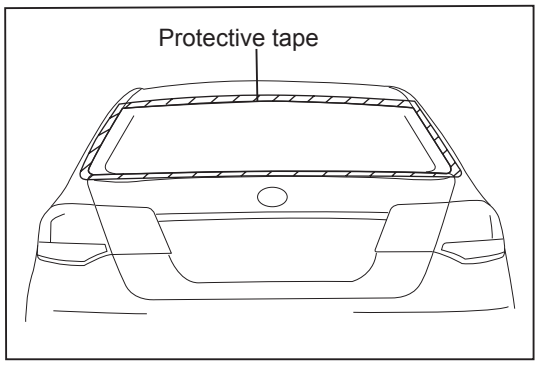
Install in the reverse order of removal. At the same time, the installation procedure includes only additional information.



1. Remove rear windscreen glass.

(a) As shown in the figure, insert the piano wire into the gap between the body and the glass from inside.

(b) Tie an object that can serve as a handle (e.g. wood block) to each end of the piano wire.



Tip:

To prevent body exterior surface from being scratched, a layer of protective tape should be applied to the surface.

Note:

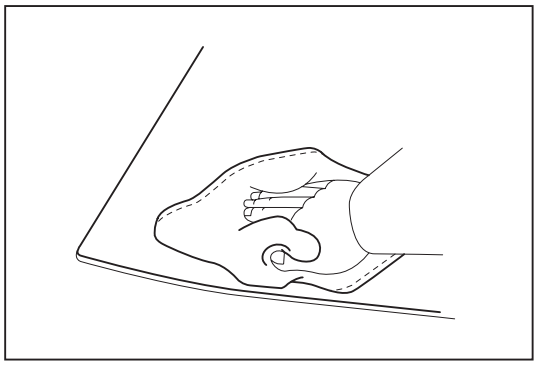
When separating the glass from the vehicle, be careful not to damage paintwork and interior and exterior trims.

(c) Pull the piano wire around the glass to cut the latter.

Note:

If the tailgate glass is to be reused, take care not to damage the clips mounted to the glass when cutting adhesive.

(d) Remove the glass using a suction cup.

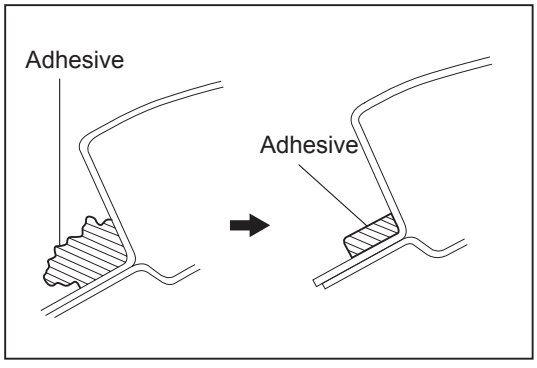


2. Clean tailgate glass.

(a) Clean periphery of the glass with white gasoline.

Note:

After cleaning, do not touch the glass surface. Be careful not to damage the glass.



3. Install rear windscreen glass.

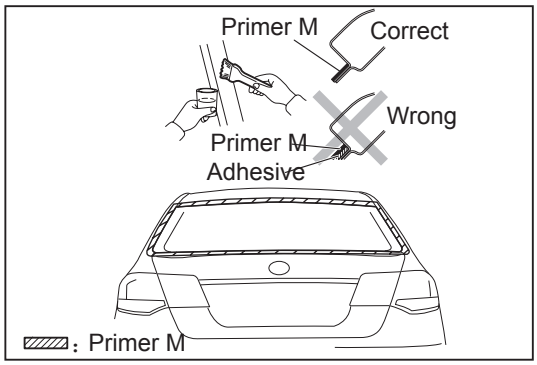
(a) Clean and dress the body contact surface.

(1) Using a knife, cut off rugged adhesive from the body contact surface to ensure a good surface shape.

(2) Use a cleanser dipped shop cloth to clean the body contact surface.

Tip:

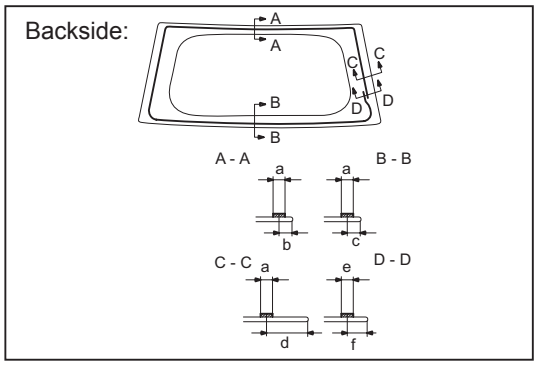
Clean the body even if all adhesive has been removed.



(b) Apply primer M to exposed parts of the body with a brush.

Note:

· Dry the primer at least for 3 minutes.
· Do not apply primer M to the adhesive.
· Discard residual primer M.



(c) Apply primer to edge and contact surface of the glass with a brush or sponge.

Tip:

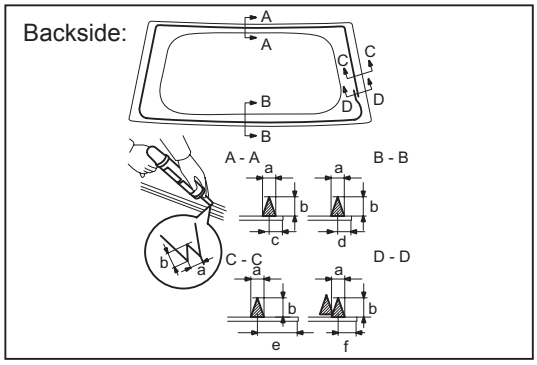
If primer is applied to other parts of the vehicle inadvertently, wipe it with a clean shop cloth before it dries.

Note:

· Dry the primer at least for 3 minutes.
· Discard residual primer.
· Do not apply excessive primer.

Specification:

Part	Measured value
a	14.0 mm
b	10.0 mm
c	12.8 mm
d	30.0 mm
e	22.0 mm
f	38.0 mm



(d) Apply adhesive.

(1) As shown in the figure, cut off nozzle end of the adhesive tube.

Tip:

After the end is cut off, all adhesive should be used up within the time given in the following table.

Lifetime:

Temperature	Lifetime
35 °C	15 min
20 °C	1 h 40 min
5 °C	8 h

(2) Install the adhesive tube onto a glue gun.

(3) As shown in the figure, apply adhesive to the glass.

Specification:

Part	Measured value
a	8.0 mm
b	12.5 mm
c	10.0 mm
d	12.8 mm
e	30.0 mm
f	30.0 mm

(e) Install the glass onto the body.

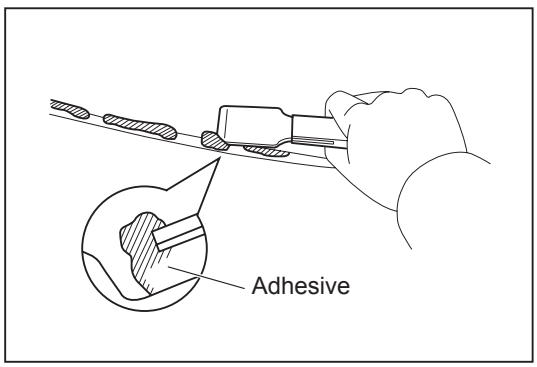
(1) Secure the tailgate window glass to the body with tape or equivalent until the adhesive cures.

Note:

Dry the primer at least for 3 minutes. Check that clips have been installed on the body properly. Check the clearance between the body and the glass.

(2) Press front surface of the glass gently to ensure close fitting.

(3) Using a scraper, clear all redundant or projecting adhesive.



Tip:

Apply adhesive to outer edge of the glass.

Note:

Do not drive your vehicle within the time given in the table below.

Shortest time:

Temperature	Shortest time before travel
35 °C	1.5 h
20 °C	5 h
5 °C	24 h

7. Check for leakage and service.

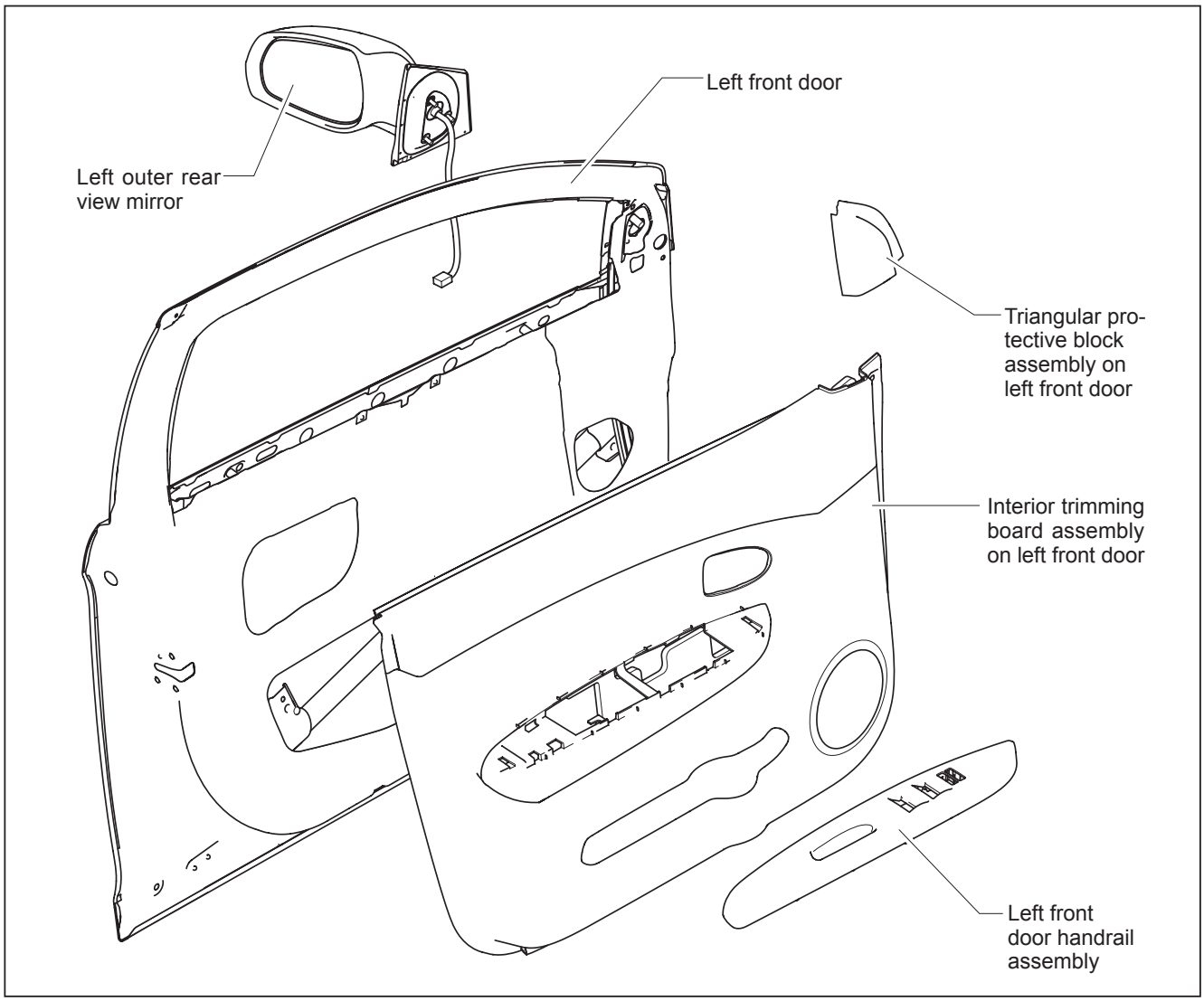
(a) After the adhesive completely cures, perform a leakage test.

(b) Seal leaky parts with automotive glass sealant

REAR VIEW MIRROR

CONTROL SYSTEM OF ELECTRIC REAR VIEW MIRROR

Structure Diagram



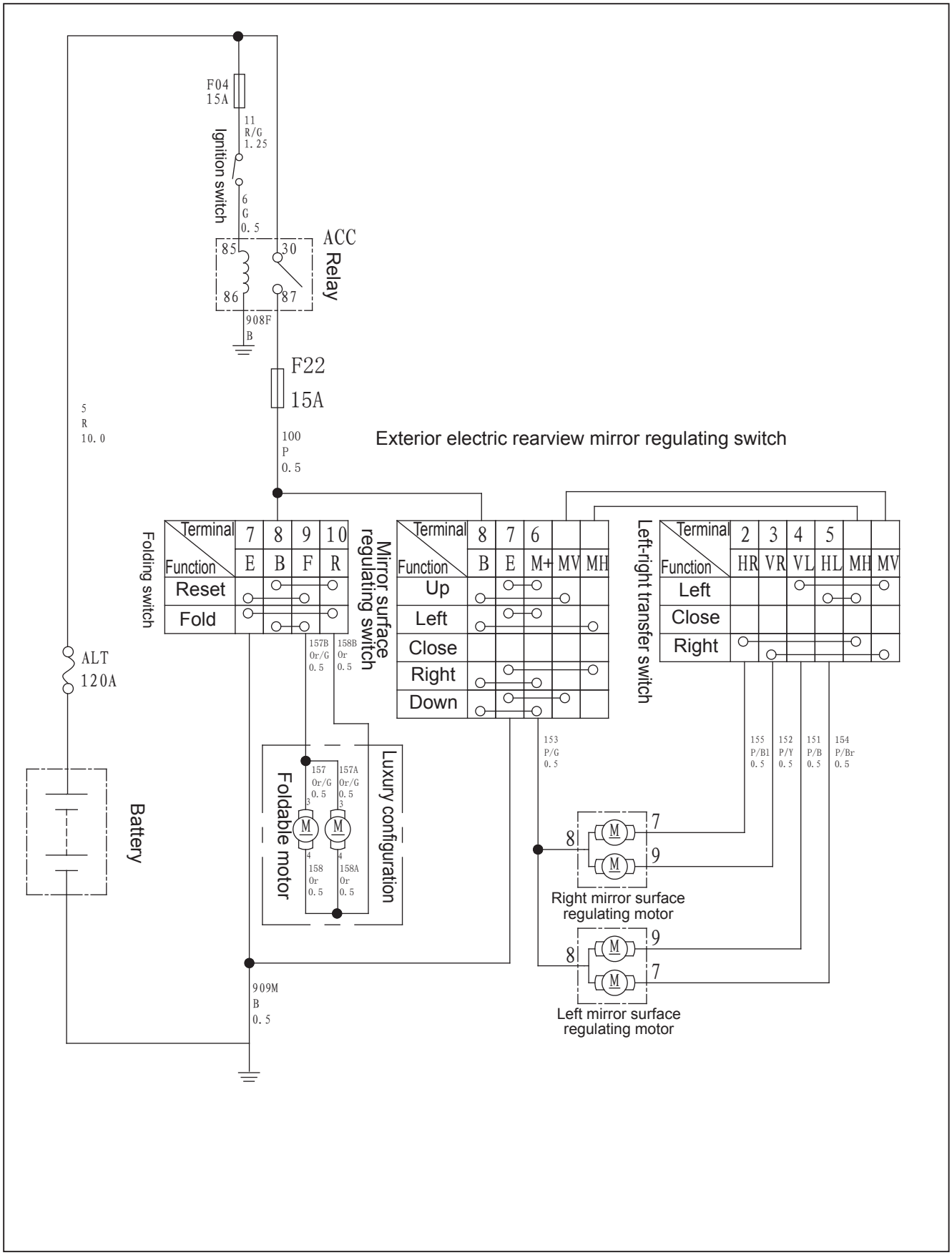
Fault Symptom Table

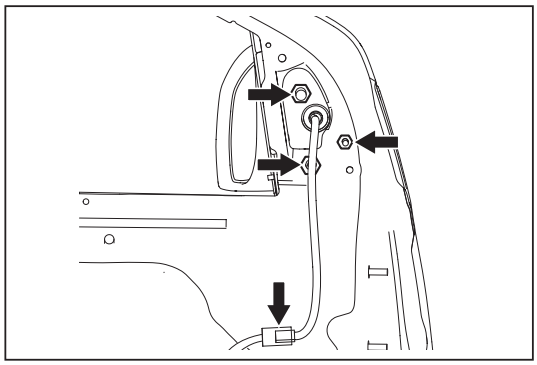
Tip:

Causes of malfunctions can be identified using the following table. Causes of malfunctions are listed in the “Suspected area” column of this table by degree of possibility. You can check each symptom by checking suspected areas in the order listed. If necessary, replace components.

Symptom	Suspected area
Rear-view mirror does not operate.	Fuse
	Outside rear-view mirror switch assembly
	Outside rear-view mirror assembly
	Harness
Rear-view mirror is malfunctioning.	Outside rear-view mirror switch assembly
	Outside rear-view mirror assembly
	Harness

System Circuit



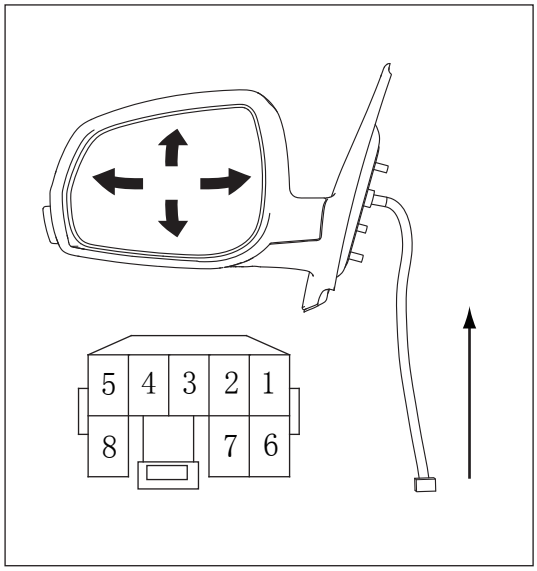


Removal

Tip:

- The removal sequence of the right side and left side are the same.
- The removal procedure specified below is for the left side

1. **Remove the cable from the negative pole of the accumulator.**
2. **Remove the inner triangular guard board on the left front door**
3. **Remove the left front door guard board**
4. **Remove the outer rearview mirror assembly**
   (a) Disconnect the connector.
   (b) Remove three nuts and the outer rearview mirror.



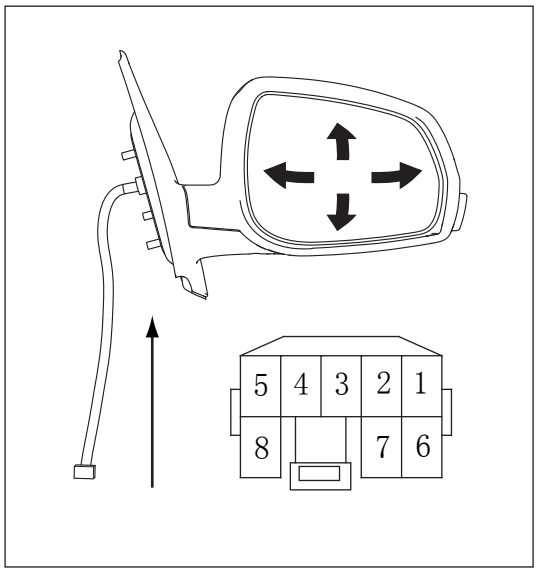
Inspection

1. **Checking outside rear-view mirror assembly (LH)**
   (a) Check operation.
      (1) Apply battery voltage to the outside rear-view mirror and then check its operation.

   Standard

Measurement condition	Rear-view mirror operation
Battery positive (+)→ 9 Battery negative (-)→ 8	Tilt up
Battery positive (+)→ 8 Battery negative (-)→ 9	Tilt down
Battery positive (+)→ 7 Battery negative (-)→ 8	Turn left
Battery positive (+)→ 8 Battery negative (-)→ 7	Turn right
Battery positive (+)→ 3 Battery negative (-)→ 4	Fold
Battery positive (+)→ 4 Battery negative (-)→ 3	Reset
Battery positive (+)→ 2 Battery negative (-)→ 6	Side turn light ON
Battery positive (+)→ 1 Battery negative (-)→ 5	Lens defrost

   If the result is out of standard, be sure to replace the left outside rear-view mirror.



2. **Checking outside rear-view mirror assembly (RH)**
   (a) Check operation.
      (1) Apply battery voltage to the outside rear-view mirror and then check its operation.

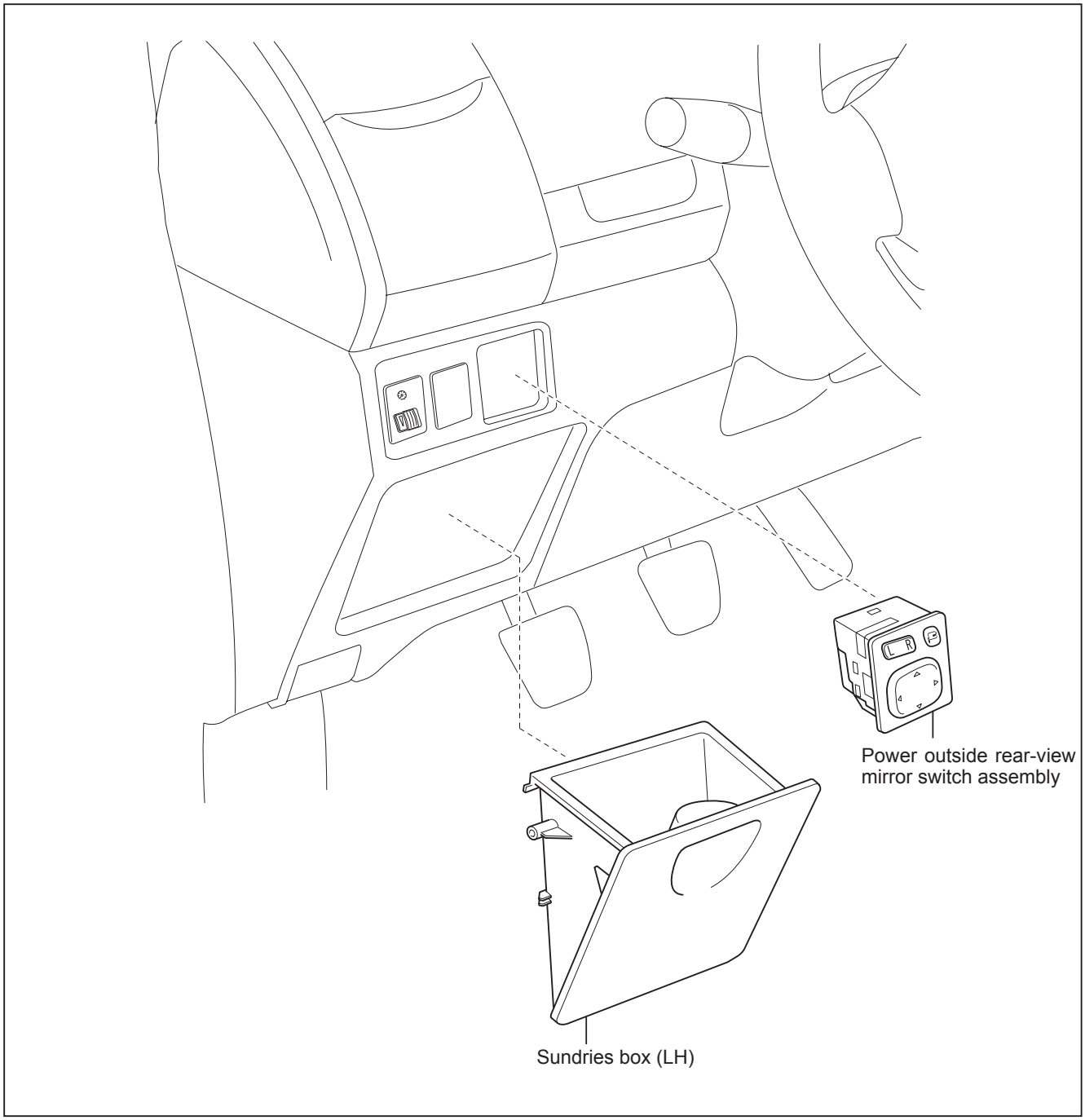
   Standard

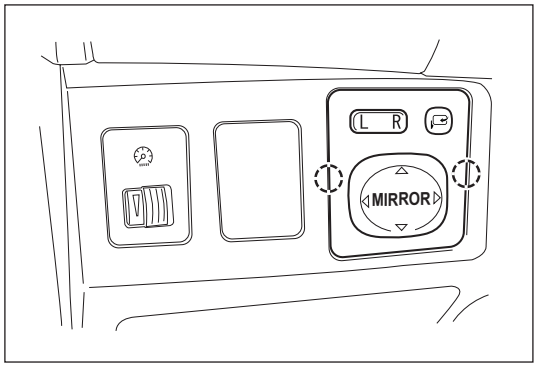
Measurement condition	Rear-view mirror operation
Battery positive(+)→ 3 Battery negative(-)→ 2	Tilt up
Battery positive(+)→ 2 Battery negative(-)→ 3	Tilt down
Battery positive(+)→ 1 Battery negative(-)→ 2	Turn left
Battery positive(+)→ 2 Battery negative(-)→ 1	Turn right
Battery positive(+)→ 4 Battery negative(-)→ 5	Fold
Battery positive(+)→ 3 Battery negative(-)→ 4	Reset
Battery positive(+)→ 7 Battery negative(-)→ 8	Side turn light ON
Battery positive(+)→ 6 Battery negative(-)→ 8	Lens defrost

   If the result is out of standard, be sure to replace the right outside rear-view mirror.

OUTSIDE REAR-VIEW MIRROR SWITCH

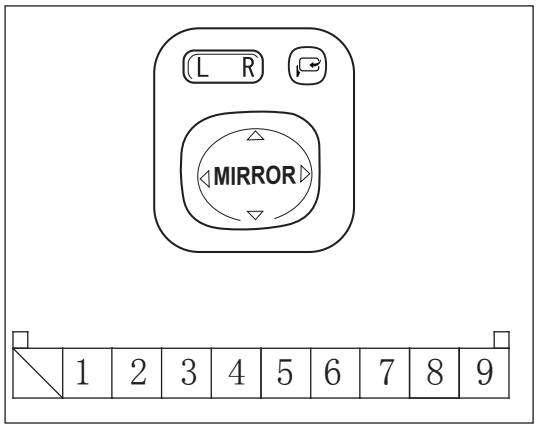
Structure Diagram





Removal

1. **Disconnect the cable from the battery negative terminal.**
2. **Remove the instrument panel cover.**
3. **Remove outside rear-view mirror switch assembly.**
   (a) Disconnect the joint.
   (b) Detach the 2 claws and the outside rear-view mirror switch.



Inspection

1. Checking outside rear-view mirror switch assembly

(a) Check resistance.

(1) Select the L (left) switch on the left/right regulating switch.

(2) Use an ohmmeter, measure resistance and check if the result conforms to the values listed in the table below.

Standard resistance

Terminal connection	Switch status	Specified status
4 - 8	Tilt up	< 1Ω
6 - 7		
4 - 7	Tilt down	
6 - 8		
5 - 8	Turn left	
6 - 7		
5 - 7	Turn right	
6 - 8		
8 - 9	Fold	
7 - 10		
7 - 9	Reset	
8 - 10		

If the result is out of standard resistance range, be sure to replace the outside rear-view mirror switch.

(a) Check resistance.

(1) Select the R (right) switch on the left/right regulating switch.

(2) Use an ohmmeter, measure resistance and check if the result conforms to the values listed in the table below.

Standard resistance

Terminal connection	Switch status	Specified status
3 - 8	Tilt up	< 1Ω
6 - 7		
3 - 7	Tilt down	
6 - 8		
2 - 8	Turn left	
6 - 7		
2 - 7	Turn right	
6 - 8		
8 - 9	Fold	
7 - 10		
7 - 9	Reset	
8 - 10		

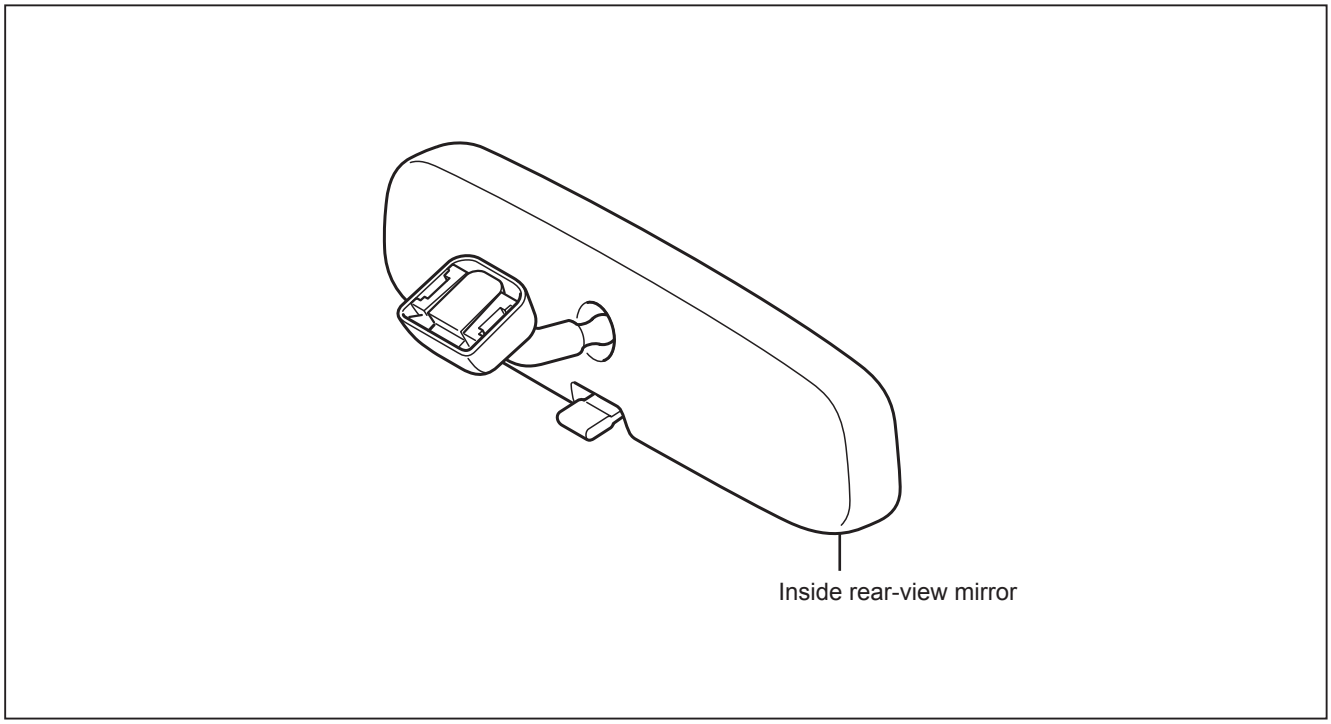
If the result is out of standard resistance range, be sure to replace the outside rear-view mirror switch.

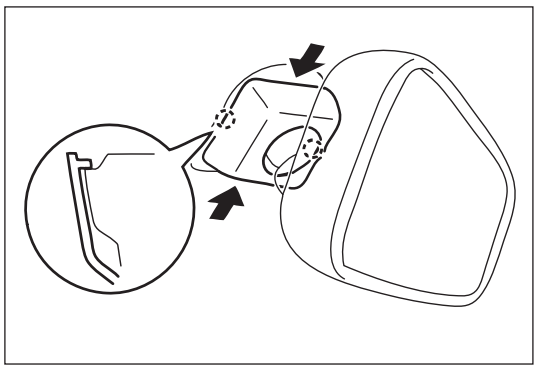
Installation

1. **Install outside rear-view mirror switch assembly.**
   (a) Install the 2 claws and the outside rear-view mirror switch.
   (b) Connect the joint.
2. **Install the instrument panel cover.**
3. **Connect the cable with the battery negative terminal.**

INSIDE REAR-VIEW MIRROR ASSEMBLY

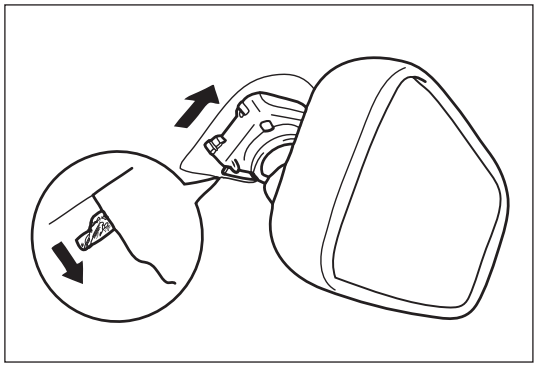
Structure Diagram



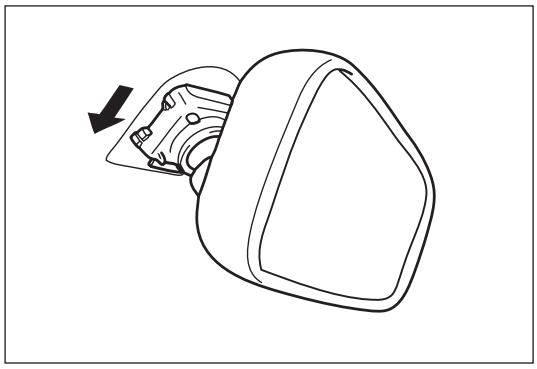


Removal

1. **Remove inside rear-view mirror assembly.**
   (a) Clamp the mirror cover, and then remove the 2 claws and the cover.



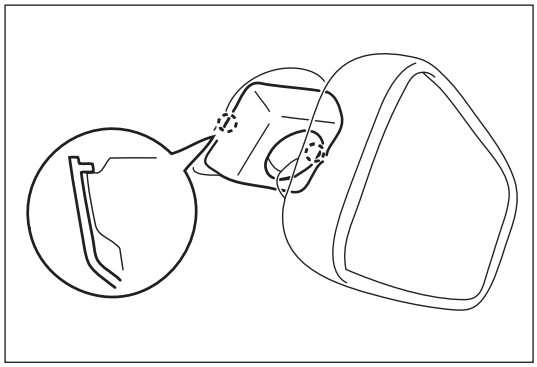
   (b) Push the lever, and then slide and remove the inside rear-view mirror.



Installation

1. Install inside rear-view mirror assembly.

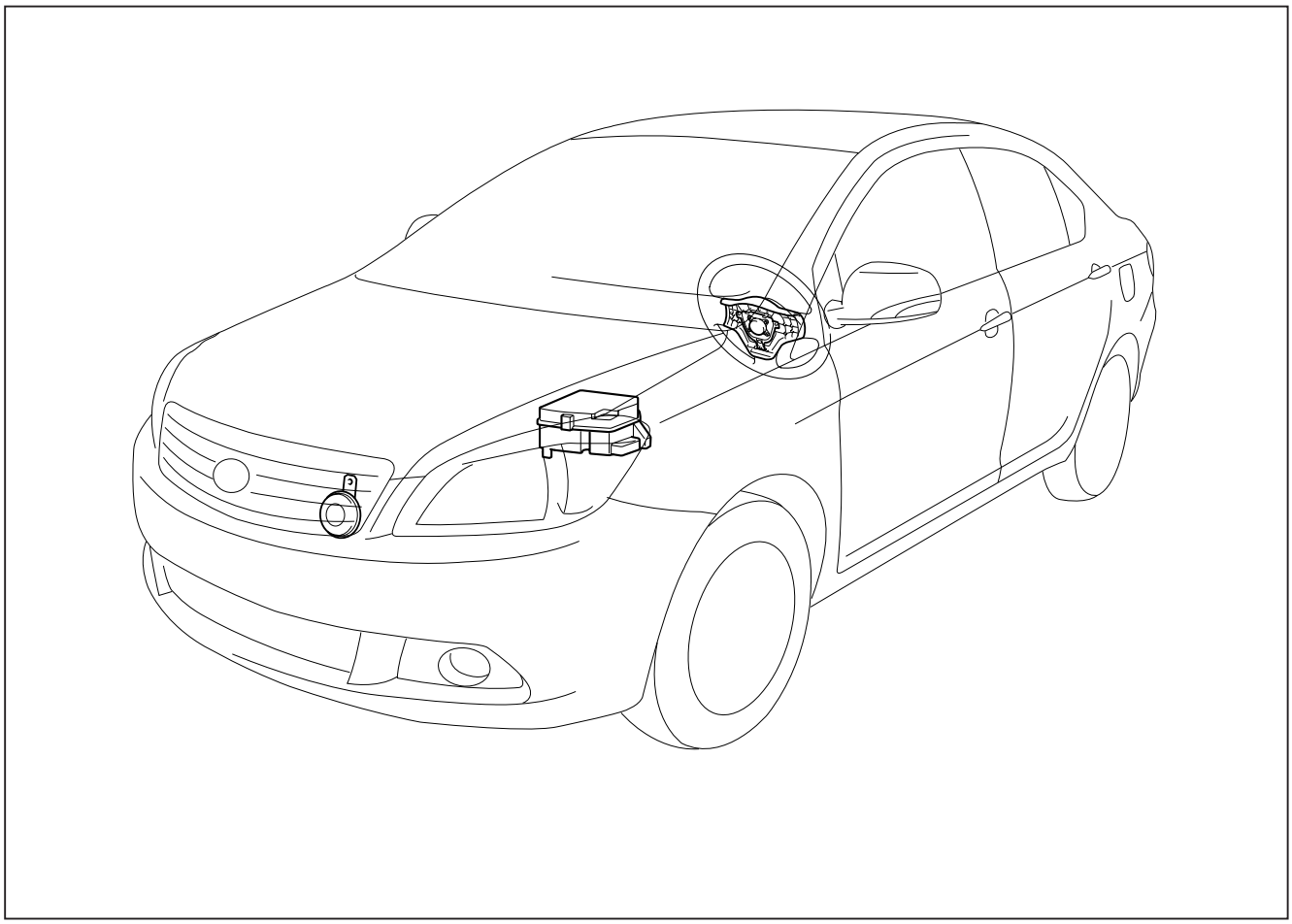
(a) Slide and install the inside rear-view mirror.



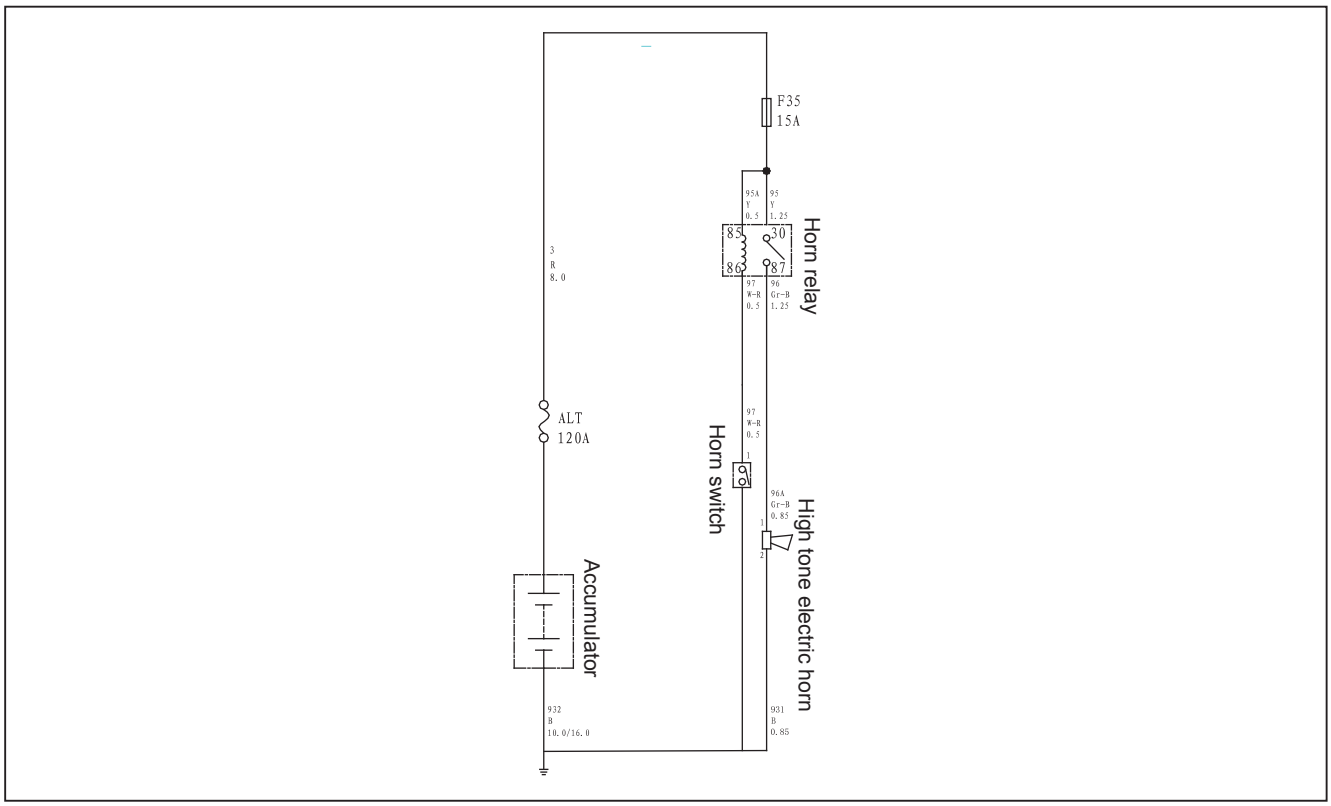
(b) Engage the 2 claws, and install the mirror cover.

HORNS

LOCATIONS OF PARTS



System circuit

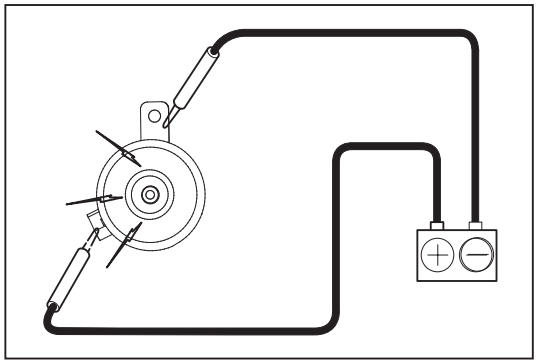


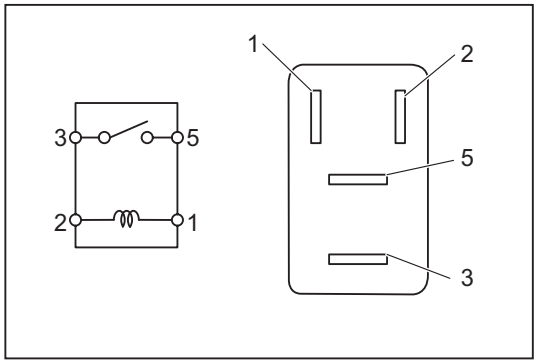
FAULT SYMPTOM TABLE

Tip:

Causes of malfunctions can be identified using the following table. Causes of malfunctions are listed in the “Suspected area” column of this table by degree of possibility. You can check each symptom by checking suspected areas in the order listed. If necessary, you can replace components.

Symptom	Suspected area
Horn does not sound.	Horn button switch
	Tweeter assembly
	Fuse
	Relay assembly
	Harness





INSPECTION

1. Checking electric tweeter assembly

(a) Apply battery voltage to the electric horn and check its operation.

Standard:

Measurement condition	Specified status
Battery positive (+) → terminal 1 Battery negative (-) →electric horn body	Electric horn sounds.

If you get out-of-specification results, replace the electric horn assembly.

2. Checking electric horn relay assembly

(a) Remove the electric horn relay from inside the engine compartment fuse box.

(b) Check electric horn relay resistance.

Standard:

Detector connection	Specified status
3 - 5	≥ 10 Ω
	< 1 Ω (When battery voltage is applied to terminals 3 and 5)

If you get out-of-specification results, replace the relay assembly.

SLIDING SUNROOF

FUNCTION INTRODUCTION

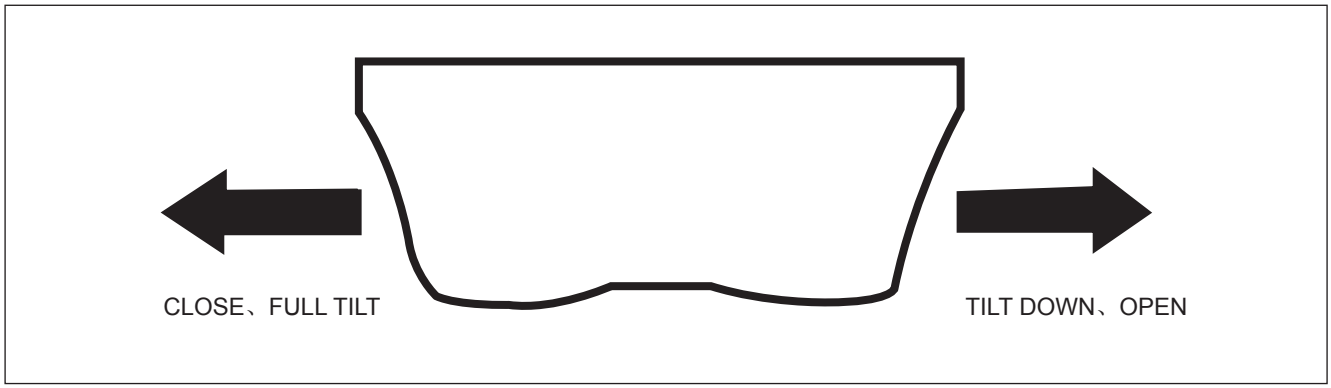
The sunroof can be open or closed by pressing the switch when the ignition switch is turned on.

1. **Glass lift – sunroof close**
   Notes: The come up—come down of the glass backend is closed.
   Function: During the drive, it is used to remove the stale air inside the vehicle, which takes cleaning effect.
2. **Glass open**
   Notes: The glass fully opens backward; at the same time, the sun visor open automatically, but it must be closed manually.
   Function: During the drive, besides the air cleaning function, it allows you to enjoy the blue sky and white clouds, the breath of earth and life, and experience comfortable driving.
3. **Automatic shut off upon flame extinguish (KEY OFF function)**
   Notes: When the engine goes out, the sunroof glass will move to state of closing (when the sunroof is not closed).
   Function: In case that the driver and passenger forgot to close the sunroof when leave the car; ensure safety.
4. **Anti-clip function**
   Note:
   The force is 100N, please do not try.

ROUTINE MAINTENANCE PROCEDURE

1. **When the sunroof is in the state of closing, push the sunroof glass plate with both hands inside the vehicle to check whether the glass plate erection bolts are loose. If the glass plate erection bolts are loose, then the glass plate may move up and down. If they are loose, tighten the bolts up and make sure the torque is within the range of 4.5～6 N•m;**
2. **Open the sunroof glass plate fully, and check whether there are foreign matters and dust on the drain tank inside the left and right tracks. If there are, tightly wipe the foreign matters and dust on the sunroof tracks;**
3. **Open and close the sunroof, and check whether there are clamping and other phenomenon during the operation. If this occurs, then it is required to apply proper amount No.00 lubricating grease or lubricant which is uneasy to absorb dust after cleaning the track and let the glass plate move again to make it fully lubricated;**
4. **When the sunroof is in the state of closing, push and pull the sun visor inside the vehicle to check whether there are clamping and other phenomenon. If there are, push the sun visor to the maximum open position, and apply proper amount No.00 lubricating grease or lubricant which is uneasy to absorb dust after cleaning the track, then let the sun visor move again to make it fully lubricated;**
5. **If too much lubricating grease is applied, wipe the surplus lubricating grease with soft cloth to avoid polluting the interior trim components of the vehicle;**
6. **Close the sunroof again and check the running state;**
7. **Let the sunroof run to the half open position, then clean the seals at the front end of the glass plate with wet sponge to remove dust, sand and other litters;**
8. **Let the sunroof run to the half open position, then clean the seals at the rear end, left and right side of the glass plate with wet sponge to remove dust, sand and other litters;**

Forced Initialization Program

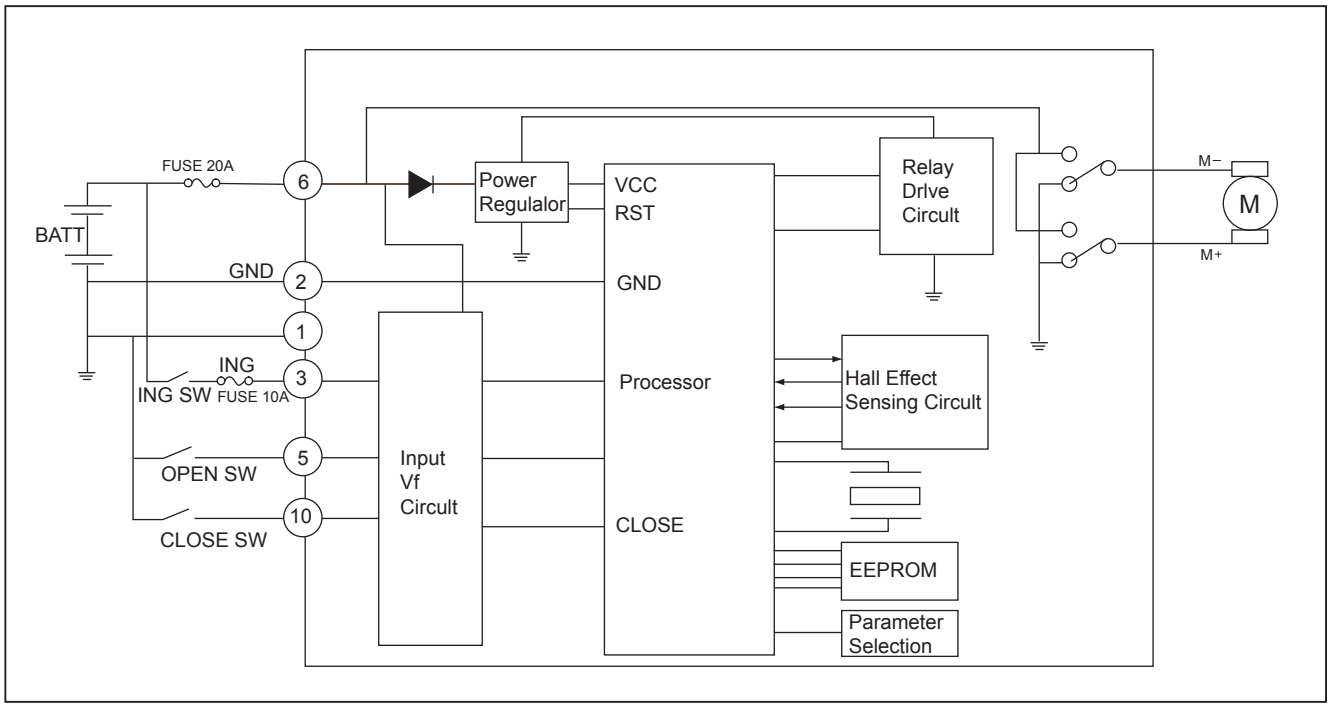


Important condition: The initialization program can be operated only when in the "ON" position
When the sunroof is in FULL TILT position, keep pushing the CLOSE button for 5s.
When the sunroof meets barrier point during running to FULL TILT position, the sunroof will be corrected immediately; hence ECU can realize full function operation.
Now ECU has all functions and all position of the sunroof

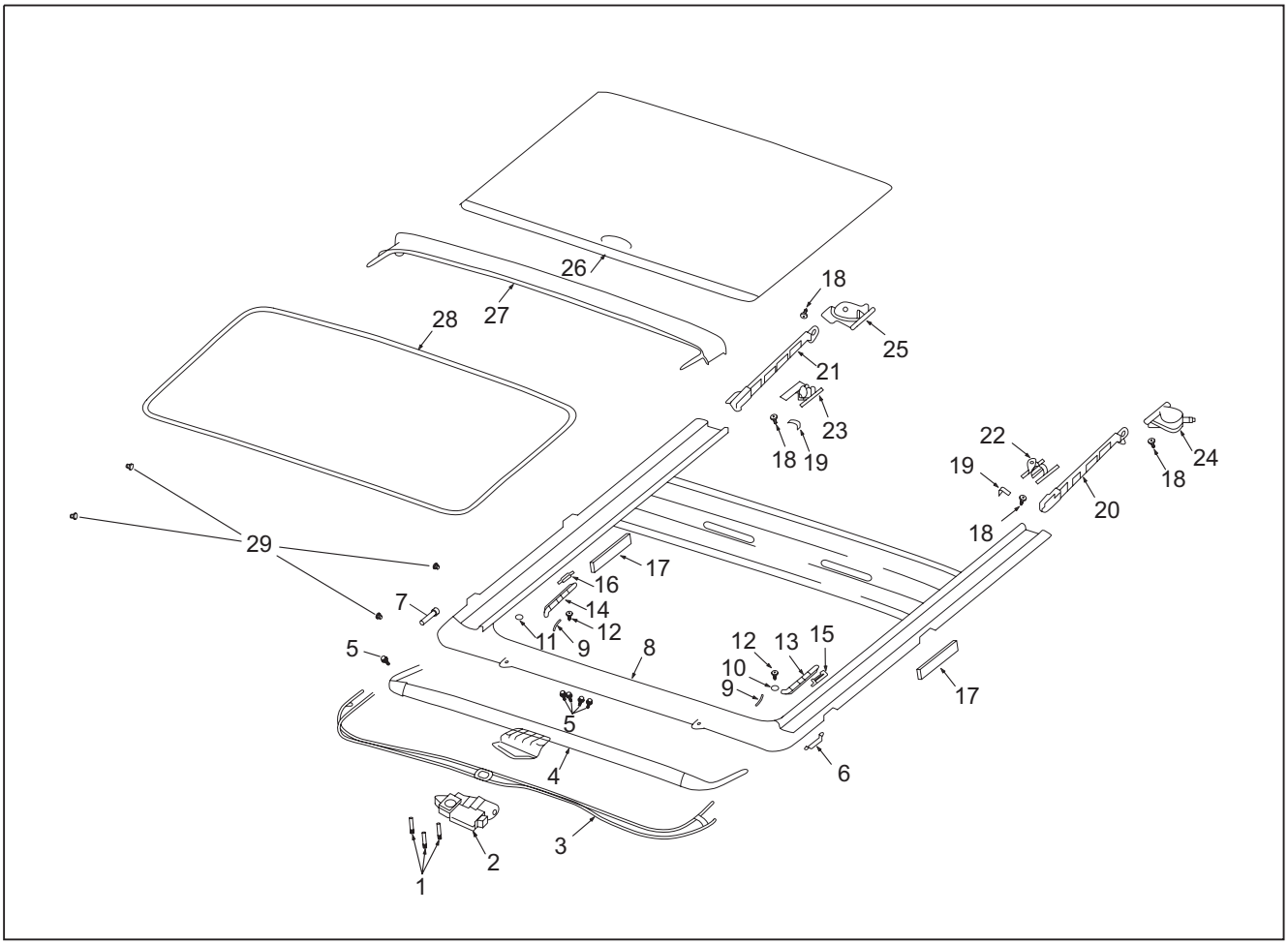
FAULT SYMPTOM TABLE

Fault Phenomenon	Possible Reasons	Fault Recovery
The sunroof does not work (The electric motor works)	There are foreign matters in the sunroof sliding track	Remove the obstruction
	There is misplaced part in the sliding track	Install the part correctly
	The sunroof part location conflicts	Repair the conflict part
	Cable error	Correct installation
The sunroof does not work (The electric motor does not work)	The fuse of the system is damaged	Change the fuse
	The sunroof operating switch fails	Check the line according to the sunroof switch instruction
	Motor fault	Check the line according to the sunroof electric motor instruction
	Controller error	Check the line according to the sunroof controller instrument

SUNROOF ASSEMBLING DRAWING

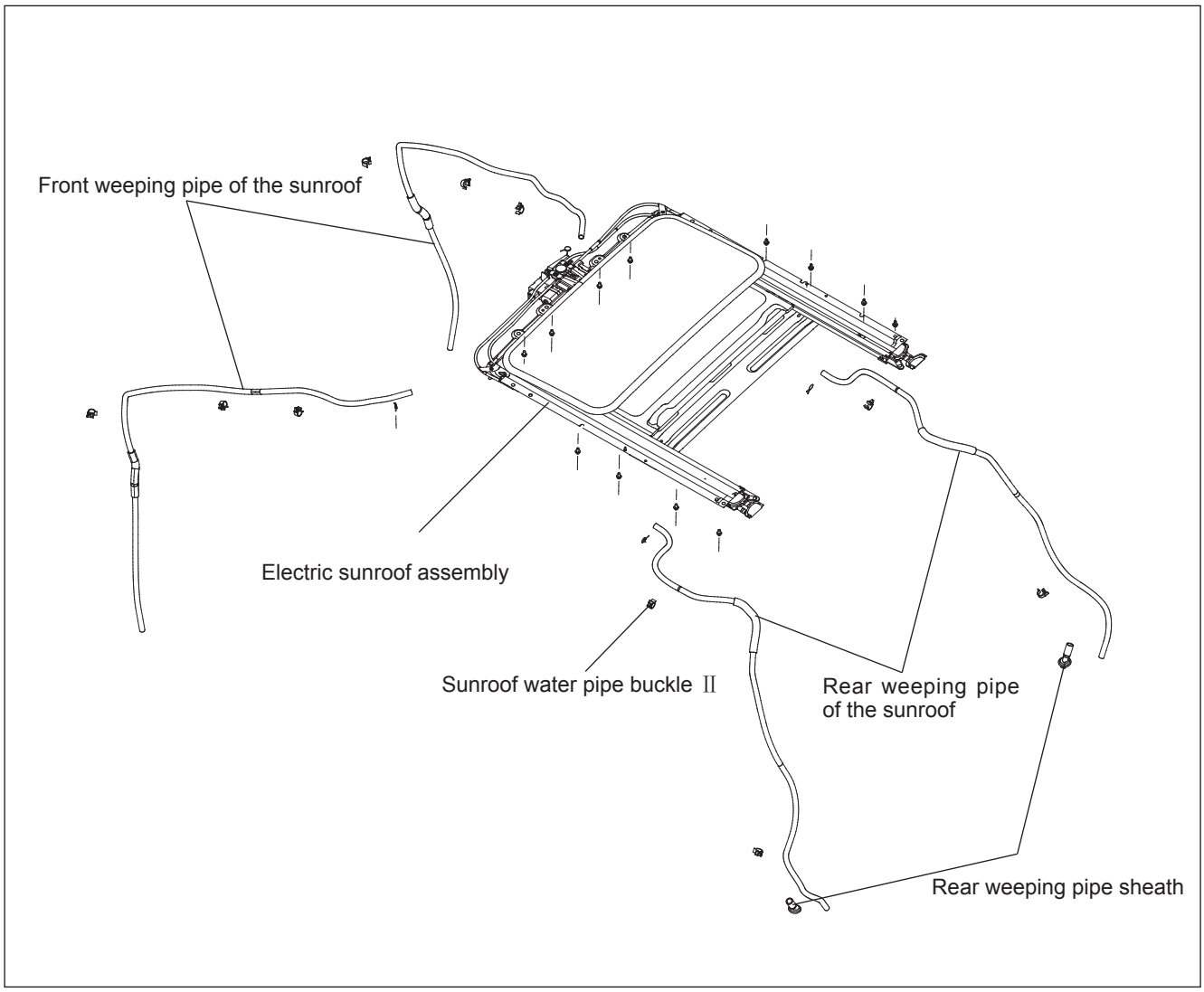


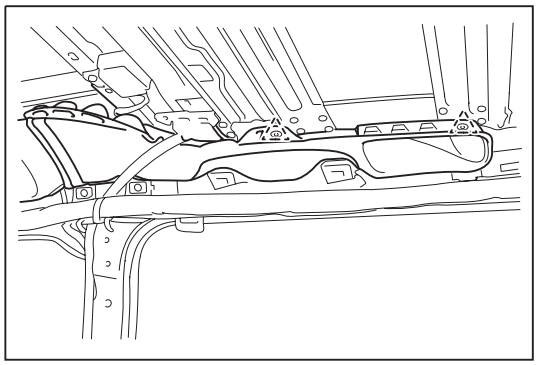
PARTS



1.Motor bolt(locking the motor)	17. Water retaining foam
2.Motor	18.Bolts
3.copper pipe assembly	19.Mechanism catch
4.Windshield assembly	20.Steering mechanism assembly L
5.Hinge screw	21.Steering mechanism assembly R
6.Coppersheath LH	22.Link mechanism assembly L
7.Coppersheath RH	23.Link mechanism assembly R
8.Frame riveting assembly	24.Rear drain pipe assembly L
9.Connecting rod	25.Rear drain pipe assembly R
10.Front sun visor block LH	26.Sun visor assembly
11.Front sun visor block RH	27.Rear drain tank
12.Bolts (front + aluminium sliding track +mechanism locating block)	28.Sunroof glass assembly
13.Mechanism locating block L	29.Glass bolt
14.Mechanism locating block R	
15.Rocker arm locating block L	
16.Rocker arm locating block L	

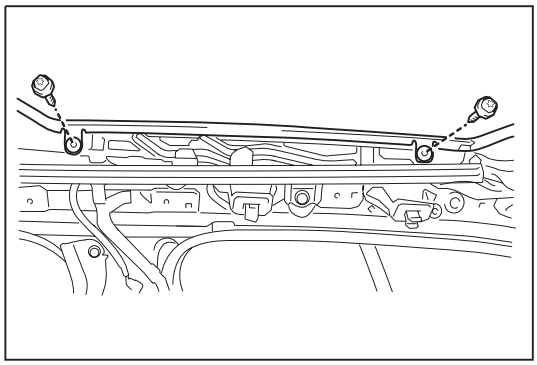
Component Diagram



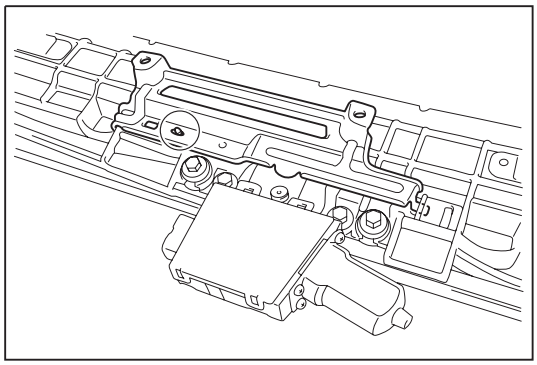


REMOVE THE SUNROOF

1. **Remove the head cover inner panel**
2. **Remove the air pipe on the rear roof**
   Depart 2 jack catches and remove the air pipe.

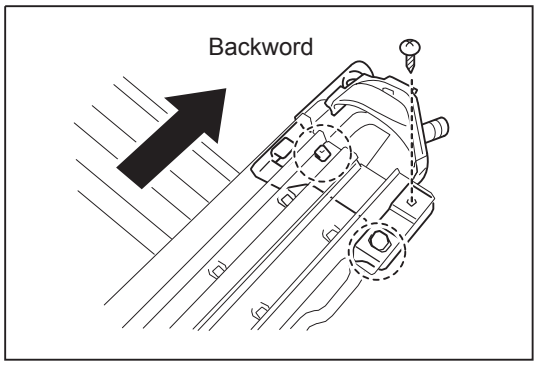


3. **Remove the sliding sunroof glass**
   Remove 4 bolts and the glass with the screw driver.
4. **Remove the sliding sunroof frame sub assembly**
   (a) Disconnect the sliding sunroof drain pipe.
   (b) Remove the bolts, nuts and sliding sunroof frame.

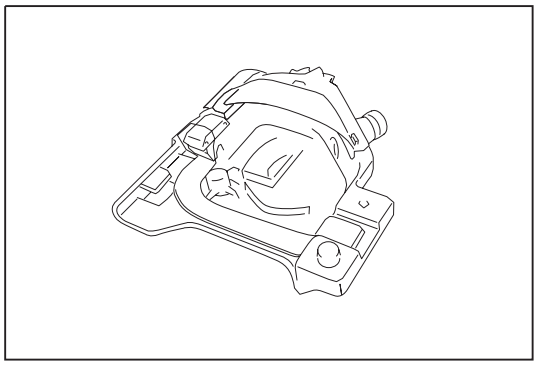


Resolution

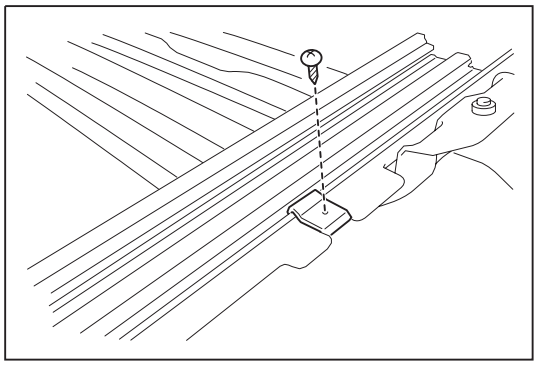
1. **Remove the left sliding sunroof locking fixing plate**
2. **Remove the sliding sunroof electric motor**
   (a) Depart the jack catches the fram and remove the frame.
   (b) Remove 3 bolts and the sliding sunroof motor.



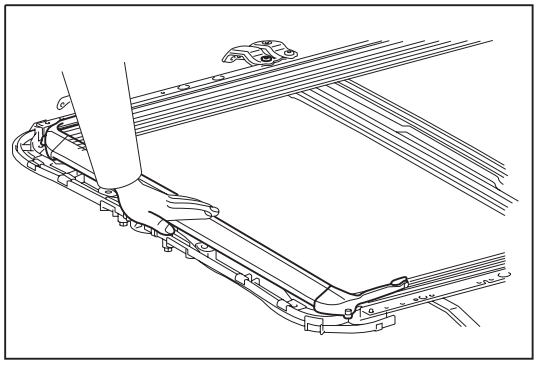
3. **Remove the sun visor trim plate assembly**
   (a) Remove 2 bolts.
   (b) Depart the 4 jack catches and remove the left right sliding sunroof parts.
   (c) Slip and remove the trim plate.



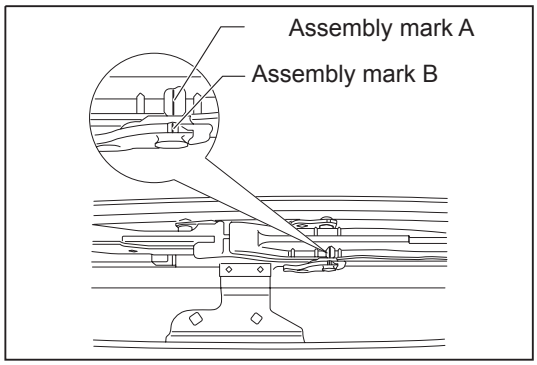
4. **Remove the sliding sunroof left sun visor block and detach the block.**
5. **Remove sliding sunroof right sun visor block**
   Tip:
   Remove the right side in accordance with the procedure dealing with the left side.



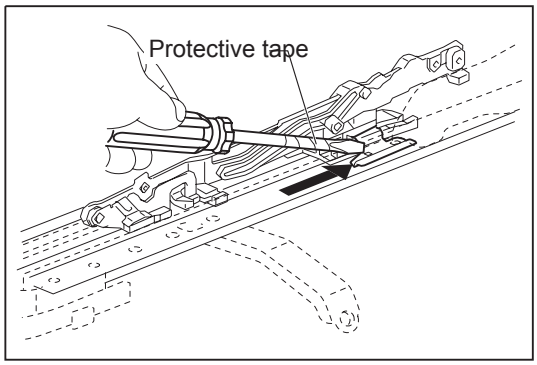
6. **Remove the sliding sunroof drive cable sub assembly**
   Note:
   Do not remove the sliding sunroof drive cable sub assembly unless replace it.
   (a) Remove 2 bolts and 2 blocks.
   (b) Depart the 2 jack catches with screw driver and slip the sunroof drain tank to remove it.
   Tip:
   Please bind the screw driver head with tapes before use it.



   (c) Compress the sunroof air deflector.



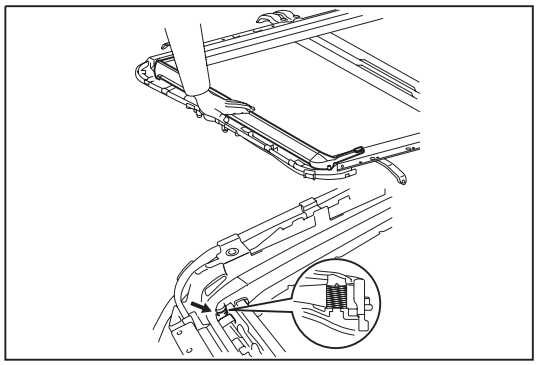
(d) Make the assembly mark in the A and B position of the sliding sunroof drive cable sub assembly, as shown in the figure.



(e) Slip the drive cable in the direction indicated by the arrow in the figure with screw driver to remove it.

Tip:

Please bind the screw driver head with tapes before use it.



INSTALL THE SUNROOF

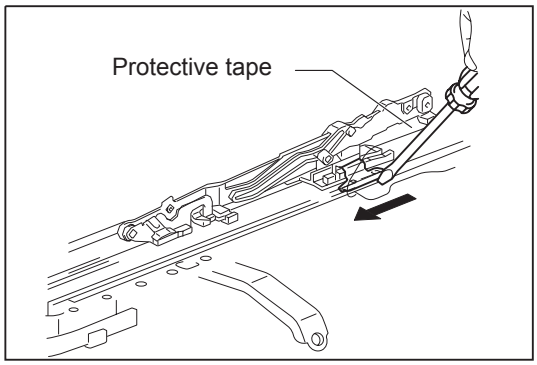
Reassembly

1. Install the sliding sunroof drive cable sub assembly

(a) Compress the sunroof air deflector

Note:

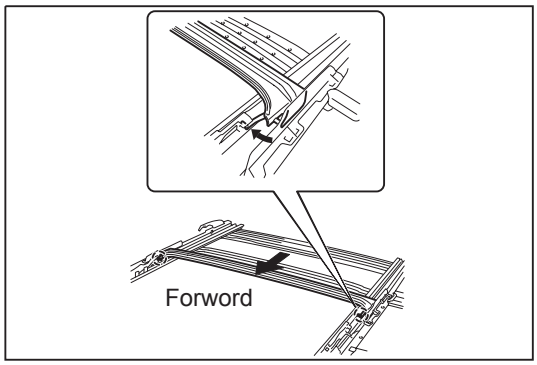
Make sure the spring in the direction of arrow in the figure has been firmly installed.



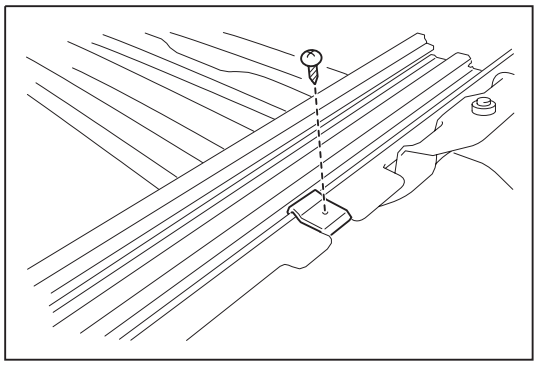
(b) Slip the drive cable in the direction indicated by the arrow in the figure with screw driver to aim at the assembly mark.

Tip:

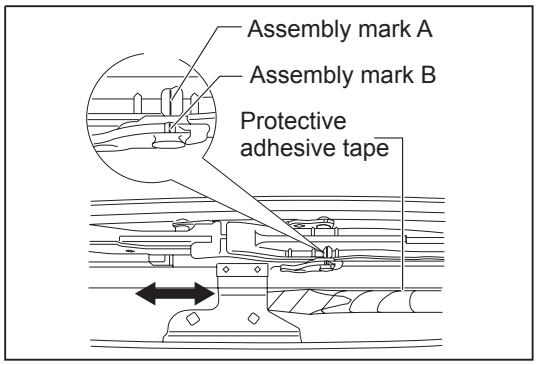
Please bind the screw driver head with tapes before use it.



(c) Slip forward the drain tank of the sliding sunroof and connect 2 jack catches to install it.



(d) Install 2 blocks with 2 bolts.

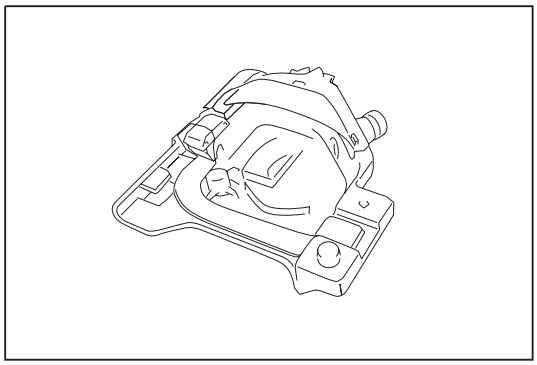


2. Adjust the sliding sunroof drive cable sub assembly

(a) Slip the drive cable in the direction indicated by the arrow in the figure with screw driver to aim at the assembly mark.

Tip:

Before using the screwdriver, please wrap its head with tape.



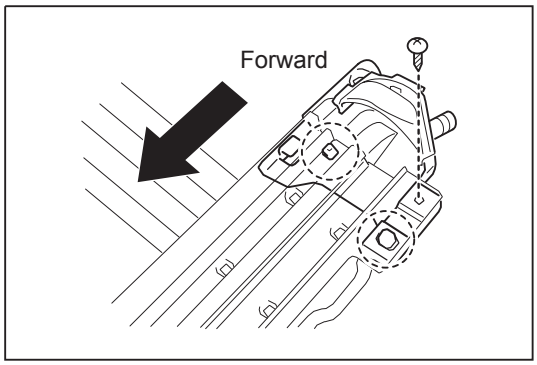
3. Install the left side sun-shading curtain block of the sunroof

(a) Install the block.

4. Install the right side sun-shading curtain block of the sunroof

Tip:

Install the right side sun-shading curtain block in accordance with the same procedure as that of the left side.



5. Install the sun visor trim plate sub assembly.

(a) Insert the sun visor trim plate to the sliding sunroof frame.

(b) Connect the 4 jack catches to install the left side and right side sliding sunroof parts.

(c) Install 2 bolts.

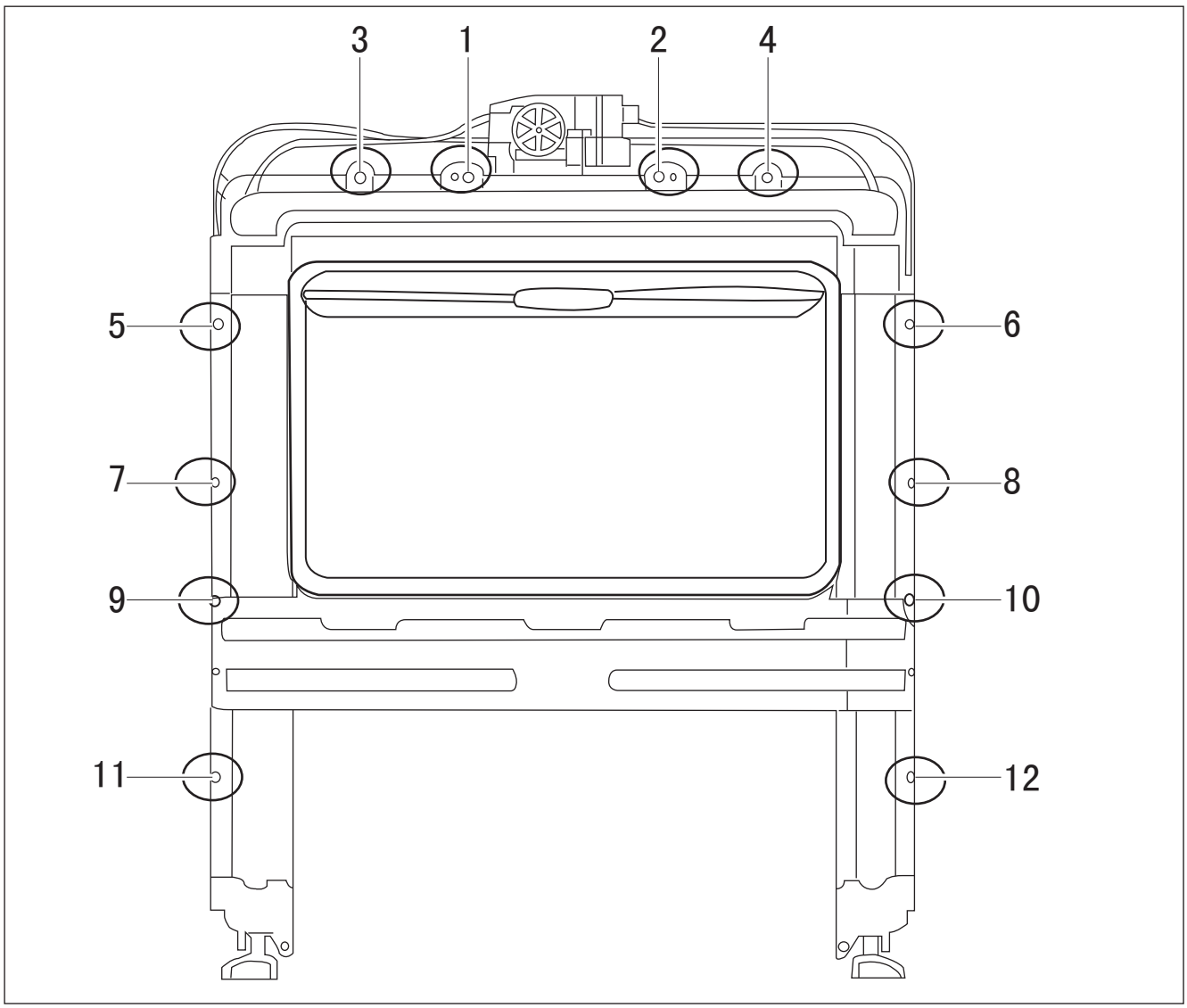
6. Install the sliding sunroof motor

(a) Use bolts to install the sliding sunroof motor.

(b) Connect the jack catch of frame to install the frame.

7. Install the left side sliding sunroof locking fixing plate

Sunroof Installation



1. **Move the sunroof assembly into the vehicle, the holes of the sunroof assembly frame should be directed at and draped around the bolts on the vehicle body reinforced frame (note that the datum hole must be directed accurately)**
2. **After the holes in the sunroof frame have been directed at the vehicle body bolts, use nuts to pre-tighten bolt 3, 4,7,8,1 and 2; then use the assembly frame to pre-tighten bolt 5,6,9,10,11and 12.**
3. **After the assembly frame has been pre-locked, all the nuts should be tightened up gradually, and they are not allowed to be tightened up one by one.**
4. **After the assembly nuts have been tightened up, adjust the surface difference between the glass and the vehicle roof to an optimal state, and then tight up the glass screws ;(the glass screws were pre-locked when delivered, and were not tightened up).**
5. **Install 4 drain pipes and pipe clips.**

Sunroof adjustment

1. **Unscrew the locked glass lock wire (in 4 positions), micro-adjust the glass assembly in the up and down direction for 2 to 3 times.**
   The additional torque of the glass screws is: 4.5-6 N•m
   In this way, the sunroof glass can be positioned in the horizontal and vertical direction.
2. **The dimension of the surface position of sunroof glass and the positioning method of the surface dimension of vehicle roof should refer to the following explanation:**
   The position of the sunroof glass (glass surface and vehicle roof surface)
   The radian difference reference value αbetween the water proof strake and the vehicle body metal plate in the glass assembly should be within(-0.4～+1.6)mm.

LIGHTING SYSTEM

ATTENTIONS

1. If surface of a halogen bulb (e.g. headlight) is coated with oil, the bulb's life will be shortened during use because of the heat produced.
2. Take care during operation because internal pressures of halogen bulbs (e.g. headlight) are very high. If such a bulb drops, it may cause personal injury.
3. When replacing a bulb, do not attempt to touch its lens with your fingers; otherwise dirt may be produced on the lens or the lens may be wetted. Before starting installation, be sure to get the replacement bulb ready.
4. Replace with the bulb of the same power only.
5. Keep the lens clear of water mist or water.
6. To keep a lens clear of water mist or water, reinstall its lamp holder firmly after bulb replacement.

FAULT SYMPTOM TABLE

Tip:

The suspected areas are listed in the following table in numerical order for identifying sources of trouble. When necessary, follow the procedures listed in the following pages to check, service or replace parts.

1. Headlights and rear position lights

Symptom	Suspected area
"Low beams" do not come on (one side).	1. Bulb 2. Harness
None of "low beams" comes on (all).	1. Low beam fuse 2. Low beam relay 3. Left combination switch assembly 4. Bulb 5. Harness
"High beams" do not come on (one side).	1. Bulb 2. Harness
None of "high beams" comes on (all).	1. High beam fuse 2. High beam relay 3. Left combination switch assembly 4. Bulb 5. Harness
None of "flash lights" comes on (all).	1. Fuse 2. Left combination switch assembly 3. Harness
Headlights are dim.	1. Bulb 2. Harness
Only one rear position light comes on.	1. Bulb 2. Harness
Neither of rear position lights comes on (front position light is normal.)	1. Bulb 2. Harness
Neither of rear position lights comes on (front position light does not come on.)	1. Position light fuse 2. Position light relay 3. Left combination switch assembly 4. Bulb 5. Harness

2. Fog lights

Symptom	Suspected area
None of fog lights comes on.	1. Fog light fuse 2. Fog light relay 3. Fog light switch assembly 4. Bulb 5. Harness
Fog lights always light up.	1. Fog light switch assembly 2. Harness
“Fog lights” do not come on (one side).	1. Bulb 2. Harness

3. Turn signal light and hazard warning system

Symptom	Suspected area
Neither “hazard warning light” nor “turn signal light” comes on.	1. Hazard warning fuse 2. Turn light fuse 3. Flasher relay 4. Harness
Hazard warning light does not come on (turn light is normal.)	1. Hazard warning fuse 2. Harness
Turn light does not come on (hazard warning light is normal.)	1. Turn light switch 2. Harness
Turn light for one direction does not come on.	1. Turn light switch 2. Flasher relay 3. Bulb 4. Harness
Only one bulb comes on.	1. Bulb 2. Harness

4. Brake light system

Symptom	Suspected area
Neither of brake lights comes on.	1. Brake light fuse 2. Brake light switch assembly 3. Harness
Brake lights always light up.	1. Brake light switch assembly 2. Harness
Brake light does not come on (one side).	1. High mount brake light is LED; brake light is standard bulb. 2. Harness

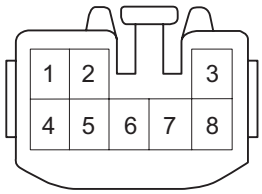
5. Backup light system

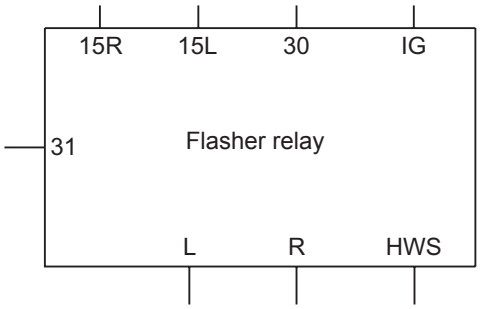
Symptom	Suspected area
Backup light does not come on.	1. Bulb 2. Fuse 3. Backup light switch assembly 4. Harness
Backup light always lights up.	1. Backup light switch assembly 2. Harness

6. Ceiling light system

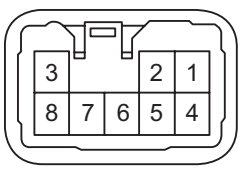
Symptom	Suspected area
Ceiling light does not come on.	1. Bulb 2. Fuse 3. Harness
Reading light does not come on.	1. Bulb 2. Fuse 3. Harness
Neither ceiling light nor reading light comes on (all).	1. Fuse

Harness view:





Turn signal flasher assembly
Front view of connector:



ON-VEHICLE INSPECTION

1. Checking turn signal flasher assembly

(a) Disconnect the connector from the turn signal flasher assembly, and check the connector on the harness side shown in the table below.

Standard:

Detector connection	Condition	Specified status
1 (IG) - Ground	Ignition switch ON	Battery voltage
1 (IG) - Ground	Ignition switch LOCK	No voltage
30 (IG) - Ground	Always	Battery voltage
7 (31) - Ground	Always	ON

(b) Connect the connector to the turn signal flasher assembly, and check the connector on the harness side shown in the table below from backside.

Standard:

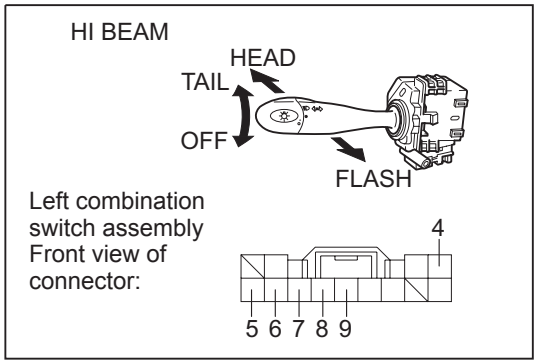
Detector connection	Condition	Specified status
2 (R) - Ground	Hazard warning switch OFF → ON	0 V → 0↔9 V (60-120/min)
6 (15R) - Ground	Turn light switch (Turn right) OFF → ON	0 V → 0↔9 V (60-120/min)
3 (L) - Ground	Hazard warning switch OFF → ON	0 V → 0↔9 V (60-120/min)
5 (15L) - Ground	Turn light switch (Turn left) OFF → ON	0 V → 0↔9 V (60-120/min)
5 (15L) - Ground	Turn light switch (Turn left) ON → OFF	Above 9 V → 0 V
6 (15R) - Ground	Turn light switch (Turn right) ON → OFF	Above 9 V → 0 V
8 (HWS) - Ground	Hazard warning switch ON → OFF	Above 9 V → 0 V

2. Ceiling light delay function (interior light switch in DOOR position)

(a) If you open a door and then close it again, then the light will light up for 10s. If it is detected that the vehicle key is reinserted into the ignition switch or the door is closed, the ceiling light will die down.

(b) If the vehicle key is pulled out from the ignition switch, then the ceiling light will come on. If the key is reinserted into the ignition switch or the door is closed, the ceiling light will go out; if no operation is performed, the ceiling light will die down after 1 minute.

(c) When the vehicle key is in the ignition switch, then the ceiling light will not come on whether a door is opened or closed.



Inspection

1. Left combination switch assembly

(a) Check continuity of the light control switch. Measure resistances according to the values listed in the following table.

Standard:

Switch operation	Detector connection	Specified status
OFF	4 - 5 - 6 - 7	≥ 10 kΩ
TAIL	4 - 7	< 1 Ω
HEAD	4 - 7	< 1 Ω
HEAD	5 - 6	< 1 Ω

When necessary, replace the switch.

(b) Check continuity of the left combination switch. Measure resistances according to the values listed in the following table.

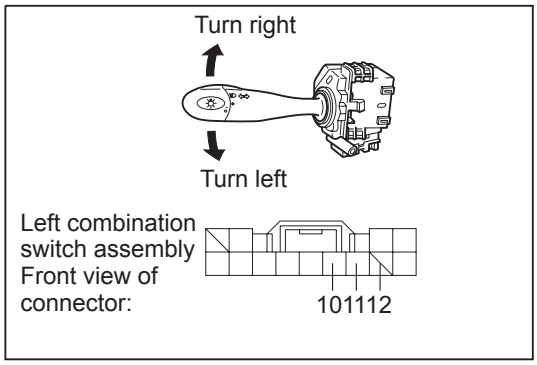
Standard:

Switch operation	Detector connection	Specified status
FLASH	5 - 6 - 8	< 1 Ω
LOW BEAM	5 - 6 - 9	< 1 Ω
HI BEAM	5 - 6 - 8	< 1 Ω

Tip:

When checking “LOW BEAM” and “HI BEAM”, set the left combination switch to HEAD position.

When necessary, replace the switch.

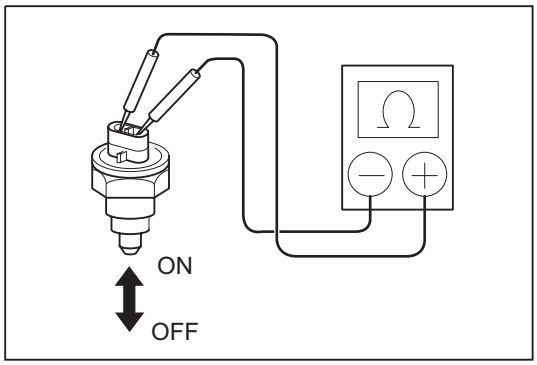


(c) Check continuity of the turn light switch. Measure resistances according to the values listed in the following table.

Standard:

Switch operation	Detector connection	Specified status
Turn right	10 - 11	< 1 Ω
Middle	10 - 11 - 12	≥10 kΩ
Turn left	10 - 12	< 1 Ω

When necessary, replace the switch.



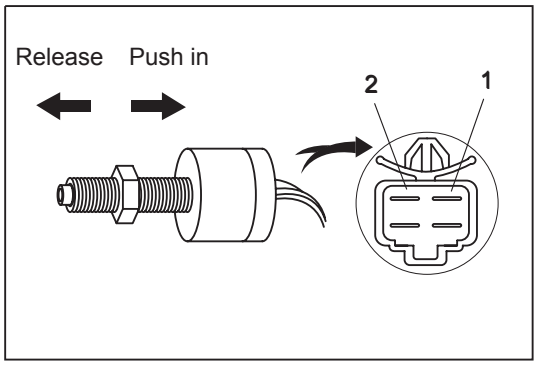
2. Backup light switch assembly

(a) Check continuity of backup light switch assembly.
Measure resistances according to the values listed in the following table.

Standard:

Switch operation	Detector	Specified status
ON	1 - 2	< 1 Ω
OFF	1 - 2	≥ 10 kΩ

When necessary, replace the switch.



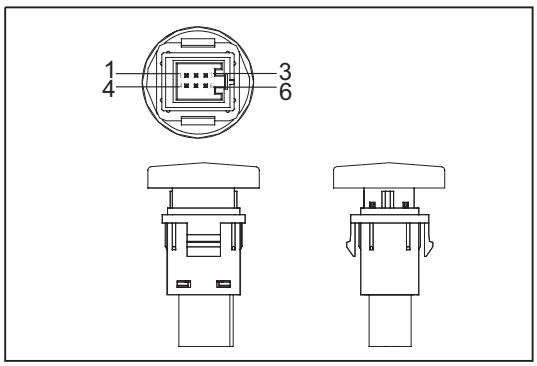
3. Brake light switch assembly

(a) Check continuity of brake light switch assembly.
Measure resistances according to the values listed in the following table.

Standard:

Switch operation	Detector connection	Specified status
Push in switch pin. (Release pedal.)	1 - 2	≥ 10 kΩ
Release switch pin. (Depress pedal.)	1 - 2	< 1 Ω

When necessary, replace the switch.



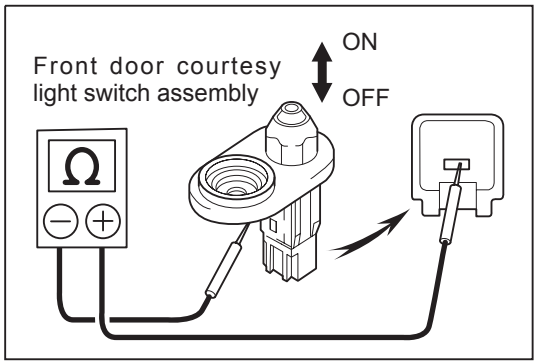
4. Alarm light switch

(a) Check continuity of the alarm light switch.
Measure resistances according to the values listed in the following table.

Standard:

Switch operation	Detector connection	Specified status
ON	1 - 4	< 1 Ω
OFF	1 - 4	≥10 kΩ

When necessary, replace the switch.
If you get nonconforming results, replace integrated controller and panel assembly.



5. Front door courtesy light switch assembly

(a) Check continuity of front door courtesy light switch assembly.
Measure resistances according to the values listed in the following table.

Standard:

Switch operation	Detector	Specified status
ON	1 – Body	< 1 Ω
OFF	1 - Body ground	≥10 kΩ

When necessary, replace the switch.

6. Rear door courtesy light switch assembly

(a) Check continuity of rear door courtesy light switch assembly.
Follow the same procedure for front door courtesy light switch assembly check to check rear door courtesy light switch assembly.

Standard: Same as that for front door.

When necessary, replace the switch.

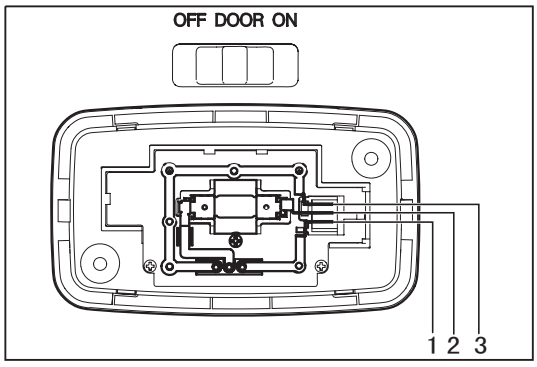
7. Luggage boot indicating light switch assembly

(a) Inspect conductive conditions of the luggage boot indicating light switch assembly.
Measure the resistance according to the value listed in the following table.

Standard:

Switching operation	Connection of inspection instrument	Specified state
ON	1- Car body grounded	Conductive
OFF	1- Car body grounded	Not conductive

Replace the switch when necessary.



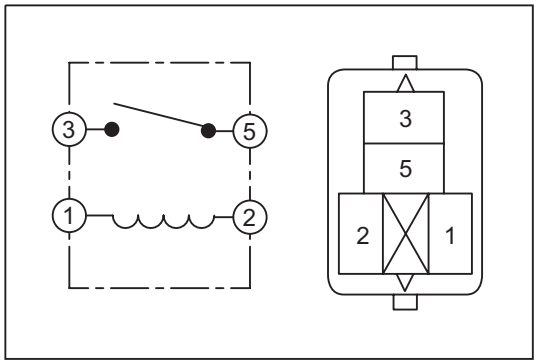
8. Ceiling light assembly

(a) Check continuity of the ceiling light assembly.
(b) Measure resistances according to the values listed in the following table.

Standard:

Switch operation	Detector connection	Specified status
ON	2 - 3	< 1 Ω
DOOR	1 - 2	< 1 Ω
OFF	1 - 2, 2 - 3	≥ 10 kΩ

When necessary, replace the light



9. Headlight high beam relay

(a) Check continuity of headlight high beam relay.
(b) Measure resistances according to the values listed in the following table.

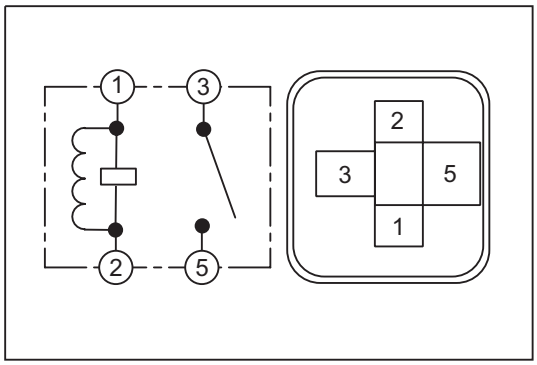
Standard:

Detector connection	Specified status
3 - 5	≥ 10 kΩ
3 - 5	< 1 Ω (When battery voltage is applied between terminals 1 and 2)

When necessary, replace the relay.

10. Headlight low beam relay

(a) Check continuity of headlight low beam relay.
Follow the same procedure for headlight high beam relay to check headlight low beam relay.
Standard: Same as that for headlight high beam relay.
When necessary, replace the relay.



11.Front fog light relay

(a) Inspect the conductive conditions of the front fog light relay.

(1) Measure the resistance according to the value listed in the following table.

Standard:

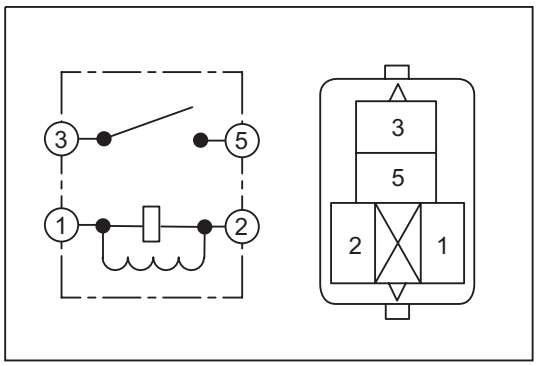
Connection of inspection instrument	Specified state
1 - 2	10KΩ or higher
3 - 5	Lower than 1Ω (when apply the voltage of the accumulator between the terminal 1 and the terminal 2)

Replace the relay when necessary.

(2) Apply the voltage of the accumulator between the terminal 1 and the terminal 2 and inspect the conductive conditions of the terminal 3 and the terminal 5.

Standard: conductive

Replace the relay if it is not conductive.



12. Rear fog light relay

(a) Inspect the conductive conditions of the rear fog light relay.

Measure the resistance according to the value listed in the following table.

Standard:

Connection of inspection instrument	Specified state
1 - 2	0KΩ or higher
3 - 5	Lower than 1Ω (when apply the voltage of the accumulator between the terminal 1 and the terminal 2)

Replace the relay when necessary.

(2) Apply the voltage of the accumulator between the terminal 1 and the terminal 2 and inspect the conductive conditions of the terminal 3 and the terminal 5.

Standard: conductive

Replace the relay if it is not conductive

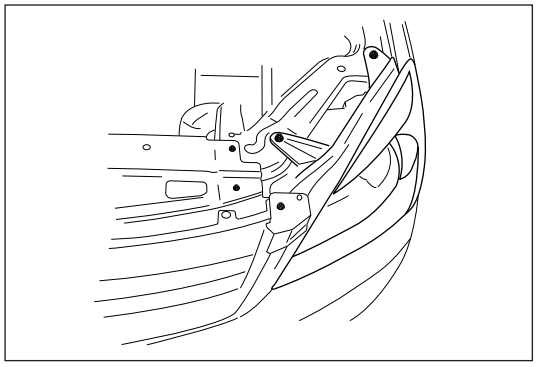
COMBINATION HEADLIGHT ASSEMBLY

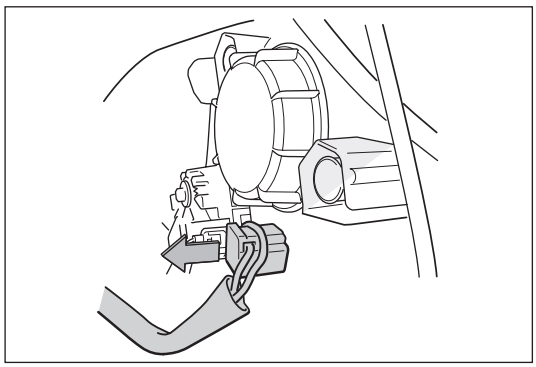
Replacement

Tip:

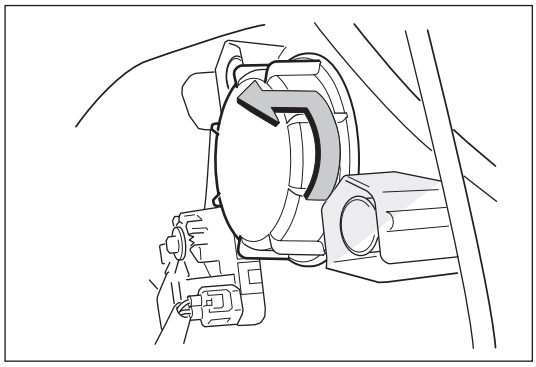
The replace sequence of the right combined head light is the same as the left side.

1. **Separate the inside lining of the left front fender inside lining**
2. **Separate the inside lining of the right front fender**
3. **Remove the front bumper and the upper grid body assembly of the front bumper.**
4. **Remove the left connecting bracket of the front bumper**
5. **Remove the right connecting bracket of the front bumper**
6. **Remove headlight assembly (LH).**
   (a) Remove the 4 screws.

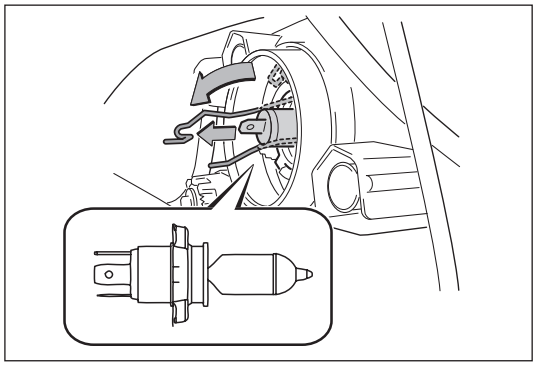




   (b) Disconnect the connector and remove the headlight assembly (LH).



7. **Remove the light holder cover of the high beam and low beam light**
   Rotate the light cover body of the high beam and low beam light counter-clockwise as Shown in the diagram.



8. Remove the high beam and low beam light bulb

(a) Unplug the harness plugging piece of the high beam and low beam light bulb.

(b) Loosen the bulb pressing spring and remove the high beam and low beam light bulb.

9.Remove the turn signal light bulb.

Rotate the light holder of the turn signal light counter-clockwise and remove the turn signal light bulb seat and the bulb.

Installation

Tip:

Installation is the reverse order of removal.

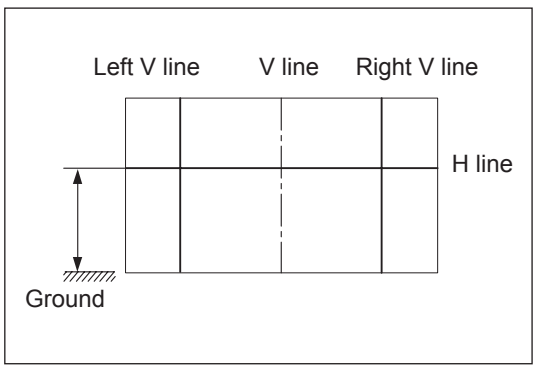
Beam focusing adjustment

Tip:

- Use the low beam to carry out the beam focusing adjustment.
- For the high beam and low beam light is the integral type, the light beam of the low beam is taken as the standard.

1. Get your vehicle ready according to the following.

- Check that the body parts around the headlight are free of damage or deformation.
- Fuel tank is full.
- Tire pressure is within the specified range.
- Your vehicle is parked on a level road.
- An average person of 68kg weight is seated on the driver's seat.
- Bounce your vehicle up and down to stabilize its suspensions to normal position.



2. Prepare a sheet of thick white paper (draw a base line).

Tip:

- Keep the paper upright against a wall.
- "Low beam check" and "high beam check" use different base lines.

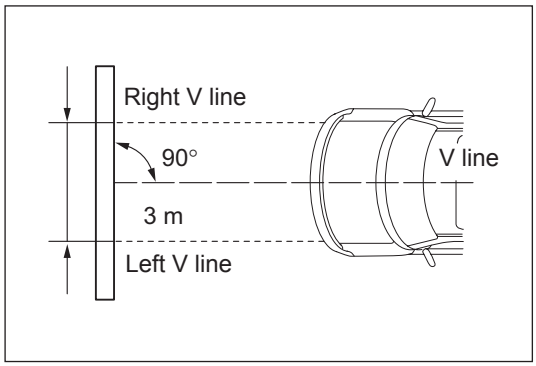
(a) V-line (vehicle center)
Draw a vertical line along center of the paper in order to align with center of the vehicle.

(b) H-line (headlight height)
Draw a horizontal line which has the same ground clearance as that of the high beam center mark on the paper.

(c) Left V-line and right V-line (center mark positions of headlights at LH and RH sides)
Draw the left and right vertical line on both sides of the center mark of the low beam and the distance from the center mark are equal.

Tip:

Carry out the same procedures when adjusting the high beam.



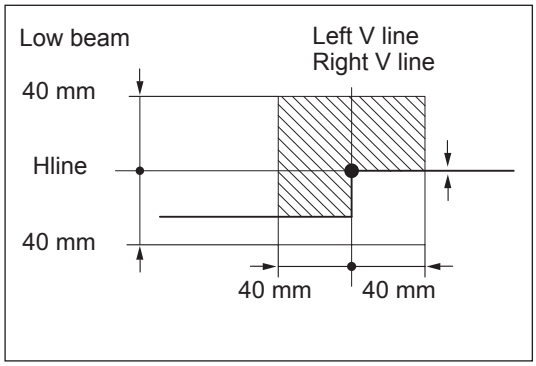
3. Check headlight high beam aiming.

(a) Align positions of the paper and the vehicle.

(1) Keep a 3m distance between the headlight and the paper, and put the paper on the wall with heights of H-line and the center mark equal.

(2) The center of vehicle is aligned with that of the paper and V-line, which have right angle.

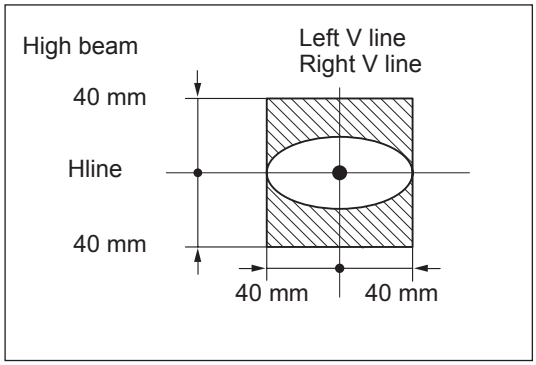
(b) Start the engine.

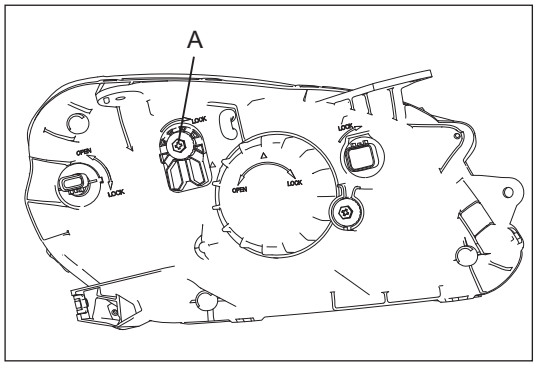


(c) Turn on headlight and check that the aiming result is within the specified value range as shown in the figure.

Caution:

Headlight finisher is made of synthetic resin, so it is liable to damage.





4. Adjust aiming in vertical direction:

Turn the aiming screw A with a screwdriver to adjust headlight high beam aiming to within the specified range.

Caution:

Turn the screw in the tightening direction to adjust headlight high beam aiming.

If the screw is over tightened, loosen it and then retighten it to adjust headlight high beam aiming.

Tip:

When you turn the screwdriver clockwise, the aiming optical axis will move down; when you turn it counterclockwise, the aiming optical axis will move up.

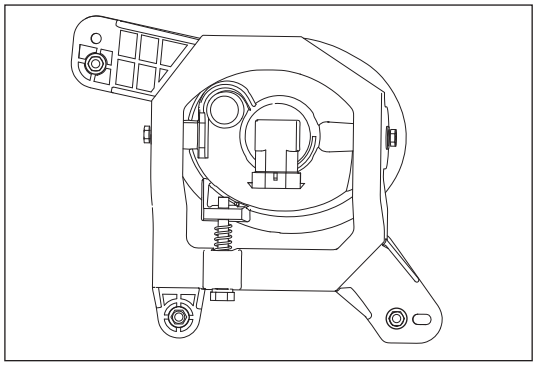
FRONT FOG LIGHT ASSEMBLY

Removal

Tip:

The replacement orders for replacement of front fog lights on LH and RH sides are the same.

1. **Remove left front fender lining.**
2. **Remove right front fender lining.**
3. **Remove the front bumper and the upper grid body assembly of the front bumper.**
4. **Remove front bumper left attachment bracket.**
5. **Remove front bumper right attachment bracket.**
6. **Remove headlight assembly (LH).**
   (a) Remove the 3 bolts securing the left front fog light.
   (b) Loosen the harness connector and remove the front fog light.



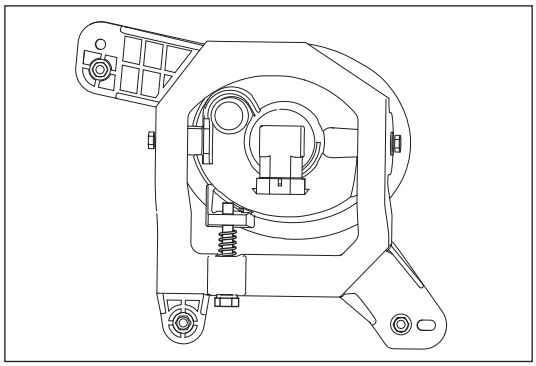
7. **Replace front fog light bulb.**
   Turn the bulb base with bulb assembly counterclockwise.

Installation

Installation is the reverse order of removal.

Adjustment

1. **Adjust the tire pressure**
   The tire pressure is with the standard range.
2. **Adjust the fog light beam.**
   Rotate the adjusting screw to adjust the fog light beam in the vertical direction.



Tip:

The light beam will move upwards when rotate the adjusting screw counter-clockwise and the light beam will move downwards when rotate the adjusting screw clockwise.

LEFT SIDE TURN SIGNAL LIGHT

Disassembly

Tip:

The replace sequence of the right side turn signal light is the same as the left side.

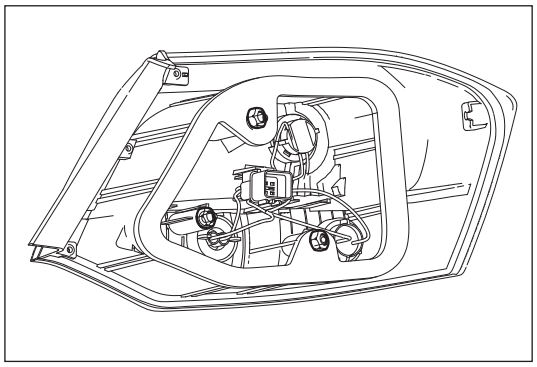
REAR COMBINED LIGHT

Disassembly

Tip:

The replace sequence of the left combined rear light is the same as the right side.

1. **Remove the luggage boot doorsill.**
2. **Remove the luggage boot protective face.**
3. **Remove the left combined rear light assembly.**
   (a) Remove three installing nuts of the combined rear light.
   (b) Loosen the harness connector and remove the combined rear light.



4. **Remove the rear combined light bulb**
   (a) Rotate the position light and the stop light bulb seat counter-clockwise and remove the bulb seat and bulb.
   (b) Rotate the rear turn signal light bulb seat counter-clockwise and remove the bulb seat and bulb.
   (c) Rotate the reversing light bulb seat counter-clockwise and remove the bulb seat and bulb.

Installation

The installation sequence is the reverse order of the remove sequence.

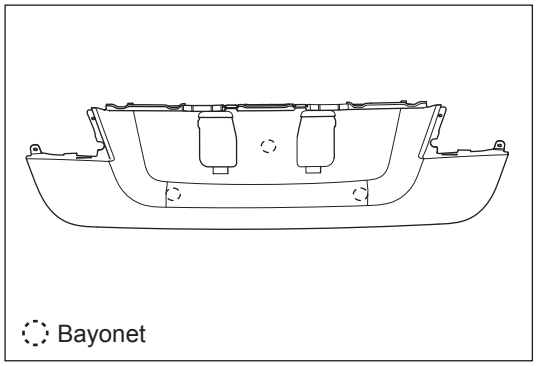
REAR FOG LIGHT

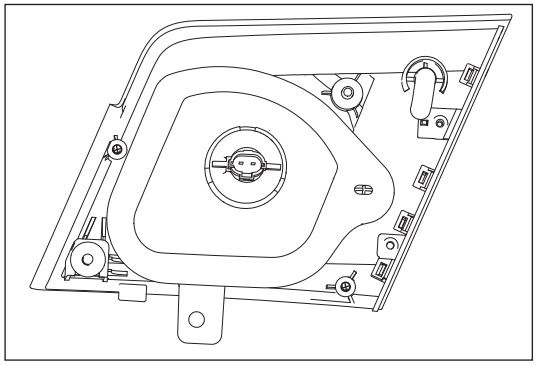
Disassembly

Tip:

The replace sequence of the left rear fog light is the same as the right side.

1. **Remove the luggage-boot lid protective face**
2. **Loosen the rear fog light harness connector.**
3. **Remove the outside trim board of the luggage boot and the left and right rear fog light assembly.**
   (a) Remove two snap fasteners.
   (b) Remove six bolts and two nuts.
   (c) Remove three clip dents.





4. **Remove the rear fog light assembly.**
   Remove two mounting screws of the rear fog light and remove the rear fog light.
5. **Replace the rear fog light bulb**
   Rotate it counterclockwise to remove the bulb seat and bulb.

Installation

The installation sequence is the reverse order of the remove sequence.

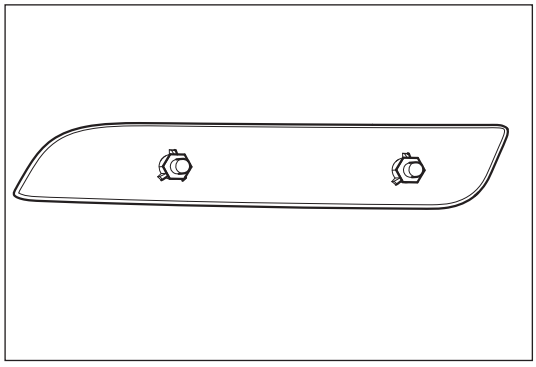
REAR REFLEX REFLECTOR

Disassembly

Tip:

The replace sequence of the left rear reflex reflector is the same as the right side.

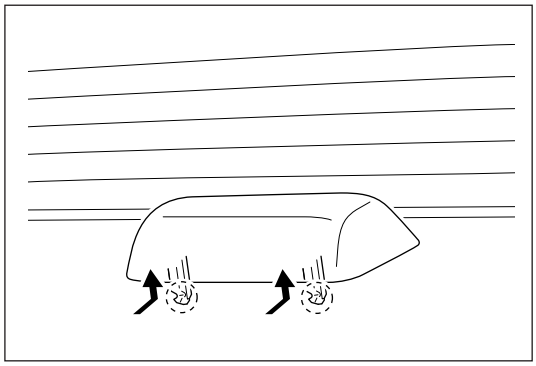
1. **Remove the rear bumper assembly.**
2. **Remove the left rear reflex reflector assembly**
   Remove two installing nuts of the reflex reflector and remove the reflex reflector assembly.



Installation

The installation sequence is the reverse order of the remove sequence.

HIGH POSITION BRAKE LIGHT ASSEMBLY.



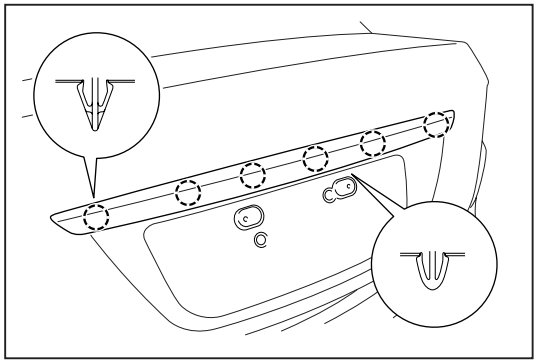
Disassembly

1. **Remove the high position brake light decorating cover**
2. **Remove the high position brake light assembly.**
   Loosen the high position brake light harness connector and remove the high position brake light
3. **Replace the brake light bulb.**
   Rotate the bulb seat counterclockwise to remove the bulb seat and bulb.

Installation

The installation sequence is the reverse order of the re-

LICENSE LIGHT ASSEMBLY



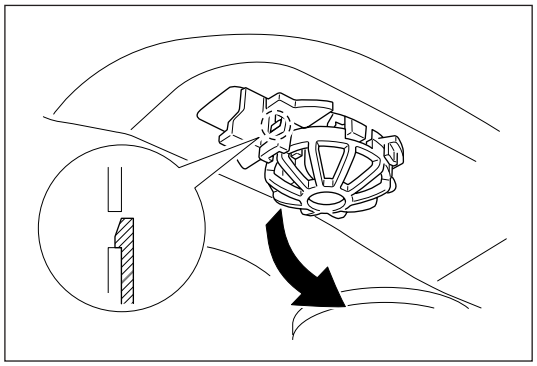
Disassembly

1. **Remove the license light assembly.**
2. **Replace the bulb of the license plate light.**
   Rotate it counterclockwise to remove the bulb seat and bulb.

Installation

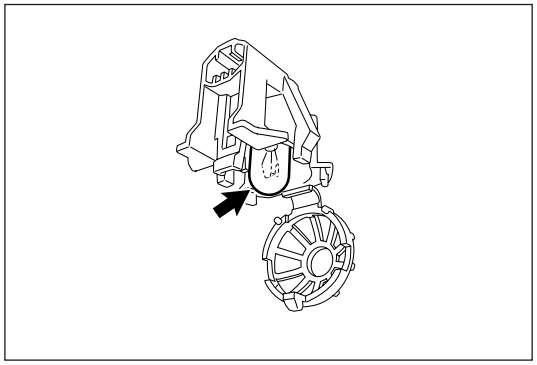
The installation sequence is the reverse order of the remove sequence.

LUGGAGE BOOT LIGHT



Disassembly

1. **Remove the luggage boot light**



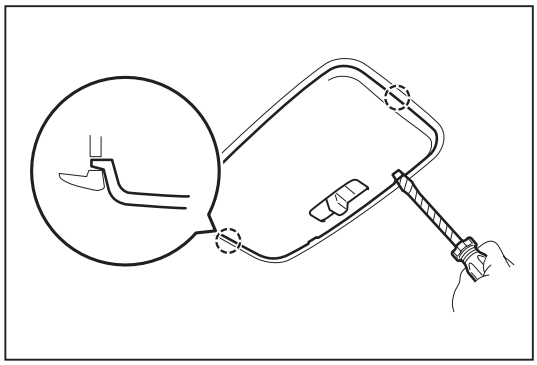
2. **Replace the luggage boot light bulb**
   Open the luggage boot light bulb protective cap and unplug the bulb.

Installation

The installation sequence is the reverse order of the remove sequence.

ROOF LIGHT ASSEMBLY

Disassembly



1. **Remove the roof light face shield**
   Use the flathead screwdriver to remove the face shield and take care not to scratch the face shield.
2. **Remove the roof light assembly.**
   Loosen two mounting screws of the roof light and remove the roof light

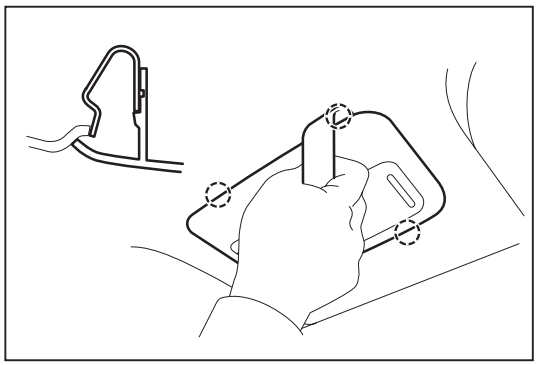
3. **Replace the roof light bulb**
   Loosen the card at both sides of the bulb to remove the bulb.

Installation

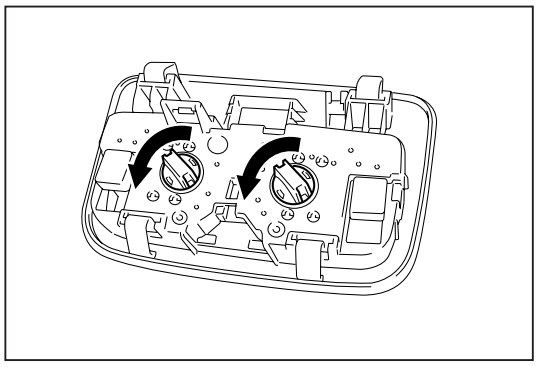
The installation sequence is the reverse order of the remove sequence.

READING LIGHT ASSEMBLY

Disassembly



1. **Remove the reading light face shield.**
   Use the flathead screwdriver to remove the face shield and take care not to scratch the face shield.
2. **Remove the reading light assembly**
   Loosen two mounting screws of the roof light and remove the reading light.



3. **Replace the roof light bulb**
   Unplug the bulb from the bulb seat.

Installation

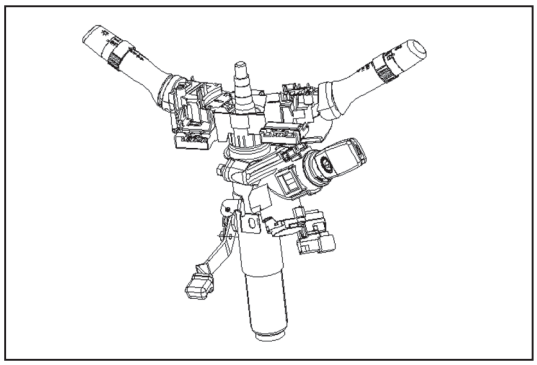
The installation sequence is the reverse order of the remove sequence.

COMBINATION SWITCH

Replacement

Tip:
Install in the reverse order of removal.

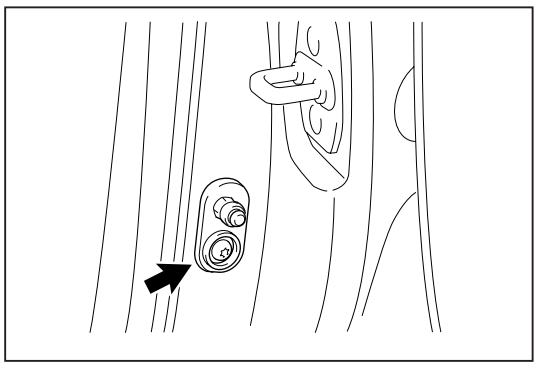
1. **Remove driver air bag.**
2. **Remove steering wheel.**
3. **Remove combination switch finisher upper and lower halves.**
4. **Remove combination switch assembly.**
   (a) Disconnect the connector and remove the left combination switch assembly.



COURTESY SWITCH

Disassembly

1. **Remove the car doorsill**
2. **Remove the car door sealing strip**
3. **Remove the lower decorating board of the car door**
4. **Remove the courtesy switch**



REVERSING RADAR

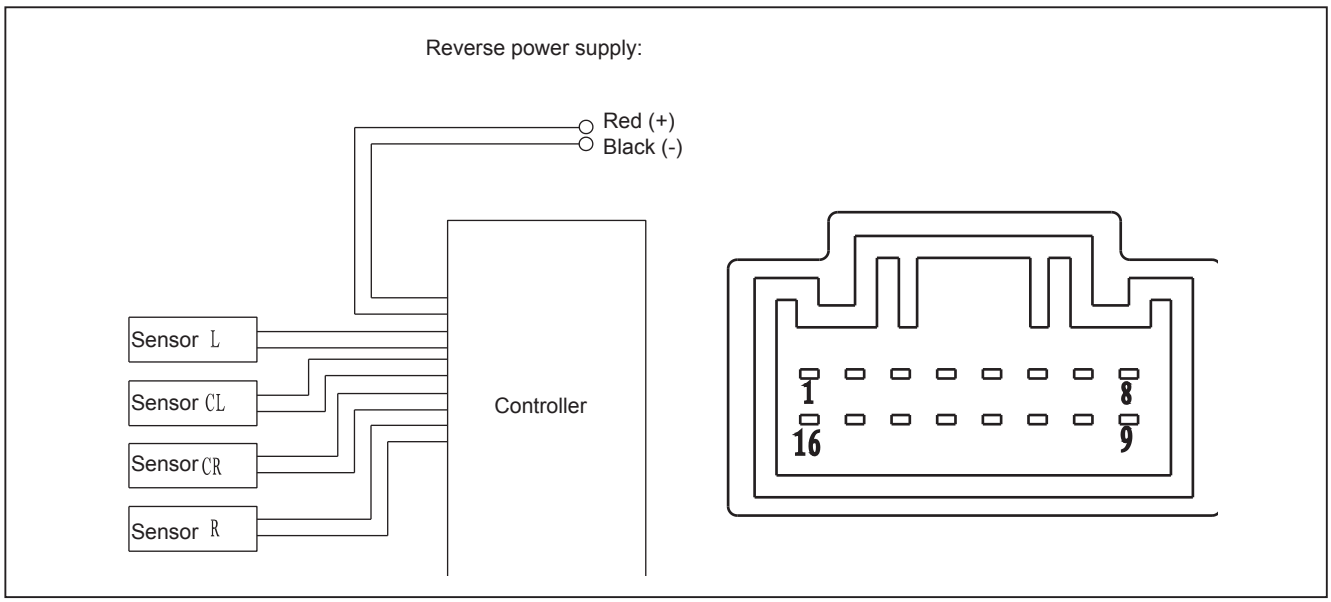
GENERAL INFORMATION

Principle of operation (ultrasonic ranging)

Sound is a kind of wave. The frequency range of sounds that human ears can hear is generally 20HZ~20KHZ. Sounds with frequencies above 20KHZ are called ultrasonic waves. Since an ultrasonic wave is also a kind of sound, its travel speed in air equals to sound velocity (340m/s). When an ultrasonic wave meets an obstruction, part of the former will bounce back. Thus, you can work out the distance to the obstruction by calculating the time difference between the moment when the sound wave is transmitted and that when the echo is received in combination with sonic speed.

Components

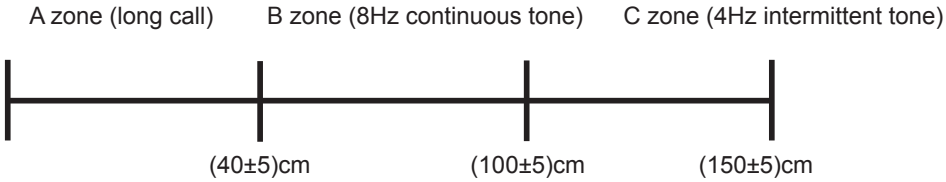
This system consists of main reversing radar unit (ECU), 4 probes (sensors).



Pin number	Definition	Remarks
1	SEN-LM	Left middle sensor
2	SEN-L	Left sensor
3	---	---
4	CLK	Clock (reserved)
5	SEN-RM	Right middle probe
6	---	---
7	---	---
8	R-SHIFT	Reverse power supply
9	---	---
10	---	---
11	---	---
12	---	---
13	DATA	Data (reserved)
14	---	---
15	SEN-R	Right sensor
16	GND	Earthing wire

Functional description and display solution

1. **This system will be activated within 1s after a reverse shift is made. If no warning tone is heard, it means that the system functions properly; if one or more probes are malfunctioning, the buzzer will make 2 sounds.**
2. **After a self-check, the system enters normal detection mode. The relationship between distance of obstruction and warning sound frequency is given below:**



A zone: The warning sound is a long call. The distance of obstruction is 0cm~(40±5) cm.
B zone: The warning sound is an 8Hz continuous tone. The distance of obstruction is (40±5)cm~(100±5) cm.
C zone: The warning sound is a 4Hz intermittent tone. The distance of obstruction is (100±5) cm~(150±5) cm.

Attentions

1. **This system may be subjected to interference when it is close to a vehicle equipped with the same system or a similar system from other supplier (the system has been activated), but normal operation will not be affected.**
2. **If the relative travel speed between the obstruction and the vehicle is less than 1m/s, this system should work normally. In the case of high reverse speed, the sensing accuracy of the reversing radar system will drop slightly. It is recommended that the reverse speed be 5km/h.**
3. **As the sensor is of high precision, opening without permission will render it hard to return to normal.**
4. **As position, angle, size and reflection of an object vary with material, reflected signals may not be received. In addition, signals reflected in a complex environment may have errors.**

TROUBLESHOOTING

1. In case the reversing radar system does not respond, the cause may be loss of power or power undervoltage. Then check battery for normal voltage, ignition switch for proper connection, and connecting wires for well placement.
2. In case the system is malfunctioning after powered, the cause may be incorrect positions of sockets. Then you need to reconnect all sockets properly.
3. In case the buzzer gives out a long call, sensors may be installed improperly or coming off, sensors may have been damaged, or the system detects the body or ground. Then repair or replace probes.
4. In case the system fails to prompt distance of an obstruction correctly, the cause may be abnormal battery voltage, incorrect socket positions, or sensor connection breakage. Then check battery for normal voltage, sensor connections for contact with exhaust pipe or muffler, or shut down the system and reconnect all sockets properly.

System parameters

Rated working voltage	DC 12V
Range of working voltage	DC 9.6V~16V
Range of working temperature	-40℃~80℃
Range of storage temperature	-40℃~80℃
Consumed power	<1W
Number of sections detected	3 sections: 150cm~100cm~40cm
Maximum detection distance	(150±5)cm
Effective distance	(10±5)cm~(150±5)cm
Detection mode	Ultrasonic

REVERSING RADAR ECU

Tip:

Install in the reverse order of removal.

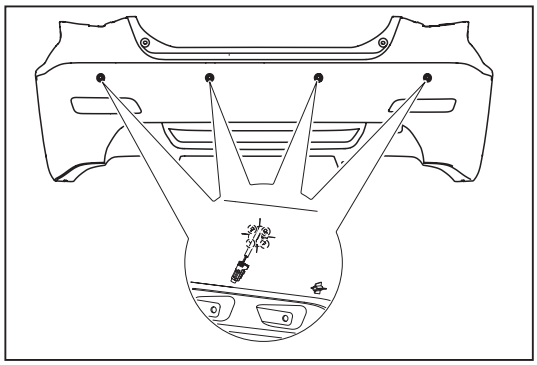
1. **Disconnect battery negative terminal.**
2. **Remove left A-pillar upper panel assembly.**
3. **Remove reversing radar ECU.**
   (a) Disconnect reversing radar ECU connector.
   (b) Remove the 2 bolts from the left A-pillar, and remove the reversing radar ECU.

REVERSING RADAR PROBE

Tip:

Install in the reverse order of removal.

1. **Disconnect battery negative terminal.**
2. **Remove rear bumper.**
3. **Remove probe.**
   (a) Depress the probe clip to simply remove the probe.
   (b) Disconnect the probe connector.



CIRCUIT DIAGRAM

GENERAL INFORMATION

FIGURE ILLUSTRATION 2
CIRCUIT INSPECTION 3
HARNESS DIAGNOSES AND TEST 3
DETECTION PROCEDURE OF CIRCUITS 4
MODULE LOCATION MAP 5
FUSE BOX 7

HARNESS ARRANGEMENT DIAGRAM AND GROUND POINT POSITION

COMPLETE VEHICLE HARNESS 10
ENGINE COMPARTMENT HARNESS 11
INSTRUMENT PANEL WIRE HARNESS 12
DOOR HARNESS 13
FLOOR HARNESS 14

RELATIONSHIP BETWEEN HARNESSES

CONNECTION NUMBER DRAWING OF PLUG-IN PIECE ... 15
FUNCTIONAL DIAGRAM OF LEAD PIN ON PLUG-IN PIECE 17

BREAKDOWN DRAWING TO CIRCUITS OF THE COMPLETE VEHICLE

POWER SUPPLY, STARTING SYSTEM 23
SAFETY AIR BAG 24
ABS BRAKE SYSTEM 25
CVT TRANSMISSION AND REVERSE RADAR SYSTEM 26
LIGHT ILLUMINATION, ALARM, ILLUMINATION LIGHT CONTROL SYSTEM 27
COMBINATION INSTRUMENT CONTROL SYSTEM 28
SEAT HEATING AND AIR CONDITIONING SYSTEM 29
CENTRAL LOCK, GLASS RISER SYSTEM 30
COMFORTABLE CONFIGURATION 31
UNITED ELECTRICAL ENGINE CONTROL SYSTEM 32
SIEMENS ENGINE CONTROL SYSTEM 33

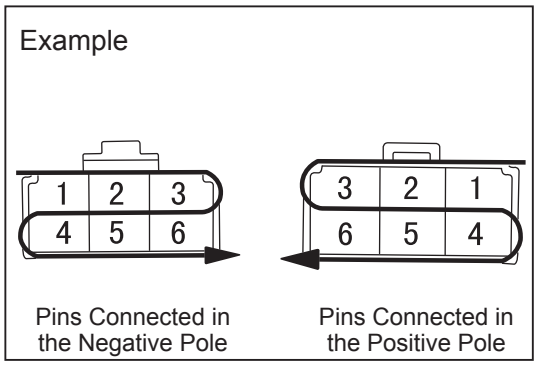
GENERAL INFORMATION

FIGURE ILLUSTRATION

1. Illustration of Fuse Box and power

The fuse box set in the left side of the instrument panel is No. 1 fuse box, while the one in the left side of the engine compartment is No. 2.

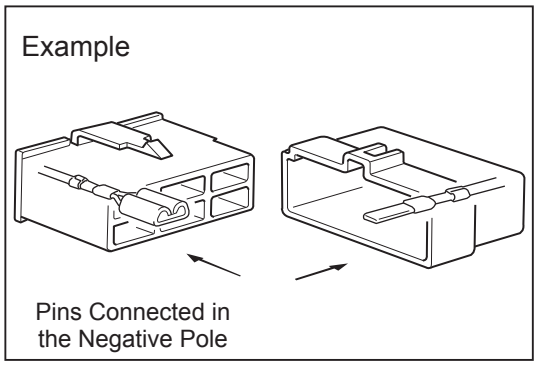
- 30 stands for the general power line coming from the fuse box-60A in the positive pole of the storage battery.
- 30a stands for the general power line coming from the fuse box-120A in the positive pole of the storage battery.
- 30b stands for the general power line coming from the fuse box-120A in the positive pole of the storage battery.
- 15 stands for the power line of small-capacity electrical appliances. The IG relay will supply power as the ignition switch remains in the state of “ON”.
- 15a stands for the power line of small-capacity electrical appliances. The ignition switch IG1 will directly supply power as the ignition switch remains in the state of “ON”.
- 15b stands for the power line of small-capacity electrical appliances. The ignition switch IG2 will directly supply power as the ignition switch remains in the state of “ON”.
- X stands for the power line used to connect small-capacity electrical appliances. The ACC relay will supply power as the ignition switch remains in the state of “ACC”.



2. Connectors

(a) The pin number of pins connected in the negative pole is complied from upper left to lower right.

(b) The pin number of pins connected in the positive pole is complied from upper right to lower left.



(c) Differences between pins connected in the negative and positive poles.

Pins connected in the negative and positive poles are distinguished by the shapes of their inside pins.

- Demonstrated by open ends, all pins are locked on the top.
- In case of pulling open pins, the pins themselves instead of wiring harnesses should be pulled.

Attention:

you should check the type of pins before pulling them open.

3. Colors and Sectional Areas (mm^2) of Wires.

B—Black	W—White	R— Red	Bl—Blue	Br—Brown	Y— Yellow
G—Green	P—Pink	Or—Orange	V—Violet	Lg—Light green	Gr—Gray

Letters in the above table are directly used as color codes for single-colored wires. As for the color codes of double-colored wires, the first letter stands for the main color while the second stands for the sub one.

For example:

Single-colored wire: Red. The color code is R.

Double-colored wire: The main color is red and the sub color is blue. The color code is RBl.

0.5BrGr stands for Brown wire with gray fine line of which the sectional area is 0.5 mm^2.

CIRCUIT INSPECTION

Attentions

1. **Before operating any electrical appliance and as tools or maintenance equipment is apt to contact naked electrical terminals, please be sure to put the ignition switch on the LOCK (locking), and then to cut off the wire on the negative pole of storage batteries so that personal injury or vehicle damage could be avoided. However, as the ignition switch remains in the state of ON (opening), whether or not the engine runs, you cannot take down the connecting wire of the storage battery or pull out the power fuse. Otherwise ECU, its relevant sensors and some other micro-electronic devices will be severely damaged.**
2. **When you exchange the fuse, please make sure that the new one possesses correct rated current, the excess or shortage of which is not allowed.**
3. **Only stipulated contacts, plugs and wires are allowed to be used as the wiring harnesses of air bags and warning predictors are being repaired.**
4. **Factors that cause damages such as sharp edges of body parts, and damages or corrosion of electrical appliances must be removed before the wiring harnesses being repaired.**
5. **It is not allowed to repair wires of screens and the damaged ones should be wholly replaced.**
6. **Unless otherwise specified in the testing process, the check or examination should be conducted by a digital multi meter with high resistance (internal resistance≥10kΩ) or an auto multi meter instead of using an analog multi meter.**
7. **When connectors are examined by a digital multi meter, the water-proof gum cover put on them should be removed and the pen watch should be fastened along with the connecting end. However, you can not operate with too much strength so to avoid crackling the connector.**

HARNESS DIAGNOSES AND TEST

Trouble Shooting Tool

Several ordinary tools must be used when determine the malfunction in the diagnostic circuit.
The description of those tools are list as follows:

1. **Jumping wire-- a testing wire used to connect two points of the circuit, and it can be used to bypath a circuit.**
   Warning:

   Do not use the jumping wire to bridge joint the load between the power supply electric wire of the accumulator and the ground, such as the motor.
2. **Voltmeter -- used to inspect the voltage of a circuit. The black conductor must be connected with the known ground which grounded well, and the red conductor shall be connected with the positive pole of the circuit.**
   Attention:
   Most of the electricity part used on the up-to-date automotive vehicles are the solid-state.
   Use a meter with a impedance of 10 megohm or higher when inspecting the voltage of the circuit.
3. **Ohmmeter - - use to inspect the resistance between two points on the circuit. The low resistance or nonresistance of the circuit means the conductive conditions is well.**
   Attention:

   Most of the electricity part used on the up-to-date automotive vehicles are the solid-state. Use a meter with a impedance of 10 megohm or higher when inspecting the voltage of the circuit. Furthermore, It shall make sure that the power supply has been switched off. The circuit powered by the electrical system on the automobile can damage the equipments and provide wrong reading.

Intermittent and Loose Connection

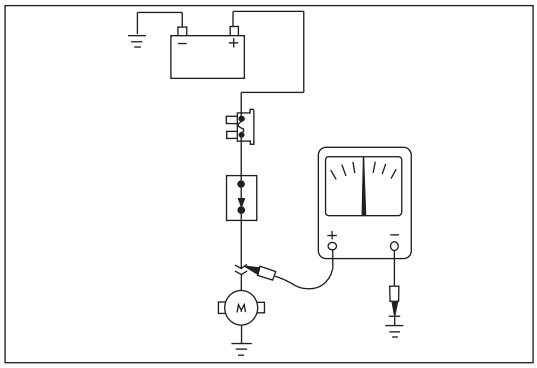
Most of the intermittent electrical faults are all caused by the electrical joint or electrical wire which are at fault. And it may be caused by a certain blocked part or relay. Check following items before determining the malfunction of a part or a wiring component.

- The joint shall be connected firmly and completely.
- Extend terminal or the terminal protrude.
- The terminal in the wiring component are inserted into the joint/part completely and locked on place.
- Smudge or corrosion on terminal.
- Any corrosion or smudge condition may lead to the intermittent malfunction.
- The damaged joint/part enclosures expose the parts to the open air and the parts are contaminated or damped.
- The insulation of the electric wire is worn out and lead to the short circuit with the ground.
- Some or all strand wires in the insulating barrier are broken.
- Inner wiring of the insulating barrier are broken.

Trouble Shooting of Wiring

Six procedures can be used to carry out the elimination of the wiring malfunction. These procedures are specified below respectively. The items on the vehicle which not installed by the manufactory must be inspected at first before carrying out any diagnoses. If there are any, it shall be disconnected to verify that the malfunction is not caused by those items.

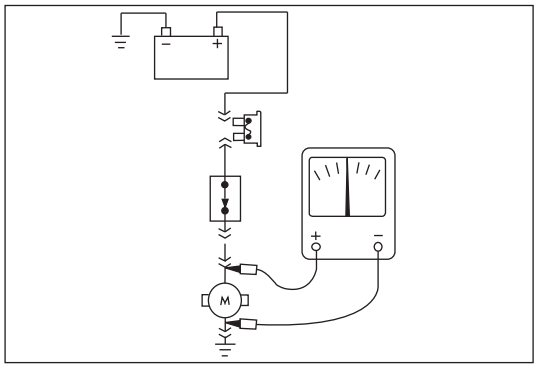
1. **Verify the malfunction**
2. **Verify relevant symptom.**
   Carry out the operational check on the parts in the same circuit to carry out this procedure. See wiring diagram.
3. **Analysis symptom.**
   Use the wiring diagram to determine the performance of the circuit and determine the place which may be at fault easily and where to carry out the diagnoses.
4. **Find out the location of the malfunction.**
5. **Repair the malfunction area.**
6. **Verify suitable operation. With respect to This procedure, inspect the operations of all items on the circuit repaired. See wiring diagram. See wiring diagram.**



DETECTION PROCEDURE OF CIRCUITS

Test Voltage and Electrical Potential

1. **Connect one grounding conductor of the voltmeter with a known ground which grounded well.**
2. **Connect the other conductor of the voltmeter with the test point selected. The automobile under test may be needed to be started to inspect the voltage. See proper test procedure.**



Test conductive conditions

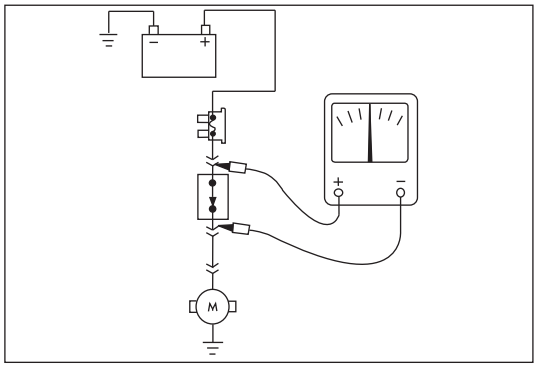
1. **Remove the fuse of the circuit to be tested, or disconnect the accumulator.**
2. **Connect one conductor of the ohmmeter with one side of the circuit under test.**
3. **Connect the other conductor with the other end of the circuit under test. The low resistance or nonresistance of the circuit means the conductive conditions is well.**

Test Short Circuit with the Ground

1. Remove the fuse and disconnect all items influenced by the fuse.
2. Connect a test lamp or a voltmeter with two terminals of the fuse.
3. Shake the wiring Harness at the fuse box and separate the harness for about 15-20cm and observe the test lamp of the voltage/ohmmeter.
4. If the voltmeter display the voltage or the test lamp is illuminated, there may be the short circuit with the ground on the area of the wiring harness.

Test The Short Circuit with the Ground of The Fuse Which Power Several Loads

1. See wiring diagram, disconnect or separate all items on the circuit with doubtful fuse.
2. Replace the fuse burnt.
3. Switch on the ignition switch or reconnect the accumulator to power the fuse.
4. Connect the load on the circuit with the fuse one by one or power the fuse. If the fuse blown out, the circuit short circuit with the ground is found.

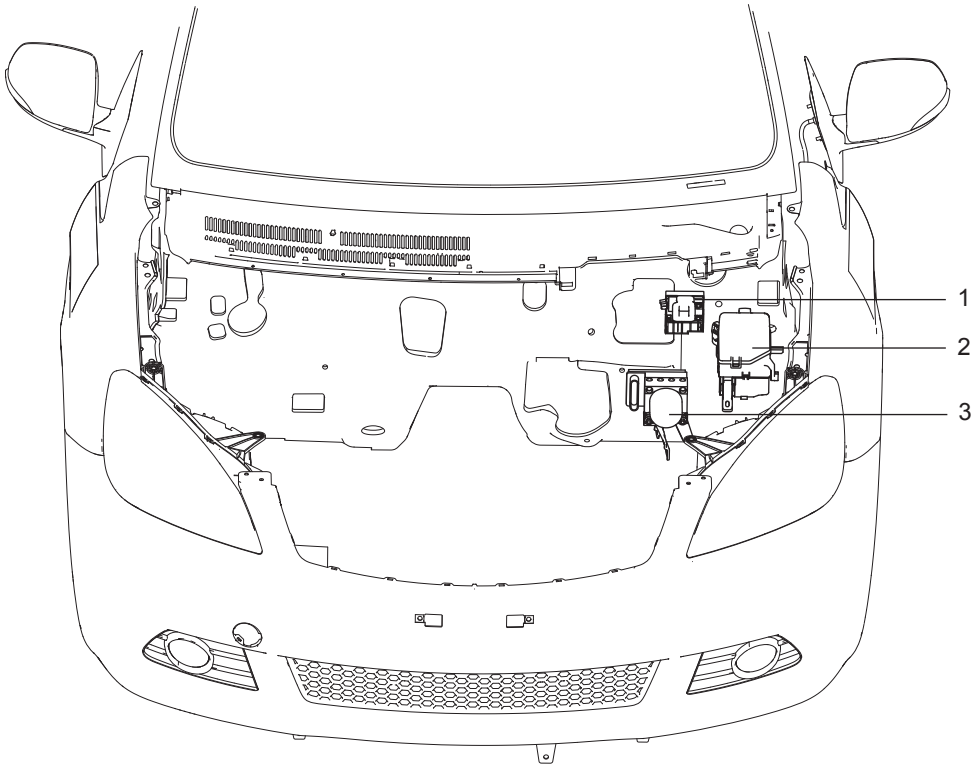


Test Voltage Drop

1. connect the positive connector of the voltmeter with the circuit on the nearest side of the accumulator.
2. Connect the other connector of the voltmeter with the other side of the switch, the parts or the circuit.
3. Operate this item.
4. The voltmeter will display the voltage difference between two points.

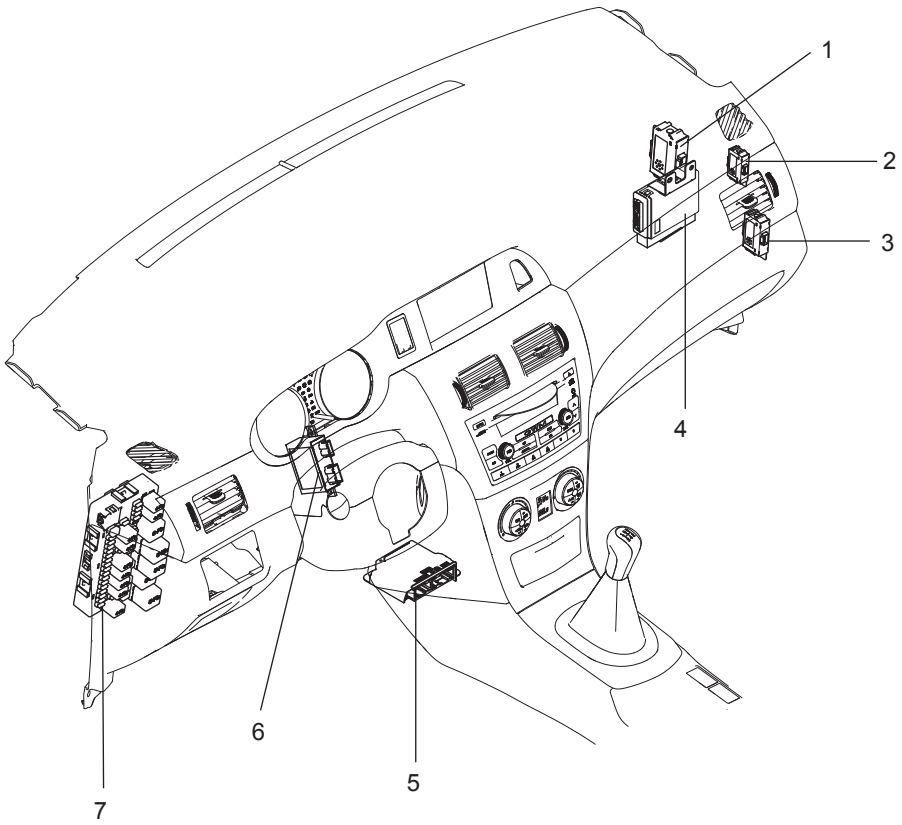
MODULE LOCATION MAP

Engine Compartment Position



1. Fuse box of positive pole of accumulator
2. No.2 fuse box of engine compartment
3. ABS ECU

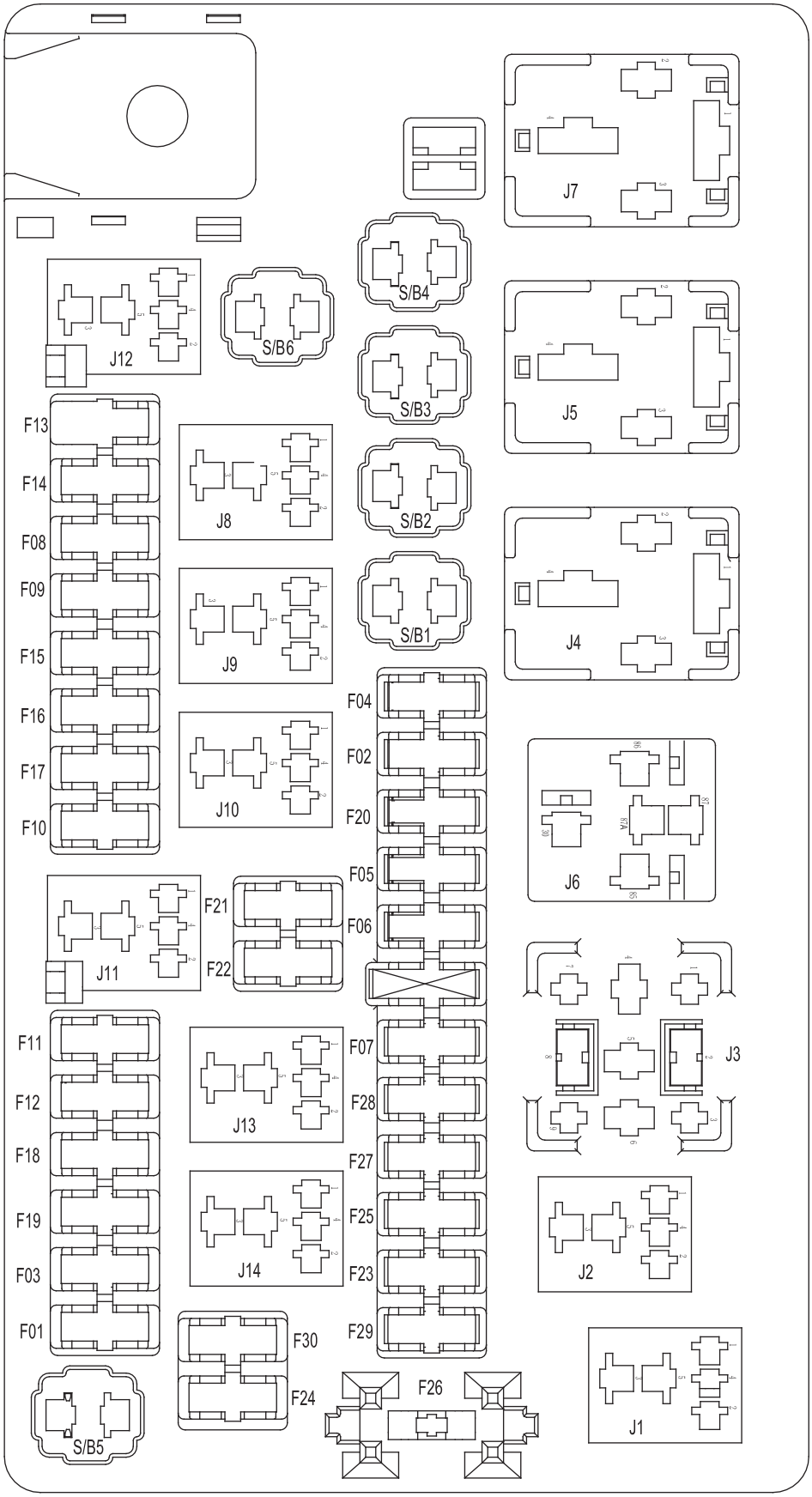
Instrument Panel Position



1. Centre door lock controller
2. Anti-collision radar ECU
3. TCU
4. Engine ECU
5. Safety air bag ECU
6. Anti-theft ECU
7. No.1 fuse box of driver's compartment

FUSE BOX

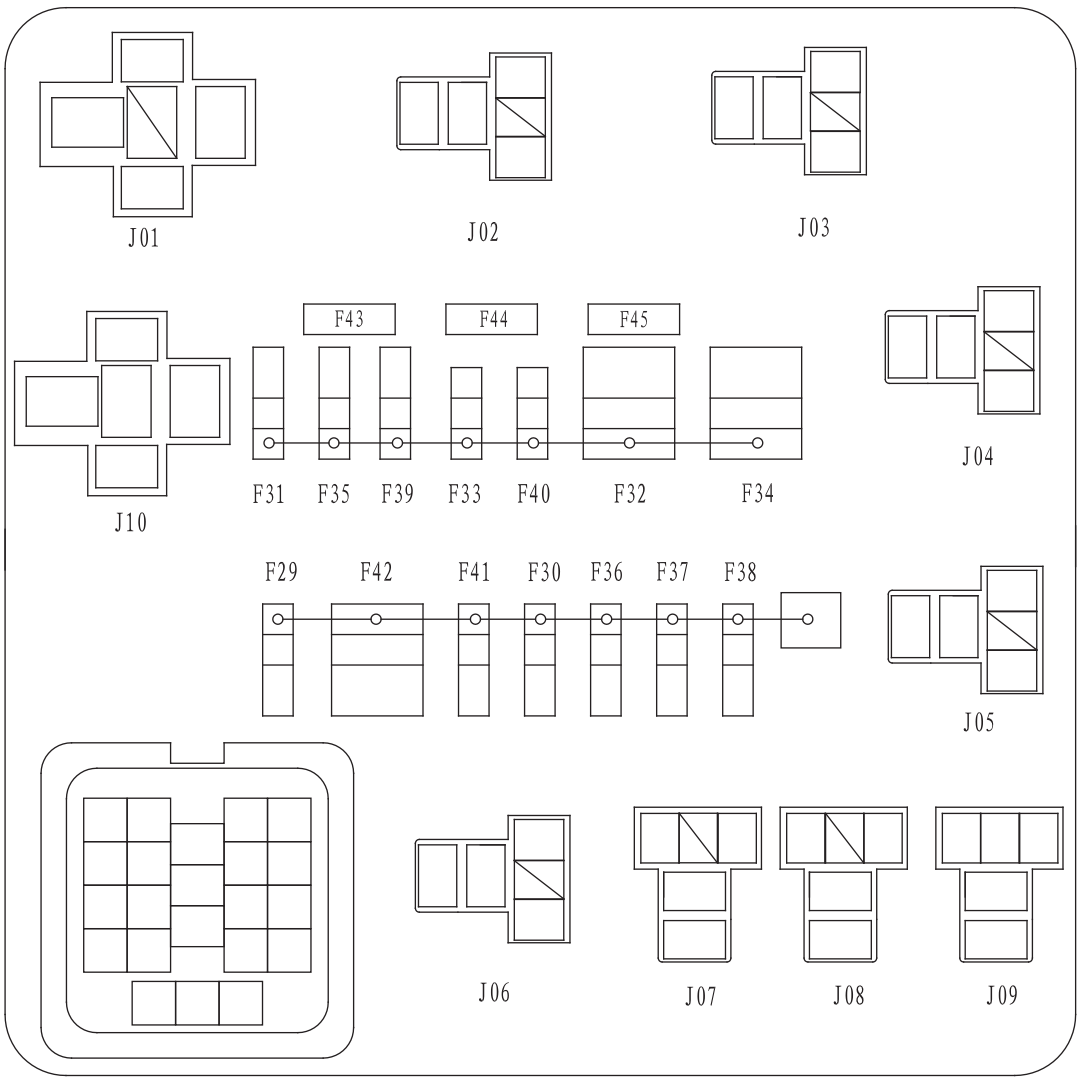
No.1 Fuse Box in the Driving Cab



Fuse		
Number	Name	Blowing current
F01	Reserved	
F02	Louver (optional)	25A
F03	Small light	10A
F04	AM1	15A
F05	Reserved	
F06	Hazard warning	15A
F07	Turn signal light	10A
F08	Front fog light (optional)	15A
F09	Rear fog light	10A
F10	Reserved	
F11	Reserved	
F12	Defrost	25A
F13	Combination instrument	10A
F14	Internal illumination	10A
F15	Central lock	20A
F16	Brake light	10A
F17	Receiver	15A
F18	Reserved	
F19	Reserved (MT)	
	TCU(CVT)	15A
F20	Reserved	
F21	Cigar lighter	25A
F22	ACC	15A
F23	Front wiper	15A
F24	Charge	10A
F25	ABS	10A
F26	Safety air bag	15A
F27	Seat heating (optional)	15A
F28	Reversing light	10A
F29	Reserved	
F30	Reserved	
S/B1	Reserved	
S/B2	Door window	30A
S/B3	Reserved	
S/B4	Blower	40A
S/B5	Reserved	
S/B6	Reserved	

Relay	
Number	Name
J1	Reserved (MT)
	Gear shifting solenoid valve (CVT)
J2	Small light relay
J3	Flicker relay
J4	Blower high speed relay (optional)
J5	Reserved
J6	Door window relay
J7	Blower relay
J8	Front fog light relay (optional)
J9	Rear fog light relay
J10	Reserved (MT)
	Starting relay 2 (CVT)
J11	ACC Relay
J12	IG Relay
J13	Reserved (MT)
	Reversing light (CVT)
J14	Defrost relay

No.2 Fuse Box of Engine Compartment

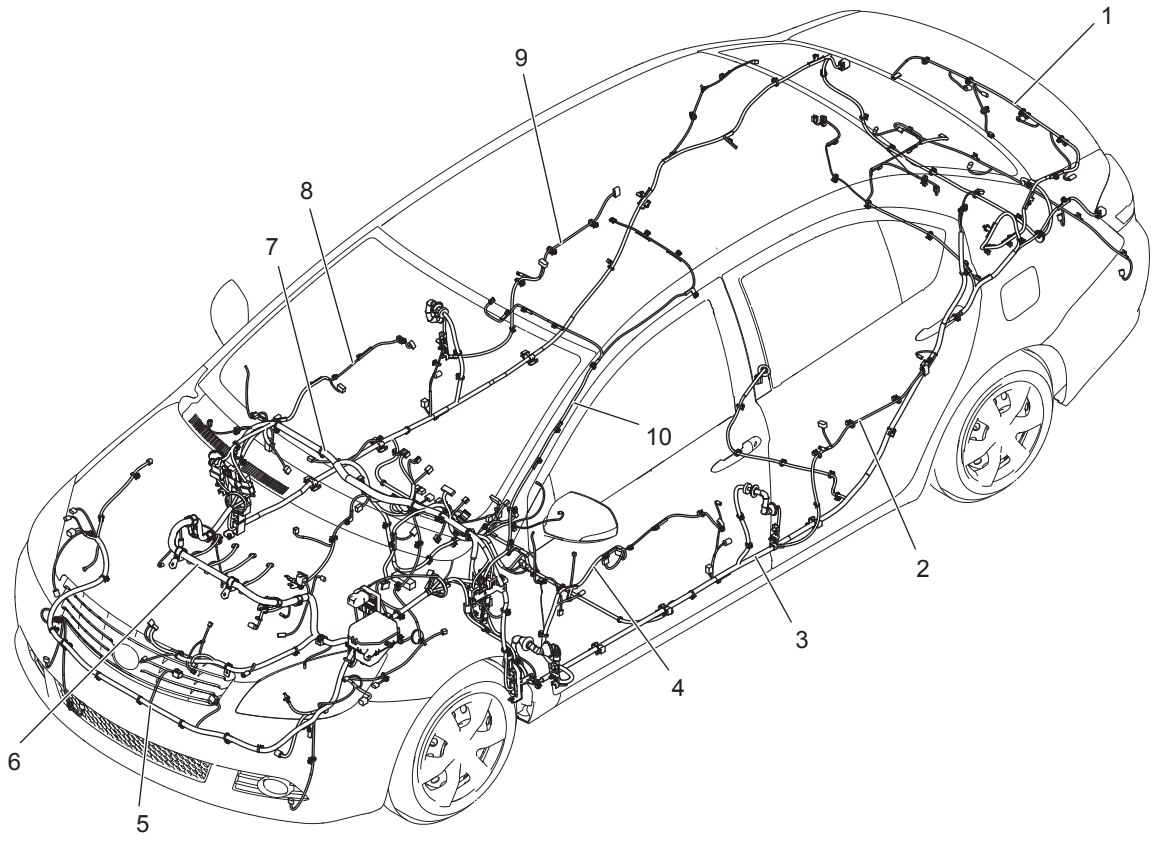


Fuse		
Number	Name	Blowing current
F29	Starter	30A
F30	Main relay	25A
F31	Oil pump	15A
F32	Fan slow speed relay	30A
F33	Compressor	10A
F34	Fan high speed relay	40A
F35	Horn	10A
F36	High beam	15A
F37	Low beam	15A
F38	ECU	10A
F39	ABS	25A
F40	Reserved	
F41	AM2	15A
F42	Reserved	
F43	Backup	10A
F44	Backup	15A
F45	Backup	25A

Relay	
Number	Name
J01	Main relay
J02	Oil pump relay
J03	Horn relay
J04	Fan slow speed relay
J05	Compressor relay
J06	Starting relay
J07	High beam relay
J08	Low beam relay
J09	Reserved
J10	Fan high speed relay

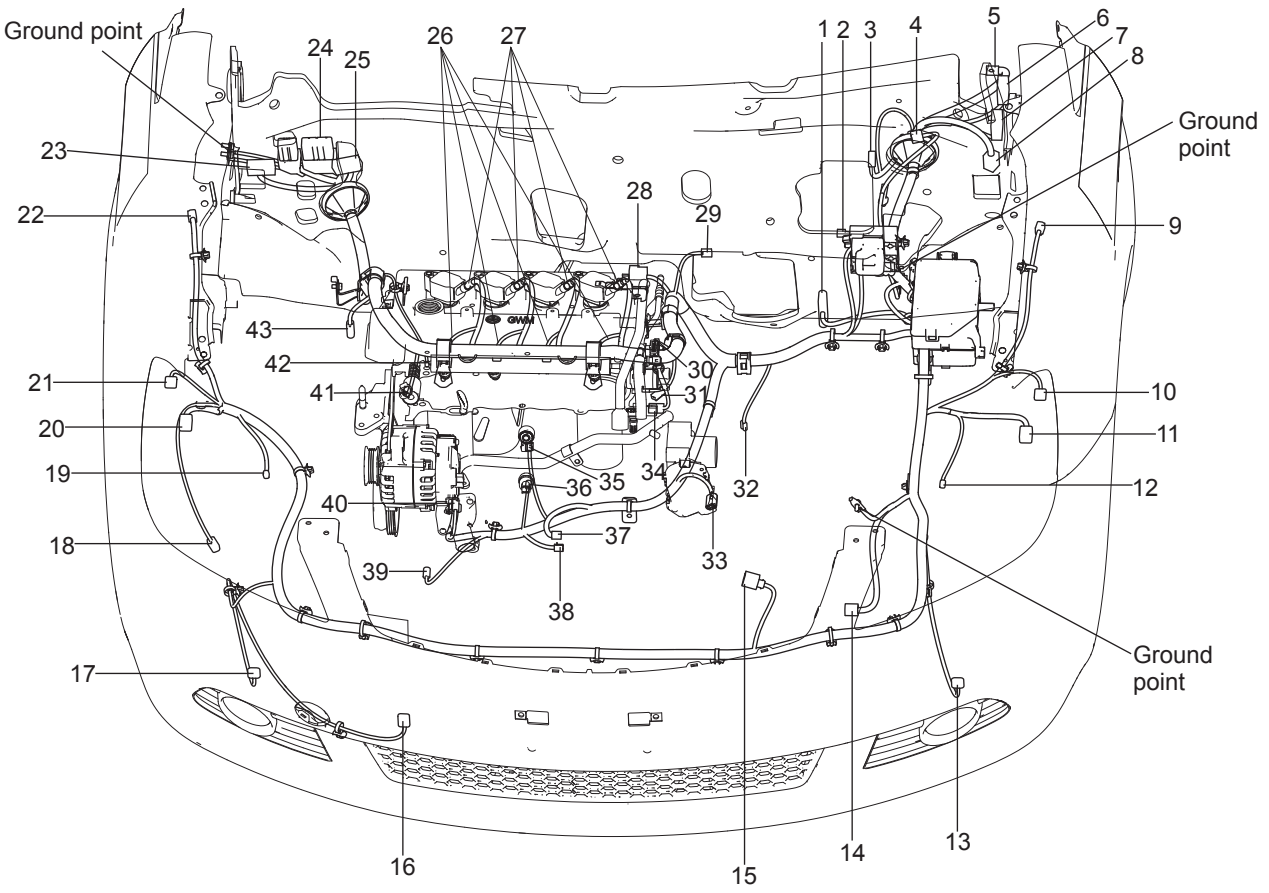
HARNESS ARRANGEMENT DIAGRAM AND GROUND POINT POSITION

COMPLETE VEHICLE HARNESS



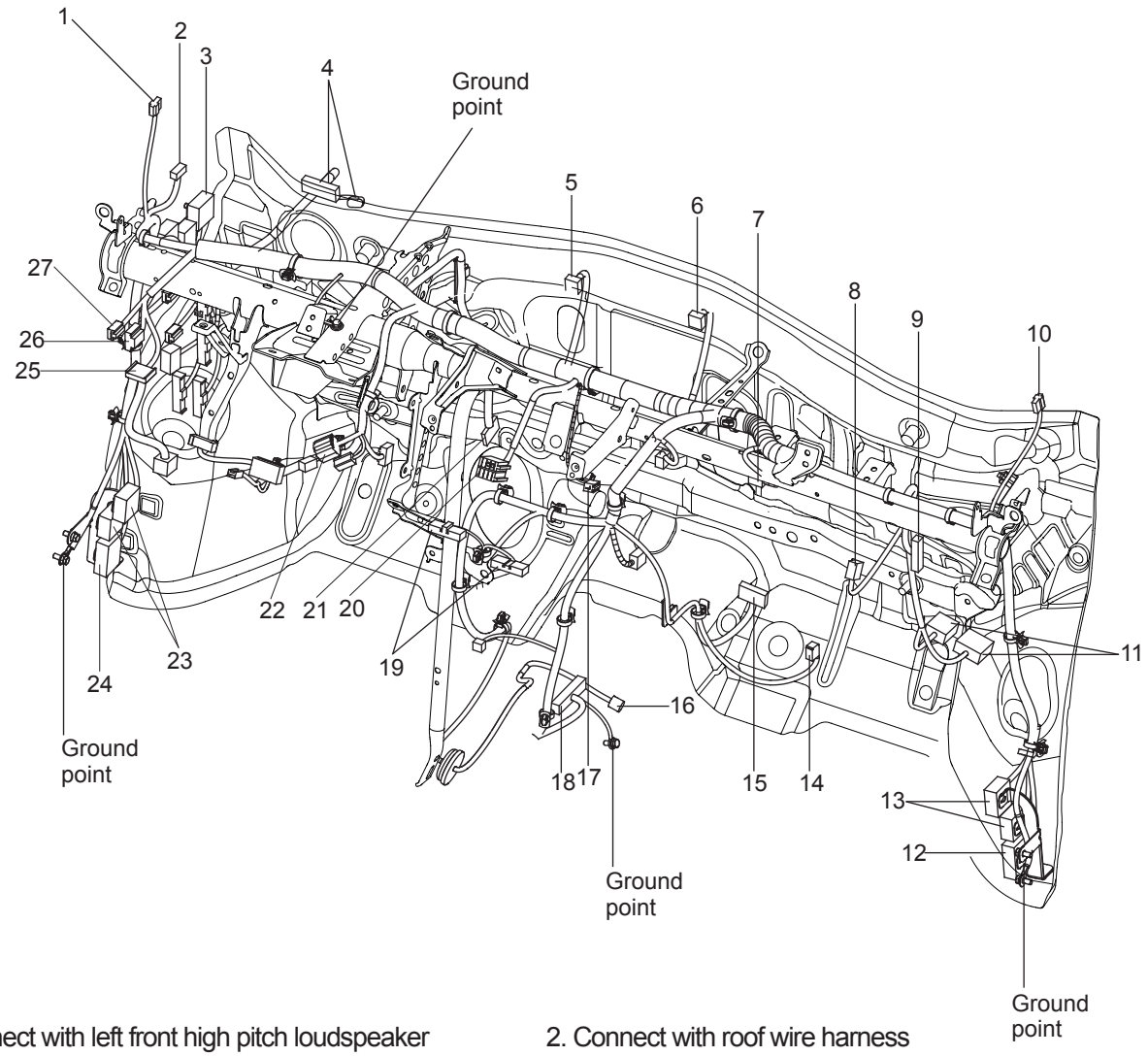
1. Rear bumper harness
2. Left rear door harness
3. Vehicle body harness
4. Left front door harness
5. Engine compartment harness
6. Engine harness
7. Dash board wire harness
8. Right front door harness
9. Right rear door harness
10. Roof harness

ENGINE COMPARTMENT HARNESS



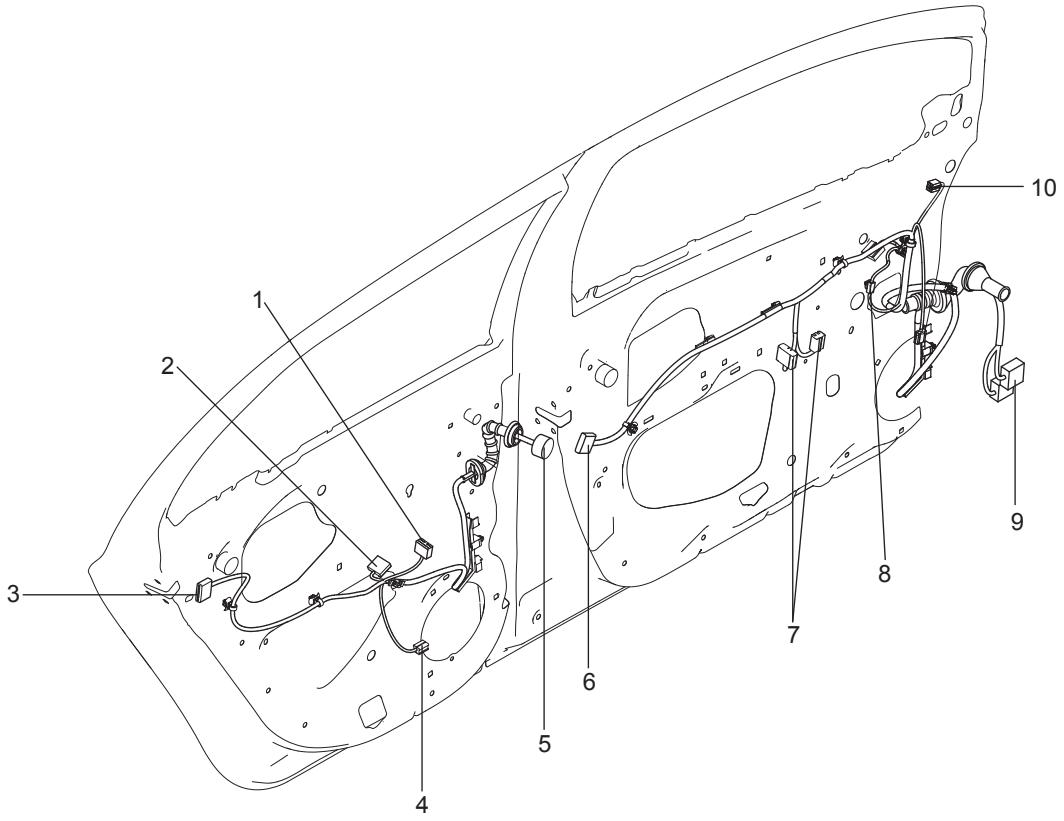
1. Connect with ABS ECU
2. Connect with braking liquid level warning switch
3. Connect with clutch switch
4. Connect with windscreen wiper motor
5. Fuse box of driving cab
6. Connect with instrument harness A
7. Connect with instrument harness b
8. Connect with vehicle body harness
9. Connect with left front wheel speed sensor
10. Connect with left front turn signal light
11. connect with left front combined light
12. connect with left front headlight adjusting motor
13. Connect with left front fog light
14. Connect with radiator fan motor
15. Connect with high tone loudspeaker
16. Connect with outside temperature sensor
17. Connect with right front fog light
18. Connect with washing motor
19. Connect with right front headlight adjusting motor
20. Connect with right front combined light
21. Connect with right front turn signal light
22. Connect with right front wheel speed sensor
23. Dash board wire harness A
24. Connect with engine ECU
25. Dash board wire harness B
26. Connect with injector
27. Connect with ignition coil
28. Connect with front oxygen sensor
29. Connect with carbon tank solenoid valve
30. Connect with phase sensor
31. 31.Connect with speed sensor
32. Connect with reversing light switch
33. Connect with electrical restrictor
34. Connect with coolant temperature sensor
35. Connect with knock sensor
36. Oil pressure switch
37. Connect with starter
38. Connect with starter excitation
39. Connect with compressor
40. Connect with generator
41. Connect with VVT valve
42. Connect with power assisted steering device
43. Connect with air conditioning pressure switch

INSTRUMENT PANEL WIRE HARNESS



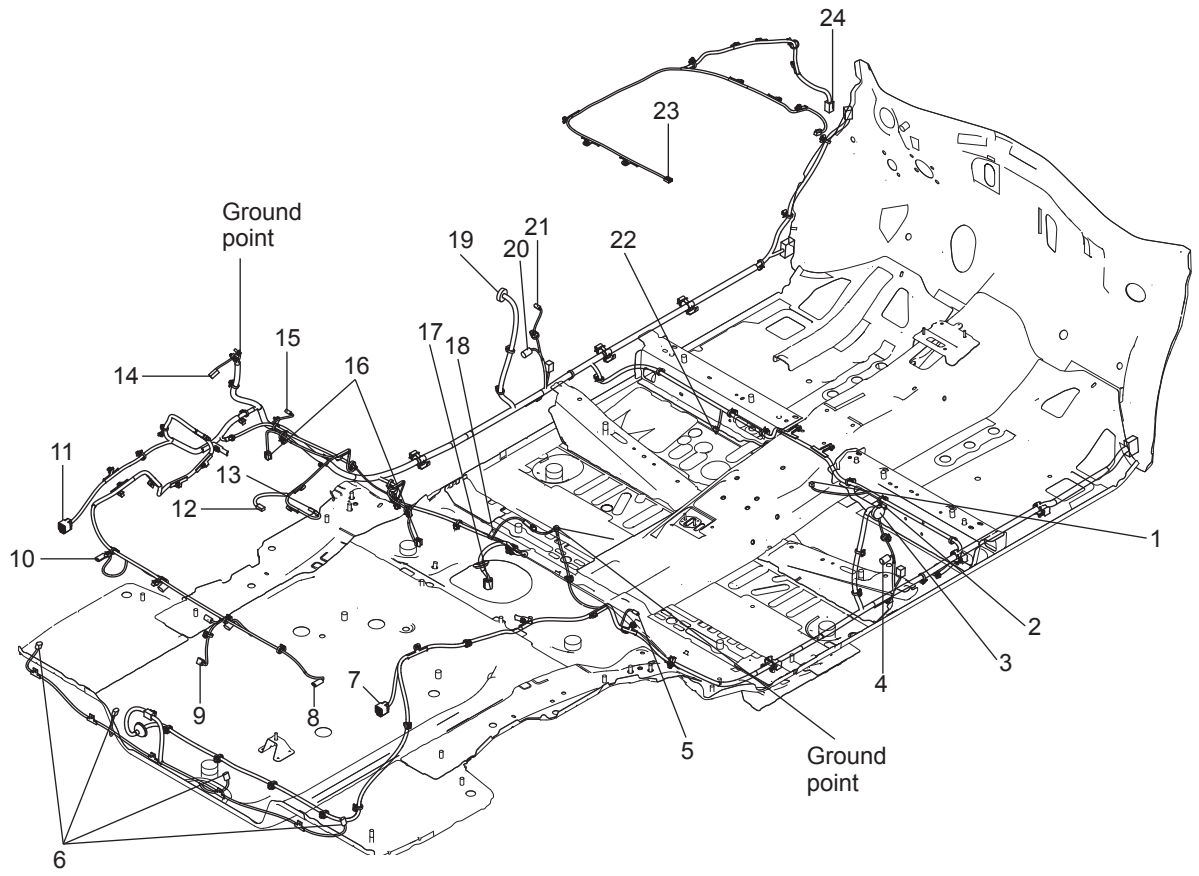
1. Connect with left front high pitch loudspeaker
2. Connect with roof wire harness
3. Connect with engine compartment harness
4. Connect with combination instrument
5. Connect with electron clock
6. Connect with not buckle up indicating light for vice driver
7. Connect with vice safety air bag vice
8. Connect with inner and outer cycling motor
9. Connect with centre door lock controller
10. Connect with right front high pitch loudspeaker
11. Connect with engine harness
12. Connect with vehicle body harness assembly
13. Connect with right front door harness assembly
14. Connect with blower
15. Connect with speed regulating resistance
16. Connect with rear oxygen sensor
17. Connect with safety emergency warning lamp switch
18. Connect with safety air bag ECU
19. Connect with air conditioning control panel
20. Connect with CD Player
21. Connect with electron accelerator pedal
22. Connect with ignition lock
23. Connect with left front door harness assembly
24. Connect with vehicle body harness assembly
25. Connect with rear view mirror adjusting switch
26. Connect with instrument brightness adjusting switch
27. Connect with headlight height adjusting switch

DOOR HARNESS



1. Connecting window regulator switch
2. Connecting regulator motor
3. Connecting rear door lock
4. Connecting rear door speaker
5. Connecting car body wiring harness
6. Connect with front door lock
7. Connecting window regulator switch
8. Connect with riser motor
9. Connecting instrument panel wiring harness
10. Connect with rear view mirror

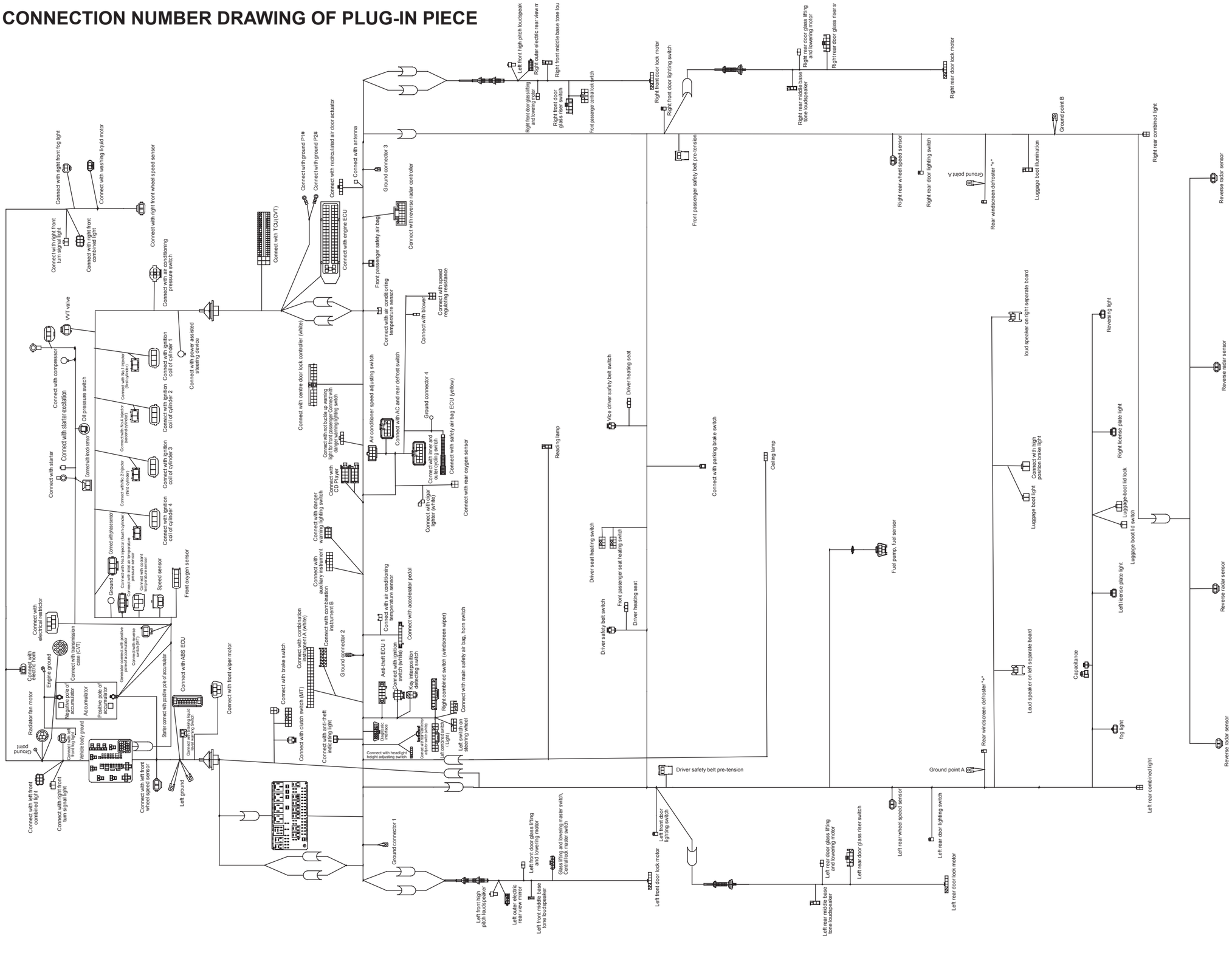
FLOOR HARNESS



1. Connect with not buckle up switch for front passenger
2. Connect with right front door lighting switch
3. Connect with right rear door harness
4. Connect with safety belt pre-tension of front passenger
5. Connect with right rear door lighting switch
6. Connect with reverse radar sensor
7. Connect with right rear combined light
8. Connect with right rear fog light
9. Connect with rear luggage boot lock
10. Connect with left rear fog light
11. Connect with left rear combined light
12. Connect with luggage boot light
13. Connect with high position brake light
14. Connect with rear defrost +
15. Connect with left rear door lighting switch
16. Connect with loud speaker on separate board
17. Connect with fuel pump
18. Connect with rear defrost -
19. Connect with left rear door harness
20. Connect with driver safety belt pre-tension
21. Connect with left front door lighting switch
22. Connect with not buckle up switch of driver
23. Connect with ceiling lamp
24. Connect with reading lamp

RELATIONSHIP BETWEEN HARNESSES

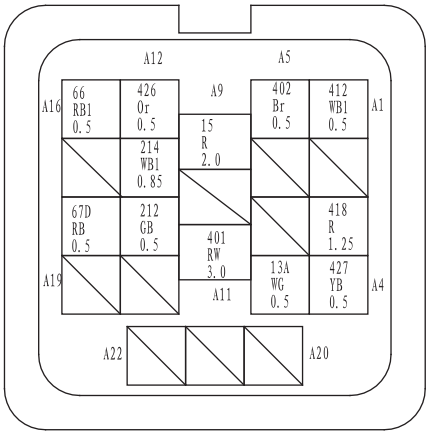
CONNECTION NUMBER DRAWING OF PLUG-IN PIECE



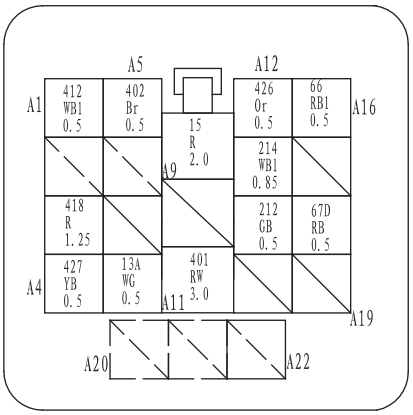
FUNCTIONAL DIAGRAM OF LEAD PIN ON PLUG-IN PIECE

Connecting Plug 1

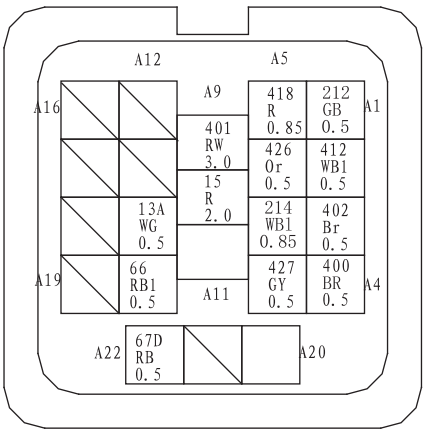
C01



MT

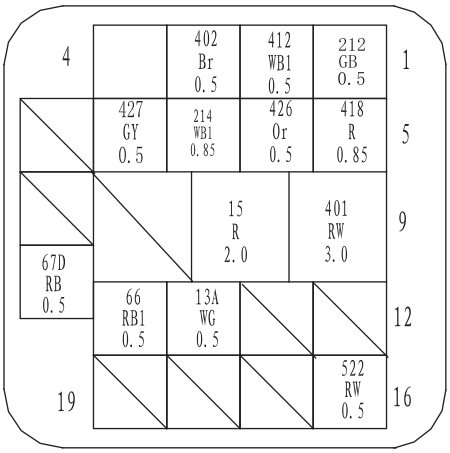


MT



CVT

Connect with engine harness

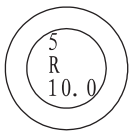


CVT

Connect with front engine compartment harness

C02

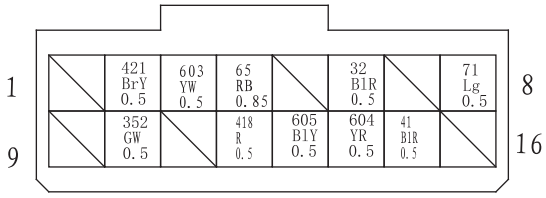
Connect with fuse box of driving cabbox of driving cab



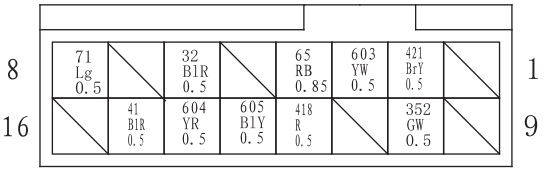
Connect with engine compartment harness

Connecting Plug 2

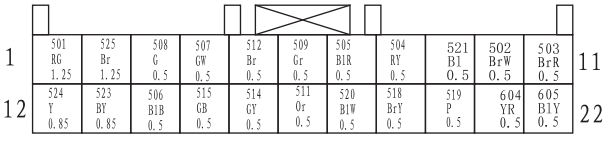
C03



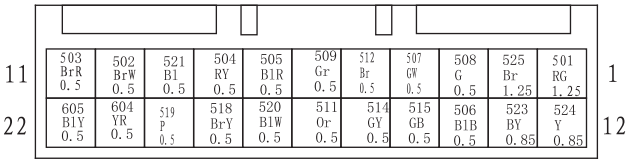
MT



MT



CVT

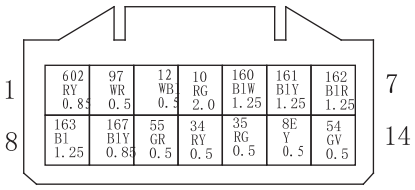


CVT

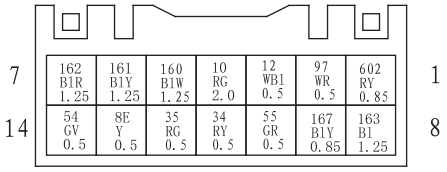
Connect with Instrument panel wire harness A

Connect with engine compartment harness A

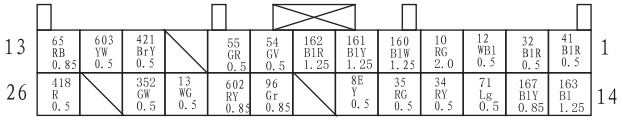
C04



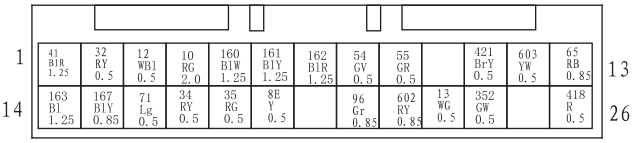
MT



MT



CVT



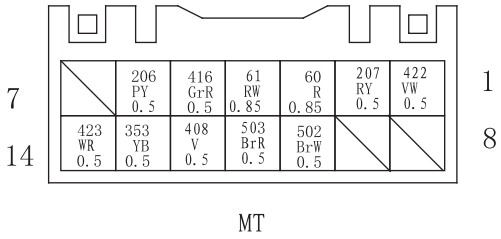
CVT

Connect with Instrument panel wire harness B

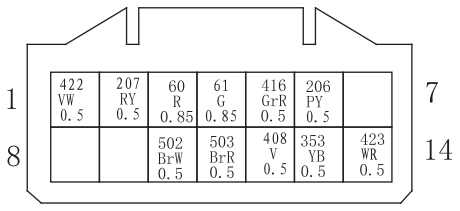
Connect with engine compartment harness B

Connecting Plug 3

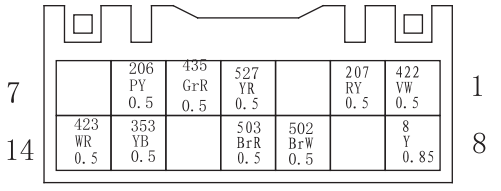
C05



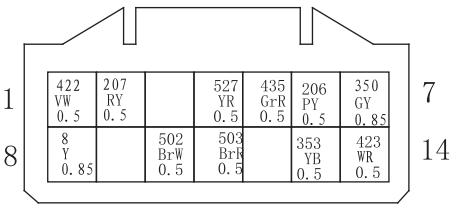
MT



MT



CVT

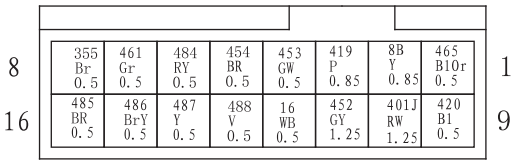


CVT

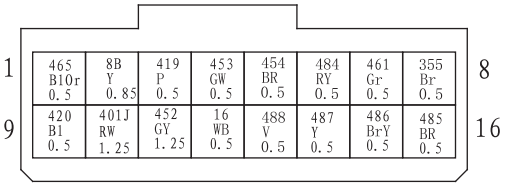
Connect with Instrument panel wire harness A

Connect with engine harness A (white)

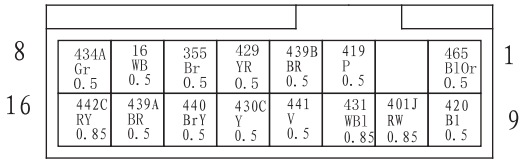
C06



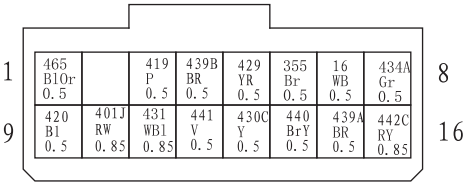
MT



MT



CVT



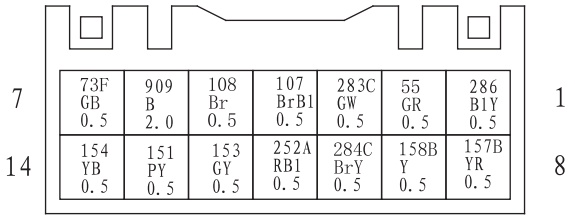
CVT

Connect with Instrument panel wire harness B

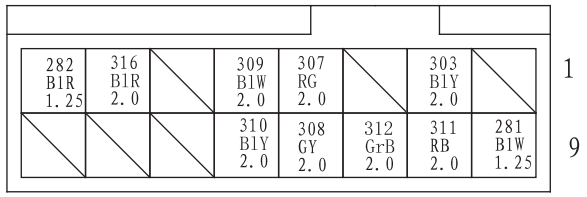
Connect with engine harness B

Connecting Plug 4

C07

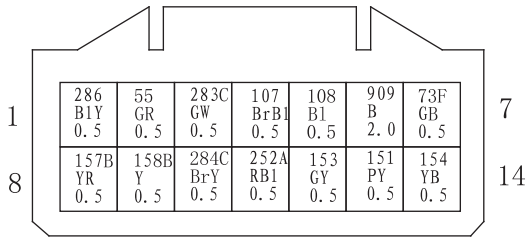


Connect with instrument harness A

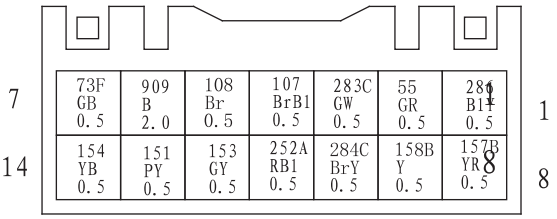


Connect with left front car door harness A (white)

C08

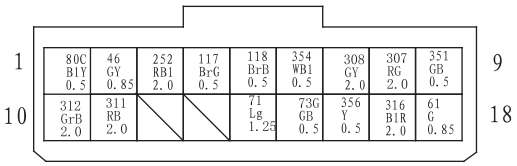


Connect with instrument harness B

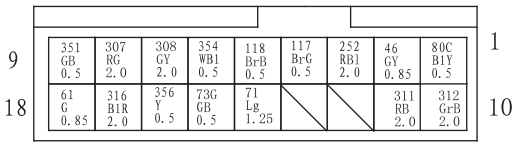


Connect with left front car door harness B

C09

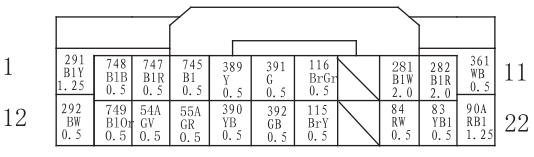


Connect with Instrument panel wire harness A

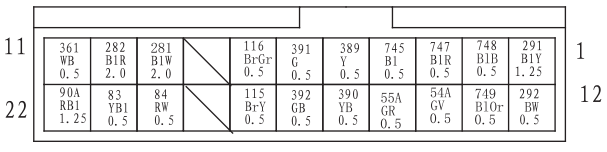


Connect with vehicle body harness A

C10



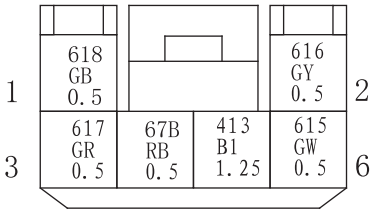
Connect with Instrument panel wire harness B



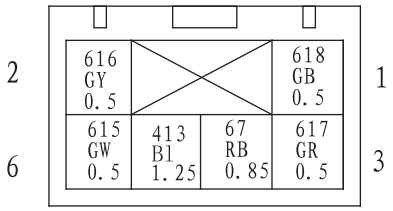
Connect with vehicle body harness B

Connecting Plug 5

C11

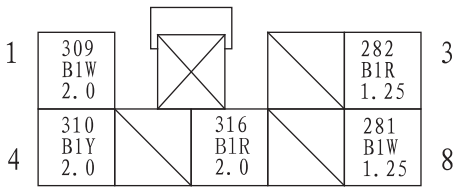


Connect with vehicle body harness

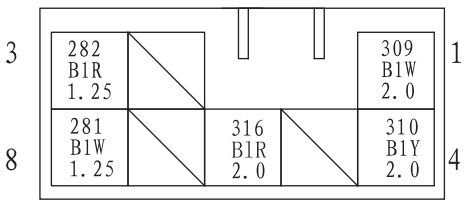


Connect with engine compartment harness

C12

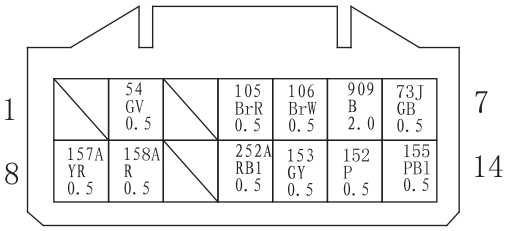


Connect with instrument harness A

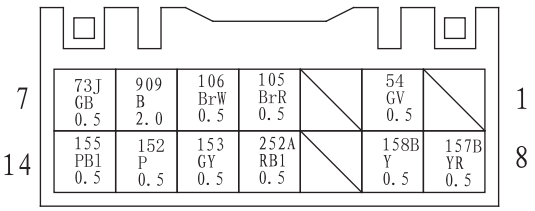


Connect with harness of right front car door A

C13

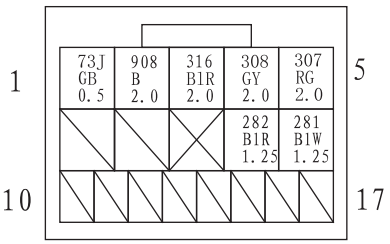


Connect with instrument harness B

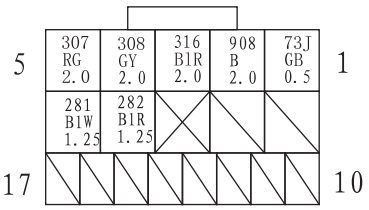


Connect with harness of right front car door B

C14



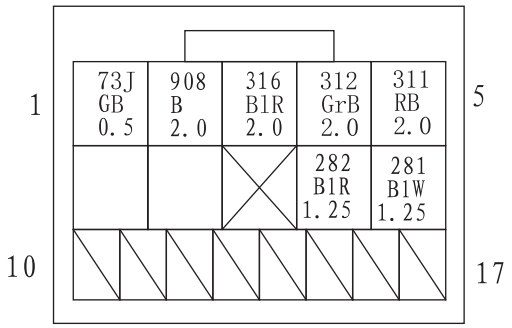
Connect with vehicle body harness



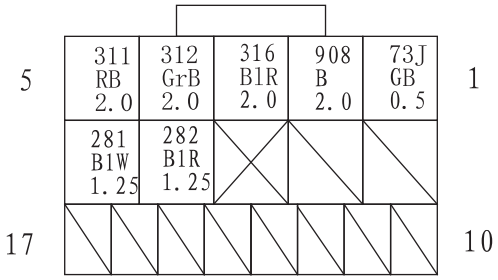
Connect with left rear door harness

Connecting Plug 6

C15

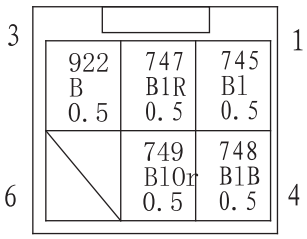


Connect with vehicle body harness

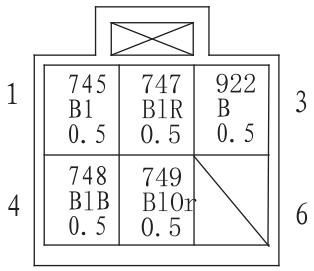


Connect with right rear door harness

C16

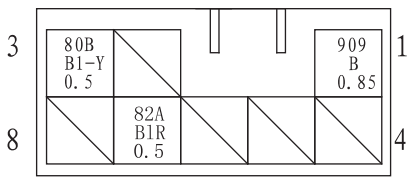


Connect with rear vehicle body harness

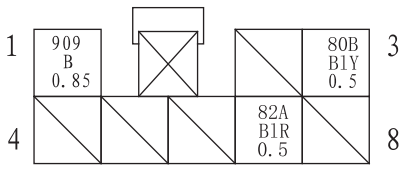


Connect with vehicle body harness

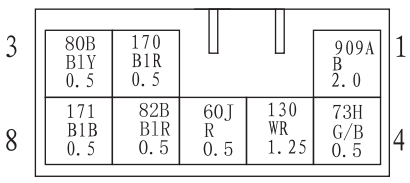
C17



MT

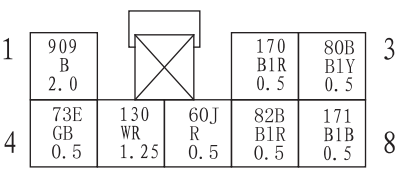


MT



CVT

Connect with roof harness

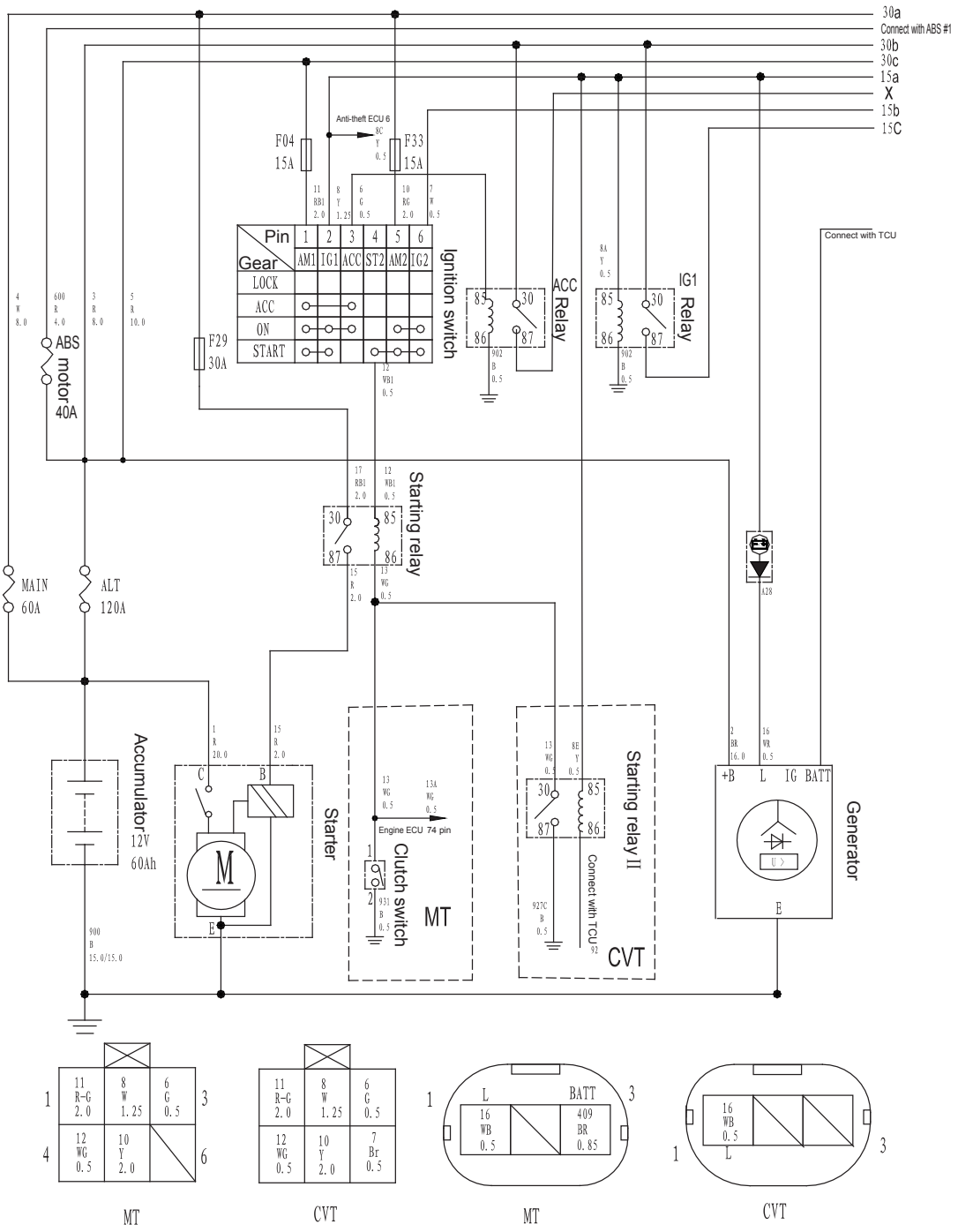


CVT

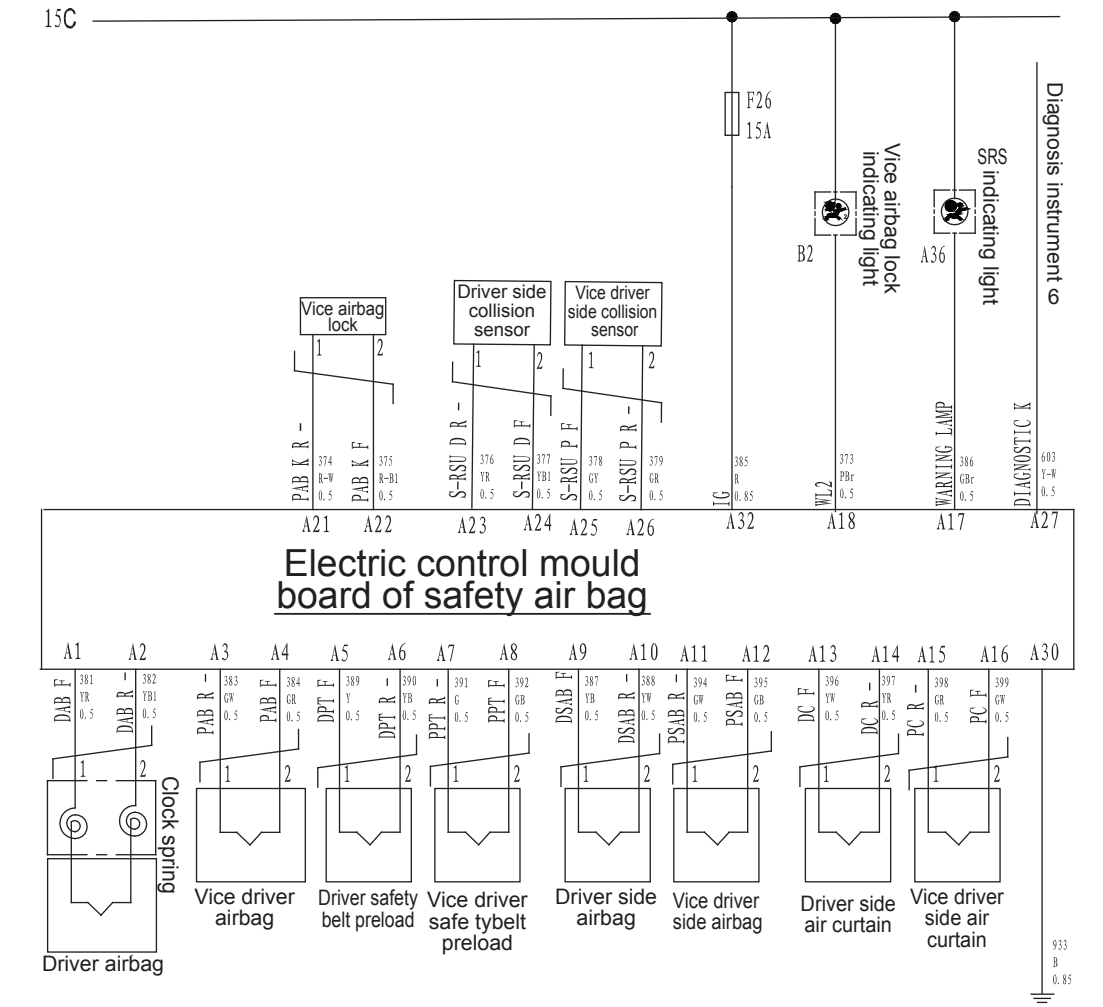
Connect with Instrument panel wire harness

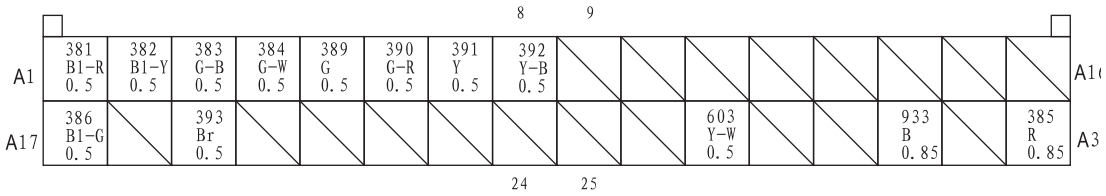
BREAKDOWN DRAWING TO CIRCUITS OF THE COMPLETE VEHICLE

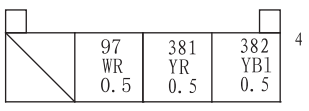
POWER SUPPLY, STARTING SYSTEM

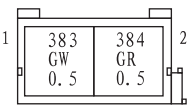


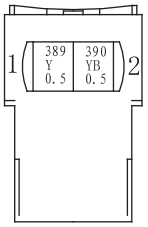
SAFETY AIR BAG

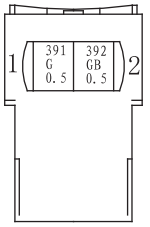


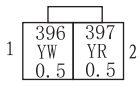


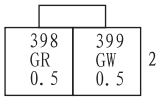


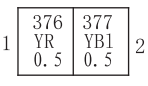


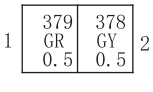


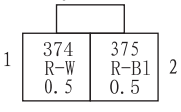




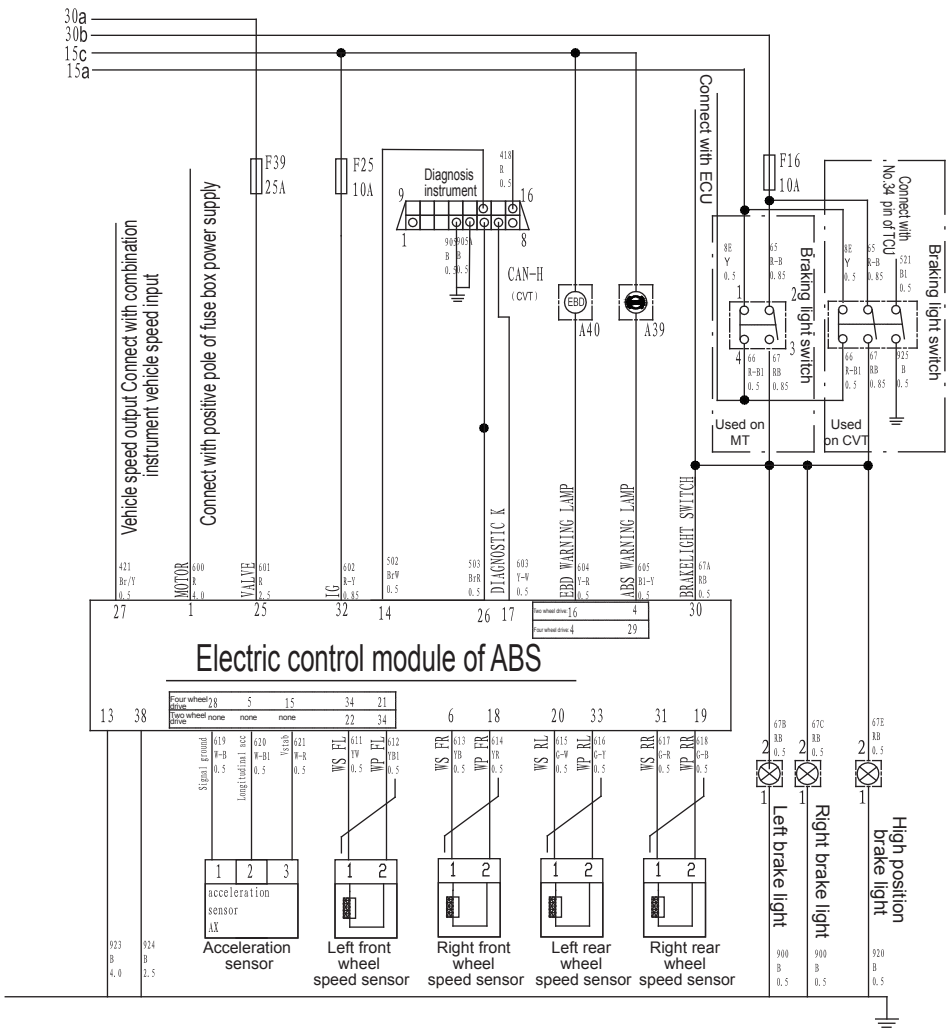


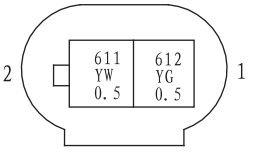




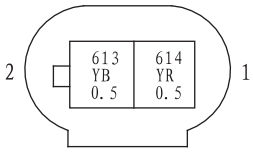


ABS BRAKE SYSTEM

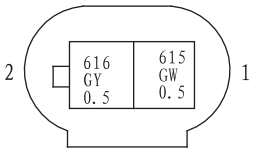




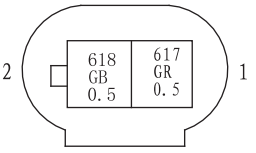
Connect with left front wheel speed sensor



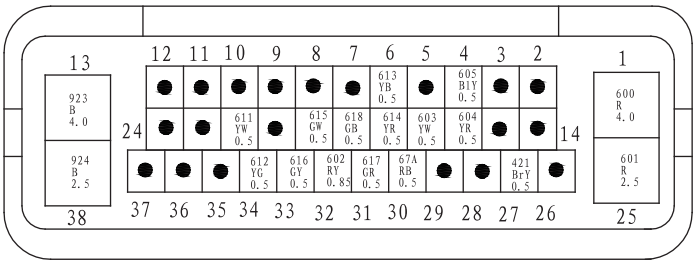
Connect with right front wheel speed sensor



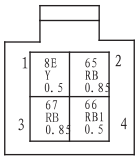
Left rear wheel speed sensor



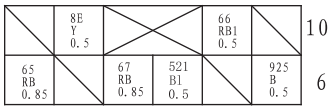
Right rear wheel speed sensor



MT

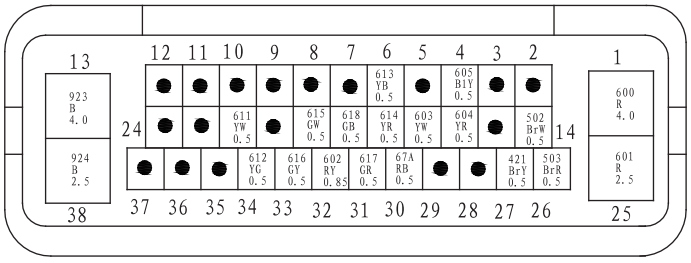


MT



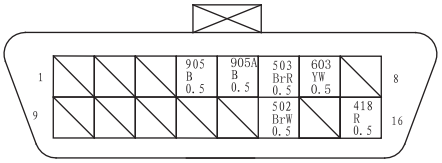
CVT

Connect with braking light switch



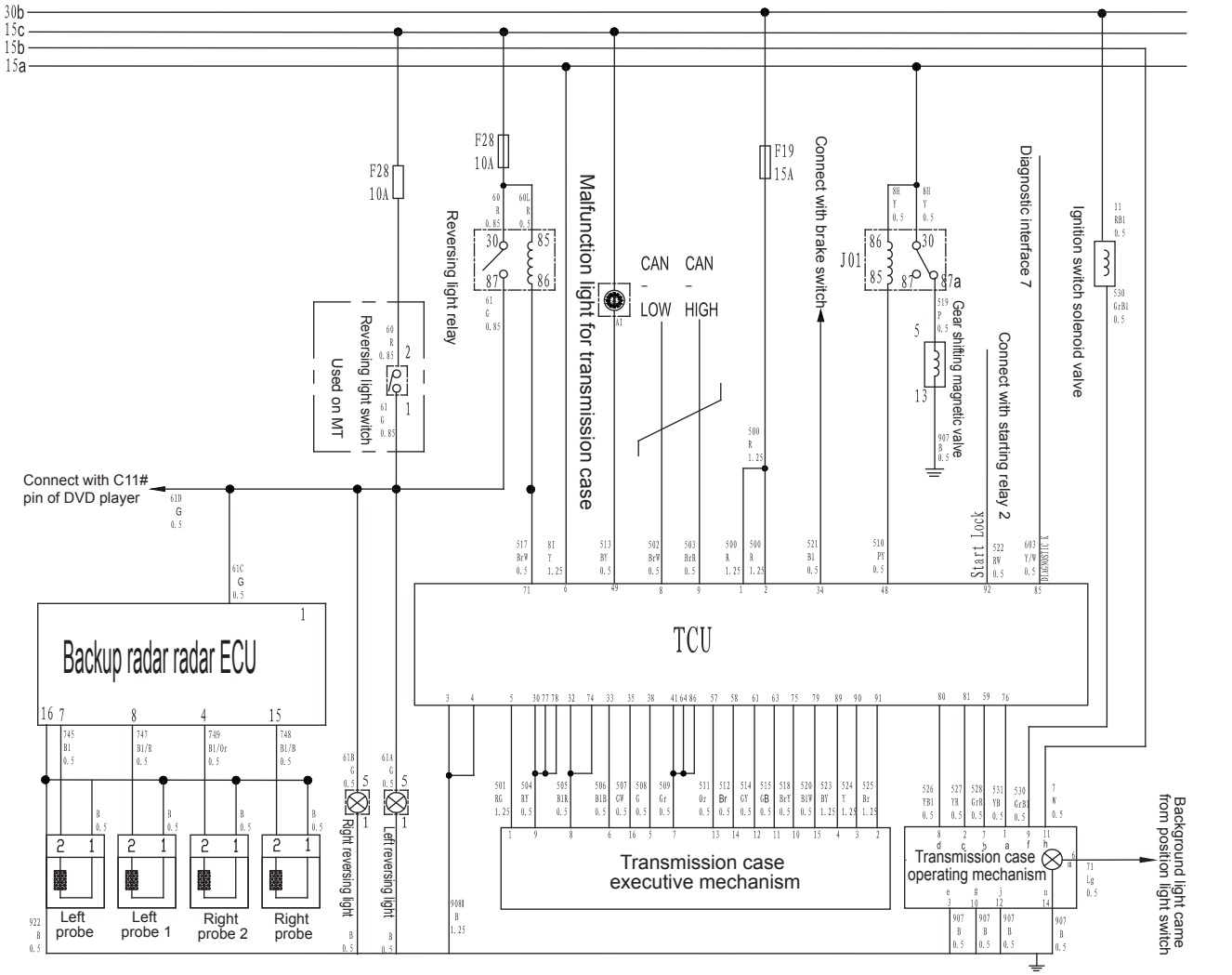
CVT

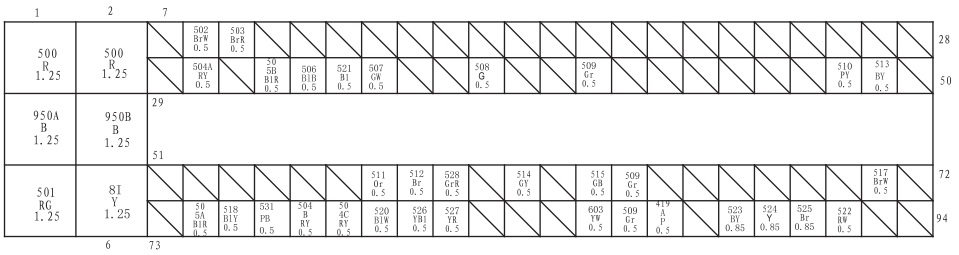
Connect with ABS ECU



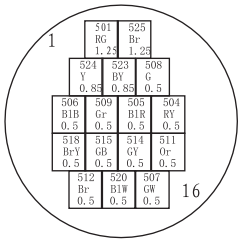
Connect with diagnostic interface

CVT TRANSMISSION AND REVERSE RADAR SYSTEM

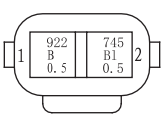




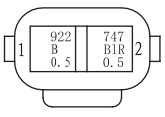
Connect with TCU



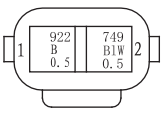
Connect with CVT transmission case



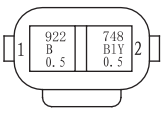
Connect with left probe



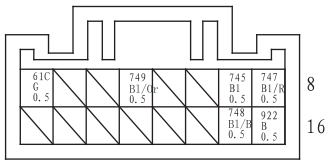
Connect with middle left probe



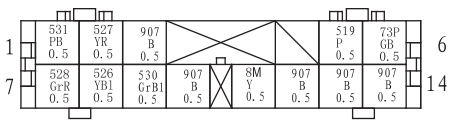
Connect with middle right probe



Connect with right probe

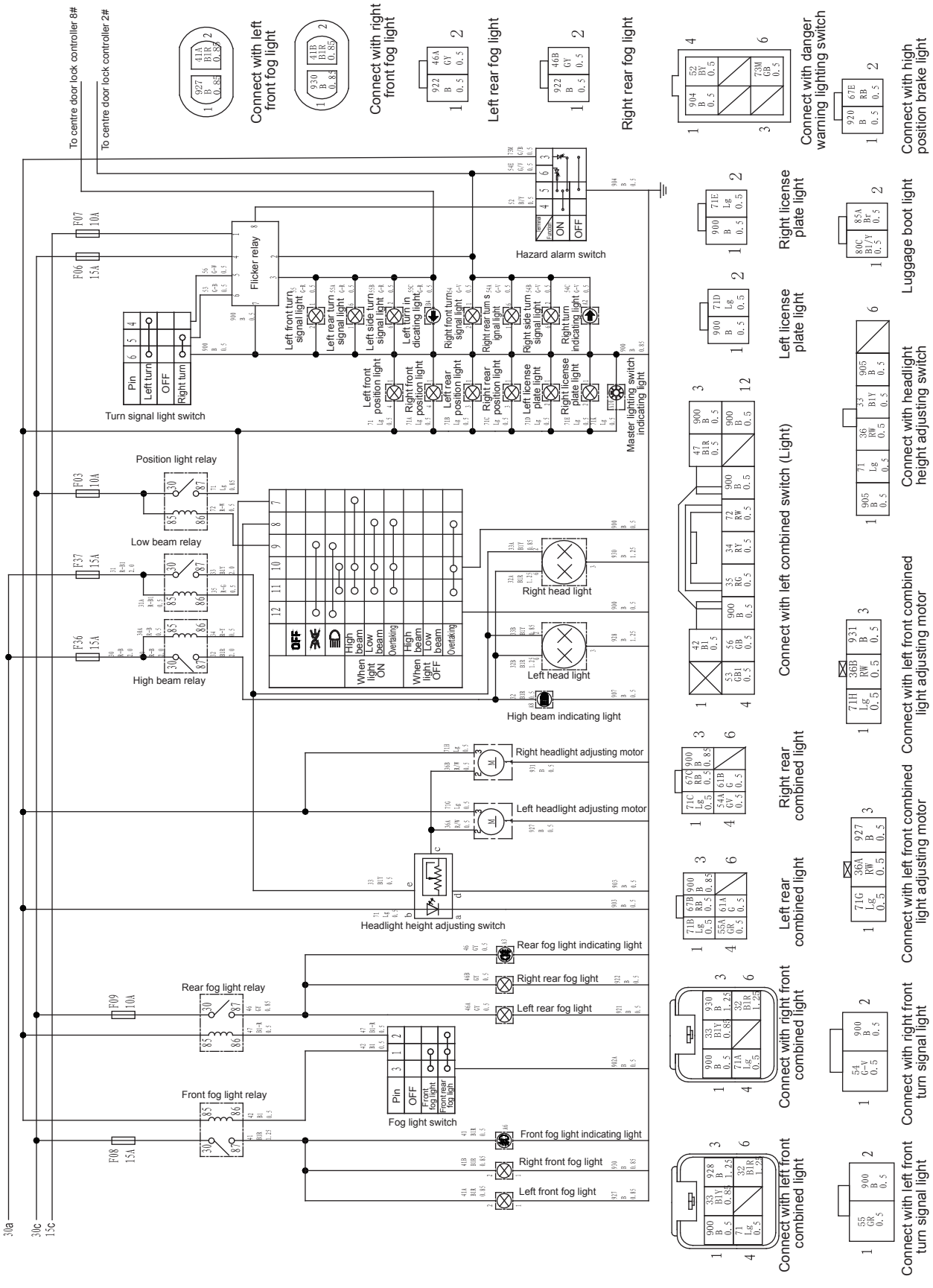


Connect with reverse radar controller

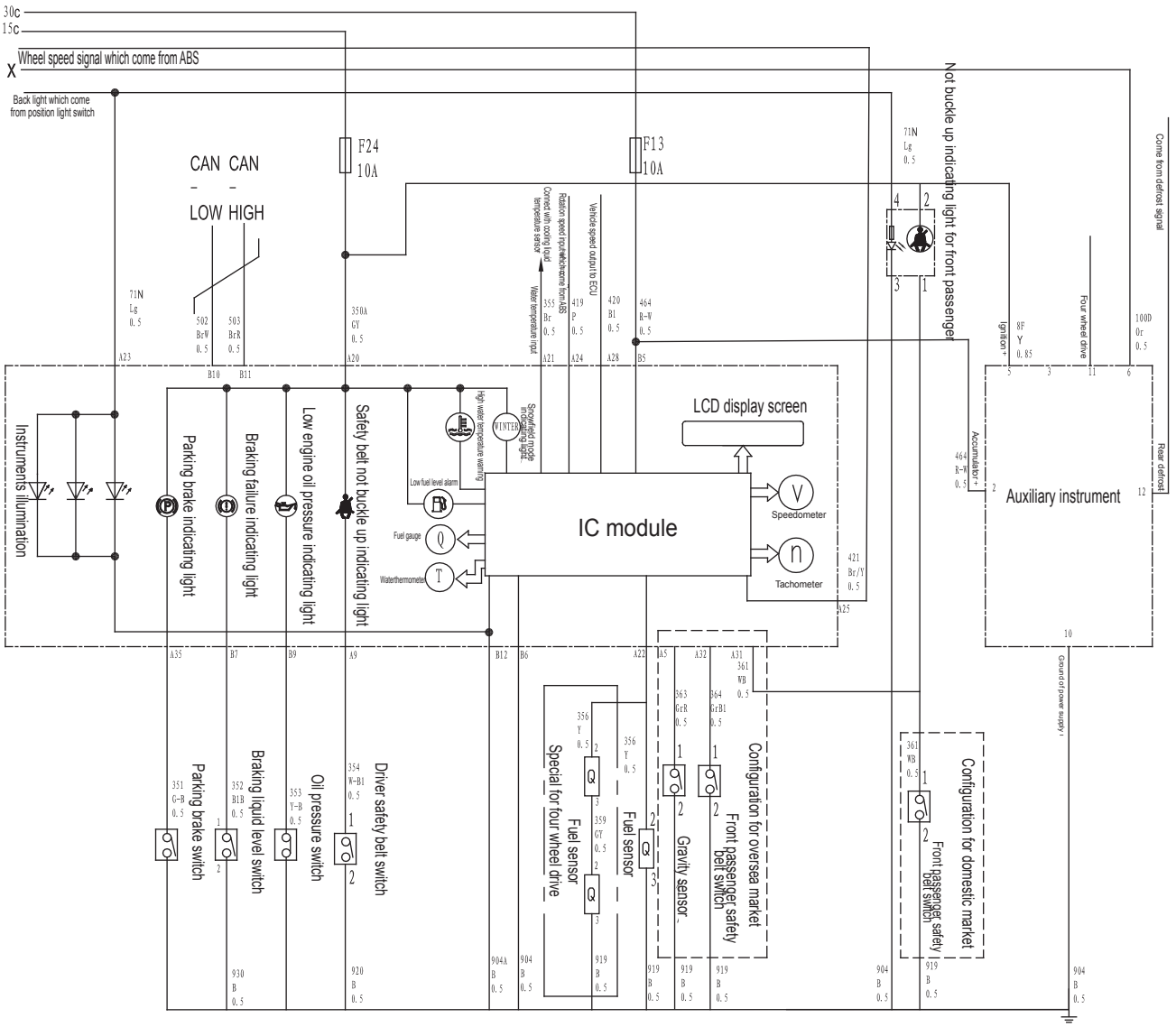


Connect with gear shifting mechanism

LIGHT ILLUMINATION, ALARM, ILLUMINATION LIGHT CONTROL SYSTEM



COMBINATION INSTRUMENT CONTROL SYSTEM



1	513 BY 0.5	54C GV 0.5	46 GY 0.5			41 B1R 0.5		32 B1R 0.5	354 WB1 0.5	71K Lg 0.5										350A GY 0.5	20
21	355 Br 0.5	356 Y 0.5	73A G-B 0.5	419 P 0.5	421 BrY 0.5			420 B1 0.5					422 VW 0.5	81 RB 0.5	351 GB 0.5	386 GBr 0.5			605 B1Y 0.5	604 YR 0.5	40

Connect with combination instrument A

1	459 Br 0.5		16 WB 0.5	55C GR 0.5	464 R-W 0.5	904 B 0.5	6
7	352 GW 0.5	423 WR 0.5	353 YB 0.5	502 BrW 0.5	503 BrR 0.5	904A B 0.5	12

Connect with combination instrument B (white)

1	352 GW 0.5	930 B 0.5

Connect with braking liquid level warning Switch

1		252C R/B1 0.5	350B GY 0.85	100D Or 0.5	4
5	904 B 0.5			464 R-W 0.5	8

Connect with auxiliary instrument

1	354 WB1 0.5	920 B 0.5

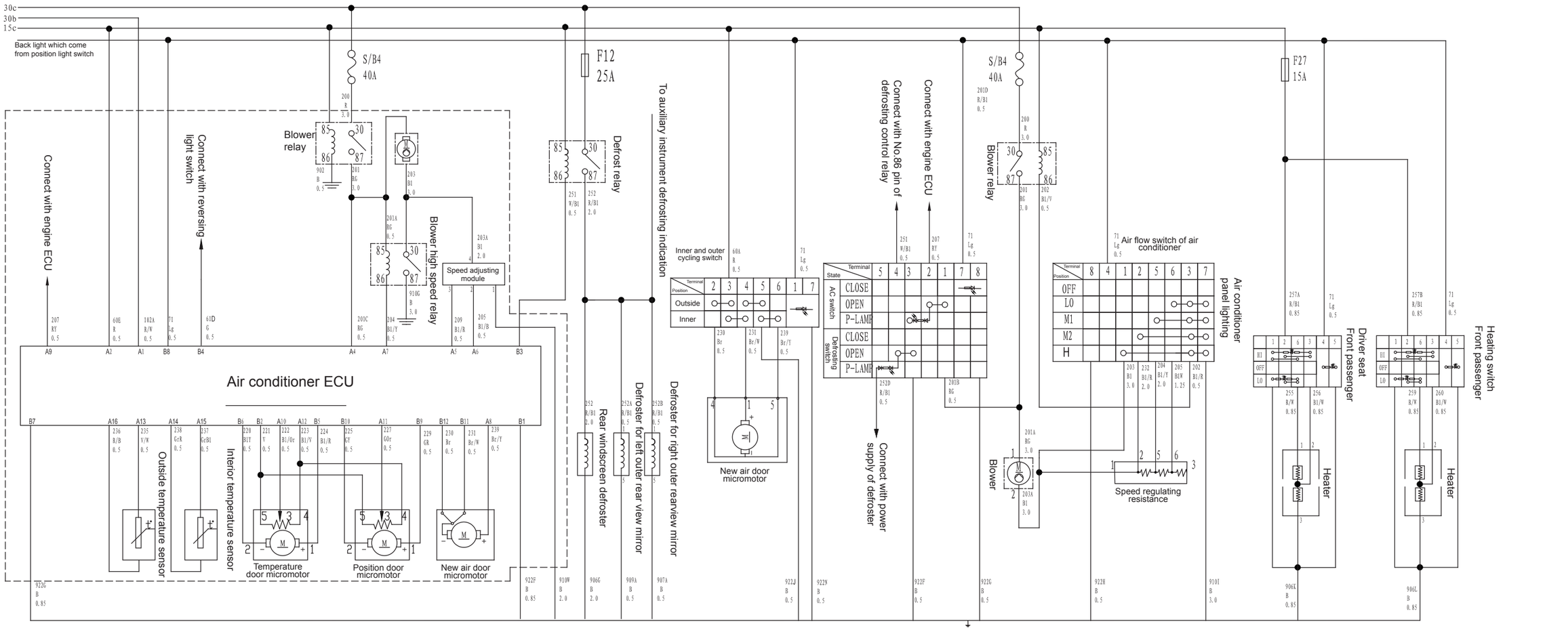
Driver safety belt switch

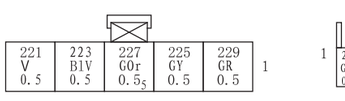
1	361 WB 0.5	920 B 0.5

1	361 W-B 0.5	350A GY 0.5	904 B 0.5	73Q G/B 0.5	4

Connect with driver not buckle up warning light

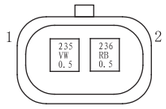
SEAT HEATING AND AIR CONDITIONING SYSTEM





Connect with actuator of temperature air door (electrical air conditioner)

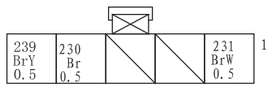
Interior temperature sensor (electrical air conditioner)



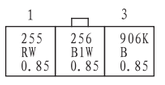
Outside temperature sensor (electrical air conditioner)

Connect with actuator of model air door (electrical air conditioner)

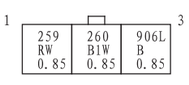
Connect with speed regulating resistance (electrical air conditioner)



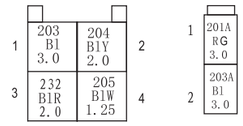
Connect with recirculated air door actuator



Driver heating seat

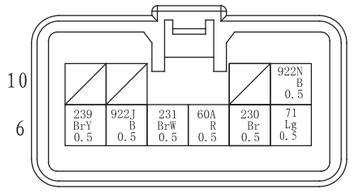


Front passenger heating seat

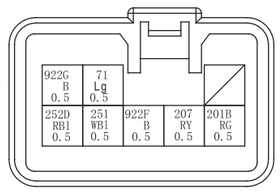


Connect with speed regulating resistance

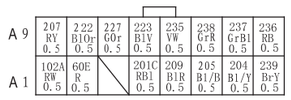
Connect with blower



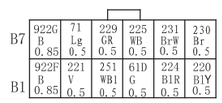
Connect with inner and outer cycling switch



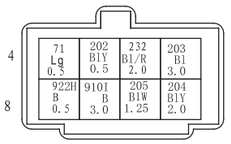
Connect with AC and rear defrost switch
Connect with air conditioner controller A



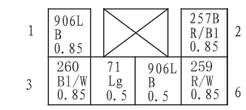
Connect with air conditioner controller A (electrical air conditioner)



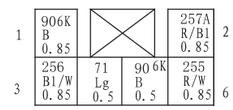
Connect with air conditioner controller B (electrical air conditioner)



Connect with air conditioner speed adjusting switch

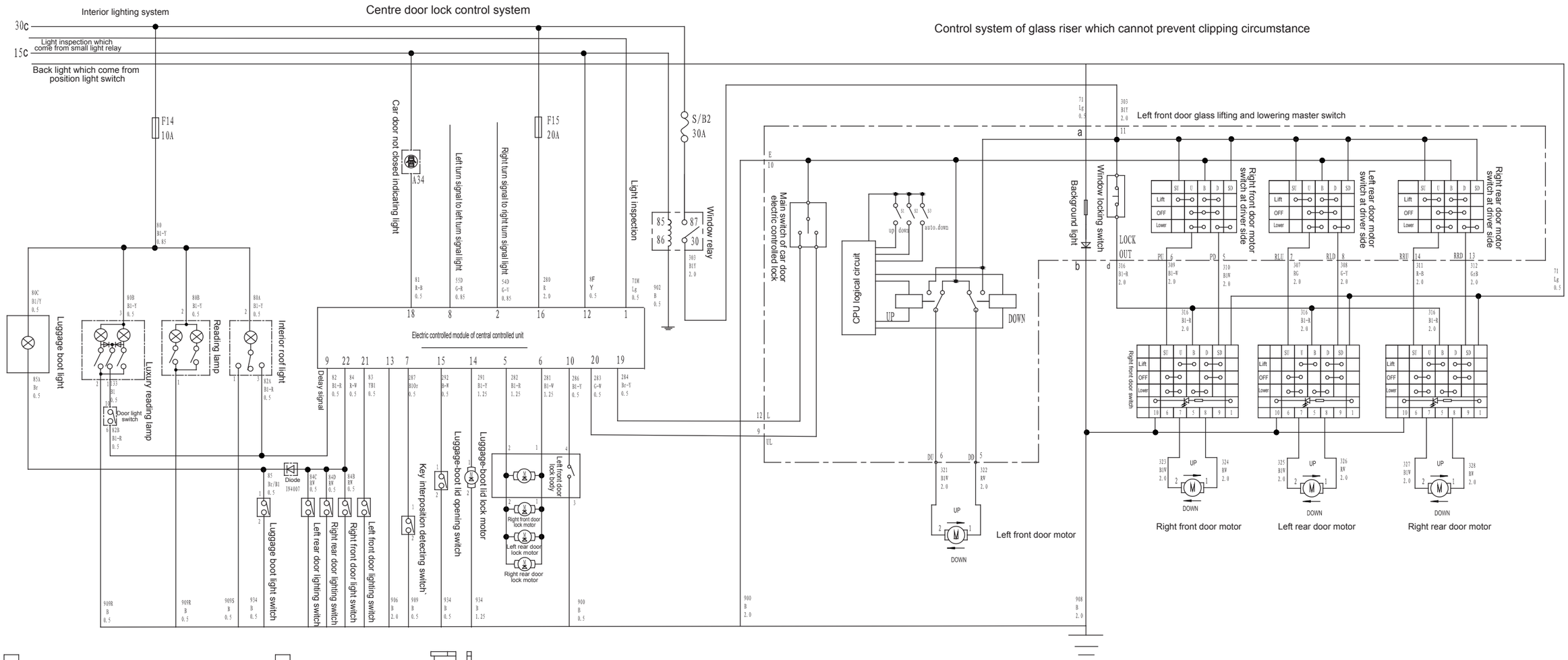


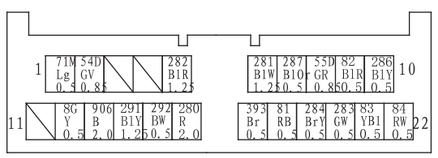
Front passenger seat heating switch



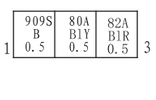
Driver seat heating switch

CENTRAL LOCK, GLASS RISER SYSTEM

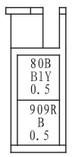




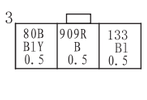
Connect with centre door lock controller



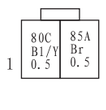
Ceiling lamp



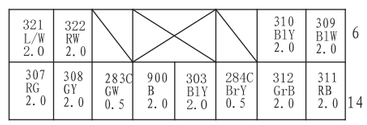
Reading lamp



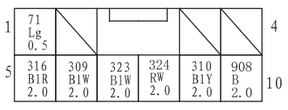
Luxury reading lamp



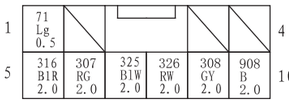
Luggage boot light



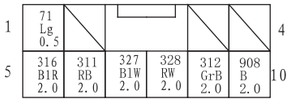
Glass lifting and lowering master switch, Central lock master switch Ⅰ



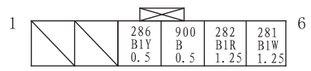
Right front glass riser switch



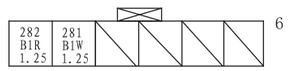
Left rear door glass riser switch



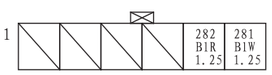
Right rear door glass riser switch



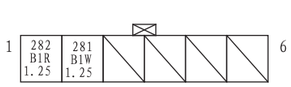
Lock motor



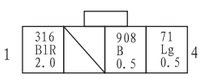
Lock motor



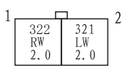
Left rear door lock motor



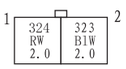
Right rear door lock motor



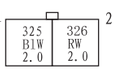
Glass lifting and lowering master switch, central lock master switch Ⅱ



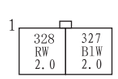
Glass lifting and lowering motor



Glass lifting and lowering motor

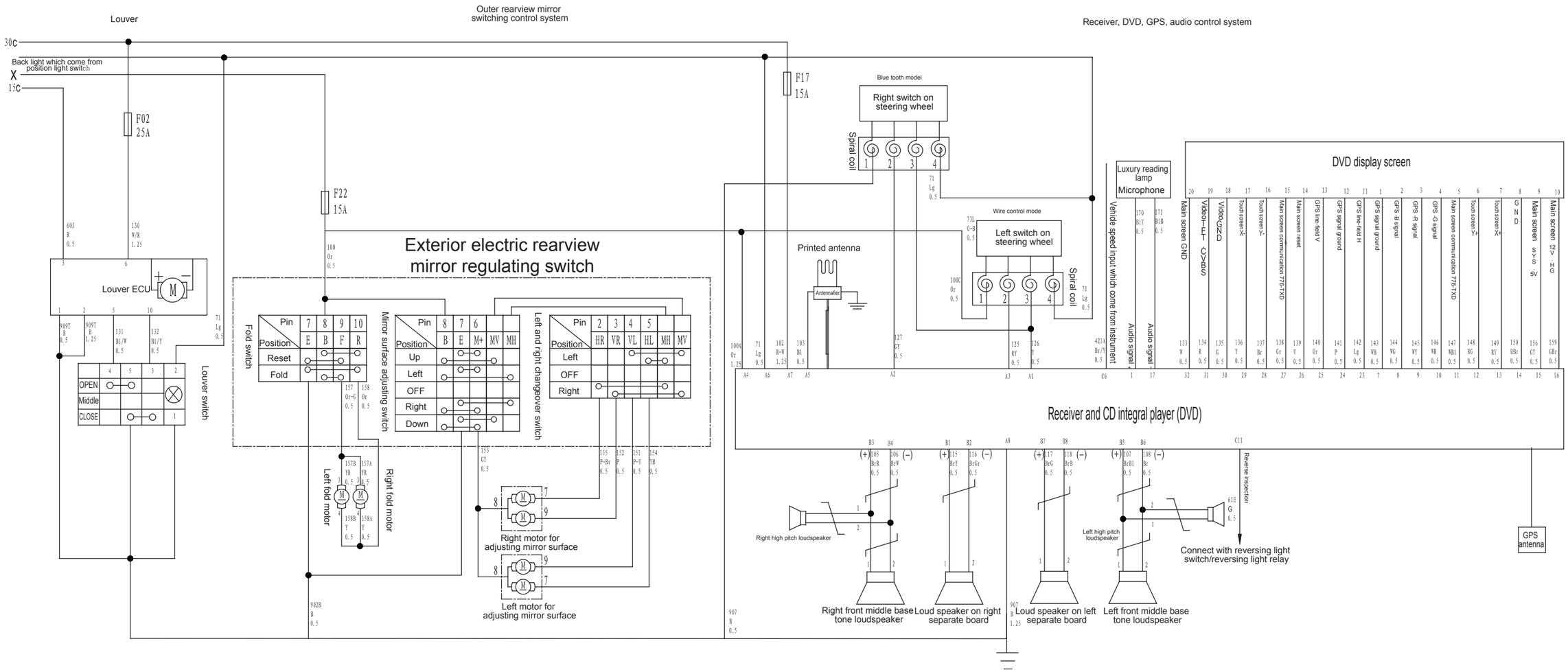


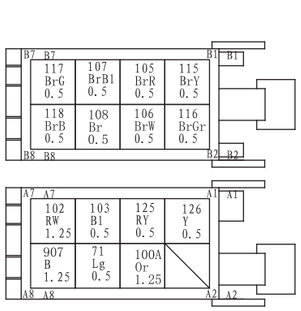
Glass lifting and lowering motor



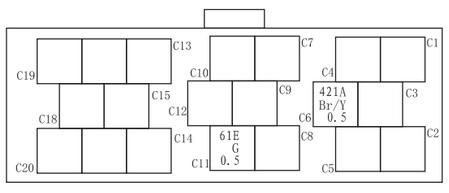
Glass lifting and lowering motor

COMFORTABLE CONFIGURATION

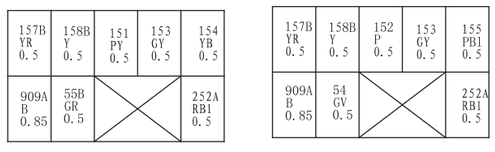




Connect with CD/DVD player

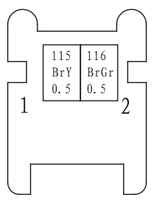


Connect with DVD player

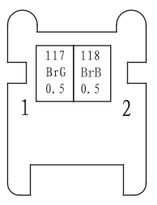


Left outer electric rear view mirror

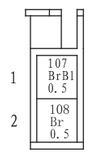
Rear outside electric rear view mirror



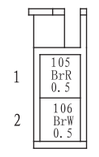
Loud speaker on right separate board



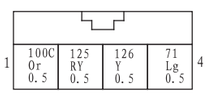
Loud speaker on left separate board



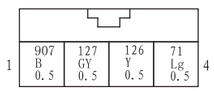
Left front middle base tone loudspeaker



Right front middle base tone loudspeaker

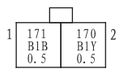


Left switch on steering wheel

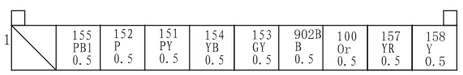


Right switch on steering wheel

Microphone

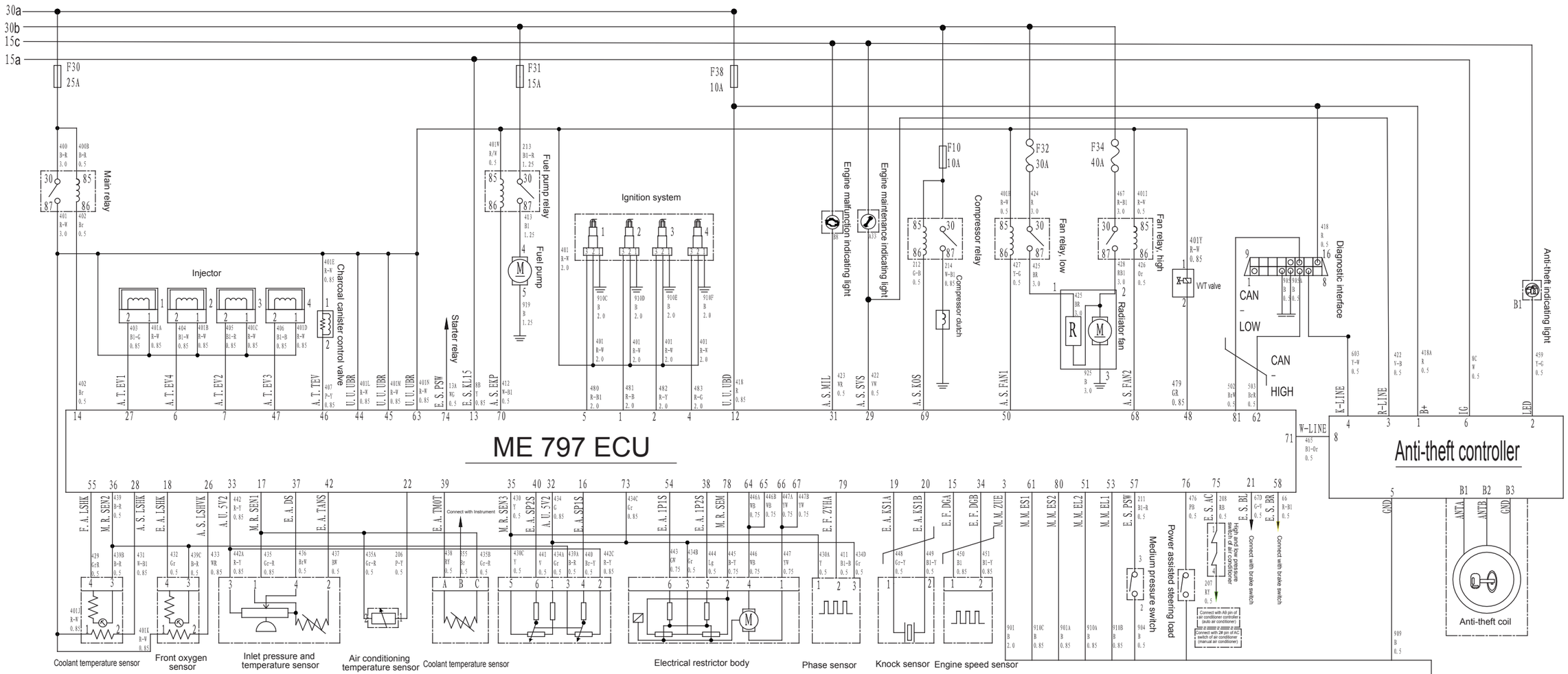


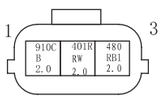
Connect with DVD MIC



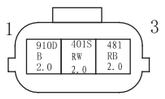
Connect with rear view mirror adjusting switch (white)

UNITED ELECTRICAL ENGINE CONTROL SYSTEM

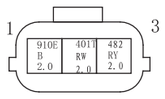




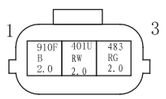
Connect with ignition coil of No.1 cylinder



Connect with ignition coil of No.2 cylinder

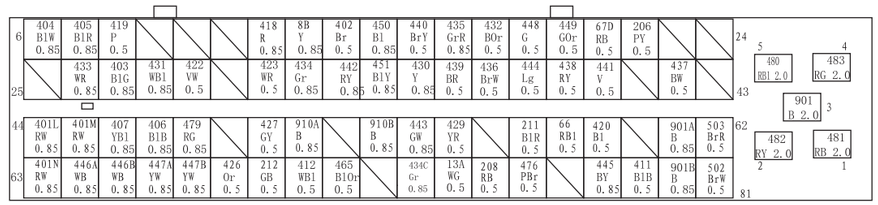


Connect with ignition coil of No.3 cylinder

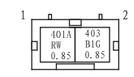


Connect with ignition coil of No.4 cylinder

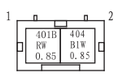
Connect with electrical restrictor



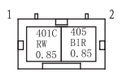
Connect with engine ECU



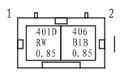
Connect with No.1 injector



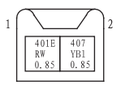
Connec2 with No.1 injector



Connec3 with No.1 injector

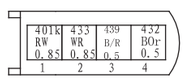


Connec4 with No.1 injector

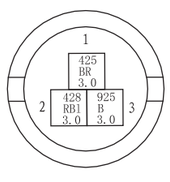


Charcoal canister control valve

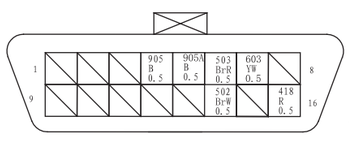
Oil pressure switch



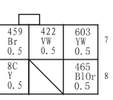
Front oxygen sensor



Connect with radiator fan motor

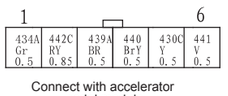


Connect with diagnostic interface



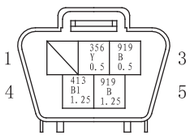
Connect with anti-theft ECU 1

Connect with VVT valve

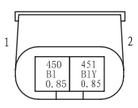


Connect with accelerator pedal module

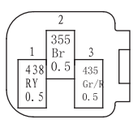
Connect with power assisted steering device



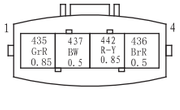
Fuel pump, fuel sensor



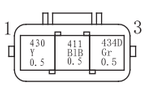
Connect with engine speed sensor



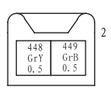
Connect with coolant temperature sensor



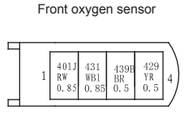
Connect with inlet air temperature pressure sensor



Connect with phase sensor

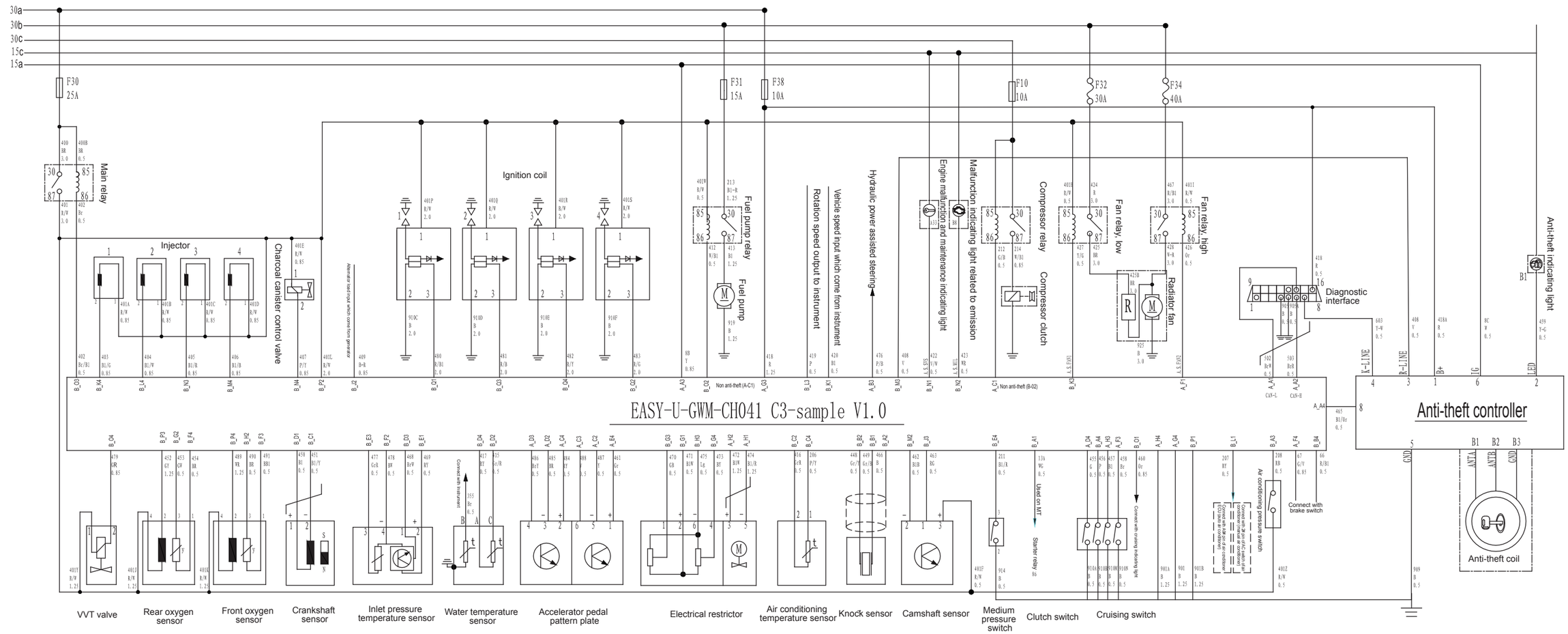


Connect with knock sensor



Rear oxygen sensor

SIEMENS ENGINE CONTROL SYSTEM

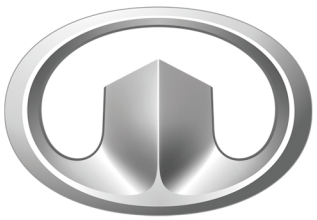


improving little by little everyday

Great Wall Motor Company Limited

Add:2266 Chaoyang South Avenue, Baoding City, Hebei Pro, P.R.China.
PostCode:071000
Sales direct line:0086-312-2197688 Fax:0086-312-2197680
Service direct line:0086-312-2197682
http://www.gwm.com.cn

Version number: 1-09.12-1



improving little by little everyday

Great Wall Motor Company Limited

Add:2266 Chaoyang South Avenue, Baoding City, Hebei Pro, P.R.China.
PostCode:071000
Sales direct line:0086-312-2197688 Fax:0086-312-2197680
Service direct line:0086-312-2197682
http://www.gwm.com.cn

Version number: 1-08.03-1