



# MK Workshop Manual



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**GEELY INTERNATIONAL CORPORATION**

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**GEELY**

# **MK Service Manual**

**GEELY INTERNATIONAL CORPORATION**

# Foreword

Geely “ MK” series sedans (JL7132U,JL7132HU,JL7152U,JL7152HU,JL7162U) are brand new superior models developed by Geely Group who has fully proprietary intellectual property rights. As a result of the three years of involvements and efforts of the experts from Geely Automobile Research Institute, these sedans reach international leading level in model design, power, sense of comfort, safety and manufacturing technology while featured in beautiful appearance, economy, environment protection and safety. The meaning of MK implied that Geely Automobile has a great development from caterpillar to butterfly. With respect to the power, Geely “ MK” series sedans are equipped with 1.3L, 1.5L, and 1.6L EFI engines developed and manufactured by Geely itself, and has reached “ Chinese III” (Euro III) emission standard.

This manual contains a detailed description of the structures and principles, servicing and adjustment, removal, assembling technology and matching clearance of the parts of the Geely “ MK” sedans with torque information of the bolts and nuts as well as schematic diagram for special tool operation. This manual also introduces the transmission control system of the automatic transmission models, vehicle electric circuits and elaborates ABS system, SRS, BOSCH M7.9.7 electronic control fuel injection and ignition system, rear parking radar, sound, air conditioning and onboard hands-free phone system. You can refer to this manual for the information about the regular maintenance, servicing, adjustment, troubleshooting, removal and installation procedure, specific operations of the “ MK” sedans.

This manual covers the matching relation among the engine assembly, transmission assembly and the vehicle, but does not have the further description of the structures and principles of the engine and transmission assemblies and their servicing process. You can refer to the service manuals solely prepared for engine assembly and transmission assembly for these information.

All information in this manual is based on the latest products released at the time of publication of this manual. However, the specifications and procedures may need to be modified, and the subsequent change will be revealed in later versions.

This manual is prepared by Geely Automobile Research Institute under the assistance of technical staff from Zhejiang Geely Automobile Co., Ltd and Geely International Corporation. Readers discovering during the use of this manual the errors and careless omissions due to limited skills of the preparers and tight schedule are encouraged and pled to contact Geely International in time for our timely correction of the mistakes.

Geely International Corporation

Nov . 2007

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Attachment: Body Key Dimensions

Appendix: Torque Table of the Fasteners for Important Assembly

# Part 1 General Information

## Chapter 1 How to Use This Manual

### I. Instruction

#### 1. General Information

(1) This manual conforms to the first part of GB/T1.1--2000 Standardization Guide: The structure and preparing rule of the standard.

(2) Generally, the repairing job can be divided into the following 3 procedures:

1. Diagnosis
2. Removal and installation, replacement, disassembly and inspection, adjustment
3. Final inspection

(3) The first procedure "Diagnosis" (the details refer to each section or chapter) and second procedure "Removal and installation, replacement, disassembly and inspection, adjustment" are scattered in the chapters and sections, and this manual omits the third procedure "Final inspection".

(4) This manual does not include the following basic operations which are imperative in real scenarios.

- a. operate the jack or lifter
- b. clean the removed parts if necessary.
- c. inspect the appearance

#### 2. Preparation

SST (Special Service Tools) and SSM (Special Service Materials) may be required and correctly used based on the repairing condition, make sure the job procedure is followed.

#### 3. Repair Procedure

(1) The disassembly illustration is placed under the title.

(2) The illustration shows the disassembly of the parts to help you understand the assembly of the parts.

(3) Non-reusable parts need to be coated with grease, and the precoated parts and torque are specially shown in the disassembly illustration.

(4) Sometimes, the illustrations of the similar model are used where there may be some details differently from the actual vehicle.

(5) The operational procedure is described in the following ways:

- a. The illustration shows what to do and where to do it.
- b. The task heading tells what to do.
- c. The detailed text tells how to perform the task and gives other information such as specifications and warnings.

#### 4. Specification

Specifications are presented in bold type throughout the manual.

#### 5. Term Definition

Caution	indicates there is a possibility of injury to you or other people.
Notice	indicates the possibility of damage to the components being repaired.
Tip	provides additional information to help you perform the repair efficiently.

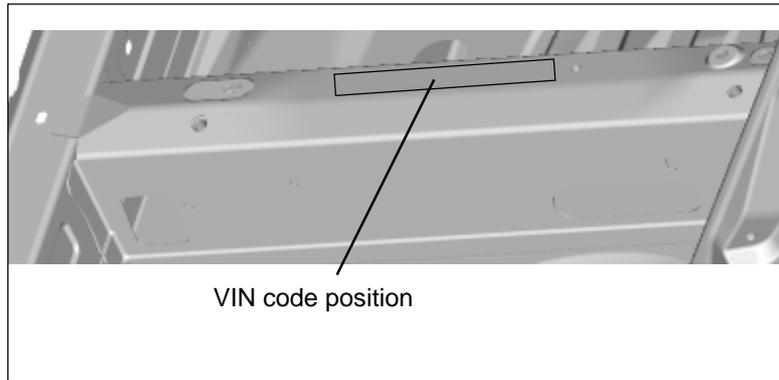
#### 6. International System of Unit

The Units given in this manual are primarily expressed according to the International System of Unit.

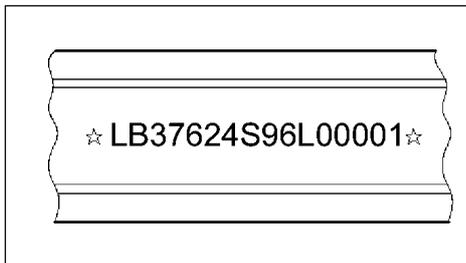
II. Vehicle Identification

1. Vehicle Identification Number (VIN):

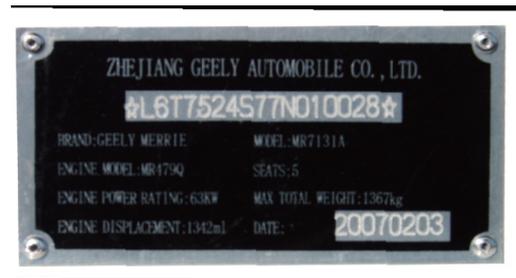
Vehicle Identification Number (VIN) is the legal identification of the vehicle which is printed on the middle of the engine compartment cowl (as shown in the illustration).



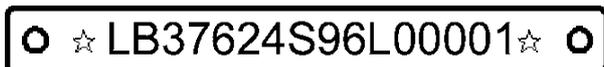
2. VIN Code



3. Ex-work Nameplate: on the middle of the engine compartment cowl

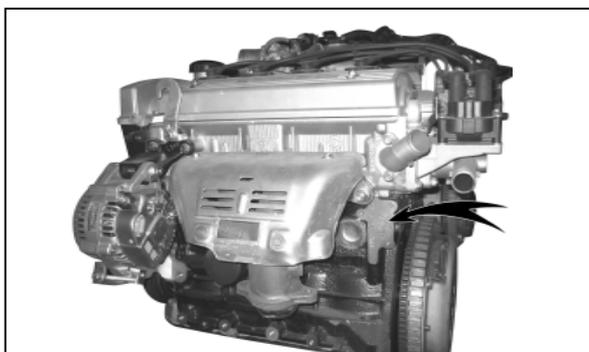


4. VIN Code: on the left lower corner of the front windshield.



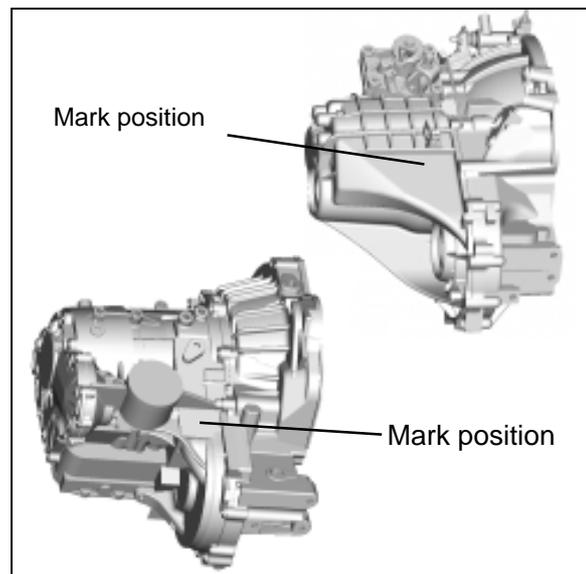
5. Engine Number:

marked on the engine block as shown in the illustration



6. Transmission Mark:

printed on the left side of the transmission

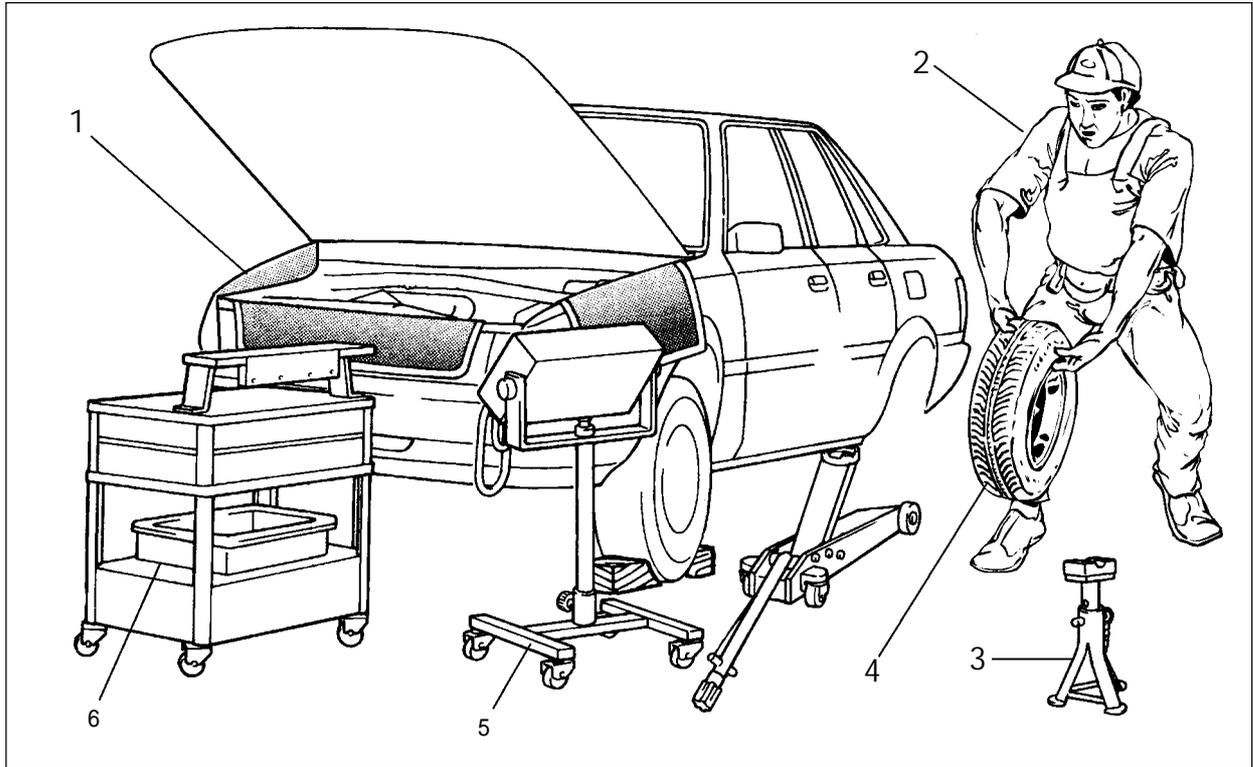


## Chapter 2 Repair Instruction

### I. Precautions

#### 1. Basic Repair Hint

##### (1) Operation Hint



Vehicle Protection	Before the work, place radiator fascia cloth, fender cloth, seat cover and mat.
Appearance	Always wear clean uniform Make sure to wear the helmet and safety shoe
Safe Operation	<ul style="list-style-type: none"> <li>● when more than 2 persons work together, be sure to pay mutual attention to the safety.</li> <li>● when it is required to run the engine, you have to pay attention to the ventilation of the workshop.</li> <li>● When handling the high-temperature, rotating, moving and vibrating parts, be careful not to be scalded or hurt.</li> <li>● When lifting the vehicle, safety stand should be used to support the specified position.</li> <li>● When lifting the vehicle, safety devices should be used.</li> </ul>
Removal and installation, disassemble and inspection	<ul style="list-style-type: none"> <li>● The diagnosis requires full understanding of the trouble and effective operation.</li> <li>● Before the parts are removed, check the assembly for distortion and damage.</li> <li>● The diagnosis requires full understanding of the trouble and effective operation.</li> <li>● Before the parts are removed, check the assembly for distortion and damage.</li> <li>● If the structure is complicated, notes or marks should made to avoid mistake and impact of the part function.</li> <li>● If needed, clean the removed parts and reassemble them after careful inspection.</li> </ul>
Prepare the tools and measuring instrument	● Before the work, prepare the tool fixture, special tools, instrument, oil, workshop cloth and required parts for replacement.
Removed parts	<ul style="list-style-type: none"> <li>● arrange the removed parts in correct sequence, do not confuse or contaminate them.</li> <li>● For non-reusable parts such as gasket, O ring and self-locking nut, replace them with new ones in accordance with the instruction described in this manual.</li> <li>● Pick up replaced parts, put them in the containers, and show them to the customers.</li> </ul>

(2)Lift and support the vehicle

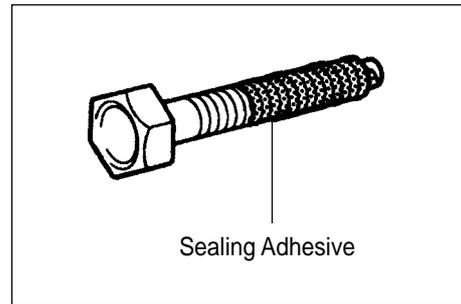
Be careful to lift and support the vehicle. Make sure that the vehicle is appropriately supported.

(3)Precoated Parts

a. Precoated parts are bolts, nuts, etc. that are coated with a seal lock adhesive at the factory.

b. If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

c. When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified sealing adhesive to the bolt, nut or threads.



Notice: the torque should achieve the lower limit of the allowed torque range.

d. The precoated parts should be kept intact for a period of time for induration based on the requirement of the sealing adhesive.

(4)Gasket

If necessary, apply the sealant to the gasket to prevent disclosure.

(5)Bolt, nut and screw

Be careful to follow all torque specification and torque wrench should be used.

(6)Fuse

When replacing fuses, be sure the new fuse has the correct amperage rating. Do not exceed the rating or use one with a lower rating.

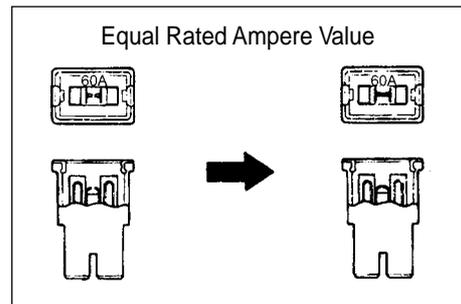


Illustration	Symbol	Part Name
		Fuse
		Medium Current Fuse
		High Current Fuse

(7)Clip

The following illustration shows the typical removal and installation of the clip for body parts.

Tip:

If the clip is damaged during the operation, you have to replace it with a new one.

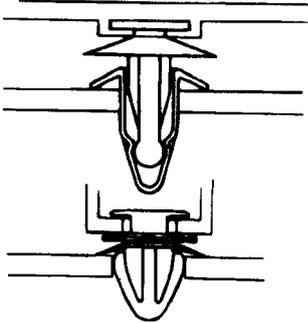
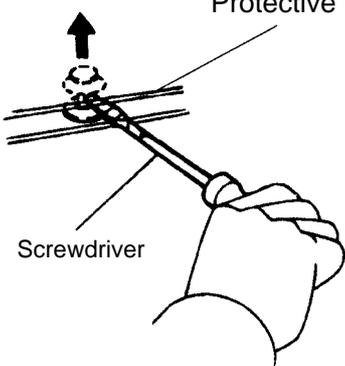
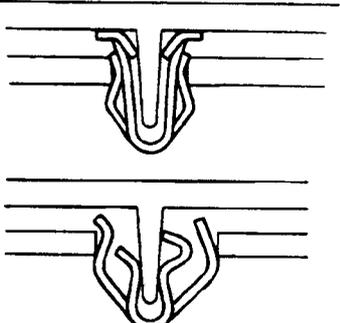
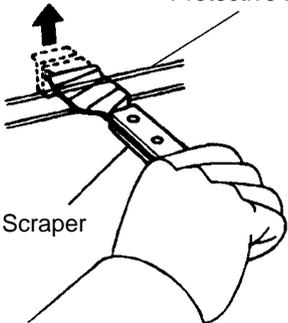
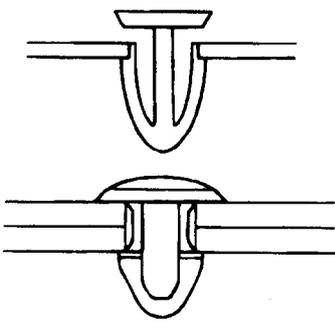
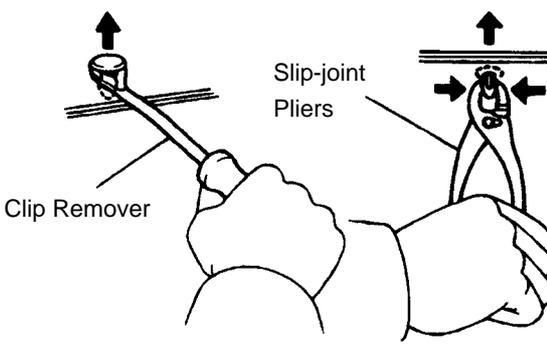
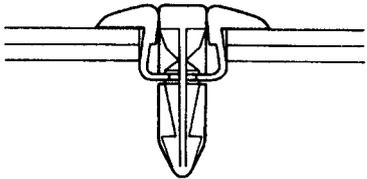
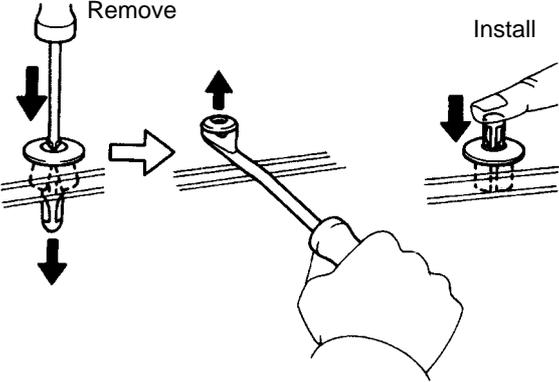
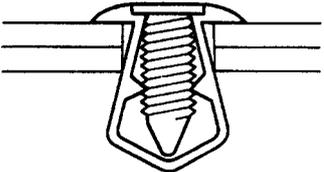
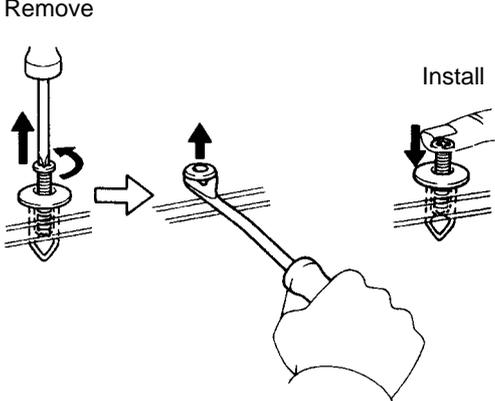
Illustration	Removal/installation
	 <p>Protective Band</p> <p>Screwdriver</p>
	 <p>Protective Band</p> <p>Scraper</p>
	 <p>Slip-joint Pliers</p> <p>Clip Remover</p>

Illustration	Removal/installation
	
	

## 2. For Vehicles Equipped With SRS Airbag and Seat Belt Pretensioner

Tip: This is equipped with an SRS (Supplemental Restraint System), such as the driver airbag assembly, front passenger airbag assembly airbag ECU and seat belt pretensioner. Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing, possibly leading to a serious accident. Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual.

### (1) General Notice

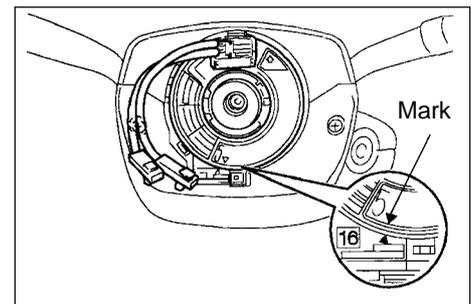
a. Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting. When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery.

b. Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery. (The supplemental restraint system is equipped with a back-up power source so that if work is started within 90 seconds of disconnecting the negative (-) terminal cable from the battery, the SRS may deploy.) When the negative (-) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by the each memory system. Then when work is finished, reset the clock and audio systems as before. To avoid erasing the memory of each memory system, never use a back-up power supply from another battery.

- c. Even in cases of a minor collision where the SRS does not deploy, the driver airbag assembly, front passenger airbag assembly and seat belt pretensioner should be inspected.
- d. Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
- e. Before repairs, remove the airbag ECU if shocks are likely to be applied to the sensor during repairs.
- f. Never disassemble and repair the airbag ECU assembly, driver airbag assembly, front passenger airbag assembly or seat belt pretensioner.
- g. If the airbag ECU assembly, driver airbag assembly, front passenger airbag assembly or seat belt pretensioner has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
- h. Do not directly expose the airbag ECU assembly, driver airbag assembly, front passenger airbag assembly or seat belt pretensioner to hot air or flames.
- i. Use a volt/ohmmeter with high impedance (10 k ohm/ V minimum) for troubleshooting of the electrical circuit.
- j. Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
- k. After work on the supplemental restraint system is completed, check the SRS warning light

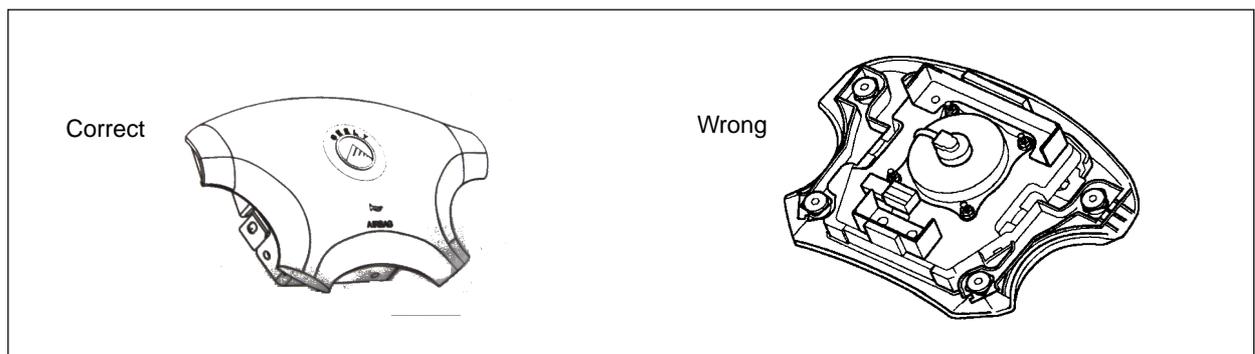
#### (2) Clock Spring (in combination switch)

The steering wheel must be fitted correctly to the steering column with the clock spring at the neutral position, otherwise clock spring disconnection and other troubles may result.



#### (3) Driver Airbag Assembly

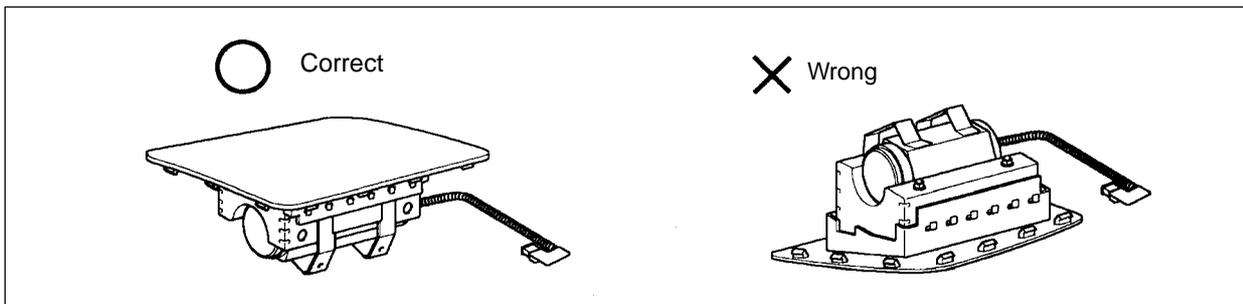
- a. When removing the driver airbag assembly or handling a new driver airbag assembly, it should be placed with the steering wheel top surface facing up. Storing the steering wheel with its top surface facing downward may lead to a serious accident if the airbag deploys for some reason. In addition do not store a driver airbag assembly on top of another one.
- b. Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)
- c. Grease should not be applied to the driver airbag assembly and the pad should not be cleaned with detergents of any kind.



- d. Store the driver airbag assembly where the ambient temperature remains below 93° C, without high humidity and away from electrical noise.
- e. When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the steering column near the combination switch connector before starting work.
- f. When disposing of a vehicle or the driver airbag assembly alone, the airbag should be deployed using an SST before disposal. Perform the operation in a safe place away from electrical noise.

#### (4) Front Passenger Airbag Assembly

- a. Always store a removed or new front passenger airbag assembly with the airbag rupture surface facing up. Storing the airbag assembly with the airbag rupture surface facing down could cause a serious accident if the airbag inflates.
- b. Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)
- c. Grease should not be applied to the front passenger airbag assembly and the airbag door should not be cleaned with detergents of any kind.
- d. Store the airbag assembly where the ambient temperature remains below 93° C, without high humidity and away from electrical noise.
- e. When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) installed on the assembly before starting work.
- f. When disposing of a vehicle or the airbag assembly alone, the airbag should be deployed using an SST before disposal. Perform the operation in a safe place away from electrical noise.



#### (5) Seat Belt Pretensioner

- a. Never measure the resistance of the seat belt pretensioner. (This may cause the seat belt pretensioner to activate, which is very dangerous.)
- b. Never disassemble the seat belt pretensioner.
- c. Never install the seat belt pretensioner in another vehicle.
- d. Store the seat belt pretensioner where the ambient temperature remains below 80° C and away from electrical noise without high humidity.
- e. When using electric welding, first disconnect the connector (yellow color and 2 pins) before starting work.
- f. When disposing of a vehicle or the seat belt pretensioner alone, the seat belt pretensioner should be activated before disposal. Perform the operation in a safe place away from electrical noise.
- g. The seat belt pretensioner is hot after activation, so let it cool down sufficiently before the disposal. However never apply water to the seat belt pretensioner.
- h. There should be no oil or water on the seat belt, no cleanser should be used to wash it.

## (6) Airbag ECU

- a. Never reuse the airbag ECU involved in a collision when the SRS has deployed.
- b. The connectors to the airbag sensor assembly should be connected or disconnected with the airbag ECU mounted on the floor. If the connectors are connected or disconnected while the airbag ECU is not mounted to the floor, it could cause undesired inflation of the supplemental restraint system.
- c. Work must be started after 60 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery, even if only loosening the set bolts of the airbag ECU.

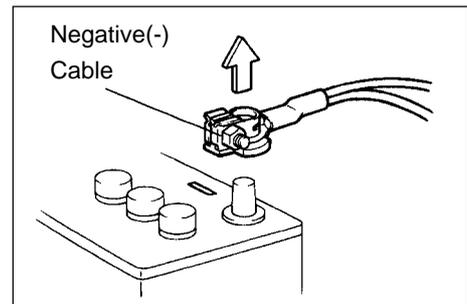
## (7) Wire Harness and Connector

The SRS wire harness is integrated with the instrument panel wire harness assembly. All the connectors in the system are a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it.

## 3. Electronic Control Device

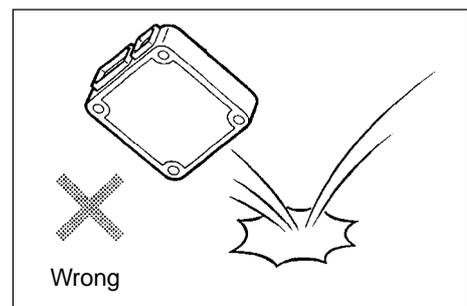
## (1) Removal of the battery terminal cable

- a. Before performing electrical servicing, disconnect the negative (-) cable from the battery in order to avoid short for burnout.
- b. When disconnecting the terminal cable, turn off the ignition and light switches, loosen the cable nut and raise the cable straight up without twisting or prying it.
- c. When disconnecting the terminal cable from the battery, all information stored in the clock, radio and DTC shall be deleted, therefore, these information shall be checked before disconnection.



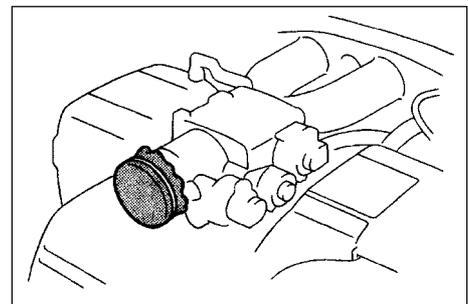
## (2) Processing of Electronic Parts

- a. Do not open the cover or case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)
- b. To pull apart electrical connectors, pull on the connector itself, not the wires.
- c. Be careful not to drop electrical components, such as ECU or relays. If they are dropped on a hard floor, they should be replaced and not reused.
- d. When steam cleaning an engine, protect the electronic components, air filter and emission-related components from water.
- e. Never use an impact wrench to remove or install temperature switches or temperature sensors.
- f. When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.



## 4. Remove and Installation of Engine Intake Parts

- (1) If any metal scrap is mixed in the inlet pass, that may give a bad effect to the engine.
- (2) When removing and installing of the inlet system parts, close



the opening of the removed inlet system parts and the engine with a clean shop rag or gum tape.

(3)When installing the inlet system parts, check that there is no mixing of a metal scrap.

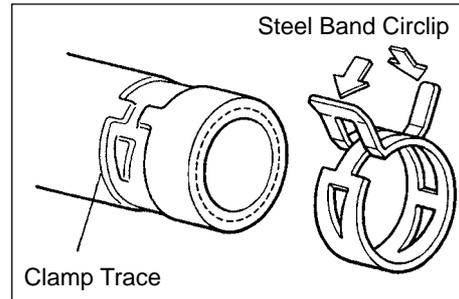
#### 5. Handling of Hose Clamp

(1)Before removing the hose, check the clamp position to re-tighten it for sure.

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

(3)In case of reusing the hose, install the clamp on the hose where it has a clamp track.

(4)For a steel band circlip, make it adjust by adding force to the arrow mark direction after the installation.



## II. Vehicle Lift and Support Location

### 1. Vehicle Conditions To Be Under Attention During Lift

(1)Generally speaking, when being lifted, the vehicle should be empty, do not lift the heavily loaded vehicles.

(2)When removing heavy parts such as engine and transmission, the center of gravity of the vehicle will move.

Place balance weight to prevent the vehicle from rolling or use special jack to support the vehicle.

### 2. Precautions for Use of Four-tappet Lift

(1)follow the safe operation instruction described in this manual.

(2)do not damage the tire or rim.

(3)use wheel stopper to retain the vehicle.

### 3. Precautions for Use of Jack and Safety Stand

(1)always use the wheel stoppers when performing servicing on level ground.

(2)use safety stand and rubber support as shown in the illustration.

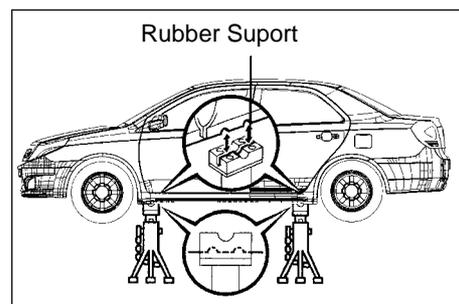
(3)use the jack and safety stand to support specified location.

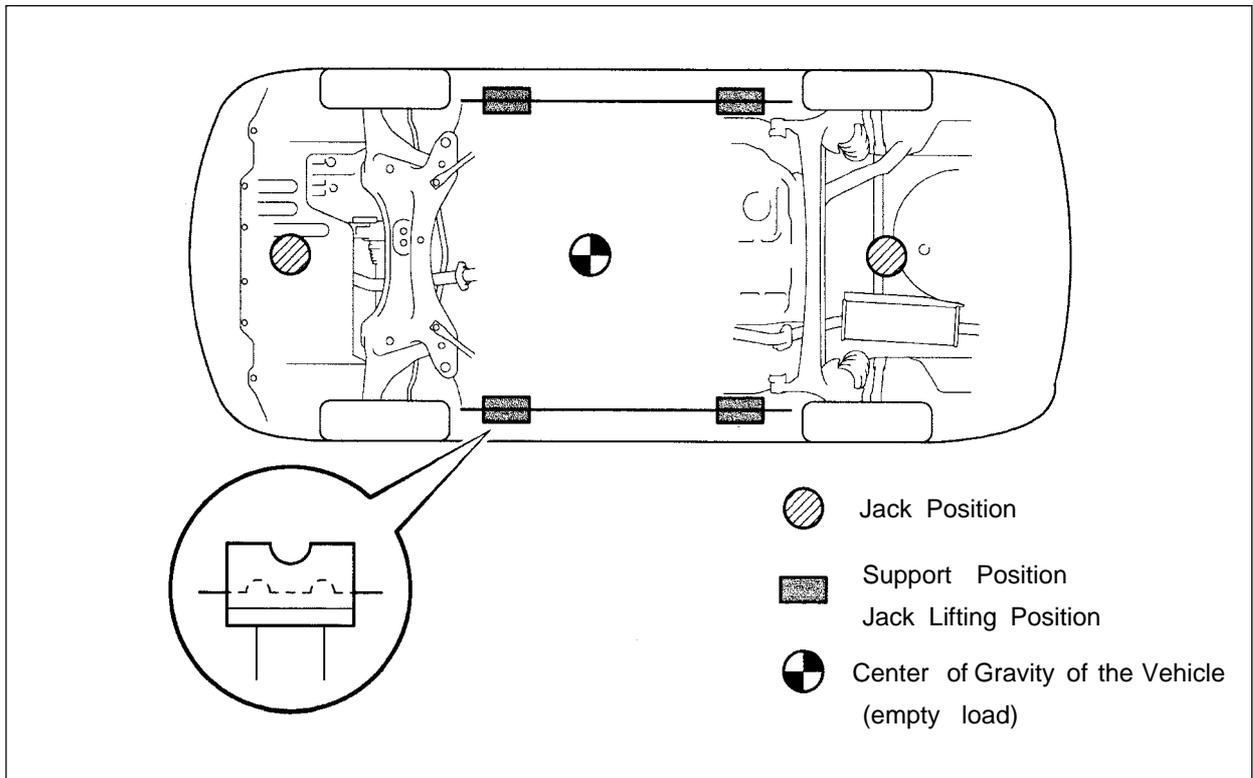
(4)When jacking up the front wheels of the vehicle, release the park brake and place stoppers only behind the rear wheels. When jacking up the rear wheels, place stoppers only before the front wheels.

(5)During the job, make sure to use safety stand instead of jack only to support the vehicle.

(6)When only jacking up the front wheels or rear wheels, place stoppers before or after the wheels touching the ground.

(7)when lowering the vehicle with its front wheels lifted, release the park brake, and place the stopper only before the rear wheels. When lowering the vehicle with its rear wheels lifted, place the stopper only after the front wheels.





4. Precautions for Use of Swing Arm Type Lift

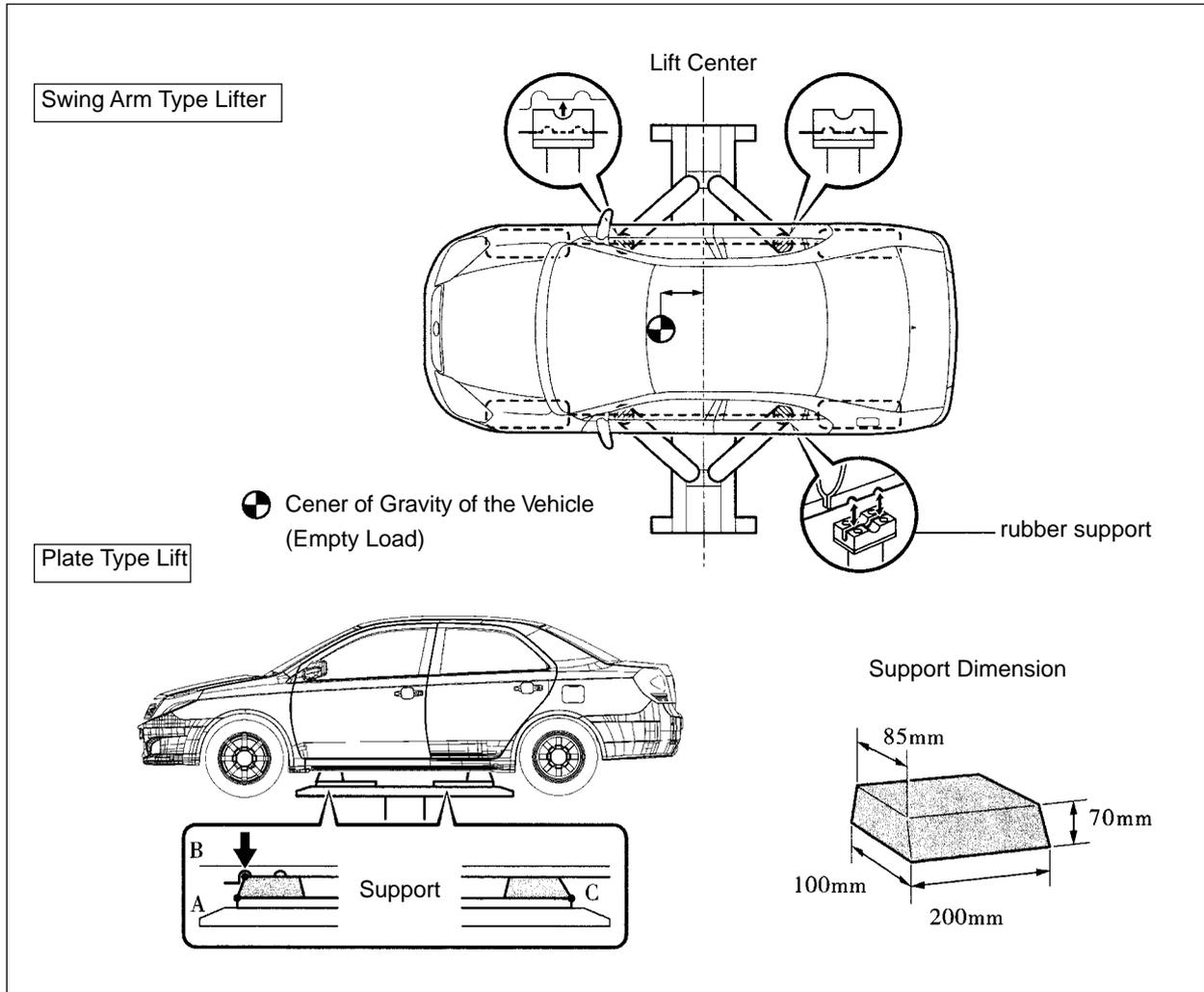
- (1) follow the safe operation instruction described in this manual.
- (2) use bracket with rubber support as shown in the illustration.
- (3) make the center of gravity of the vehicle as close as possible to that of the lift ("L" should be smaller).
- (4) adjust the bracker height, level the vehicle, align the groove of the bracket with the safety stand support location.
- (5) the arm should be locked during the job
- (6) lift the vehicle until the tires become round.Swing the vehicle to make sure of stable vehicle.

5. Precautions for Use of Plate Type Lift

- (1) follow the safe operation instruction described in this manual.
- (2) use the support of the plate type lift.
- (3) make sure to secure the vehicle in the specified position.

Left and right set position	<ul style="list-style-type: none"> <li>● Place the vehicle over the center of the lift.</li> </ul>
Front and rear set position	<ul style="list-style-type: none"> <li>● Align the cushion gum ends of the plate with the attachment lower ends (A, C).</li> <li>● Align the attachment upper end (B) with the front jack supporting point.</li> </ul>

(3) lift the vehicle until the tires become a little bit round. Swing the vehicle to make sure of stable vehicle.



## Part II Vehicle Usage and Maintenance

### Chapter 1 Brief Introduction of Geely MK

#### Section 1 Major Functional and Technical Data of MK Series.

##### I. Vehicle performance and structural data

Table 1 vehicle data

ID	Item		Unit	JL7132U	JL7152U	JL7162U	JL7132HU	JL7152HU		
1	Dimension	Dimension	Length	mm	4342					
			Width		1692					
			Height		1435					
		Axle	Front		1450					
			Rear		1431					
		Wheelbase	2502							
		Front Suspension	848							
		Rear suspension	992							
2	Number of passengers		person	5						
3	Weight	Curb weight		kg	1090(1040)			1080		
		Curb	Front Axle		660(640)			665		
			Rear Axle		430(400)			415		
		Gross Vehicle Weight	Vehicle		1460(1410)			1450(1455)		
			Front		780(760)			780(785)		
			Rear		680(650)			670		
4	Road adaptability	Minimum turning diameter		m	$\leq 10.4\text{m}$					
		Minimum Ground Clearance		mm	$\geq 150\text{mm}$					
		Approach angle		°	$\geq 15^\circ$					
		Deviation angle		°	$\geq 20^\circ$					
5	Wheel Positioning	Max turning angle of front wheel	Left: Inner/out	°	$37.2^\circ \pm 2^\circ / 32^\circ \pm 2^\circ$					
			Right: inner/out	°	$37.2^\circ \pm 2^\circ / 32^\circ \pm 2^\circ$					
		Front wheel leaning angle		°	$-0^\circ 30' \pm 45'$					
		Kingpin inward leaning angle		°	$10^\circ 0' \pm 45'$					
		Kingpin rearward leaning angle		°	$2^\circ 0' \pm 45'$					
		Left front wheel toe-in		mm	$1 \pm 2\text{m m}$					
Rear wheel outward		°	$-0^\circ 56' \pm 45'$							

## II. Introduction of major systems

Table 2 Models and technical data of major systems.

ID	Item Description		Unit	JL7132U	JL7152U	JL7162U	JL7132HU	JL7152HU
1	Drive Type			4 $\times$ 2 Front Wheel Drive				
2	Engine	Model		MR479Q	MR479QA	MR481QA	MR479Q	MR479QA
		Type		In-line 4 cylinder	In-line 4 cylinder	In-line 4 cylinder	In-line 4 cylinder	In-line 4 cylinder
		Bore Diameter	mm	78.7	78.7	81.0	78.7	78.7
		Piston play	mm	69.0	77.0	77.0	69.0	77.0
		Displacement	L	1.342	1.498	1.587	1.342	1.498
		Compression Ratio		9.3 : 1	9.8 : 1	9.6 : 1	9.3 : 1	9.8 : 1
		Max Power	kw/r/min	63/6000	69/6000	78.7/6000	63/6000	69/6000
		Max Torque	N·m/r/min	110/5200	128/3400	137/4400	110/5200	128/3400
		Idle Speed	r/min	800 $\pm$ 50	800 $\pm$ 50	800 $\pm$ 50	800 $\pm$ 50	800 $\pm$ 50
		Ignition Sequence		1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
		minimum fuel consumption rate	g/kw·h	259	279	269	259	279
3	Transmission	Model		JL-S160	JL-S160A		JL-Z110	JL-Z130
		1st gear		3.182			3.087	3.087
		2nd gear		1.895			1.634	1.634
		3rd gear		1.250			1	1
		4th gear		0.909			/	/
		5th gear		0.703			/	/
		Reverse gear		3.083			2.29	2.29
		Final Drive Ratio		4.308			3.317	3.317
4	Clutch Type			Single disc, Plate and dry Spring			/	
5	Steering type			Hydraulic Gear-rack				
6	Braking system	Model		Hydraulic, X-type pipe				
		Booster type		Vacuum booster, Front Wheel Disc, Rear Wheel Drum				
7	suspension	Front		McPherson suspension strut system				
		Rear		Twist beam independent suspension system				
8	Tire	Specification		85/60R15(1175/65R14)				
		Tire pressure	KPa	230(Front)/210(Rear)				
		Wheel		Aluminum 15X6J (Iron 14X5 1/2JJ)				
9	Fuel Tank Capacity		L	45				
10	Body structure			Unitary construction body				

Table 3 Power Performance Parameter

No.	Item Name	Unit	JL7132U	JL7152U	JL7162U	JL7132HU	JL7152HU
1	Maximum vehicle speed	km/h	≥ 155	≥ 165	≥ 175	≥ 155	≥ 165
2	Acceleration time within the fourth gear from 30km/h to 120km/h	s	≤ 33	≤ 30	≤ 28	/	/
3	Acceleration time from 0-100km/h	s	≤ 20	≤ 18	≤ 16.5	≤ 22	≤ 20
4	Minimum stable vehicle speed within the fourth gear	km/h	≤ 25			/	
5	Maximum gradeability	%	≥ 30				

Table 4 Economic Performance Parameter

No.	Item Name	Unit	JL7132U	JL7152U	JL7162U	JL7132HU	JL7152HU
1	Fuel consumption at constant speed (60km/h)	L/100km	≤ 4.5	≤ 4.6	≤ 4.7	≤ 5.0	≤ 5.1
2	Fuel consumption at constant speed (90km/h)	L/100km	≤ 6.2	≤ 6.2	≤ 6.3	≤ 6.6	≤ 6.7
3	Coasting distance (fully loaded, initial speed 50km/h)	m	≥ 550	≥ 550	≥ 550	≥ 550	≥ 550

## Section 2 Vehicle Configuration

No.	Item Name	Type	Standard	Comfortable	Luxury	
1	Body color	Common color	Chinese red, snow mountain white, pearl black, sky blue, ribbon silver			
2		Uncommon color	Crystal diamond silver, golden sand green, pineapple yellow			
3	Exterior device	Front chromeplated trim molding	●	●	●	
4		Diamond-shape headlight	●	●	●	
5		Crystal diamond taillight	●	●	●	
6		Highly penetrable front fog light	●	●	●	
7		Green heat insulating four-door glass			●	
8		Scuff strip with same color as that of the body	●	●	●	
9		Aluminum alloy wheel rim	●	●	●	
10		Tire (185/60R15) (with spare tire)	●	●	●	
11		Retractive antenna (A pillar)	●	●	●	
12		Bumper with same color as that of the body	●	●	●	
13		Light color (T)deep color(S)mixed color(R)interior trim		● / ● ●	● / ● ●	● / ● / ●
14		Central control panel		Firry red	Firry red	Titanium silver
15	A/C outlet vent + trim ring		●	●	●	
16	Chromeplated inner handle		●	●	●	
17	Sun shade (with ticket folder)		●	●	●	
18	High-grade flannelette	Seat	●	●		
	Luxury leather				●	
19	Front seat headrest front and rear angle/height adjustable function		●	●	●	

No.	Item Name	Type	Standard	Comfortable	Luxury
20	Interior device	Front seat back trash bag	●	●	●
21		6/4 split foldable rear seat	●	●	●
22		Cable-controlled oil tank cap	●	●	●
23		Cable-controlled trunk	●	●	●
24		plastic	Adjustable steering wheel	●	●
	leather				●
25	Electric device	Power window (with one-touch function)	●	●	●
26		Remote control central door lock	●	●	●
27		Power rearview mirror with turn signal light	●	●	●
28		Smart remote control key (control the closure of the door and window and the delay of the vehicle lights)	●	●	●
29		Adjustable intermittent wiper	●	●	●
30		On-board handsfree handset		●	●
31		Anti-clamp retractive power window			●
32		Central pointer type instrument	●	●	●
33		Temperature display	●	●	●
34		Hi-fi CD audio	Single Disc	Single Disc	6 Discs
35		MP3 function		●	
36		Speaker	6 speakers (2 Tweeters)	6 speakers (2 Tweeters)	6 speakers (2 Tweeters)
37		Freon-free A/C system	●	●	●
38		Air cleaner	●	●	●
39	Safety device	ABS + EBD	●	●	●
40		Driver side airbag	●	●	●
41		Front passenger side airbag	●	●	●
42		Telescopic steering column	●	●	●
43		Front seat belt pretensioner /height adjustable	●	●	●
44		Rear row triple-person seat belt	●	●	●
45		Anti-glaze inner rearview mirror	●	●	●
46		Anti-explosion and anti-leak plastic oil tank	●	●	●
47		Rear windshield defroster function	●	●	●
48		High-mounted stop light	●	●	●
49		Four-door anti-impact beam	●	●	●
50		Digital display rear parking radar		●	●
51		Follow me home light delay system	●	●	●

Remark: ● - denote standard configuration Z - standard C - comfortable D - luxury S - dark interior trim  
T - light colored interior trim R - mixed color

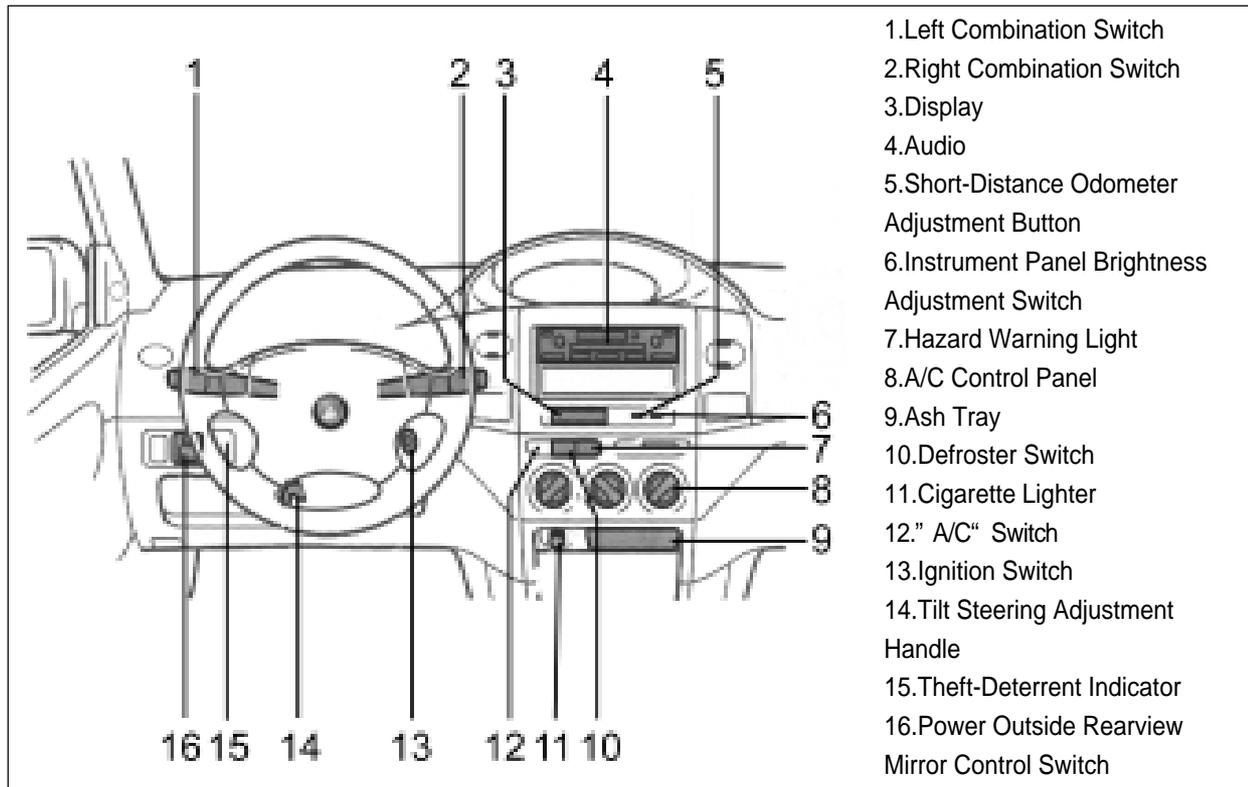
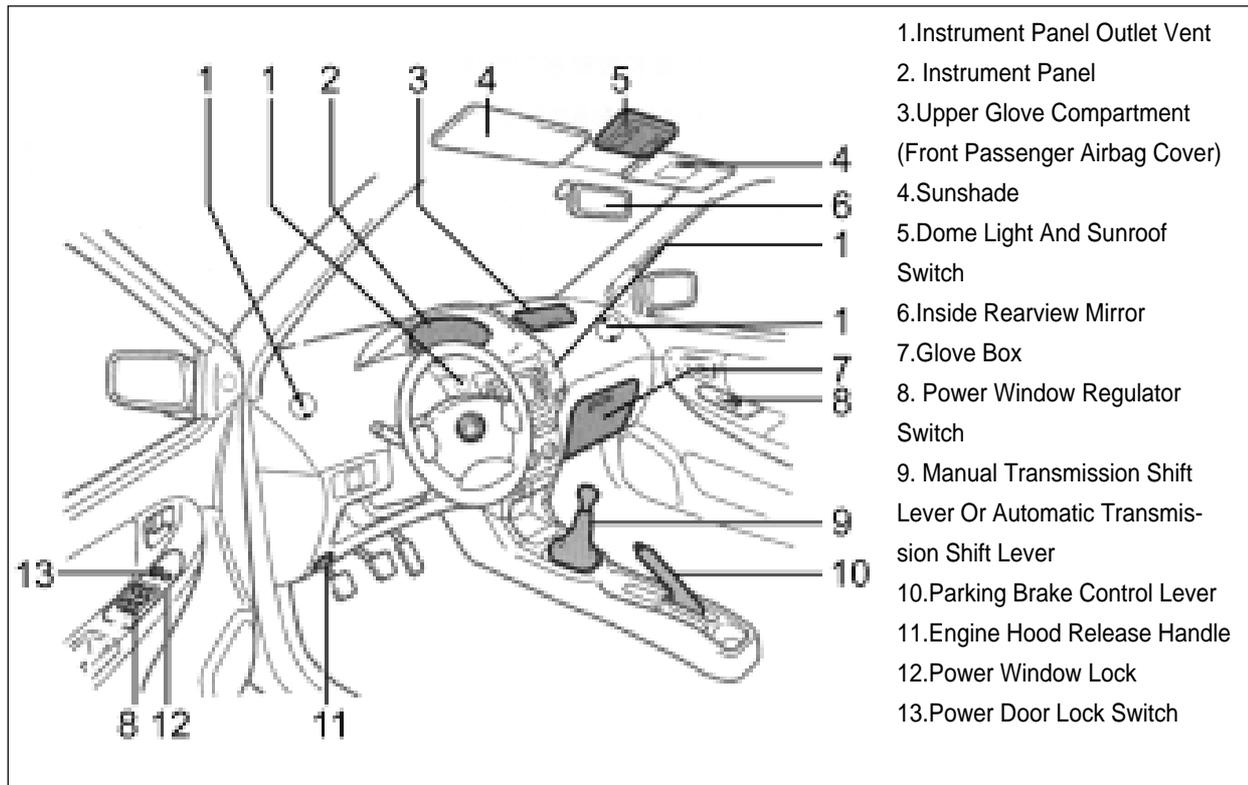
## Section 3 Main Vehicle Test Technical Specification

Item	Description	Specification
Inspection line items	Front wheel outward leaning angle	$-0^{\circ} 30' \pm 45'$
	Kingpin inward leaning angle	$10^{\circ} 0' \pm 45'$
	Kingpin rearward leaning angle	$2^{\circ} 0' \pm 45'$
	Left front wheel toe-in (mm)	$1 \pm 2$
	Rear wheel outward leaning angle	$-0^{\circ} 56' \pm 45'$
	% of braking total power vs. gross vehicle weight	$\geq 60\%$ (no load), $\geq 50\%$ (full load)
	% of front wheel braking power vs. front axle load	$\geq 60\%$ (no load, and full load)
	% of gap between left and right wheel brake power vs. the greater braking power of them two	$\leq 20\%$ (Front Axis), $\leq 24\%$ (Rear Axis)
	rolling resistance of each wheel should not be larger than the axle load by	5%
	parking brake total power should be lighter than the test vehicle weight by	20%
	sliding distance of front/rear wheels	$\leq 2$ m/km
	when vehicle speed meter shows 40km/h, vehicle speed monitor indicates	33.3Km/h-42.1Km/h
	brightness of left/right headlamps	$\geq 15000$ cd
	tolerance of close lamps is	(0.6-0.8)H, H refers to the central height of headlamps.
tolerance of distant lamps is	$\leq 10$ cm/10m	
Regular quality inspection items	Harsh brake at 50km/h. the stop distance is	$\leq 19$ m
	Rain test. 100 points is full mark. Minus one point for each seepage. Minus 3 points for slow seepage 3 points, and minus 6 for a quick seepage. The limit of vehicle sealing is	$\geq 93$ points
	Check leaks of the vehicle. When vehicle has run 50km, stop it and inspect for leaks. Check if there is oil/water marks at static joints, or if there is oil/water drops dripping down at dynamic joints 10min after the vehicle is stopped, there is a leak; if there is oil/water marks/drops, but it does not drip down, there is seepage.	Daily inspection and smell with nose
	Measure the temperature of transmission oil inspection hole. Usually it is not higher than ambient temperature.	70°C
	Check the surface temperature of wheel trim column. Usually it is no higher than ambient temperature.	40°C
	vehicle should be slightly steering insufficient i.e. driving on a circle with same steering wheel angle, and accelerate from low to high speed, the diameter of the circle increases gradually.	Inspect regularly
	Maximum front wheel turning angle (inner/outer)	$37.2^{\circ} \pm 2^{\circ} / 32^{\circ} \pm 2^{\circ}$
Emission	Specification: GB18352.3-2005	

# Chapter 2 Usage and Maintenance of MK Series

## Section 1 Usage of MK Series

### 1. Instrument Panel Overview



## 2. How to use ignition switch

(1) LOCK when key is at this position, it can be pulled out and inserted in easily. The function of this position is to lock steering wheel. If the key cannot be turned from LOCK to ACC, please rotate the steering wheel slightly while turning the ignition key.

(2) ACC radio and cigarette lighter is turned on when key is at this position.

(3) ON when key is at this position, the following indicator is on: battery charging, ABS, brake fluid level, park brake, engine coolant temperature, engine MIL, airbag oil pressure.

(4) START Turn the key to this position to start the engine. When engine is started, release the key immediately. It returns to ON automatically. When engine is on, do not turn the key to this position.

### Notice:

(1) Do not pull the key out or turn it to LOCK before the car is fully stopped, or there will be dangers caused by locking steering wheel or disabling some safety functions.

(2) It is prohibited to drive the car with engine turned off to ensure functioning of braking and steering booster.

(3) Do not let the key stay at ON for a long time when engine is off, or the battery fully discharged.

(4) Shift to neutral gear before ignition key is switched to START.

(5) Turn the steering wheel lightly after the car is fully stopped to make sure it is locked.

## 3. Unlock Steering Wheel

How to unlock steering wheel: insert ignition key, turn the steering wheel lightly and switch the ignition key.

Steering wheel is unlocked.

## 4. Adjust seat position

Seat back angle and cushion angle of front seats in MK-1 sedan can be adjusted.

### (1) Adjust seat back angle

Turn around adjusting handle, and adjust seat back to appropriate position.

### (2) Move seat forward or backward

Steps:

a. pull adjusting handler up

b. Move the seat forward or backward, and adjust the seat to appropriate position.

c. Put the handler down and move the seat again till it is locked.

Attention: adjust the seat only when the car is fully stopped to ensure safety.

### (3) Front head rest can be adjusted in two ways.

Push the head rest from back to front, there are three fixed positions to lock. If pushed over the final locking position, the head rest can return to the original position after hand withdraws.

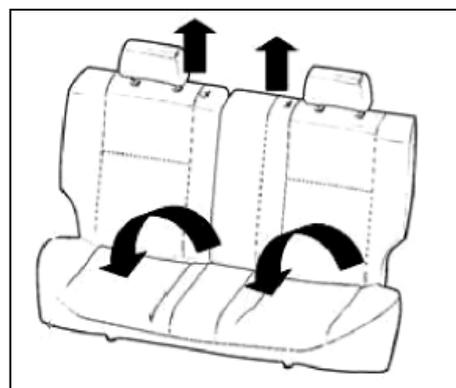
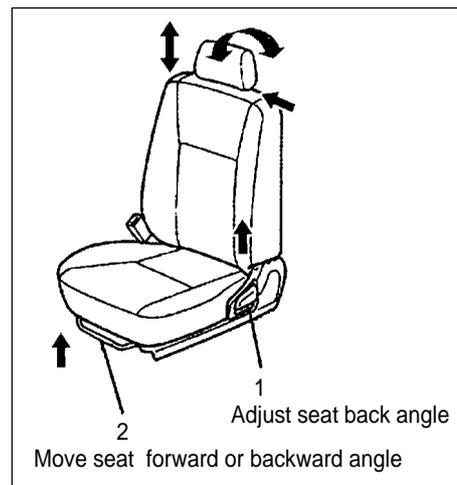
### (4) Fold Rear Row Seat

The seat back can be tilted forward so that the trunk will be used to the last degree.

a. Remove the head rest

b. Unlock the seatback and fold it down.

Split seatback can be folded separately on demand.



#### 5. Actions to ensure vehicle working condition and safe driving.

(1) To make sure of driving safety, execute the following inspections before driving.

- a. Inspect fuel level, and add fuel when necessary.
- b. Inspect illuminating lights, turning signal lights, braking signal lights to see if they work.
- c. Check the position of rearview mirrors.
- d. Check if breaking system functions well.
- e. Check if glass of all the lights, windshield is clean.

(2) Regular inspection Perform the following regular inspections to ensure the vehicle work condition and driving safety.

- a. Check engine oil level. Park the vehicle on flat road; check the oil level with engine oil level indicator at least 10 minutes after the engine is stopped. The oil level should be between the two marks. If it is lower than "L" mark, add some oil; if it is higher than "F" mark, there is excessive oil, so release it. Or investigate the cause of high oil level.

The volume between the lowest oil level ("L") and highest oil level ("F") is 1.4L.

- b. Check engine coolant level. Check the level when the engine is cool. The coolant level should be between LOW and FULL. If it is lower than "LOW", add coolant. If the coolant is much lower than Min (every coolant fill is more than 1L) or the vehicle requires frequent fills, investigate if there is any problem with the cooling system.

To keep the function of coolant, replace coolant every two years at the beginning of cold winter.

- c. Check brake and clutch fluid level (sharing a reservoir). Brake fluid level should between the Max and Min marks. And it is better to keep it close to the Max mark. Add fluid in time when there is not enough fluid.
- d. Check power steering fluid tank. The level should be between Max and Min marks. Refill when there is not enough steering fluid to avoid pump stuck. It is strictly prohibited to run the vehicle without steering fluid in any circumstances.
- e. Check the charging status of battery and if the connection of battery wires is good.
- f. Check tire status and pressure
- g. Check the status of wipers.

(3) Observe warning lights and indicators on instrument panel.

- a. There are various warning lights and indicators on the instrument panel of MK-1 sedans to indicate and warn abnormal operations of engine, braking, and charging systems.
- b. Pay attention to these lights when driving. When the warning lights or indicators are on, stop the vehicle, check the vehicle and resolve the causes to make sure the vehicle works well or drives safely.

#### 6. Correct ways to use new cars

Reliability and stability of components in new cars and recently repaired cars still need to be confirmed, and relative parts are not broken-in, so they must be used carefully to ensure driving safety, to avoid abnormal damage, and to extend the useful life of the car.

(1) Before driving inspection The following inspections must be performed on the new car to ensure car safety and reliable operation:

- a. Check if instrument panel, warning lights, and indicator, front and rear wiper and washer, and switches work.
- b. Check if the fastening of driveline, steering, suspension, wheels and other connection parts is good.

- c. Check levels of braking fluid, engine coolant, engine oil, transmission oil, power steering fluid, and washing fluid to see if there is any leaking.
- d. Inspect if brake pedal, clutch pedal, accelerator pedal, transmission shifter, steering wheel, choke are loose or stuck. The free travel of clutch pedal is 5~15mm, the free travel of brake pedal is 1~6mm and the free play of steering wheel is less than 30mm(measurement point at margin of steering wheel). if it is out of this normal range, the clutch needs to be tuned.
- e. Inspect if the connection of battery, lamps and signal lights are normal, and if the wire routing and position are correct and not loose.
- f. Inspect if the tire pressure is correct.

(2) On-road inspection If the inspection result of the above items is good, start the engine and test the car on road, and perform the following inspections.

- a. Acceleration pedal, see if the operation is smooth and if it is loose.
- b. Clutch, see if there is any stuck or abnormal noise, and slip when driving.
- c. Transmission, check if shifting is smooth, or rough and wrong shifting. Inspect if the display of A/T shift lever is normal.
- d. Steering, check if steering is light and smooth, and if the steering wheel turns back after steering.
- e. Brake pedal, apply brake pedal to check if the braking functions well when vehicle speed is at 40km/h and if the vehicle runs off track.
- f. Park brake, when parking brake handler is pulled, there should be 6~9 clicking sounds. Pull park brake when vehicle is running at the speed of 20km/h and transmission is at neutral gear to see if it brakes.
- g. Vehicle speed meter, observe the vehicle speed meter while driving. When speed changes, check if the indicator is moving steadily or shakes.
- h. Heating and air-conditioning. Try every control button to see if both heating and cooling system work well.
- i. Abnormal noise, listen carefully to see if there is any abnormal noise from engine, drive line system or any other parts of the vehicle at a steady speed and during accelerating, and decelerating.

(3) Inspection after test ride check if there is anything abnormal in the vehicle while driving and conduct the following inspections after the vehicle is parked.

- a. Check electrical fan When engine coolant temperature is beyond 92.5° C, the radiator fan should be running; When A/C is on and the pressure of refrigerant is more than 1.5 cooling ton, air conditioning cooling fan should be running.
- b. Check headlamp, method: park the car 5m away from the inspection surface (inspection board, curtain, or wall) to the front bumper, and check if the beam from headlamp is good. The upper level of headlamp should be 540mm above the ground, and the distance between headlamps on the two sides is 900mm.
- c. Inspect engine idle speed, idle speed of hot engine is 800r/min± 50r/min, when A/C compressor works, the idle speed should be 900r/min± 50r/min. If idle speed is abnormal, adjust the idle speed adjustment screw to adjust it.

(4) Usage of new cars in breaking-in period Follow the instructions below in the first 1500~2500km breaking mileage to avoid wear and abnormal damage in breaking-in period, and to improve vehicle performance, fuel economy and to extend vehicle useful life.

- a. Drive steadily during breaking-in; do not accelerate harshly to avoid running engine at high speed. Engine should not exceed 4500r/min in any gears. Especially at the early stage of breaking-in, vehicle

must be running at medium speed without load. Increase the speed and load gradually with the accumulation of breaking-in mileage.

- b. Because the brake plate is not broken in on a new vehicle, in order to ensure safety and reduce wear, avoid harsh brake, and brake for multiple times to break in the brake plate faster.
- c. It is better to avoid driving vehicle on steep roads or in bad conditions during breaking-in period.
- d. Pay special attention to engine coolant temperature meter and oil pressure meter. Check engine oil level frequently and make sure engine works in normal temperature and good lubrication.
- e. Maintain the vehicle strictly according to first-time maintenance requirements to bring the vehicle into normal usage life under good condition.

#### 7. vehicle towing

There are towing facilities both in the front and rear end of MK-1 sedan for towing other vehicles and being towed.

To ensure safety, pay attention to the following instructions when towing.

- (1) Towing car Towing car should be started and shifted steadily. The speed should be no more than 40km/h.
- (2) Follow the instructions below when being towed:
  - a. Steering system of the vehicle being towed works well.
  - b. Braking system of the vehicle being towed works well or it cannot be towed with a rope and must be towed with the towing shaft instead.
  - c. Release park brake and shift the transmission to neutral gear when the vehicle is being towed.
  - d. Turn the ignition switch to ACC to allow turning signal lights, braking indicator to be turned on when necessary.
  - e. The towing rope must be tensioned in the towing process.
  - f. If the purpose of towing is to start the engine, shift the transmission to the 2nd or 3rd gear to increase engine speed. It is good for starting the engine.

#### 8. Instructions to save fuel when using the vehicle

(1) Reasonable load Do not store useless articles in luggage compartment because they consumes fuel for nothing.

(2) Correct driving style Instructions as follows:

- a. When engine is started, do not heat it but press the accelerator pedal slightly, drive the vehicle slowly and accelerate gradually.
- b. Shift to higher gears when driving to allow the engine to work at appropriate engine speed and avoid running the engine at low or high speed. The engine speed should be higher than 2500r/min when driving, and higher than 3000r/min when up-shifting.
- c. Keep the vehicle speed stable, and avoid harsh acceleration and frequent braking.
- d. Pay attention to vehicle speed. Drive at high speed results in excessive fuel consumption.

(3) Organize vehicle usage well Pay attention to the following two instructions.

- a. Organize vehicle usage time and avoid short trips. Because at the beginning when the vehicle is started (around 1km), the engine has not reached its efficiency point, and the fuel consumption doubles compared to regular.
- b. Select a good driving route, avoid driving through the city or blocks with heavy traffic.

(4) Keep the vehicle under good work condition Strictly follow instructions to maintain the vehicle to make sure the vehicle is under good technical working condition, and inspect and replace key parts that affect vehicle fuel consumptions. For example:

- a. Keep air filter clean, Block of air filter affects engine air induction efficiency and increases fuel consumption. So it must be cleaned and replaced in time.
- b. Keep ignition system under good work condition. Bad connection or electricity leak of ignition coil and power distributor or inappropriate gap or carbon residue of spark plug decreases ignition power supply and efficiency, which leads to engine fuel consumption increase. So they need regular inspection and repair to keep their good work condition.
- c. Fuel feeding system works well. Often check if fuel feeder pipe leaks, and check if injectors and other parts perform well on regular basis (electrical injection engines).
- d. Keep regular tire pressure. If the tire pressure is not enough, vehicle rolling resistance increases and engine fuel consumption increases accordingly. So tire pressure must be checked on time (around once a week).

## Section 2 Maintenance Category and Content of MK Sedan

As the vehicle is being used, its technical performance changes as the mileage accumulates and being affected by various factors, which results in decrease of power, fuel economy, safety, and increase of emission pollutions, noise and incidents. So timely maintenance during vehicle usage eliminates potential risks and prevents incidents from happening, improves vehicle integrity and technical functionality, and prolongs useful life of the vehicle.

According to the vehicle technical requirements and usage history, maintenance of freedom Cruiser sedan can be classified into several categories.

### I. first time maintenance

First time maintenance is also called breaking-in maintenance. It is performed when the vehicle mileage has accumulated to 1500~2500km in breaking-in period. First time maintenance must be conducted at the appointed service shops. It includes:

1. Check if there is any leak in engine, transmission, and differential. Fix if there is any.
2. Replace engine oil filter, engine oil and ATF for A/T.
3. Check the level of engine coolant, braking fluid, windshield washing fluid, power steering fluid and if there is any leak. Refill if the level is too low and repair if there is any leak.
4. Check if there is any damage in triangle arm and ball joint, connection ball joint, triangle arm flexible hinge, or the ball joint is loose. If there is, fix or replace it.
5. Check if the drive shaft dust cover is damaged. If there is, replace it.
6. Check if there is any leak in steering mechanism, or front and rear absorber and fix it there is any.
7. Check the tire pressure, front 230kpa, and rear 210kpa.

### II. Regular maintenance

After first time maintenance, the vehicle is in regular usage life. During regular use, the vehicle needs to be maintained regularly according to the way it is used in.

1. Regular maintenance for vehicles used under extreme bad conditions. Any of the condition below is defined as extreme bad condition:

- (1) Frequent start.
- (2) Often drive the vehicle in dusty circumstances.
- (3) Drive the vehicle in hot areas (such as in summer in the south).
- (4) Often drive in cold areas (often runs short trips, engine temperate cannot reach regular work temperature).

Vehicles ran under extreme bad conditions need to be maintained every 5000km.

2. Regular maintenance for vehicles Vehicles that have not been through extreme bad conditions need to be maintained every 7500km.

Regular maintenance is required to be performed at Geely service shop, too.

List of parts that need to be replaced regularly is in table 1.

Maintenance timetable is in table2.

### III. Geely maintenance program

Geely recommends following Geely maintenance program.

The intervals of maintenance schedules are determined by mileage meter or time periods. Maintain the vehicle when either meets the schedule. For details, please refer to the schedule.

For servicing items whose deadlines have expired, they should be maintained at the same intervals as before. The intervals are recorded in maintenance schedule.

#### Rubber hoses

Used in cooling and heating system, braking and fuel-feeding systems should be inspected by qualified Geely technicians according to Geely maintenance schedule.

There are all very important maintenance items. Hoses must be replaced immediately should there be any aging or damage. Please pay attention, rubber hoses age as time goes by, and they may have problems of inflation, wear, or crack.

#### Special Tips

If the vehicle is driven under one or more of the following circumstances, the maintenance items should be carried out more frequently. See attached maintenance schedule.

#### A Road condition

1. drive on rough, muddy or skiddy roads
2. drive on dusty roads.

#### B driving condition

1. Repeat driving within 8km a few times, or when the outdoor temperature is below 0 degree centigrade.
2. Idle the car drive at a low speed for a long time, such as police car, taxi, or door to door delivery vehicles.
3. Continuously drive the car at high speed for more than 2 hours (80% of the max speed).

### IV. Regular inspections

#### 1. weekly schedule

- inspect engine oil level and cleanness
- inspect engine coolant level
- inspect brake fluid level
- inspect windshield wash fluid level
- inspect power steering fluid level

#### 2. monthly inspections

- inspect water pump belt
- inspect electrolyte level in battery
- inspect tire air pressure and wear
- inspect steering wheel
- inspect brake
- inspect acceleration pedal

#### 3. inspection when driving (low speed)

- inspect speed meter and water temperature
- check steering wheel power and if vehicle runs off-track
- check if the front wheels skid or swing
- inspect if brake functions or if the vehicle runs off-track when brake is functioning

#### 4. other inspection items

Eliminate problems immediately when there is anything abnormal

V. Table 1 List of parts to be replaced regularly

(Table 1)

System	Parts need to be replaced regularly		Intervals	
Braking System	1	Brake master cylinder cup valve and dust cover		Every 2 years (or as required)
	2	Brake master cylinder cup		Every 2 years (or as required)
	3	Brake hose		Every 2 years (or as required)
	4	Brake caliper valve		Every 4 years (or as required)
	5	Brake booster rubber		Every 2 years (or as required)
	6	Brake booster vacuum hose		Every 4 years (or as required)
	7	Brake fluid		Every 2 years, or 40000km (or as required)
Driveline	8	MT Transmission oil		Every 2 years, or 40000km (or as required)
	9	AT Transmission oil		Every 2 years, or 40000km (or as required)
Steering System	10	Steering fluid		Every 2 years, or 40000km (or as required)
A/C System	11	Air Cleaner		To be cleaned every 10,000km and changed every 30,000km (or as required)
Engine	12	Air cleaner filter		First 2500km or 2 months. Every 7500km or 6 months afterward (or as required)
	13	Lubricant	(API) SG or above	First 2500km or 2 months. Every 7500km or 6 months afterward (or as required)
	14	Oil filter		Every 5000km (or as required)
	15	Fuel filter		Every 40000km (or as required)
	16	Coolant		Every year (or as required)
	17	All hoses		Every 2 years (or as required)
	18	Canister		Every 60000km (or as required)
	19	Timing belt		Every 120000km (or as required)
	20	Wedge belt (including the power steering pump, air conditioner compressor and generator belts)		Every 50000km (or as required)
	21	PCV system		Every 20000km or 12 months (or as required)
22	Spark plug		Every 20000km (or as required)	

The intervals in the part list are for cars driven under normal condition. If the car is driven in special circumstances, the replacement can be advanced from the schedule above.

VI. Table 2 Maintenance Timetable of Geely Freedom Cruiser Sedan

Maintain the vehicle when either mileage or time has reached maintenance requirements. User should keep maintaining the vehicle to no less than 100000km. User can send the vehicle for inspection and repair in advance if it has been through special conditions.

○ .....Inspect ● .....Replace Table 2

System	Inspection item		X1000km	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75
			Year	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Steering System	Steering Wheel	Steering-wheel Play,Fastening and abnormal noise		○			○		○		○		○
		Operation		○			○		○		○		○
	Steering Gear	Oil Leak		○			○				○		
		Fastening					○				○		
	Steering Link and Joint	Fastening,abnormal noise and damage		○			○		○		○		○
		Steering link,joint,rack and dust boot crack and damage		○			○		○		○		○
	Knuckle	Abnormal noise at a joint					○				○		
	Front Wheel	Wheel adjustment		○	○		○				○		
Left and right rotation angle						○							
Drive line	Wheel	Tire pressure	○	○	○	○	○	○	○	○	○	○	○
		Tire crack and damage	○	○	○	○	○	○	○	○	○	○	○
		Tire thread and uneven wear	○	○	○	○	○	○	○	○	○	○	○
		Metal dust,stone and foreign material	○	○	○	○	○	○	○	○	○	○	○
		Loose hub nut and bolt		○			○		○		○		○
		Front wheel bearing abnormal noise					○				○		
		Rear wheel bearing abnormal noise					○				○		
Drive Train	Clutch	Free play	○	○	○	○	○	○	○	○	○	○	○
		Operation		○			○		○		○		○
	Manual Transmission	Oil leak and oil level		○			○		○		○		○
		Operation system abnormal noise					○				○		
		Replace oil					●				●		
	Automatic Transmission	Replace ATF					●				●		
		Oil leak and oil level		○			○		○		○		○
	Driveshaft	Joint fastening		○			○		○		○		○
		Universal joint,dust root crack and damage		○			○		○		○		○
		Spline abnormal noise					○				○		
Universal joint abnormal nosie						○				○			
Braking System	Brake Pedal	Free play and Function	○	○	○	○	○	○	○	○	○	○	○
		Function	○	○	○	○	○	○	○	○	○	○	○
	Parking Brake	Operating travel	○	○	○	○	○	○	○	○	○	○	○
		Function		○			○		○		○		○
		Parking brake cable fastening,abnormal noise and damage					○				○		

o .....Inspect ●.....Replace

System	Inspection item		X1000km	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	
			Year	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	
Braking System	Brake Booster	Brake reservoir level	o	o	o	o	o	o	o	o	o	o	o	
		Function				o					o			
	Master brake cylinder,brake cylinder and brakecalipel	Brake liquid leak	o	o		o		o			o		o	
		Function wear and damage				o					o			
	Brake Drum and Shoe	Clearance between brake drum and brake lining		o		o		o		o		o		o
		Brake shoe sliding part and brake lining wear		o		o		o		o		o		o
		Brake drum wear and damage				o					o			
	Brake Disc and Brake Lining	Brake lining wear		o		o		o			o		o	
Brake disc wear and damage					o					o				
Suspension System	Spring	Damage				o					o			
	Attachment and Joint	Fastening and damage of attachment				o					o			
		Abnormal noise at a joint				o					o			
	Suspension Arm and Shock Absorber	Noise from joint,damage to arm and shock absorber fluid leak and damage				o					o			
		Abnormal noise at fixture				o					o			
Electrical System	Ignition System	Spark plug working status	o	o	o	o	o	o	o	o	o	o	o	
		Lgnition time		o		o		o		o		o		
		Distributor air gap		o		o		o		o		o		
		Distributor cap condition		o		o		o		o		o		
	Battery	Connection		o		o		o		o		o		
	Wiring Harness and Clip	Fastening and damage of joints				o					o			
	Lighting	Function	o	o	o	o	o	o	o	o	o	o	o	
	Combined Instrument	Function		o		o		o		o		o		
	Horn,Wiper and Washer	Function		o		o		o		o		o		
Defrost and Power Door Lock	Function		o		o		o		o		o			
Engine	Engine General Status	Starting performance,abnormal noise, idle and acceleration		o		o		o		o		o		
		Valve clearance				o				o				
		Oil leak	o	o		o		o		o		o		
Body and Accessory	Door and Trunk Lock	Lock Function				o					o			
	Hood	Fastening abnormal noise and damage				o					o			
	Seat	Seat and seat belt status				o					o			
	Others	Lubrication		o		o		o		o		o		

VII . Additional maintenance schedule

Vehicles run in special circumstances require higher frequency of maintenance as listed below.

A-1: driving on bumpy, muddy or melted snow road.	
<ul style="list-style-type: none"> <li>o Inspection of the brake friction wafer and braking drum</li> <li>o Inspection of the braking pad and braking disc</li> <li>o Inspection of the brake piping and hose</li>   <li>o Inspection of the transmit shaft ball and joint and dust shield</li> <li>o Inspection of the drive shaft cover</li> <li>o Inspection of the steering wheel, connecting rod and steering gear box oil</li> <li>o Inspection of the front and rear suspension devices</li> <li>o Screwing down the bolts and nuts of the chassis and vehicle body</li> </ul>	<p>Every 10,000 km (kilometer) or every 6 months</p> <p>Every 5,000km (kilometer) or every 3 months</p> <p>Driving for 1000 km (kilometer) for the first time and then every 10,000 km or every 6 months</p> <p>Every 10,000 km (kilometer) or every 6 months</p> <p>Every 10,000 km (kilometer) or every 12 months</p> <p>Every 5,000km (kilometer) or every 3 months</p> <p>Every 10,000 km (kilometer) or every 6 months</p> <p>Every 10,000 km (kilometer) or every 6 months</p>
A-2: driving on dusty road	
<ul style="list-style-type: none"> <li>o Replacement of engine oil</li> <li>o Replacement of engine oil filter</li> <li>o Inspection and replacement of air filter</li> <li>o Inspection of the brake friction wafer and braking drum</li> <li>o Inspection of the braking pad and braking disc</li> <li>o Replacement of the air conditioner filter</li> </ul>	<p>Every 5,000km (kilometer) or every 6 months</p> <p>Every 5,000km (kilometer) or every 6 months</p> <p>Every 2,500km (kilometer) or every 3 months</p> <p>Every 10,000 km (kilometer) or every 6 months</p> <p>Every 5,000km (kilometer) or every 3 months</p> <p>Every 10,000km (kilometer)</p>
B-1: repeated short-distance driving and outer air temperature under zero within 8km (kilometer)	
<ul style="list-style-type: none"> <li>o Replacement of engine oil</li> <li>o Replacement of engine oil filter</li> </ul>	<p>Every 2,500km (kilometer) or every 3 months</p> <p>Every 5,000km (kilometer) or every 6 months</p>
B-2: long-term empty run and / or long-distance driving with low speed, such as police wagon, taxi or automobile delivering goods to the customers etc	
<ul style="list-style-type: none"> <li>o Inspection of the brake friction wafer and braking drum</li> <li>o Inspection of the braking pad and braking disc</li> </ul>	<p>Every 10,000 km (kilometer) or every 6 months</p> <p>Every 5,000km (kilometer) or every 3 months</p>
B-3: continuous high-speed driving for more than 2 hours (80% of the maximum vehicle speed or above)	
<ul style="list-style-type: none"> <li>o Replacement of driving axle oil of the manual transmission</li> <li>o Inspection or replacement of the driving axle fluid of the automatic transmission</li> </ul>	<p>Every 40,000km (kilometer) or every 48 months</p> <p>Every 40,000km (kilometer) or every 24 months</p>

## Section 3 Daily Maintenance of MK Sedan

Daily maintenance means operation of vehicle regular inspection, cleaning, fastening, and refilling according to vehicle usage and condition on the basis of regular maintenance to make sure the vehicle is at good status. Daily maintenance can be performed by driver or professional automotive mechanics in daily use of vehicle. But some of the items must be conducted by professional mechanics at service shops.

### 1. Maintenance of air cleaner

Air cleaner filters the air that is coming into engine for the first time. Dust and other dirt filtered out gathers in the induction tube. Air cleaner filters a lot of dust and dirty, so it must be cleaned in time.

### 2. Maintenance of air filter

Air filter does not only filter the dust and dirt in the air, but also keeps smooth ventilation. Its status has great effects on the fuel economy and power of the engine, so it must be checked and maintained in time.

Before it is time to replace air filter, maintain it. Remove the filter, knock it with hand or stick to get rid of dust on the filter and remove dirt inside the filter cover according to the cleanness of the road that the vehicle usually runs on.

**ATTENTION:** do not clean the filter with wet cloth. Fasten the filter well when installing it back.

### 3. Maintenance of battery

Battery is used to start the vehicle and supply power to electrical facilities. Its status directly affects the regular usage of the vehicle, especially for vehicles equipped with electrical controlled facilities. Keeping the battery in good technical status and connections is especially important. It is necessary to often perform the following inspections and maintenance in regular usage:

(1) Clean the outside of battery Inspect if the battery case or cover surface is dirty or has dirt, oil, or other dirty things regularly. Clean it and keep the surface dry to avoid electrical leak caused by cover deformation.

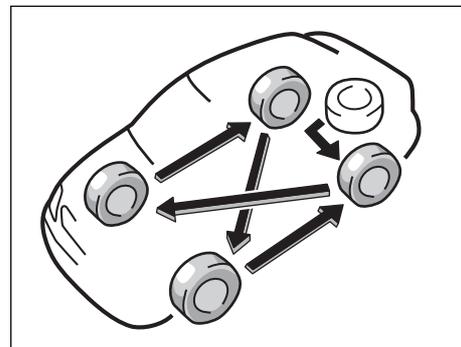
(2) Check battery connections Bad connection between battery electrode and cable results in low engine start speed which makes it difficult to start the vehicle or the vehicle cannot be started because of low output voltage from battery. Loose connection at battery end leads to damage of electrical components and loss of trouble code and other information stored in RAM of the computer system as a result of low voltage. Therefore, it is necessary to check if the connection of cables on the battery electrode is good. When it is found loose, it must be fastened. If there is any rust, the cables must be loosened, washed clean and be connected again.

### 4. Maintenance of tires and wheels

(1) Keeping tires and wheels under good condition is very important to vehicle fuel consumption and driving safety. Therefore, inspect and maintain the tires regularly. Every 10000 km, the wheels should be adjusted. Follow the sequence in picture 3:

Judge if there is any hidden problems in vehicle chassis mechanism by observing wear in different places, and finding out the hidden problems does not only help you to understand the technical status of the vehicle, but also benefits driving safety.

- a. Serious wear on both edges of tire tread, means tires often work with low tire pressure.
- b. Wear of middle of the tire tread is mainly because the tires are used with high tire pressure. This kind of wear shortens the useful life of tires, and may result in sudden flat tire when the vehicle runs on uneven road surface or meets any obstacles.



c. Wavy wear on the tread is related to its quality and positioning of the wheels. Find out the root cause and eliminate any problems.

d. Serious wear on the outer side beside the tread of steering wheels means the wheel outward leaning angle is too big; wear on the inner side beside the tread means the leaning angle is too small.

e. When the toe-in value is getting smaller, the wear on the outer side of tread is in shape of saws. On the contrary, when the inner side has the saw shape wear means the toe-in value is too big.

#### (2) Maintenance

a. Keep the tire pressure to specified value under any circumstances. Measure the pressure on cold tire

b. Check tire pressure regularly, and remove any indented objects that may stick through the tires.

c. Avoid oil, gasoline, and brake fluid on tires.

d. When replaced with new tires, the wheels need to be balanced and adjusted again. Or the vehicle may shake when running at high speed and bear abnormal wear.

e. Do not mix tires of different structure, pattern, or brand on one vehicle.

#### (3) Tire specification and pressure

	Tire Specification	Tire Pressure (KPa)
Front Tire	185/60R15 84H or 175/65R14 82H	230
Rear Tire	185/60R15 84H or 175/65R14 82H	210

#### (4) Tire wear limits

When the wear limit mark on tire shows up as the tire wears, it must be replaced with new tires (wear limit mark indicates the thickness of tire pattern is 1.6mm).

#### 5. Maintenance of wiper and washer

Status of wiper and washer directly influences windshield and driver's view. So, pay attention to wipers and washers.

(1) Wiper Check if the wiper blade has any damage, deformation, which affects windshield wiping quality and if the wiper works well. If wiper blade does not wipe well or the wiper does not work well, fix or replace it in time.

(2) Washer Check washing fluid level in the tank, and refill when necessary. To get best washing effects, use specified washing fluid, refill slowly, and pay attention not to mix it with any dirt. Mix the washing fluid with some alcohol in winter to avoid freezing.

#### 6. inspect and adjust headlamp

Incorrect beam of the headlamps affects safety of driving in the dark. So they must be inspected regularly, and be adjusted when necessary.

#### 7. Maintenance of inside the vehicle

The major content of maintenance inside the vehicle is cleaning, to keep the vehicle clean and provide fresh and pleasant driving circumstance. The key points of indoor cleaning are:

(1) Ways to remove stains Get rid of dust before trying to remove stains, and then apply appropriate cleansing, and wipe the stains off with clean, soft, and not too wet cloth repeatedly.

(2) Cleansing It is better to remove stains on textile and man-made leather with hydro solvent made from soap fluid and surface active agent. Be careful to avoid using any cleansing because they may corrode the synthetic decoration materials more or less. Ball-pen and lipstick marks can be removed with alcohol, grease can be removed with low Ron value gasoline, and chocolate and sugar stains can be cleaned with ammonia spirit, asphalt must be cleaned with special cleansing.

(3) Long time exposure to sun damages interior. So it is better to use covers on upper seat backs, and rear separation board that are exposed to sun.

#### 8. Maintenance of body exterior

Body exterior is to keep body cleanness and brightness to give the impression of beauty and comfort, and to avoid rust and abnormal paint peeling off. The key points of body maintenances are:

##### (1) Wash body using the method below:

- a. Wash the dirty things off the body by pressurized water, and then clean the body with soft cloth or sponge from up to down.
- b. Dry body surface with good white cloth. Apply brake pedal several times when driving after the car is washed to get rid of water in braking system.
- c. Do not wipe the body when it is dry. Do not clean paint surface and glass with gasoline, coal oil, narkosid, strong lye or alcohol.

##### (2) Cleaning windshield glass

Do not use silicon-bronze radical products. To get better cleaning effects, use special glass cleanser.

##### (3) Cleaning asphalt on the body

Do not peel the asphalt off from body or bumper, but use special cleanser

##### (4) Paint

Scratches or slight damages can be fixed with special paint spray. It dries in the air.

##### (5) Cleaning exterior decoration parts and aluminum parts.

Wash with water with soap fluid or cleanser, and wash with clean water. To keep the gloss of painted surface, wax on the surface after it is dry.

(6) Polish and wax the body paint polishing and waxing keeps the body bright and pretty, and protects the paint as well.

- a. Polish in winter. Make sure the vehicle body is absolutely clean and dry before polishing, polish with fluid or milky wax.
- b. Vehicle body must be absolutely dry and clean before waxing. Use waxing tools (soft table tissue or smooth cotton cloth) to cover the body paint surface evenly with wax. Check if the vehicle body is covered by wax: spray some water onto the paint surface, if water drops are formed, that surface is waxed, otherwise, clean the surface and wax it again. Attention: do not wax under sun, or in cold weather.

#### Attention

- 1) When using high pressure washing machine, do not point the washing sprayer to transmission, steering mechanism and other rubber protection parts, or exterior decoration parts, roof welding lines, heat radiator or engine compartment.
- 2) The bottom of vehicle body is made of anti-corrosion material, and has been through anti-corrosion process. After the vehicle has been running frequently on roads de-frozen with salt for some time, clean engine compartment and lower part of vehicle body and take some protection actions.

# Part III Engine

## Chapter 1 Engine Assembly

Information about engine accessories in MK-1 Car Maintenance Manual deals with only that concerned with a complete car. Please refer to separated Maintenance Manual for information about the engine body. Engines concerned are MR479Q, MR479QA and MR481QA.

### Section 1 Engine Inspection

#### 1. Check the engine oil

- (1) Check the oil level.
- (2) Start the engine, and reach warm-up temperature.
- (3) Shut the engine down, wait for 3-5min, and check the oil level.
- (4) Check whether the oil level is in within the range marked by the scale; if it is lower than the limit (mark L), fill oil to mark F.
- (5) Keep the oil clean without any coolant or petrol mixed in and with appropriate viscosity.

#### 2. Change oil.

- (1) Start the engine. When normal temperature is reached, shut down the engine.
- (2) Open the oil cap, remove the oil drain plug, and drain the oil.
- (3) Tighten the oil drain plug to a specified torque 54N.m.
- (4) Fill fresh oil into the crank case with oil quantity 2.8L in case of the filter not changed, 3.0L in case of the filter changed and 3.5L in case of the dry filter.
- (5) Fit on the oil filling cap.
- (6) Start the engine.
- (7) Shut down the engine and check the oil quantity, and fill oil to the mark F on the oil scale if necessary.

#### 3. Replace the oil filter.

- (1) Remove the oil filter.
- (2) Before mounting the oil filter, apply a small quantity of engine oil to the O-ring of the new oil filter.
- (3) Tight the oil filter to a specified torque (12.7N.m).
- (4) Start the engine, and check whether there is any leakage
- (5) Shut down the engine, check the oil quantity and fill as required.

#### 4. Oil selection

Oil over PAI SG grade is preferred.

SAE10W-30 or SAE10W-40 is preferred, and ASE5W-30 is used in cold region in the winter.

Note: For the best effect and the greatest safety, it is advisable to use the following lubrication oil.

- a. Meet the requirements of API level.
- b. Select proper SAE viscosity rating within expected ambient temperature.

The lubrication oil that can not meet the requirements of SAE viscosity and API label at the same time is not allowed.

#### 5. Check the coolant.

- (1) After the engine is cooled down, remove the radiator cover.

(2) Make sure that the coolant level is above the neck of the radiator.

(3) Put the radiator cover in place, pressurize to 2.0Mpa, and keep the pressure for 1 minute unless the coolant leaks. (Mount a tester on the radiator cover, start the engine, and then shut down under a pressure 2.0Mpa).

(4) Check whether the coolant quantity in the dilatation can is between the mark "Low" and "Full".

(5) Check whether the radiator cover is clean; test whether the opening pressure of the main valve is 107.8KPa with a radiator cover tester. The minimum opening pressure is 58.5KPa.

6. Check the battery.

(1) The terminal voltage of the battery is 12.5-12.9V at 20° C, and charge when the voltage value is less than the specified value. Check whether the fusible cutout and the fuse are loose, corrosive or on.

7. Check the air filter.

(1) Whether the cover, the case or the element of the filter is distorted, corroded or damaged.

(2) Whether the air hose is damaged.

(3) Whether the air chamber is distorted or damaged.

(4) Whether the air filter element is blocked, polluted or damaged. If the filter element is blocked slightly, remove the dirt by blowing the element from above.

(5) Whether there is any pollutant or dirt on the air filter support.

8. Check the spark plug.

(1) Spark generation.

- a. Disconnect the coupling of the injector.
- b. Remove the spark plug from the secondary wire.
- c. Remove the spark plug.
- d. Connect the spark plug to the secondary wire.
- e. Ground the spark plug.
- f. Start the engine, and check whether spark is generated.

Prompt: The starting time is not more than 1-2s.

(2) Clean the spark plug: The air pressure is not greater than 588kp and the time is not more than 20s.

(3) Check whether the thread and the insulator of the spark plug are damaged. Replace if necessary.

(4) Check the electrode gap of the spark plug: 0.8±0.1mm for MR479Q and MR479QA; 1±0.05mm for MR481QA.

9. Check the driving belt.

Belt distortion (see Table 1):

Belt pressure: 98N

Table

	New belt mm	Used belt mm
Generator drive belt	7~9	11.5-13.5
Power steering belt	5~6	6~8
Air conditioner belt	6.5~7	8~9

Note:

- Check the belt distortion at the specified point (see Figure 1-1).
- When mounting a new belt, set the tensioning force to specified value.
- After the belt has been operated more than 5 minutes, check and ensure the distortion not exceeding specified value.

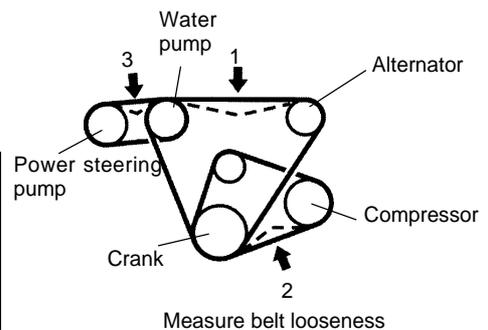


Figure 1-1

- After the belt is re-mounted and operates more than 5 minutes, check the distortion based on old belt distortion.
- Check the tensioning force and the distortion of the V-belt after the crankshaft of the engine has rotated 2 turns.

10. Check the ignition timing (see Figure 1-2).

- (1) Start the engine for warming up.
- (2) When using the portable tester:

Connect the portable tester to the fault diagnosis socket (DLC3).

Ignition timing:

$10^{\circ} \pm 20'$  before the top dead center when idling.

Prompt:

Please refer to the operating manual of the portable tester for detail.

- (3) When not using the portable tester:

a. Short the terminals 13(TC) and 4(CG) of the fault diagnosis socket(DLC3) with special service tool(SST).

Attention:

- Make sure to connect correctly, or else the engine can be damaged.
- Switch off all the electric systems.
- Check when the cooling fan motor is disconnected.

b. Check the ignition timing with a timing light.

Ignition timing:  $10^{\circ} \pm 20'$  before the top dead center when idling.

Note:

- (a) Check the ignition timing, and the transmission should be set to the neutral position.
- (b) Keep the engine speed at 1,000-1,300r/min for 5s and check when idling.
- (c) Remove the special tool on the fault diagnosis socket.
- (d) When the engine speed rises, the advance angle of ignition timing will increase.
- (e) Remove the timing light.

11. Check the engine idle (see Figure 1-3).

- (1) The engine warms up.
- (2) When using the portable tester: Connect the portable tester to the fault diagnosis socket (DLC3).

Tip: Please refer to the operating manual of the portable tester for detail.

- (3) When not using the portable tester:

Connect the test pen of the tachometer to the terminal 9(TAC) of the fault diagnosis socket (DLC3) with special tool (SST). (see Figure 1-3).

- (4) Check the idling speed:  $800 \pm 50$ r/min.

Attention:

- Check idle when the cooling fan motor is disconnected.
- Switch off all the electric accessories and air conditioners.

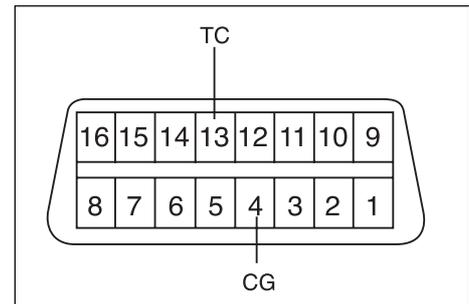


Figure 1-2

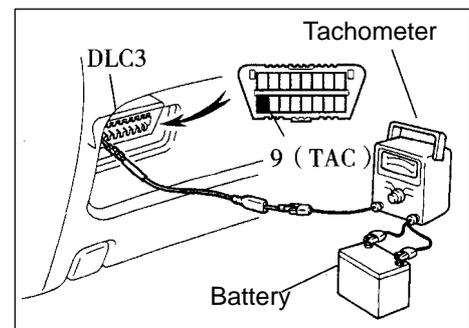


Figure 1-3

## 12. Check the compressing pressure (see Figure 1-4).

- (1) Warm up and switch off the engine.
- (2) Remove the secondary wire.
- (3) Remove the spark plug.
- (4) Check the compressing pressure in the cylinder.
  - a. Insert the pressure gauge into the spark plug bore.
  - b. Throttle widely opens.
  - c. Rotate the engine crankshaft and measure the compressing pressure (see Table 2).

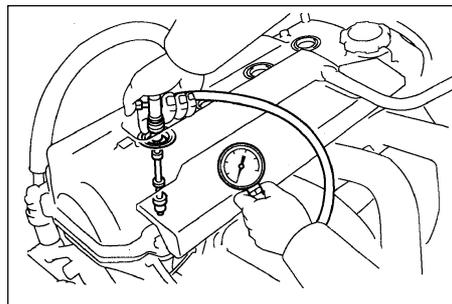


Figure 1-4

Table 2

Cylinder compressing pressure (KPa)	MR479Q	MR479QA	MR481QA
	1250	1320	1360
Pressure difference range of cylinders of this model (KPa)	100		
Minimum compressing pressure (KPa)	980		

## Attention:

- The electric quantity in the battery should be always enough, and the engine speed should be not less than 250r/min.
- Check the compressing pressure in other cylinders in the same way.
- Measure as soon as possible.

(5) If the compressing pressure in more than one cylinder is relatively low, fill a bit engine oil to the cylinder through the spark plug bore, and repeat step a to c to check.

## Tip:

- If the compressing pressure is increased after the oil is filled, the piston ring or the cylinder may be worn or damaged.
- If the pressure is still low, the valve may be jammed or badly sealed, or the washer may be leaked.

## 13. Check CO/HC.

- (1) Start the engine.
- (2) Keep the engine running at a speed of 2500 r/min for about 180s.
- (3) During idling, insert the test bar of CO/HC instrument into the exhaust pipe about 40cm depth at least.
- (4) Check the concentration of emission of CO/HC at idle speed and at a speed of 2500 r/min respectively.

## Tip:

- Measure within 3 minutes.
- Test the concentration of emission and lambda value of CO/HC at idle speed and at a speed of 2500 r/min respectively according to GB18352.3-2005 standard.

(5) If the concentration of CO/HC is not up to standard, carry out fault diagnosis by following the steps below.

- (1) Check oxygen sensor.
- (2) Refer to Table 3 to find possible causes, check and repair.

Table 3

CO	HC	Problems	Causes
Normal	High	Bad idle speed	1. Ignition fault: <ul style="list-style-type: none"> <li>● Incorrect ignition timing;</li> <li>● Dirt, short circuit, or incorrect spark plug gap.</li> </ul> 2. Incorrect valve gap.                     3. Suction and exhaust valve leak.                     4. Cylinder leaks.
Low	High	Bad idle speed (HC reading fluctuates)	1. Vacuum leaks. <ul style="list-style-type: none"> <li>● PCV pipe . manifold;</li> <li>● Idle speed control valve;</li> <li>● Brake booster pipeline.</li> </ul> 2. Spark lacks since the mixed gas is too thin.
High	High	Bad idle speed (Black smoke exhausts)	1. Air filter is blocked.                     2. PCV valve is blocked.                     3. EFI system fails. <ul style="list-style-type: none"> <li>● ECU fails.</li> <li>● Pressure regulator of fuel oil is out of order.</li> <li>● Water temperature sensor does not work.</li> <li>● Suction pressure/temperature sensor fails.</li> <li>● Injector fails.</li> <li>● The throttle position sensor fails.</li> </ul>

## Section 2 Removal of the Engine Assembly from the Vehicle

1. Avoid petrol overflowing (Disconnect from the fuel tank).
2. Remove the front wheel.
3. Discharge the coolant completely.
4. Remove the air filter assembly with hose (see Figure 1-5).
  - (1) Disconnect the joint of the temperature sensor and the wire plug.
  - (2) Disconnect the vent duct from the hose of the air filter.
  - (3) Release the wire clip bolt on the air filter.
  - (4) Disconnect the hose of the air filter from the throttle body.
  - (5) Remove 3 bolts and the air filter assemblies.
5. Remove the battery.
6. Remove the fuel pipe sub-assembly.
7. Disconnect the water pipe; disconnect the water outlet pipe of the heater from the air conditioner pipe.
8. Release the nut and remove the accelerator control cable.

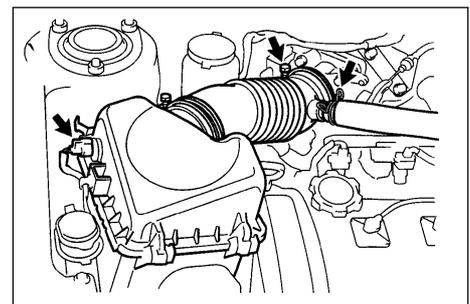


Figure 1-5

9. Remove the oil tank assembly of the power steering pump (with power steering).
10. Remove the radiator assembly.
11. Disconnect the harness.
12. Disengage the steering column assembly.

13. Disengage No.2 steering countershaft assembly (see Figure 1-6).

Remove the cover sheet of the steering column on the car body.

14. Remove the exhaust pipe assembly in the front.
15. Remove the nut on the front hub (Parts on the other side are disassembled in the same way).
16. Disconnect the speed sensor on the front wheel (with ABS).
17. Disengage the ball assembly of the steering tie rod.
18. Disengage the front suspension arm sub-assembly.

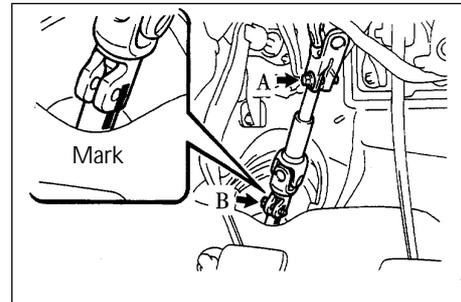


Figure 1-6

19. Disengage the front drive shaft assembly (see Figure 1-7).
20. Disengage the front drive shaft from the hub with a plastic hammer.
21. Disconnect the shift cable or the tie-rod assembly of the transmission.
22. Disconnect the clutch wheel cylinder assembly or the clutch cable (M/T).

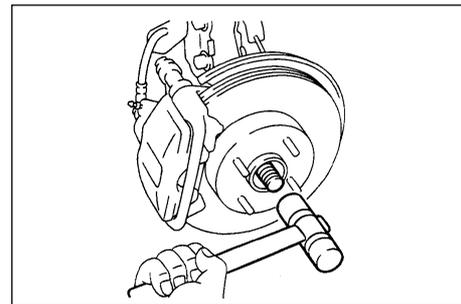


Figure 1-7

23. Remove the engine assembly together with the drive bridge:
  - (1) Hoist the engine a bit with lifting equipment;
  - (2) Remove 2 bolts, and disengage the right support of the engine (see Figure 1-8);
  - (3) Remove 2 bolts, and disengage the left support of the engine;
  - (4) Remove one bolt, 3 nuts and disengage the rear support of the engine;
  - (5) Remove the engine together with the drive bridge and place them on the floor;
  - (6) Lift the body.

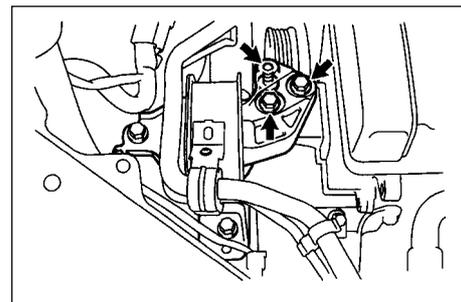


Figure 1-8

## Section 3 Drive Belt Replacement

1. Remove the V-belt of the generator (see Figure 1-9).

- (1) Release bolts A and B.
- (2) Release the bolt C and remove the V-belt.

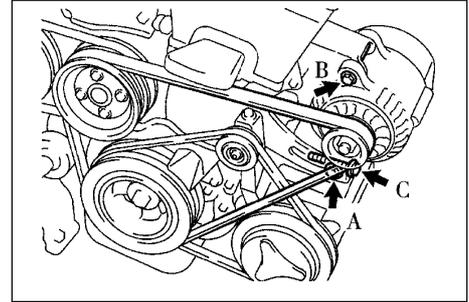


Figure 1-9

2. Remove the V-belt (from the air conditioner compressor to the crankshaft sheave (see Figure 1-10).

- (1) Release the nut A.
- (2) Release the bolt B, and remove the V-belt.

3. Remove the belt of the water pump.  
Release bolts A and B, and remove V-belt.

4. Mount the V-belt of the water pump.  
Mount the V-belt on the sheave briefly.

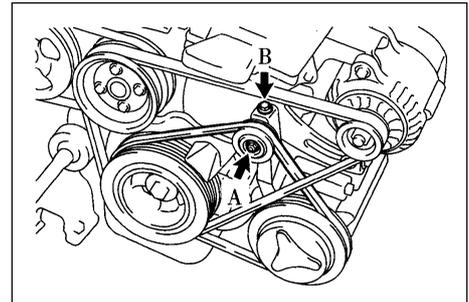


Figure 1-10

5. Adjust the V-belt of the steering pump (see Figure 1-11).

- (1) Adjust the tension of the power steering belt, and fasten the bolt B.
- (2) Fasten the bolt A.  
Torque: 39N.m

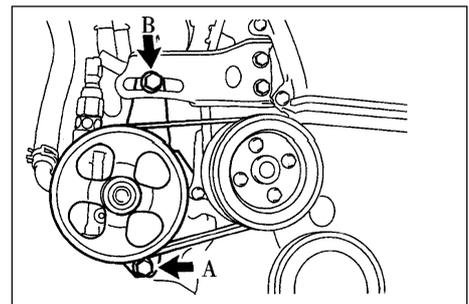


Figure 1-11

6. Mount No.1 V-belt (from the air conditioner compressor to the crankshaft sheave). (See Figure 1-10).

7. Adjust No.1 V-belt (from the air conditioner compressor to the crankshaft sheave).

- (1) Adjust the tension of the belt of the air conditioner by fastening the bolt B.
- (2) Fasten the nut A. Torque: 39N.m.

8. Mount the V-belt of the generator (see Figure 1-9).

9. Adjust the V-belt of the generator.

- Fasten the bolt A, and then the bolt B.  
Torque: 18N.m for bolt A, 58N.m for bolt B.

10. Check distortion and tension of the driving belt.

# Chapter 2 Engine Mechanical

## Section 1 Engine Components

### Component View

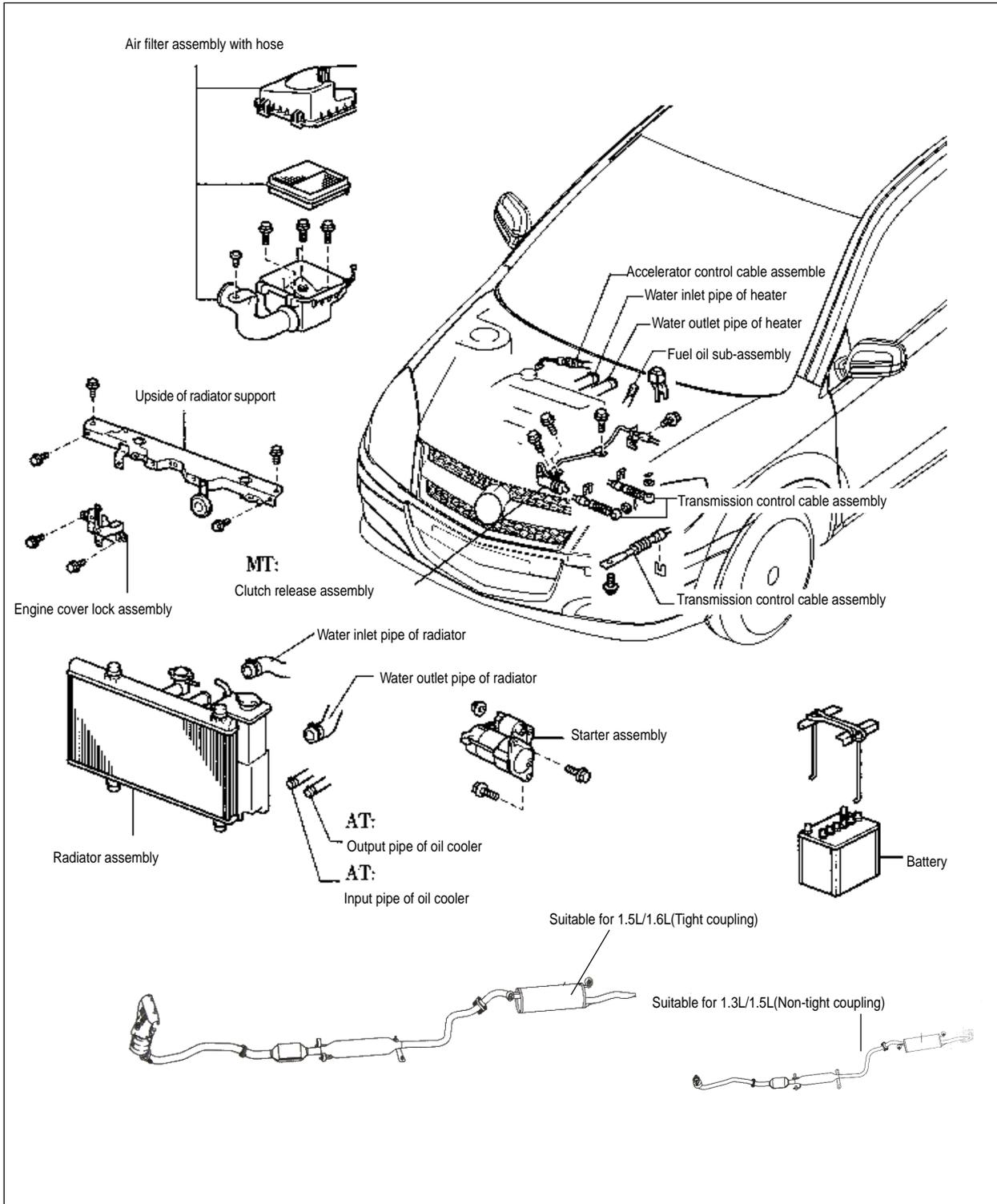


Figure 2-1

Component View

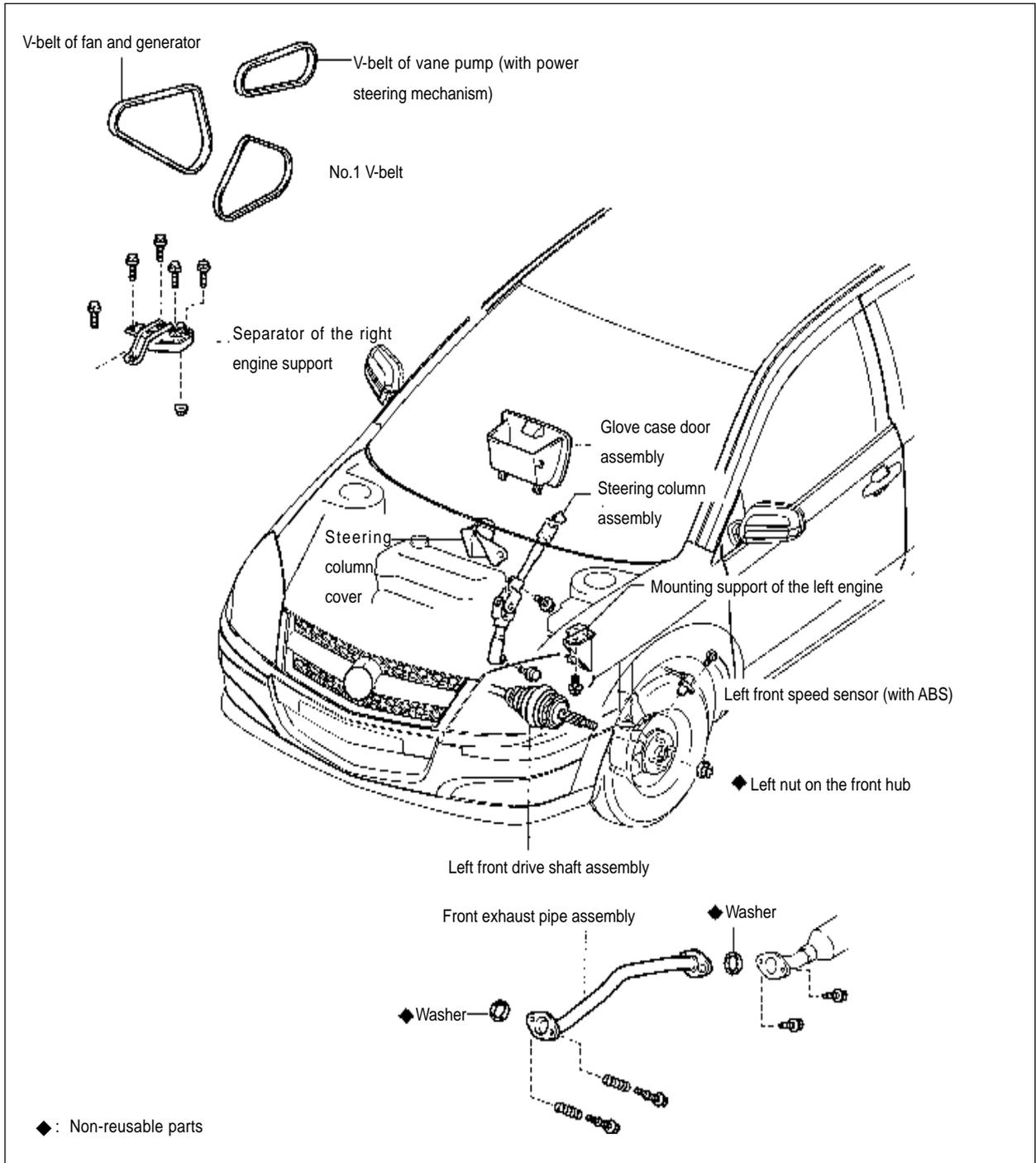


Figure 2-2

### Component View

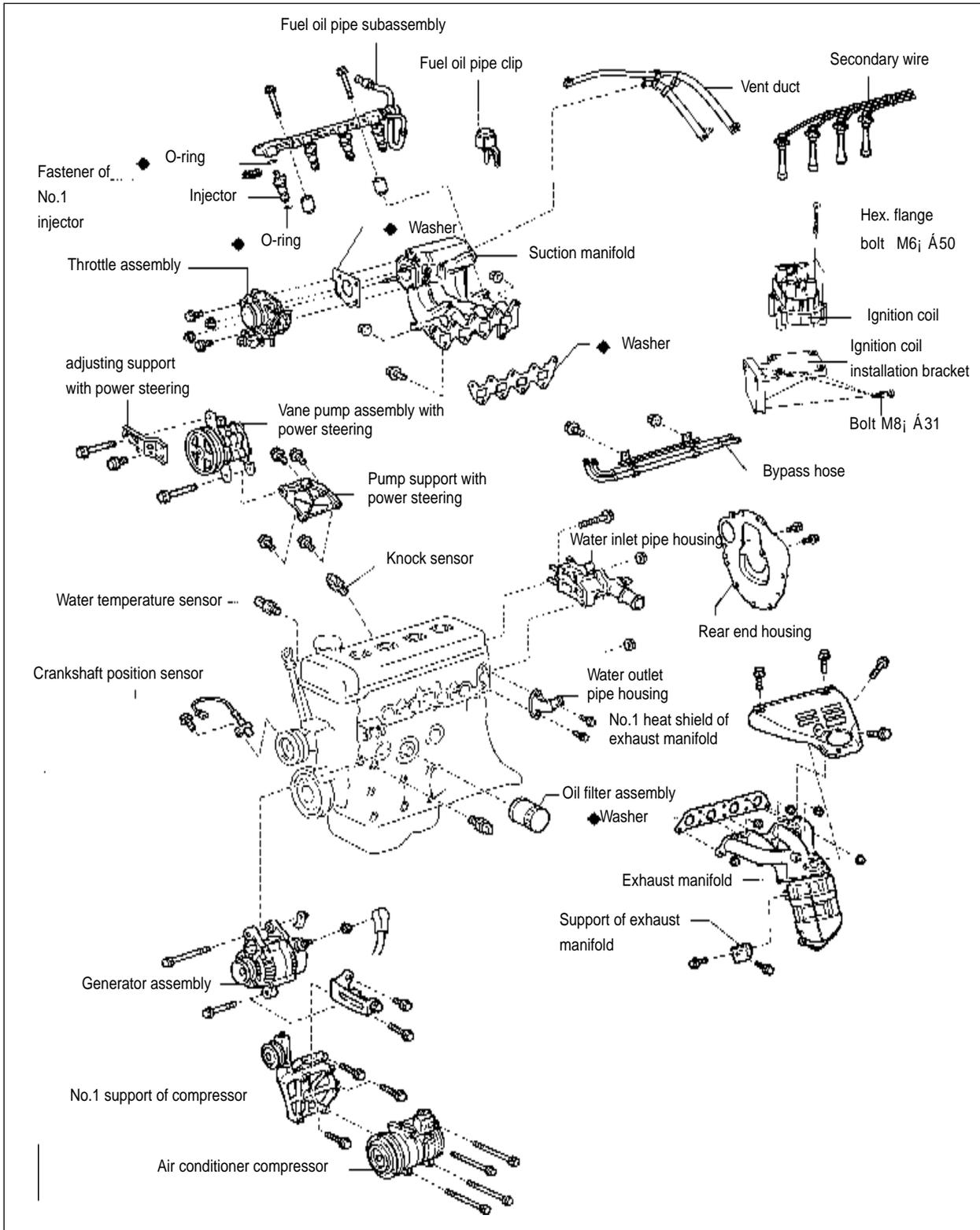


Figure 2-3

Component View

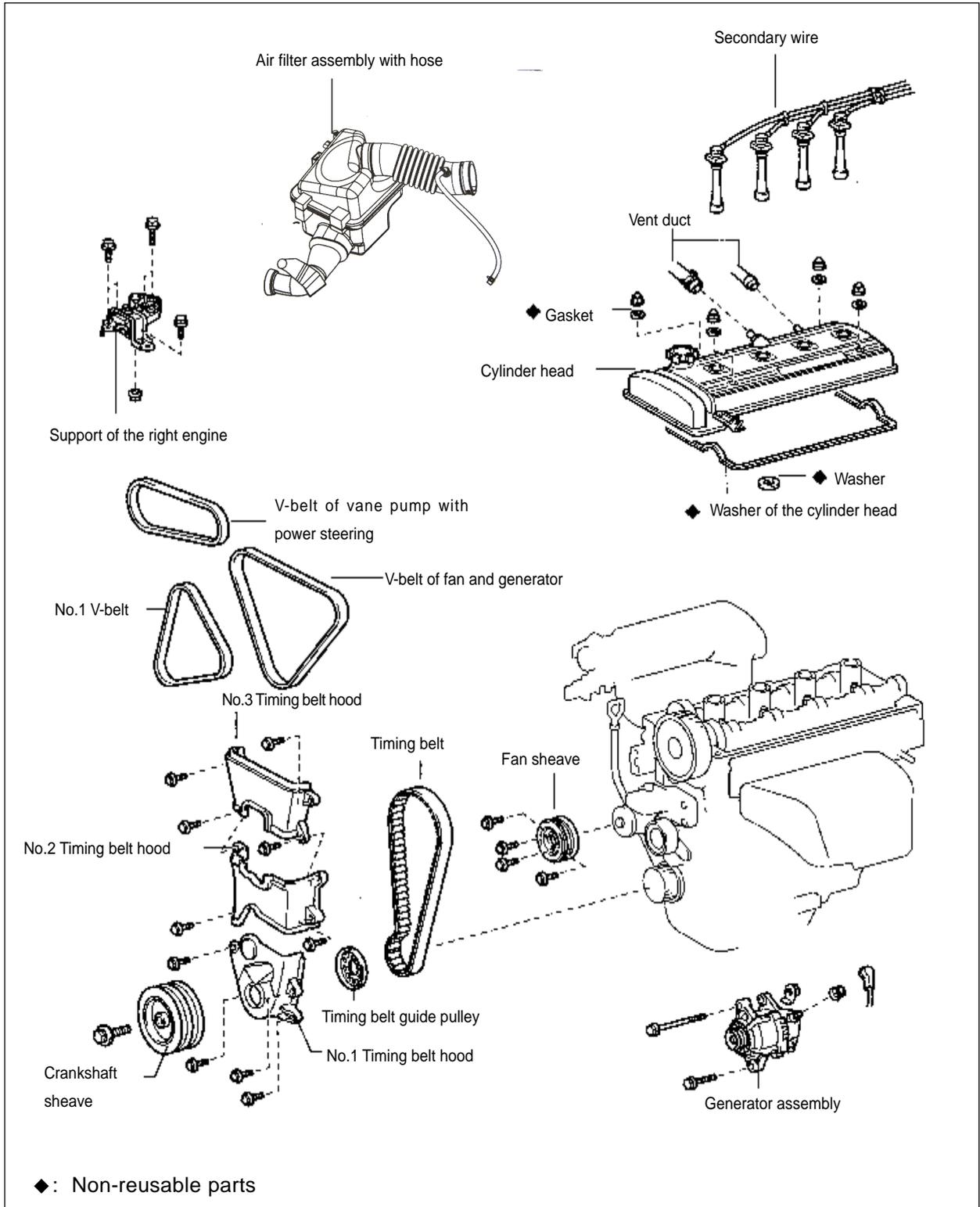


Figure 2-4

## Section 2 Throttle Body

### Component View

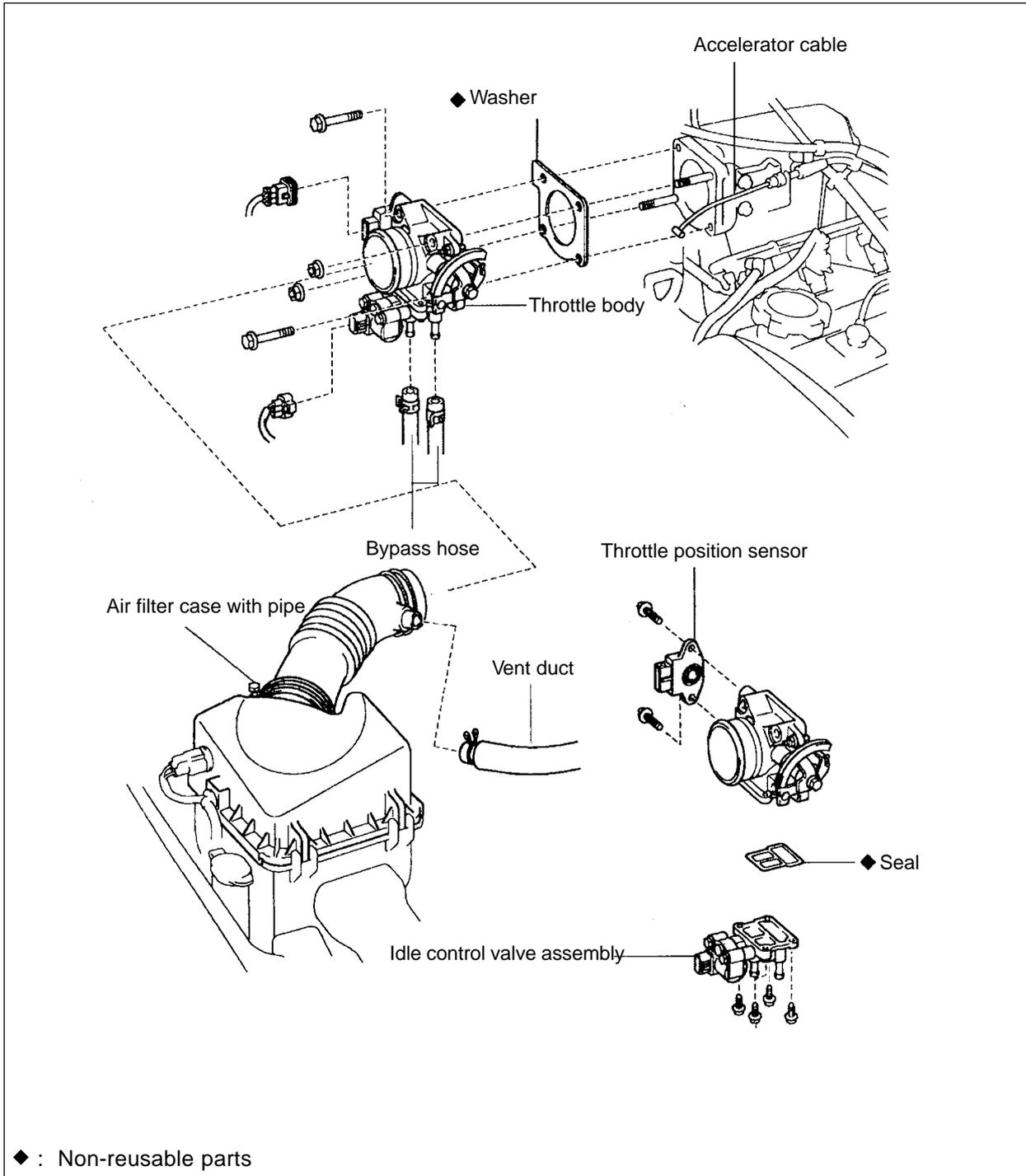


Figure 2-5

Dismounting/mounting and disassembly and assembly (see Figure 2-1~2-5).

1. Drain the coolant.

Warning: Do not remove the radiator cover, liquid under pressure or steam (likely to eject) while the engine and the radiator are still hot in order to avoid scalding.

- (1) Remove the radiator cover.
- (2) Remove the plug of the radiator, and discharge the coolant.

2. Remove the cable of the accelerator.

Release the nut and remove the cable of the accelerator.

3. Remove the air filter hood with hose.

- (1) Disconnect the connector and the wire fastening device of the suction temperature sensor.
- (2) Disconnect the vent duct from the air filter hose.
- (3) Release the clamping collar bolt of the air filter hose.
- (4) Release 2 clamps on the air filter hood.
- (5) Disconnect the air filter hose from the throttle body, and remove the air filter hood together with the hose.

4. Remove the throttle body assembly (see Fig. 2-6).

- (1) Disconnect the connector of the throttle position sensor.
- (2) Disconnect the connector of ISC valve.

(3) Remove 2 bolts and 2 nuts, and remove the throttle body from the suction manifold (see Fig. 2-7).

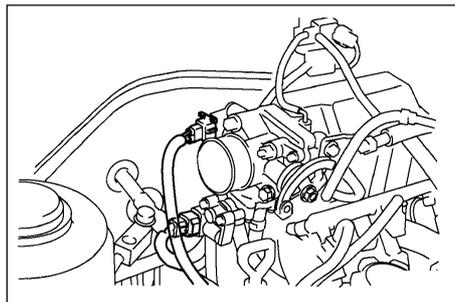


Figure 2-6

(4) Disconnect 2 bypass hoses, remove and check the throttle body (see Fig. 2-8).

Check:

- a. Check whether the throttle shaft shakes.
- b. Check whether there is any block at each state.
- c. Check whether the throttle can open and close smoothly.
- d. Check whether there is a gap between the check screw and the rod of the throttle when the throttle is at CLOSE position.

Attention:

Do not adjust the check screw of the throttle.

If the operation deviates from specifications, replace the throttle.

(5) Remove the washer of the throttle body.

5. Dismantle throttle body idle speed control valve assembly.

Detach 4 screws, idle speed control valve and washer.

6. Detach throttle position sensor

Detach 2 screws and throttle position sensor.

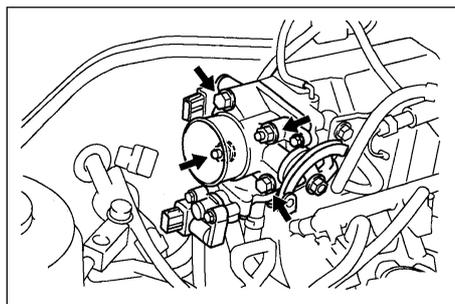


Figure 2-7

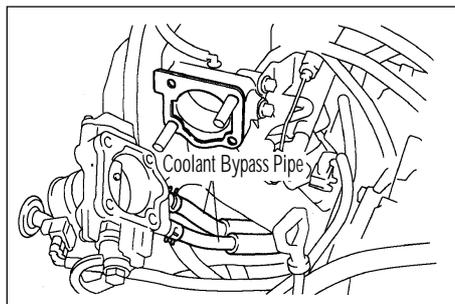


Figure 2-8

## Section 3 Valve Clearance Adjustment

Adjust the throttle gap (see Figure 2-9).

Calculate the thickness of new washer to allow the gap of the exhaust valve to reach a specified value.

$$N=T+(A-0.2\text{mm})$$

Note: where,

N -- Thickness of new washer

T -- Thickness of the washer removed

A -- Measured throttle gap

Calculation formula of the suction valve is:  $N= T+(A-0.3\text{mm})$ .

(1) Remove the adjusting washer.

- a. Rotate the crankshaft until the top of the cam is upwards.
- b. The nick of the valve tappet faces toward the front.
- c. Press the valve tappet down with a special tool, and place the tool between the camshaft and the valve tappet (see Figure 2-10).

Tip:

- Place one end, with a mark "9", of the special tool to the position shown in Figure 1-24 a bit aslant.
- If the special tool (B) is put into a deep position too much, it will be clipped by the washer. In order to avoid the special tool (B) being too hard to take out, put it into slowly by decreasing the inclination angle from the suction side.
- It is difficult for the special tool (B) to insert due to the shape of the cam when inserting it from the suction side to the back side of No.3 cylinder (see Figure 2-10). When adjusting the washer, therefore, it is advisable to insert from the exhaust side.

- d. Press the valve tappet down alternately with the special tool (A) and (B) to check the throttle gap.

(2) Re-mount the adjusting washer.

- a. Mount a new adjusting washer on the valve tappet.
- b. Press the valve tappet down with the special tool (A), and remove the special tool (B).
- c. Re-check the throttle gap.

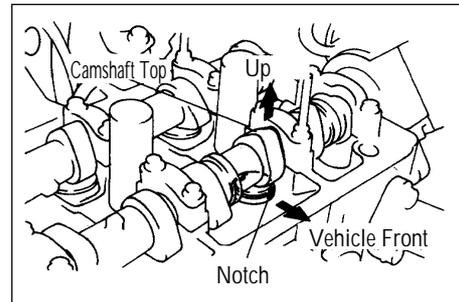


Figure 2-9

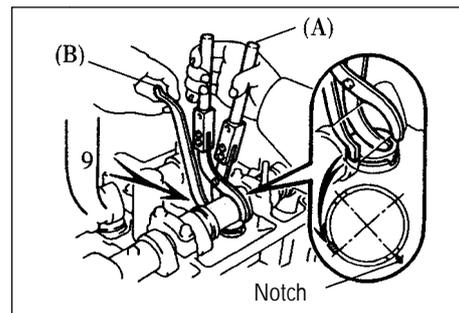


Figure 2-10

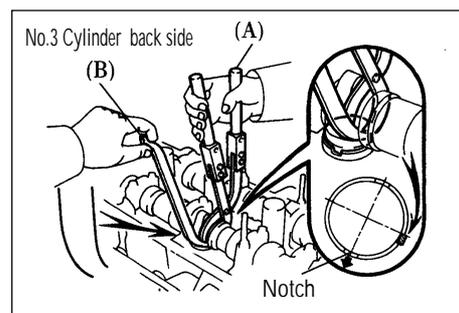


Figure 2-11

# Chapter 3 Fuel System

## Section 1 Check Fuel System Pressure

### On-board inspection

#### 1. Check the operation of the fuel pump.

(1) Connect the positive and the negative of the battery to appropriate connector sockets of the fuel pump (see Figure 3-1).

Attention: Do not start the engine.

If there is pressure present, you will hear that the fuel is flowing.

If there is no pressure present, check the fusible cutout, fuse, EFI open-circuit relay, fuel pump, ECM (Electronic Control Module) and circuit joint.

(2) Turn the ignition switch to "OFF".

#### 2. Check the pressure of the fuel.

(1) Check whether the battery voltage is more than 12V.

(2) Disconnect the negative wiring cable from the battery.

(3) Mount a pressure gauge on the fuel input pipe (see Figure 3-2).

(4) Connect the negative terminal of the battery.

(5) Measure the fuel pressure.

Fuel oil pressure: 265-304kPa

If the pressure is low, check the fuel pipe and connection, fuel pump, and fuel filter. If the pressure is too high, replace the regulator.

(6) Start the engine. Measure the fuel pressure at idle speed. The fuel pressure is 265-304KPa. If the pressure is unsatisfactory, check the fuel pump, pressure regulator, and injector, and replace if necessary.

(7) After shutting down the engine, check the fuel pressure and keep the specified pressure for about 5 minutes. The fuel pressure is: 147KPa.

#### 3. The fuel oil pressure regulator (DR) (see Figure 3-3).

Mounting position: On the distributing pipe for fuel.

Faults: Too low or too high fuel pressure, or hard to start.

General causes: Using poor fuel for a long time results in: 1. strainer blocked; 2. serious leakage caused by particles and impurities. Other reasons: Man-made mechanical damage, etc.

Maintenance precautions: During maintenance: 1. Never impact the diaphragm element with high pressure gas; 2. Never clean it with aggressively corrosive liquid; 3. No distortion caused by external force.

Easy measuring method: For the system with oil return, connect a pressure gauge for the fuel on the suction pipe, start the engine, and run at idle speed. Now, the fuel pressure in the engine should be about 260KPa; pull out the vacuum pipe of the fuel pressure regulator, and the pressure should be 300KPa approximately.

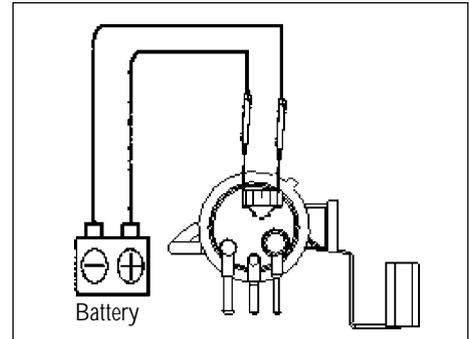


Figure 3-1

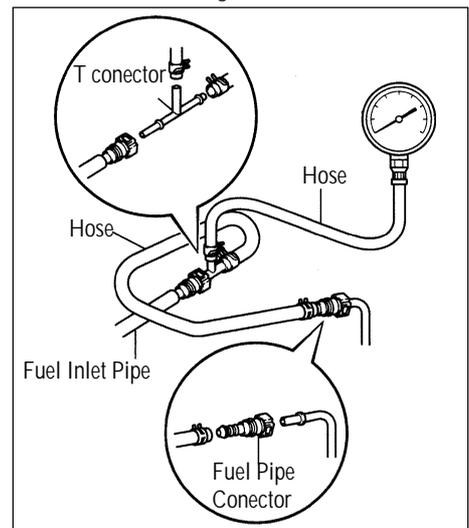


Figure 3-2

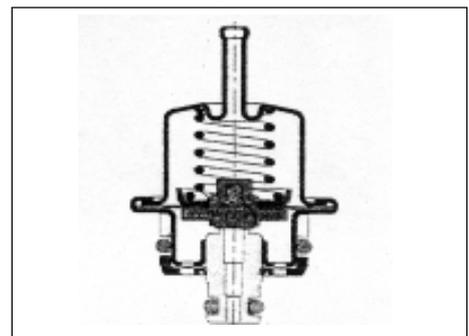


Figure 3-3

## Section 2 Fuel Pump Inspection

### 1. Fuel pump

(1) Check whether the resistance of the fuel pump is 0.2~3.0 ohm, at 20° C. If not, replace the fuel pump (see Figure 3-4).

(2) Fuel oil pump running:

Switch on the fuel pump with a battery and check. If the operation is unsatisfactory, replace the fuel pump or wires (see Figure 3-5).

The test should be done within 10s to protect the coil from burning out.

### 2. Fuel injector assembly

Oil injecting quantity: 40~50cm<sup>3</sup>/s.

Tolerance of each injector: not more than 10 cm<sup>3</sup>.

If the fuel injecting quantity is not up to the specification, replace the injector.

Check leakage: Under above conditions, disconnect the wire from the battery, the fuel should not drip one per minute.

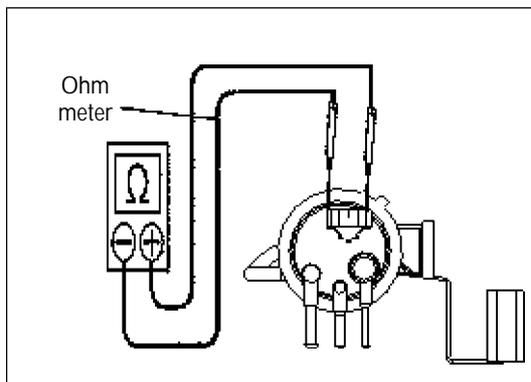


Figure 3-4

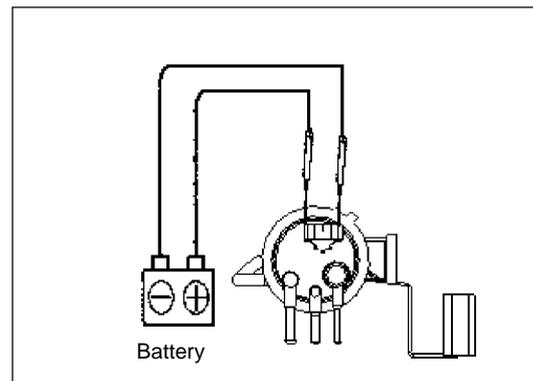


Figure 3-5

## Section 3 Fuel Pump Replacement

### Component View

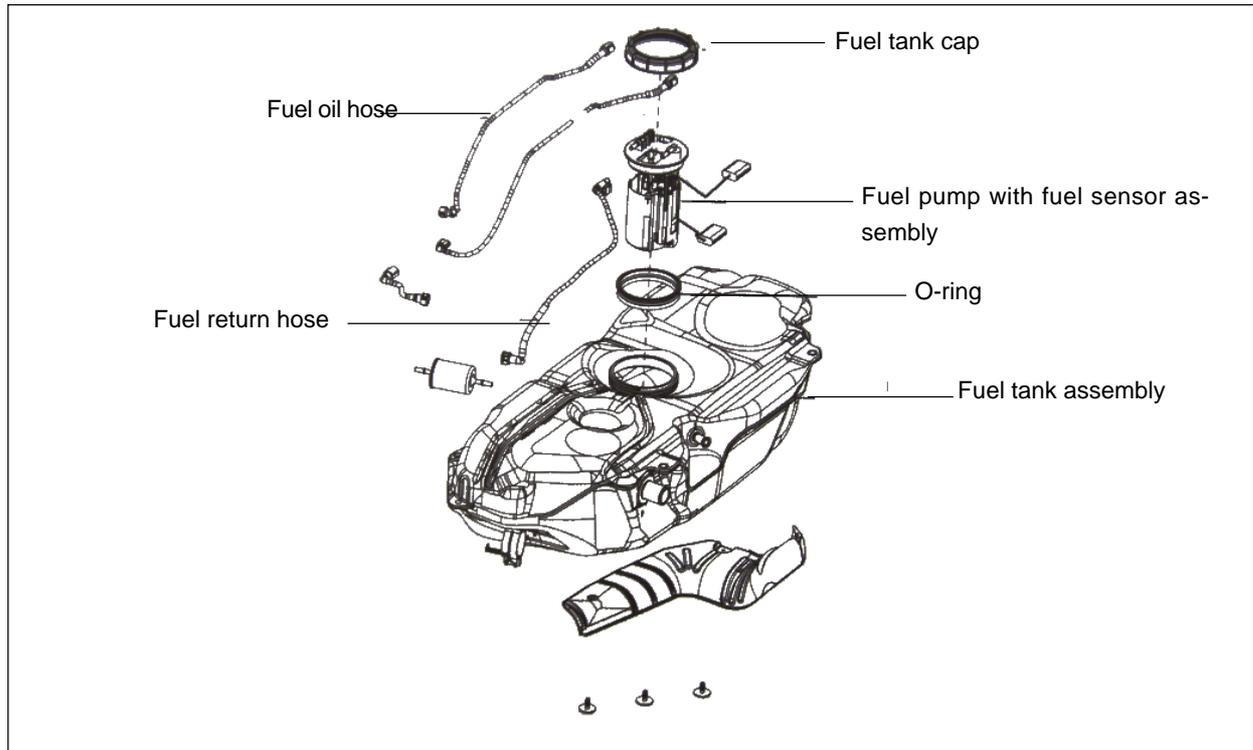


Figure 3-6

### Replace

- Operations avoiding petrol overflowing.
- Disconnect the fuel oil hose from the oil tank.
- Disconnect the oil return hose from the oil tank.
- Disconnect the vapor discharge pipe from the oil tank.
- Remove the fuel oil pump assembly with a filter (see Figure 3-7)  
Loosen the oil tank cap with a tailored tool. Take care not to bend the arm of the oil quantity sensor when taking the fuel oil pump out
- Mount the fuel oil pump assembly (see Figure 3-8). Replace the sealing ring. Align the boss on the oil pump with the nick on the oil tank port; tighten the oil tank cap with special tool.  
Torque: 40N.m
- Mount the vapor discharge pipe.
  - Mount the oil return hose;
  - Mount the fuel oil hose;
  - Check leakage of the fuel oil.

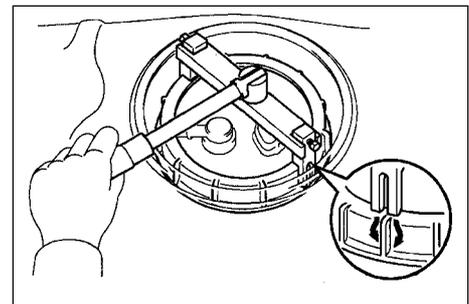


Figure 3-7

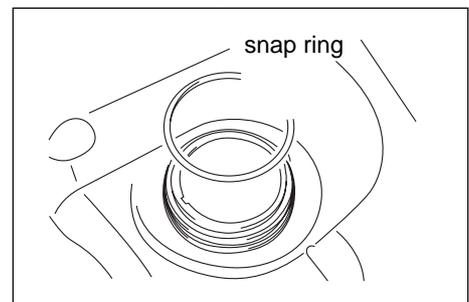


Figure 3-8

## Section 4 Fuel Emission Control System

### On-board Inspection

1. Check the operation when disconnecting the fuel supply.

(1) Warm the engine up to 2,500r/min at least, and check the noise of the injector with a sound level meter (see Figure 3-9).

(2) When the throttle releases, the noise from the injector should stop immediately; repeat several times.

2. Check the fuel vapor discharge control system (see Figure 3-10).

(1) After starting the engine, disconnect the vacuum pipe.

(2) Make sure that there is vacuum present at the canister control valve (TEV) port when selecting "ACTIVE TEST" and "PURGE TEV" based on the display on the fault diagnosis instrument.

(3) After "ACTIVE TEST", connect the vacuum pipe.

(4) Carry out "ECM DATA MONITOR" on the fault diagnosis instrument, and then select "PURGE TEV" for operation inspection.

(5) Start up the car after the engine warms up, and make sure the TEV ON from OFF (see Figure 3-11).

3. Check whether there is any distortion or damage on the filling cap and the washer (see Figure 3-12).

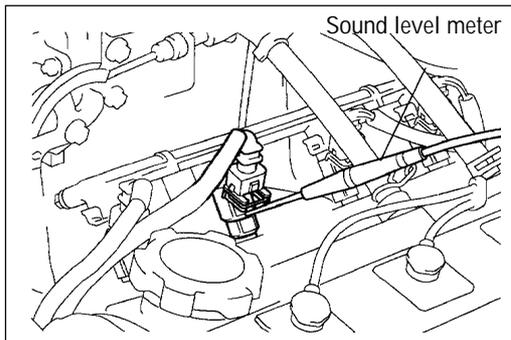


Figure 3-9

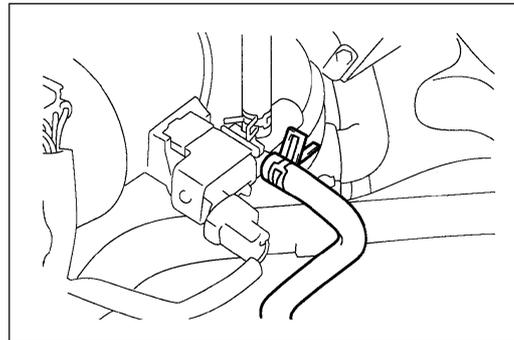


Figure 3-10

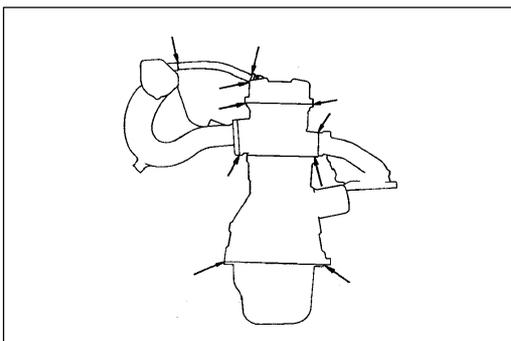


Figure 3-11

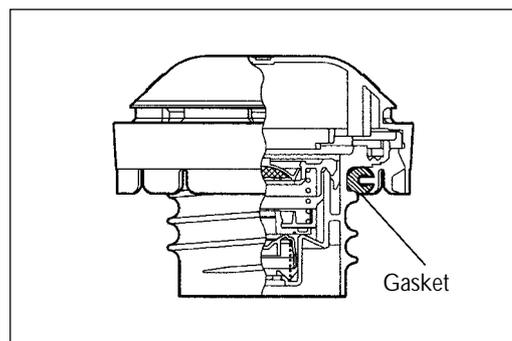


Figure 3-12

## Section 5 Carbon Canister Replacement

### 1. Check and replace the canister.

(1) Check for crack or damage on the canister visually (see Figure 3-13).

(2) Check the operation of the canister.

a. Plug the discharge port (see Figure 3-14).

b. Blow air (4.71KPa, 48kgf/cm<sup>2</sup>) into the absorption port when keeping the discharge port closed, and the air should flow out from the exit port.

If the operation is unsatisfactory, replace the canister.

c. Blow air into the absorption port, the air should flow from other ports without any resistance.

If the operation is unsatisfactory, replace the canister.

(3) Clean the canister: Block the desorption port, blow air (4.71KPa, 48kgf/cm<sup>2</sup>) into the absorption port, and the air should flow from the discharge port (see Figure 3-15).

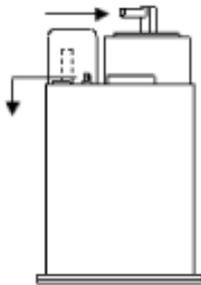


Figure 3-13

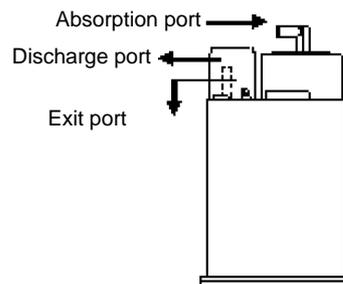


Figure 3-14

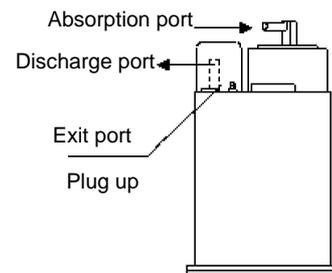


Figure 3-15

### 2. Canister control valve (TEV) (see Figure 3-16)

Mounting position: On the vacuum pipeline of the canister - suction manifold.

Faults: Bad idle speed, malfunction, etc.

General cause: Ingress of foreign materials into inside of the valve results in corrosion and Poor tightness.

Maintenance precautions: During maintenance:

1. Air flowing direction must conform to specifications;
2. If the control valve fails due to black particles in the valve body, and it is necessary to replace the control valve, please check the condition of the canister;
3. Avoid liquid such as water and oil entering into the valve during maintaining as possible;
4. It is advisable to mount the canister control valve on the hose hanging in the air or fasten with soft rubber to avoid transmission of solid borne noise.

Easy measuring method: (disconnect the connector) Set the digital multi-meter to ohm position, with two leads connecting to two pins of the canister control valve respectively, rated resistance 22-30 ohm at 20° C

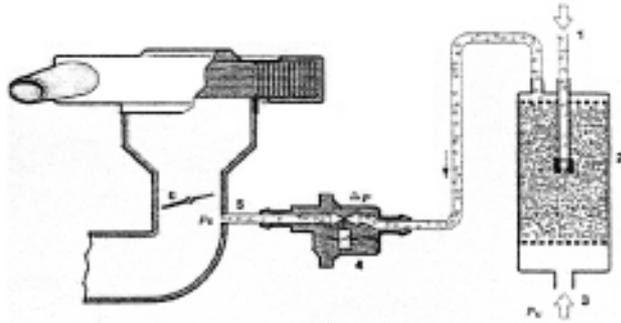


Figure 3-16

### 3. Vent valve (PCV) sub-assembly

Air should flow through the cylinder cap side freely.

Attention:

- Do not suction air through the valve.
- Never put anything into the valve. If the operation is unsatisfactory, replace PCV.
- Blow air into from the suction side, and the air should be hard to flow through. If the operation is unsatisfactory, replace PCV (see Figure 3-17).

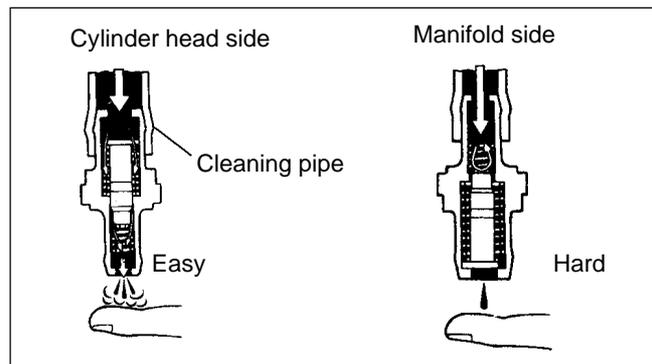


Figure 3-17

## Chapter IV Exhaust System

### Component View

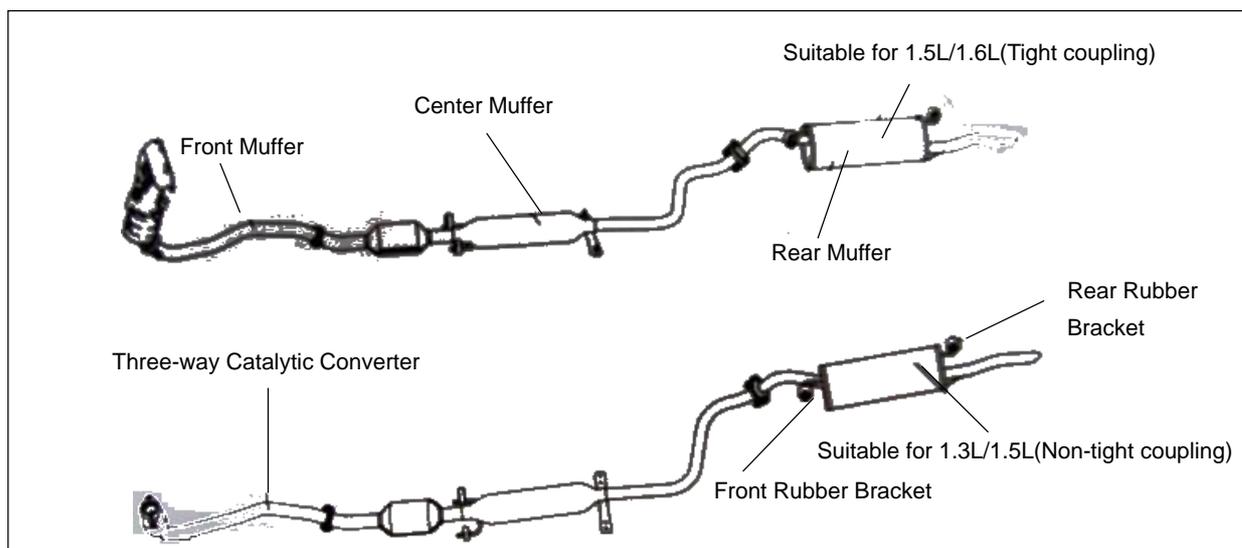


Figure 4-1

### Replace

1. Remove the tail exhaust pipe assembly.  
Remove 2 bolts and the tail exhaust pipe assembly.
2. Remove the middle exhaust pipe assembly.  
Replace the exhaust system.  
Remove 2 bolts and the middle exhaust pipe assembly.
3. Remove the front exhaust pipe assembly.  
Remove 2 bolts and the front exhaust pipe assembly.
4. Mount the front exhaust pipe assembly.  
Measure the free length of the spring with a slide caliper.  
Free length: 42mm

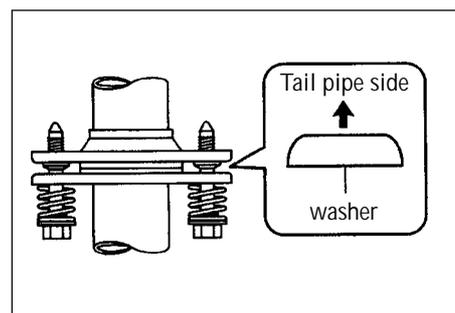


Figure 4-2

Mount the front exhaust pipe on the exhaust manifold with new washer.

Notes:

- Do not use the removed washer any more.

5. Mount the front exhaust pipe assembly.  
Torque: 43N.m
6. Mount the middle exhaust pipe assembly.  
Mount the middle exhaust pipe on the front exhaust pipe with new washer.  
Torque: 44N.m
7. Mount the tail exhaust pipe assembly.  
Mount the tail exhaust pipe on the middle exhaust pipe with new washer. (see Figure 4-2).  
Torque: 43N.m
8. Check exhaust leakage.

# Chapter 5 Cooling System

## Section 1 System Inspection

### 1. Check leakage in the cooling system (see Figure 5-1).

- (1) Fill coolant in the radiator, and mount the tester at the radiator cover port.
- (2) Start the engine.
- (3) Keep the pump pressure at 118KPa without drop. If the pressure drops, check whether there is any leakage at the port, radiator and water pump; if not, check the heating core, cylinder and cap.

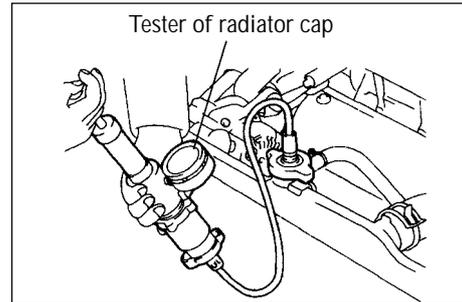


Figure 5-1

### 2. Check the engine coolant quantity in the compensating tank.

The coolant level should be between LOW and FULL.

### 3. Check the coolant quality.

- (1) Remove the radiator cover.

Do not remove the radiator cover when the engine and the radiator are still hot in order to avoid scalding since the liquid vapor may inject.

- (2) Check whether there are excessive deposit and rust or sundries around the radiator cover. The coolant is not allowed to contact with oil.

- (3) Remount the radiator cover.

### 4. Thermostat

Notes:

The temperature indicated on the thermostat is marked as open temperature of the valve (see Figure 5-2).

- (1) Submerge the thermostat into water and heat gradually.
- (2) Check the open temperature of the valve.

Open temperature of the valve: 80-84° C

- (3) Check the lift of the valve (see Figure 5-3 and Figure 5-4).

Lift of the valve: 8mm or more at 95° C

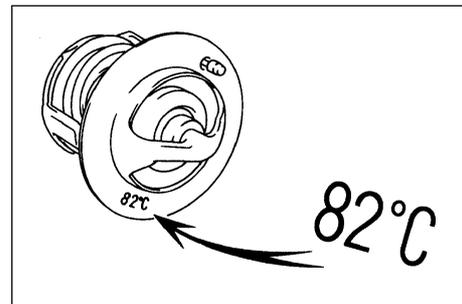


Figure 5-2

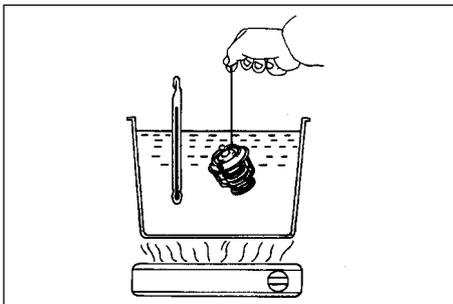


Figure 5-3

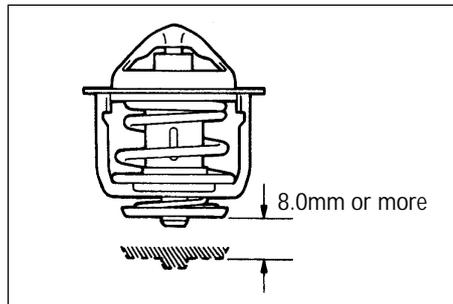


Figure 5-4

- (4) When the thermostat is at low temperature (lower than 77° C), the valve should close completely.

## 5. Fan

(1) At low temperature (lower than 83° C), check the operation of the cooling fan.

- a. The ignition switch is set to ON.
- b. The cooling fan should stop.
- c. Disconnect the connector of the water temperature sensor.  
(see Figure 5-5)
- d. Touch the ground with a wire.
- e. Check if the cooling fan rotates.
- f. Re-connect the connector of the water temperature sensor.

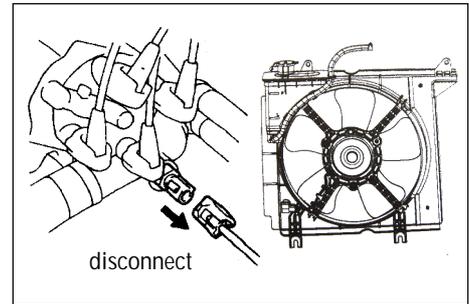


Figure 5-5

(2) At high temperature (more than 93° C), check the operation of the fan (see Figure 5-6).

- a. Start the engine, and enable the coolant temperature higher than 93° C.
- b. Check whether the cooling fan rotates.  
If not, replace the water temperature switch.

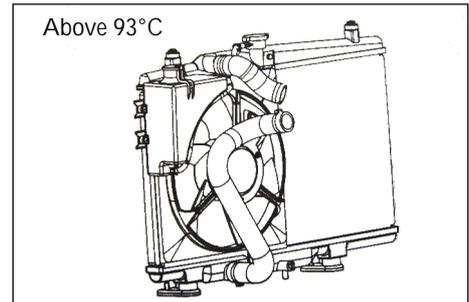


Figure 5-6

(3) Check the cooling fan (see Figure 5-7).

- a. Disconnect the joint of the cooling fan.
- b. Connect the battery and the ammeter with the connector.
- c. The cooling fan should rotate stably and check the current readings.  
Standard current: 5.7-7.7A.
- d. Connect the connector of the cooling fan.

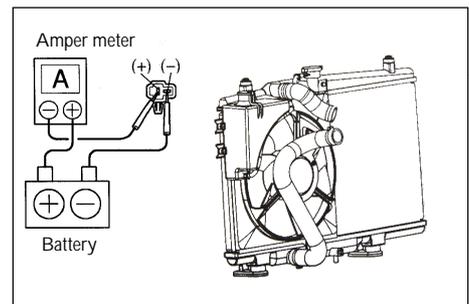


Figure 5-7

## Section 2 Radiator Replacement

### 1. Replace the radiator.

- (1) Open the radiator cover.
- (2) Open the water drain valve and discharge the coolant.
- (3) Disconnect the water inlet pipe of the radiator.
- (4) Disconnect the water outlet pipe of the radiator.
- (5) Disconnect the input pipe of the oil cooler of the automatic transmission (automatic transmission).
- (6) Disconnect the output pipe of the oil cooler of the automatic transmission (automatic transmission).
- (7) Remove 4 bolts of the radiator mounting support (see Figure 5-8).

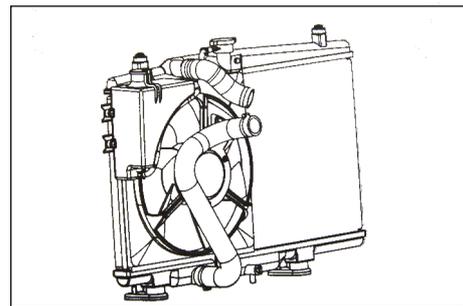


Figure 5-8

(8) Remove the radiator assembly, remove 4 bolts, and separate the fan and the fan housing (see Figure 5-9).

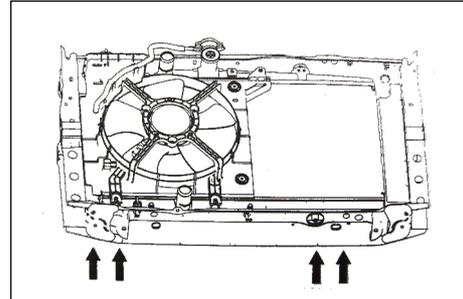


Figure 5-9

### (9) Mount the cooling fan assembly.

- a. Secure the compensating tank assembly on the cooling fan support with bolts; torque: 16 N.m.
- b. Mount the fan and the fan housing with 3 bolts; torque: 7.5N.m.
- c. Mount the cooling fan assembly on the radiator assembly with 3 bolts; torque: 16N.m.
- d. Connect the overflow pipe on the compensating tank assembly and the radiator assembly, and fasten with the elastic ring.
- e. Mount the radiator assembly in the reverse order of dismounting.

# Chapter 6 Manual Transaxle Assembly

## Section 1 Frequent Problem Diagnosis

### Component View

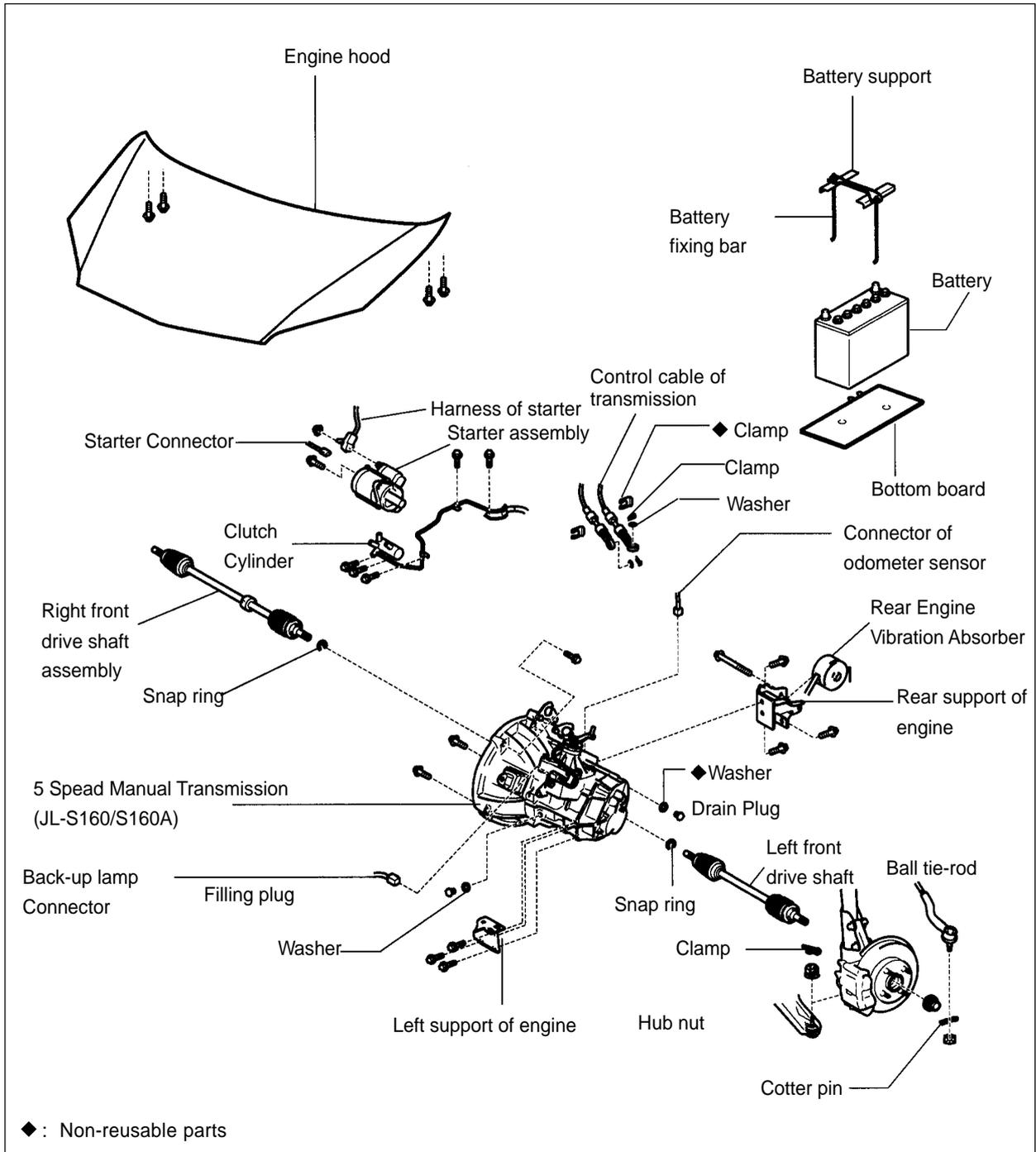


figure 6-1

Table 6-1 Frequent problem diagnosis

Sympton	Possible causes
Vibration and noise	Transmission or the engine is suspended loosely or damaged; Axial gap is improper; Gear or bearing is worn or damaged; Unsatisfactory transmission oil is used or oil level is low; Engine idle is incorrect.
Oil leakage of the transmission	The oil seal or the O-ring is damaged.
Hard to shift	The control cable is unqualified; Synchronizer is poorly contacted with gear or worn; Elasticity of the synchronous spring is insufficient; Unqualified transmission oil is used.
Trip stop	Fork of the shift gear is worn or lifting spring is broken; Gap between the synchronizer bush and the sleeve spline is too large; Gear or bearing is worn or damaged.

## Section 2 Vehicle Speed Sensor Replacement

1. Disengage the vehicle speed sensor (see Figure 6-2).
2. Remove the bolt and the vehicle speed sensor.

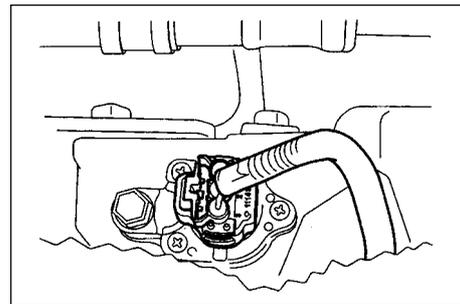


Figure 6-2

3. Mount the vehicle speed sensor (see Figure 6-3).

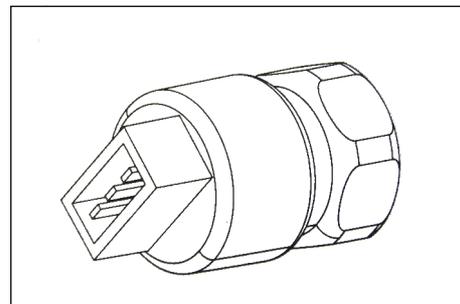


Figure 6-3

4. Connect the vehicle speed sensor.

## Section 3 Manual Transaxle Replacement

Replace

1. Open the engine cover.
2. Remove the battery.
3. Remove the clutch wheel cylinder assembly (see Figure 6-4).
4. Separate the transmission shift cable assembly (see Figure 6-5).
5. Disengage the joint of the backup lamp switch.
6. Disengage the speed sensor.  
Disengage the speed sensor joint.
7. Remove the forepart of the exhaust pipe.
8. Discharge the drive bridge oil.
9. Remove the nut on the left and the right front hub.
10. Disengage the speed sensor on the left and the right front wheel (ABS).
11. Disengage the front stabilizer bar.
12. Disengage the left and the right ball tie-rod.
13. Disengage the front stabilizer bar.
14. Disengage the left and the right lower cantilever.
15. Remove the left and the right front drive shaft assembly.
16. Hoist the engine from the machinery space according to "Point 24, Section 2, Chapter 1".
17. Remove the starter assembly.
18. Disengage the engine support.
19. Remove the manual drive bridge assembly.
20. Mount the engine support.
21. Mount the manual drive bridge assembly.
22. Couple the vibration insulating pad of the engine.
23. Mount the starter assembly.
24. Mount the left and the right front drive shaft assembly.
25. Connect the left and the right lower cantilever.
26. Connect the left and the right ball tie-rod.
27. Connect the front stabilizer bar.
28. Connect the left and the right front speed sensor (ABS).
29. Mount the left and the right front shaft nut.
30. Mount the fore part of the exhaust pipe.
31. Connect the joint of the odometer sensor.
32. Connect the joint of the back-up lamp switch.
33. Connect the transmission shift cable assembly (see Figure 6-5).
34. Mount the clutch wheel cylinder assembly (see Figure 6-4).

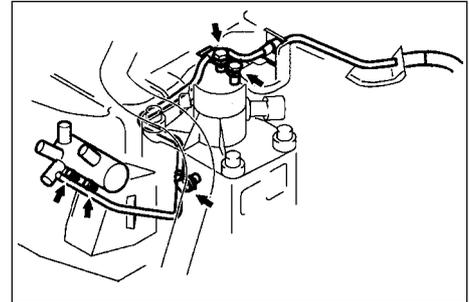


Figure 6-4

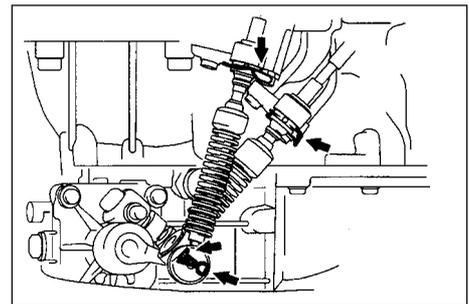


Figure 6-5

## Section 4 Transmission/Transaxle Case Oil Seal Replacement

### I. Replace the oil seal of transmission housing

1. Remove the oil seal of the transmission housing (see Figure 6-6).

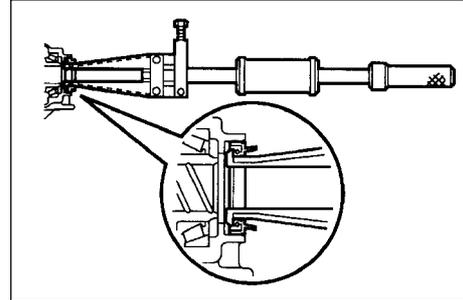


Figure 6-6

2. Mount the oil seal of the transmission housing (see Figure 6-7).

Attention:

Take care not to damage the lip surface of the oil seal.

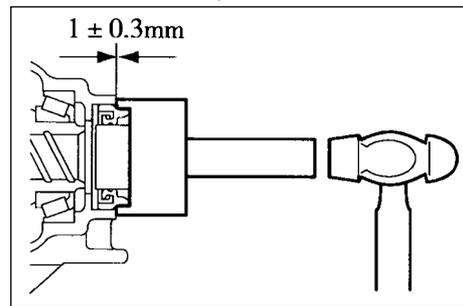


Figure 6-7

### II. Replace the Oil Seal of the Drive Bridge Housing

1. Remove the oil seal of the transaxle housing with special maintenance tool (see Figure 6-8).

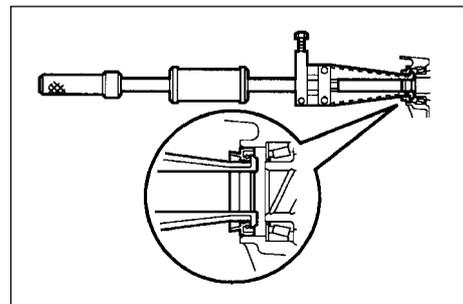


Figure 6-8

2. Mount the oil seal of the transaxle housing (see Figure 6-9).

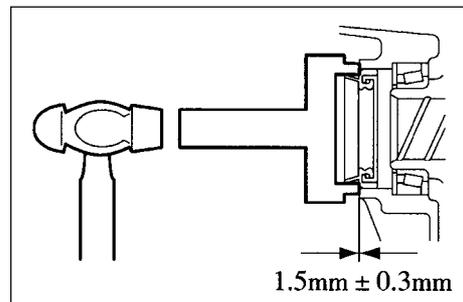


Figure 6-9

# Chapter 7 Automatic Transaxle Assembly

## Section 1 Frequent Problems Diagnosis

### Possible Cause

1. There is no scan information.
  - (1)The diagnosis system fails.
  - (2)The automatic transmission unit fails.
2. The engine can't start.
  - (1)The engine system fails.
  - (2)The fuel pump or torque meter fails.
3. The vehicle can't run forwards.
  - (1)The circuit voltage is improper.
  - (2)The rear clutch or single clutch fails.
  - (3)The valve fails.
4. The vehicle can't run backwards.
  - (1)The low speed brake or front clutch pressure is improper.
  - (2)The front clutch or low speed reverse gear fails.
  - (3)The valve fails.
5. The vehicle can't run forwards or backwards.
  - (1)The pressure deduction is improper or the transmission signal fails.
  - (2)There is pressure in the oil pump or the valve body fails.
6. The engine stalls in gear shift.
  - (1)The engine system or clutch torque meter fails.
  - (2)The valve body or torque meter fails.
7. The vehicle vibrates and lasts for a long time when the gear is shifted from N to D.
  - (1)The rear clutch fails.
  - (2)The valve body clutch fails.
  - (3)The restrictor switch fails.
8. The vehicle vibrates and lasts for a long time when the gear is shifted from N to R.
  - (1)The front clutch pressure fails.
  - (2)The front clutch or valve body fails.
  - (3)The low speed reserve gear pressure or low speed reverse gear fails.
9. The vehicle vibrates and lasts for a long time when the gear is shifted from N to D/R.
  - (1)The pressure reduction fails.
  - (2)The oil pump fails.
  - (3)The valve body fails.
10. The gear shift impacts.
  - (1)The servo switch or restrictor position switch fails.
  - (2)The pressure is decreases abnormally.
  - (3)The clutch or brake fails.
11. All gear shift points are either too early or too late in the running status.

The valve body fails.

12. The vehicle shifts before or after some gear points in the running status.

The vehicle switch or parking switch fails.

13. The vehicle has poor acceleration in running.

(1)The clutch or brake fails.

(2)The engine system fails.

14. The vehicle vibrates when it runs at a constant speed or accelerating speed.

(1)The hydraulic torque clutch pressure or hydraulic torque meter fails.

(2)The engine system or valve fails.

15. The acceleration switch system fails.

(1)The acceleration switch or ignition switch fails.

(2)The connector or automatic transmission control unit fails.

## Section 2 Hydraulic Torque Converter and Transaxle

### I. Automatic transmissions Removal

1. Put the select lever in "N" position
2. Remove 3 bolts of the flexibility plate (engine side)
3. Remove starter and 2 cooling hoses.
4. Disconnect neutral switch connector and odometer sensor.
5. Loosen the drain screw under the housing to bleed ATF and tighten the drain screw with sealing glue when assembling. Tightening torque is 29~35N.m
6. Loosen the locking bolt for select lever cable.
7. Remove Drive Shaft LH&RH, using plastic stopper in the oil sealing of differential.
8. Detach suspension bolts.
9. Separate transmission from engine after bolts between engine and transmission remove.

### II. Automatic Transmission Installation

1. Check whether torque converter of the transmission is in the right position, the methods as follows:  
Check whether the distance from 3 anchor point of torque converter to front contact face of the transmission box  $A \geq 28\text{mm}$  , If the space  $A < 28\text{mm}$  , try install again. The way to install is that left hand catch hold of the central anchor column of the converter and make it in alignment with input shaft as near as possible, push the torque converter in rotating way by right hand until it gets to the bottom to meet the requirement of  $A \geq 8\text{mm}$ . (See figure 7-1 and 2)
2. Install Flexibility plate and central plate on the crankshaft end face with 6 bolts in the direction of Figure 2. Tightening torque is 45~55 N.m. Turn the longer hole of the Flexibility plate to the lowest of the engine position in order to connect torque converter.

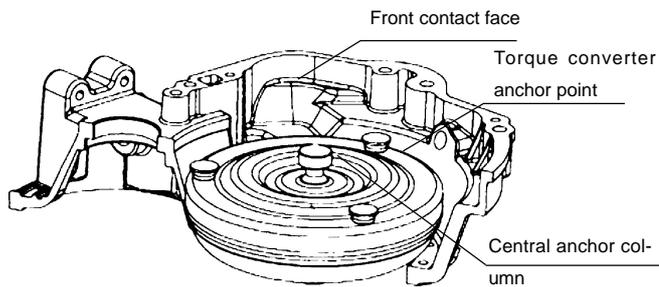


Figure 7-1

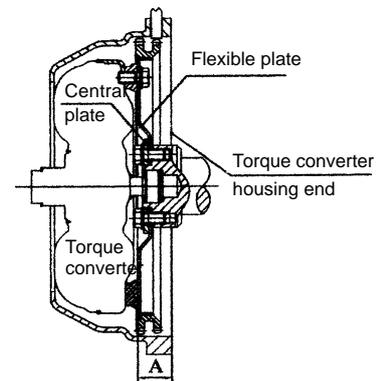


Figure 7-2

3. Install transmission in the engine, its way like manual transmission. The torque converter cannot be allowed to move in axial motion during operating (The dimension of A keeps constant). Install starter in the transmission housing.

4. Connect Flexibility plate with torque converter, using 3 special bolts. The way is as follows. First, assemble one bolt in the torque converter by the longer hole of the Flexibility plate, and then rotate engine belt pulley to install the other bolts, finally use torque spanner to tighten the bolts. Tightening torque is 40~50N.m.

5. Install suspension bolt and drive shaft LH&RH, the assembling way like manual transmission.

6. Connect two cooling pipes as showed in the figure 7-3 with the corresponding pipe of transmission with clip.

7. Connect the cable between bracket of throttle and transmission actuator.

8. Throttle valve cable adjustment as follows:

First, use pliers to clip the hexangular position under throttle valve cable. Turn  $60^\circ \sim 90^\circ$  counterclockwise, and lift throttle valve cable to make throttle valve cable adjustable move to top position, and then turn back  $60^\circ \sim 90^\circ$  clockwise, meanwhile, make it lock (See figure 7-4). Finally put accelerator pedal to end position. When throttle valve makes "ka-ka" sound, the distance under the throttle valve should meet  $B=2\sim 8\text{mm}$ . If not, try again until the gap  $B=2\sim 8\text{mm}$  under the throttle valve (see figure 7-5), if gap  $B=2\sim 8\text{mm}$ , throttle valve cable adjustment is finished.

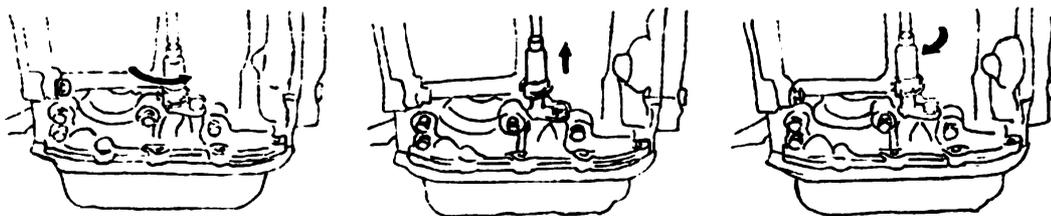


Figure 7-4

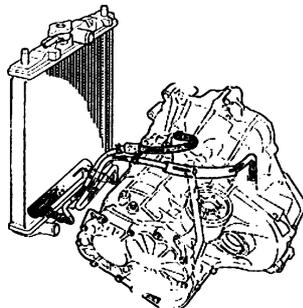


Figure 7-3

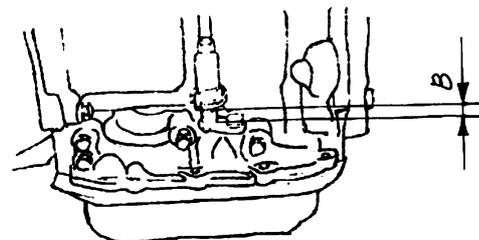


Figure 7-5

9. Put shift lever to "N" position, meanwhile, adjust the shift fork in neutral position. Connect shift cable with bracket and fix by fastening bolt. The tightening torque is 6.9~13.7 N.m (See figure 7-6).
10. Connect neutral switch connector.
11. Install odometer sensor (connect the sensor with the actuator of odometer in the transmission)
12. Fill in ATF.

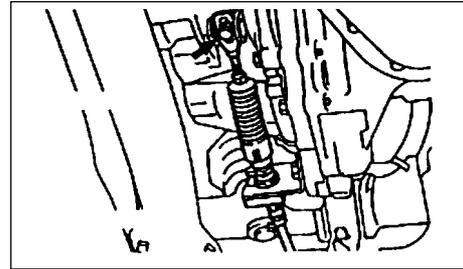


Figure 7-6

- ★ "ATF " is the oil only for automatic transmission, its grade is DEXRONII or DEXRONIII. First, take dipstick out of automatic transmission and fill in 3 liter ATF from dipstick pipe. Put select lever to "P" position and start engine until AT temperature is up to 80° C, and then put select lever in "P" → "R" → "N" → "D" → "2" → "L" and "L" → "2" → "D" → "1" → " " → " " step by step. Insert and take out dipstick, wipe out the liquid in the dipstick. Repeat above-mentioned procedure without wiping to check oil level by dipstick. If oil level is between the third and fourth hole in the dipstick, the level is normal. Filling in oil is over and Insert dipstick tightly.
13. Wipe ATF in the A/T surface when filling.
  14. A/T installation is completed.

### III. Automatic Transmission Assembly JL-Z110 and JL-Z130

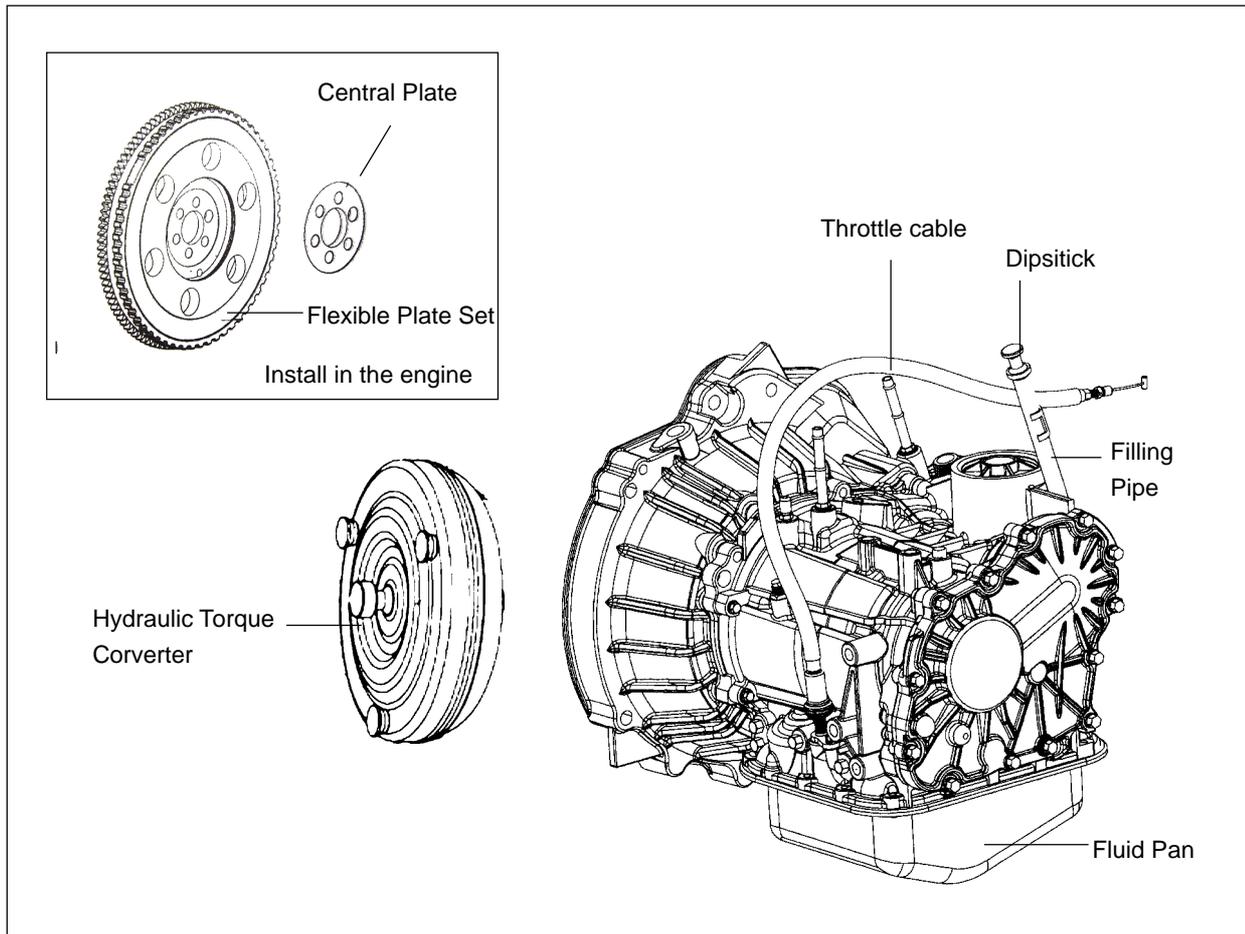


Figure 7-7

1. Check the hydraulic torque converter assembly.
  - (1) Measure the status of the hydraulic torque converter.
  - (2) Replace the ATF in the hydraulic torque converter.
  - (3) Wash and check oil freezer and oil pipe.
  - (4) Prevent the hydraulic torque converter being deformed and the oil pump gear being damaged.
2. Check the drive disc and gear ring.

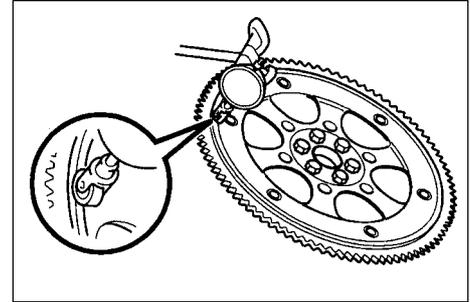


Figure 7-8

- (1) Install a dial test indicator to measure the runout of the drive disc. (See Fig.7-8)
- (2) Check the damage of the gear ring.

Maximum runout: 0.25mm

If the runout is beyond the specified scope or the gear ring is damaged, replace the drive disc.

Torque: 64N.m

3. Check the hydraulic torque converter. (See Fig.7-9)
- Install the hydraulic torque converter on the drive disc temporarily, and install a test indicator to measure the radial runout of the hydraulic torque converter bushing.

Maximum radial runout: 0.20mm

If the radial runout is beyond the specified scope, readjust the direction of installation.

Notes:

Mark the position of the torque converter to install it properly.

Remove the hydraulic torque converter.

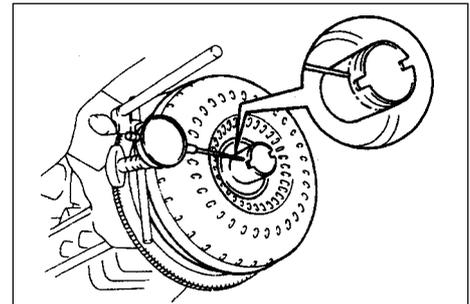


Figure 7-9

## Section 3 Differential Front Oil Seal (ATM)

### Replacement

1. Discharge the automatic transmission oil.
  - (1) Remove the discharge plug and washer to discharge the ATF oil.
  - (2) Install the discharge plug and new washer.

Torque: 25N.m
2. Remove the front wheel.
3. Remove the left/right front wheel hub nuts.
4. Unfix the front stabilizer bar.
5. Unfix #1 left/ring front suspension sub-assembly.
6. Unfix the left/right ball extension rod sub-assembly.
7. Unfix the left/right front axles.
8. Remove the differential front oil seal (on the transaxle housing).

9. Pull out oil seal (on the transaxle housing) with a special tool.  
(See Fig.7-10)

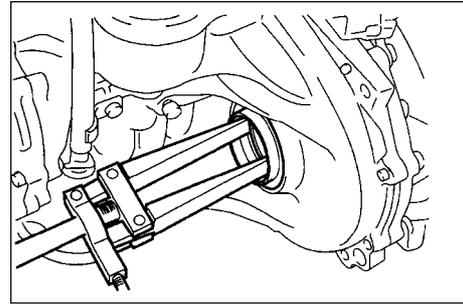


Figure 7-10

10. Remove the differential front oil seal on the transmission housing.  
Pull out the oil seal on the transmission housing with a special tool. (See Fig.7-11)

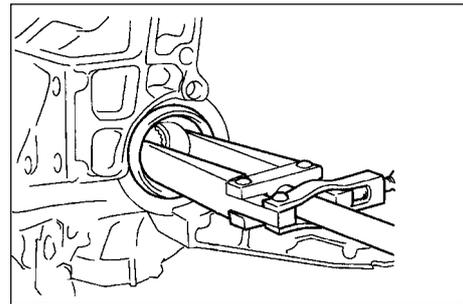


Figure 7-11

11. Install the differential front oil seal onto the transmission housing.  
(1) Install a new oil seal on the transmission housing with a special tool and hammer. (See Fig.7-12)  
(2) Apply MP lube on the flange of the oil seal.

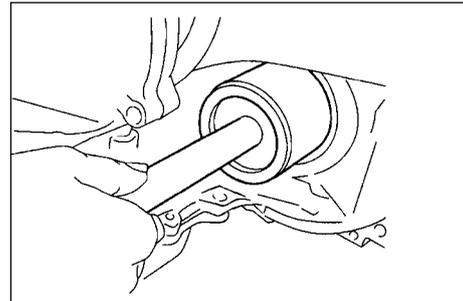


Figure 7-12

12. Install the differential front oil seal onto the transmission housing.  
(1) Install a new oil seal onto the transmission housing with a special tool and hammer. (See Fig.7-13)  
(2) Apply MP lube on the flange of the oil seal.

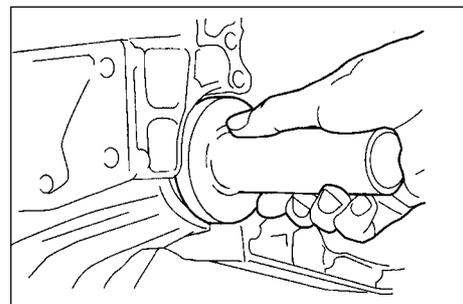


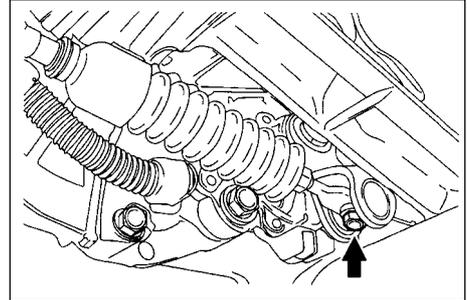
Figure 7-13

13. Install all parts in the sequence of removal till the front wheel is installed, and then add transmission oil.  
14. Check and adjust the alignment of the front wheel.

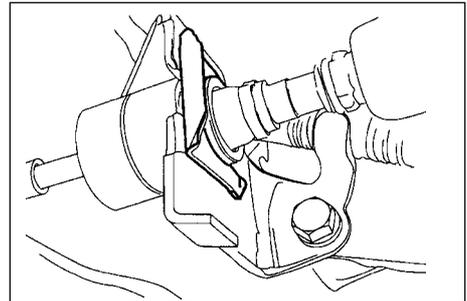
## Section 4 Neutral Switch Assembly

### Replacement

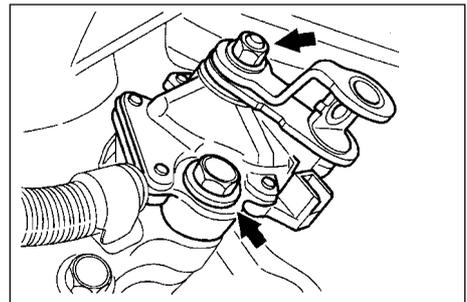
1. Remove the lower engine mud baffle assembly.
2. Disconnect shift cable.
  - (1) Detach the bolt and remove shift cable from the rocker arm.



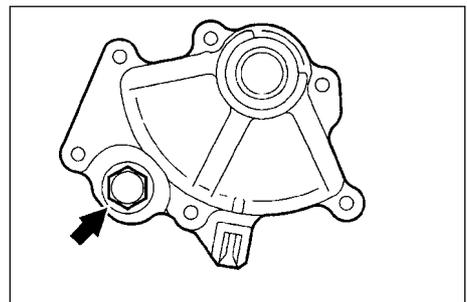
- (2) Detach E-shaped clip to remove shift cable from the rocker arm.



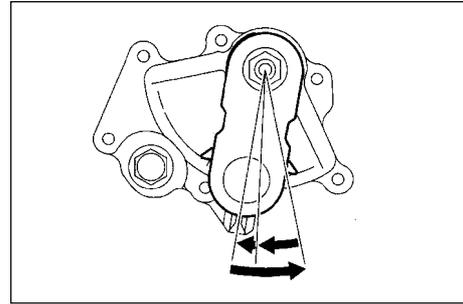
3. Detach neutral switch assembly.
  - (1) Remove the connector from neutral switch.
  - (2) Loosen nut and rocker arm.
  - (3) Detach bolt to separate neutral switch.



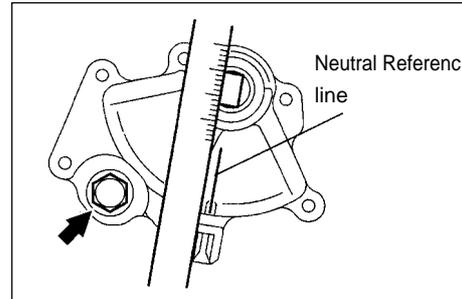
4. Install neutral switch.
  - (1) Install neutral switch to the manual valve axle.
  - (2) Install bolt temporarily.
  - (3) Install neutral switch temporarily.



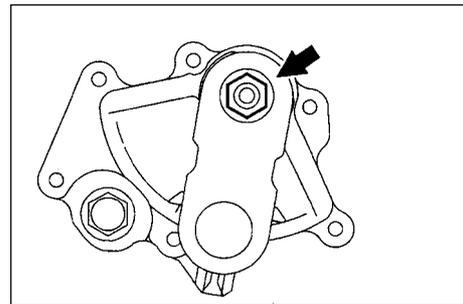
- (4) Turn the rocker arm to the end counterclockwise and rotate 2 teeth clockwise.



- (5) Make the position of neutral switch parallel to the basic central line of neutral switch with a straight rule.  
 (6) Keep this position and tighten the bolt.

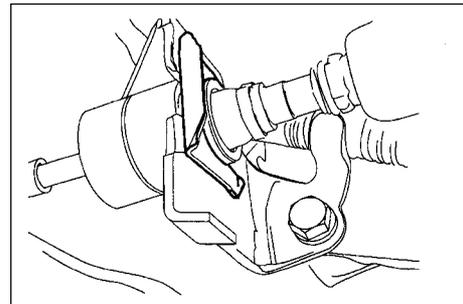


- (7) Tighten the shift rocker arm.  
 (8) Connect the harness of neutral switch.

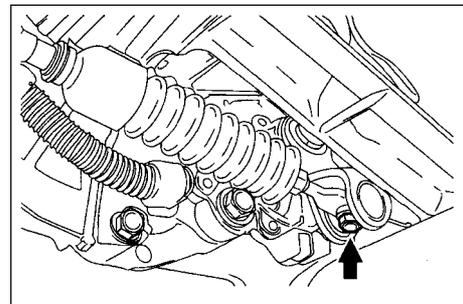


#### 5. Install transmission cable

- (1) Put shift lever to "P" position, meanwhile, make neutral switch at "P" position.  
 (2) Use a new E-shaped clip to fix shift cable on the bracket.



- (3) Tighten the nut in the front of shift cable.  
 Torque: 6.9 ~ 13.7 N.m



6. Check and adjust neutral switch. The display should be clear and correct.  
 7. Install the lower engine mud baffle.

# Part IV Chassis

## Chapter 1 Transmission Control

### Section 1 Introduction of Transmission Control

#### I. Description on Transmission Control

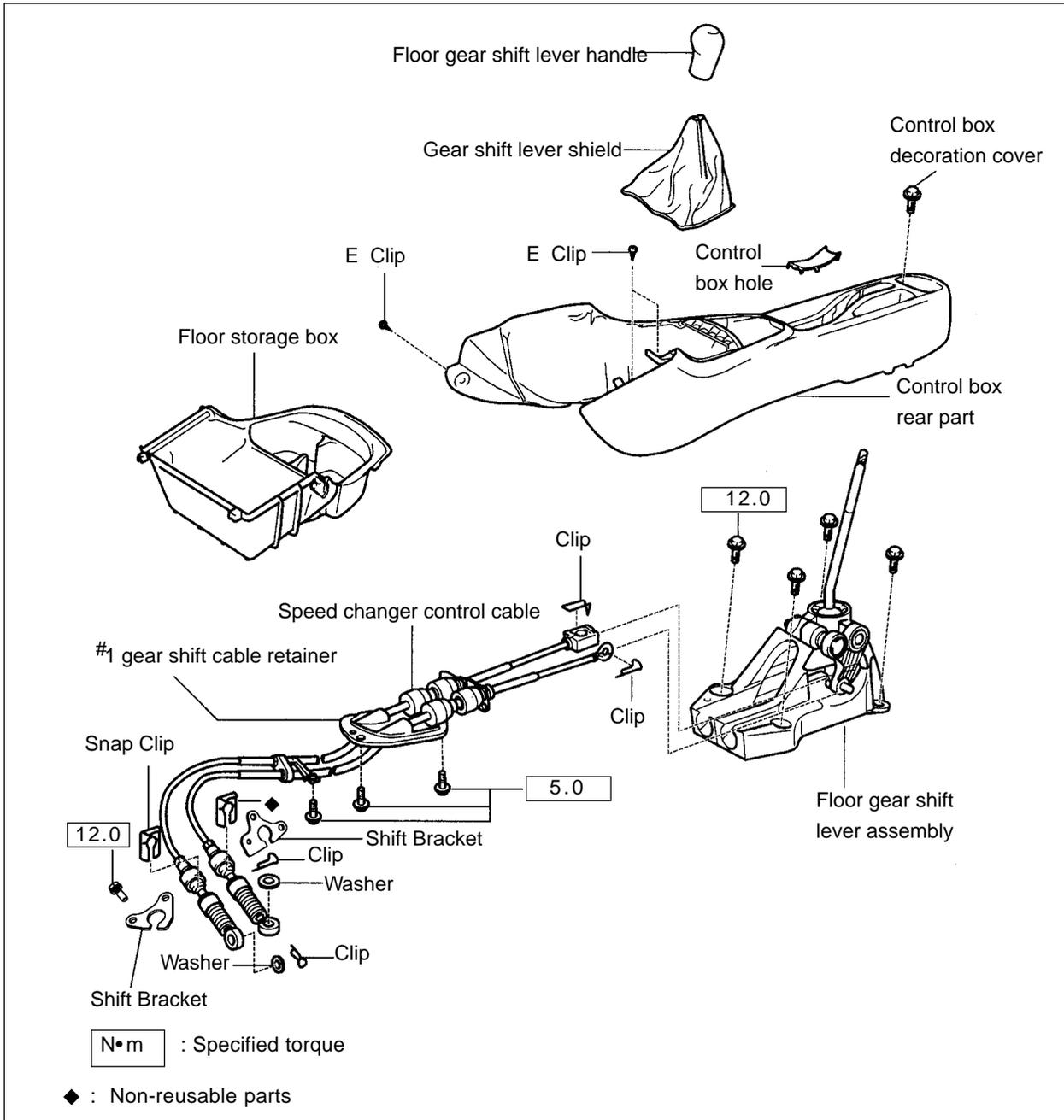
This model is equipped with cable Transmission Controls, respectively used for 1.3L, 1.5L and 1.6L engine. Their gears are: 5 forward gears + 1 reverse gear.

#### II. Symptom Table

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area
Transmission out of gear	<ol style="list-style-type: none"> <li>1. Transmission Control selector (position changing) cable (improperly assembled)</li> <li>2. Cable or shift lever (worn)</li> <li>3. Cable assembly (incorrect)</li> <li>4. Transmission (faulty)</li> </ol>
Transmission shift difficult	<ol style="list-style-type: none"> <li>1. Transmission control selector (position changing ) cable (improperly assembled)</li> <li>2. Cable or shift lever (worn)</li> <li>3. Cable assembly (incorrect)</li> <li>4. Transmission (faulty)</li> </ol>

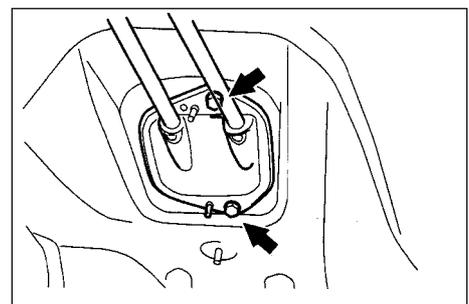
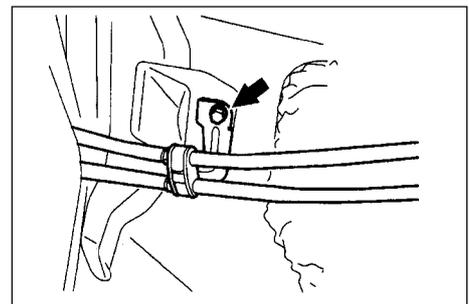
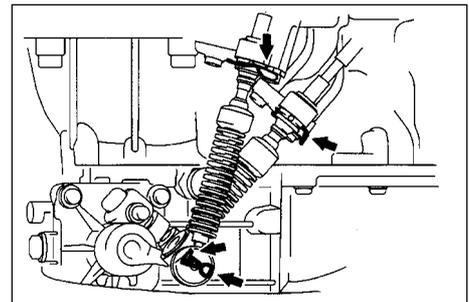
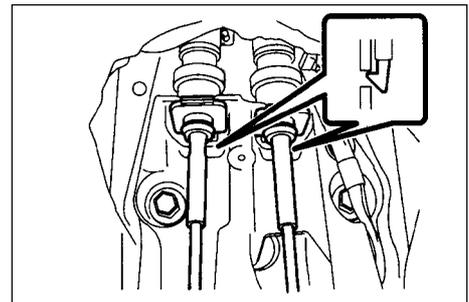
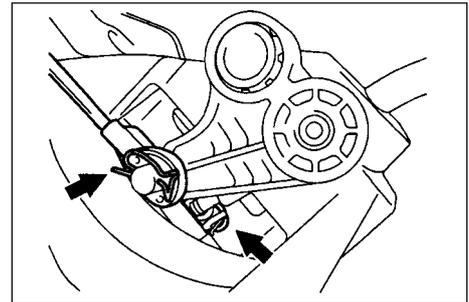
### Component View



## Section 2 Cable Type Transmission Control

### Replacement

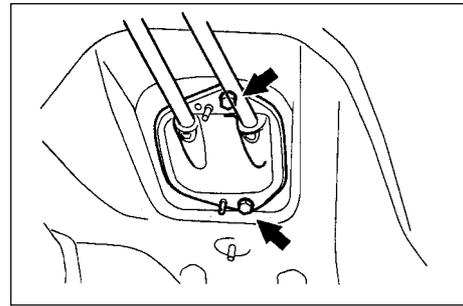
1. Remove the upper cover in dashboard panel.
2. Remove the lower cover in dashboard panel.
3. Remove the cup-holder in the middle console.
4. Loosen transmission control cover.
5. Remove the handle of the gear shift lever.
6. Remove the middle console body.
7. Remove the control cables assembly of the transmission.
  - (1) Remove the two cotter pins and unfix the head of the control cables of the transmission (see the right figure).
  - (2) Remove the control cables assembly after loosening the shift bracket with bolts.
  - (3) Remove the two cotter pins and two washers, and then unfix the two control cables from the manual transmission.
  - (4) Remove the two spring clips and unfix the two control cables from the bracket.
  - (5) Remove the bolt and unfix the control cables.
  - (6) Remove the two bolts.
  - (7) Pull the control cables out of the body.
  - (8) Remove the retainer from the control cables.



## 8. Install the control cables assembly of the transmission.

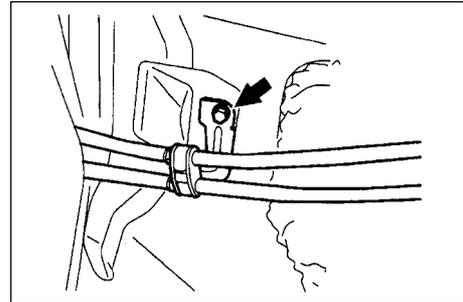
- (1) Install the retainer on the control cables.
- (2) Push the control cables into the floor.
- (3) Install the control cables assembly with two bolts.

Torque: 5.0N.m

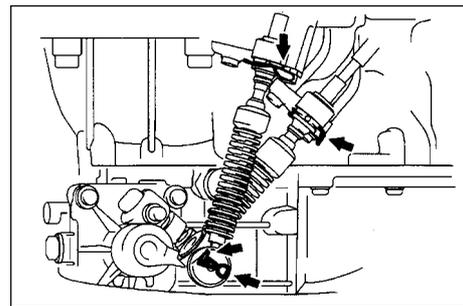


- (4) Connect the control cables assembly and fix the control cable with bolts.

Torque: 5.0N.m



- (5) Connect the ends of the two control cables, and then install two washers and two new spring clips.
- (6) Install two new spring clips on the cable bracket.



- (7) Connect the control cables to gear shift lever.

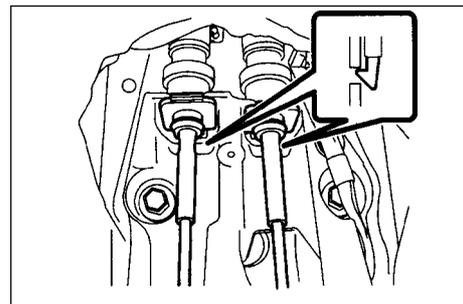
Note:

Make sure the claws engage firmly.

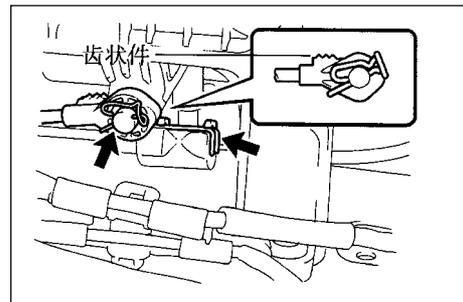
- (8) Connect the ends of the control cables to the gear shift lever selectively, and then install the cotter pin.

Note:

- When connecting the control cables, the dents of their ends shall be made upwards.
- The cotter pins are inserted in a direction as shown in the figure.



- (9) Connect the ends of the gear shift cables to the gear shift lever assembly.

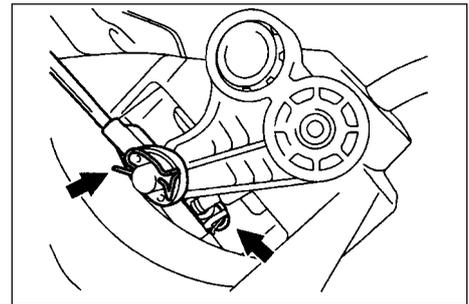


9. Install the middle console body.
10. Install the parking brake cover.
11. Install the handle of the gear shift lever.
12. Install the cup-holder.
13. Install the lower cover in dashboard panel.
14. Install the upper cover in dashboard panel.

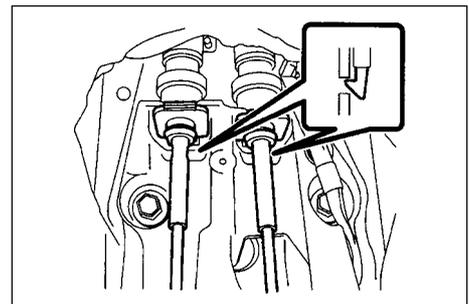
## Section 3 Manual Transmission Shift Mechanism

### Replacement

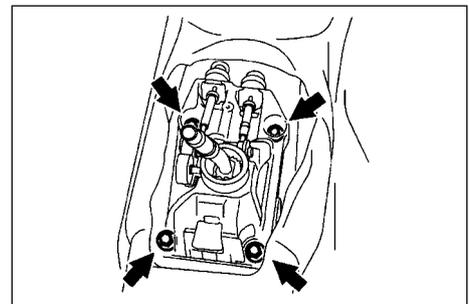
1. Remove the upper cover in dashboard panel.
2. Remove the lower cover in dashboard panel.
3. Remove the cup-holder in the middle console.
4. Loosen transmission control cover.
5. Remove the handle of the gear shift lever.
6. Remove the middle console body.
7. Remove the control cables assembly of the transmission.
  - (1) Remove the two cotter pins and unfix the head of the control cables of the transmission



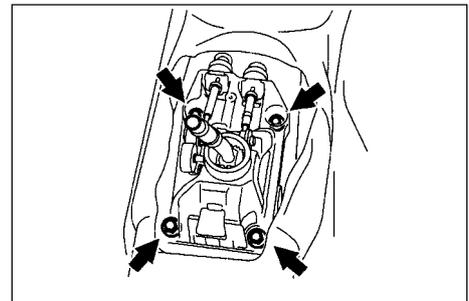
- (2) Remove the spring clips and separate the control cables from the bracket.



8. Remove the four bolts and floor gear shift lever assembly.



9. Install the floor gear shift lever assembly.  
Install the floor gear shift lever assembly with four bolts.  
Torque: 12N.m

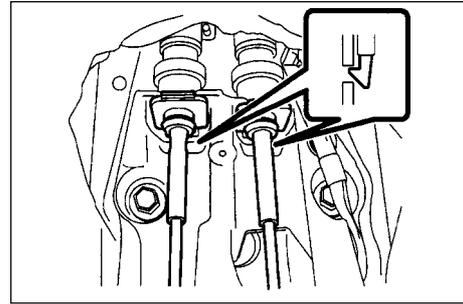


## 10. Connect the control cables assembly.

- (1) Connect the control cables to floor gear shift lever assembly.

Note:

Make sure the spring clips engage firmly.

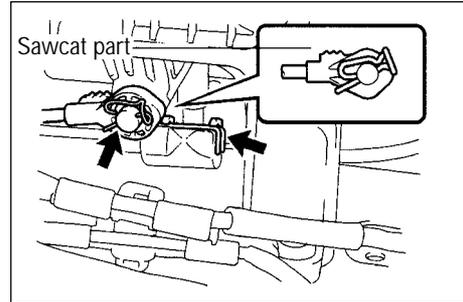


- (2) Connect the ends of the control cables to the floor gear shift lever assembly, and then install the cotter pins.

Note:

- When connecting the ends, the dents shall be made upwards.
- The cotter pins are inserted in a direction as shown in the figure.

- (3) Connect the ends of the gear shift cables to the floor gear shift lever assembly.



## 11. Install the middle console body.

## 12. Install the parking brake cover.

## 13. Install the handle of the gear shift lever.

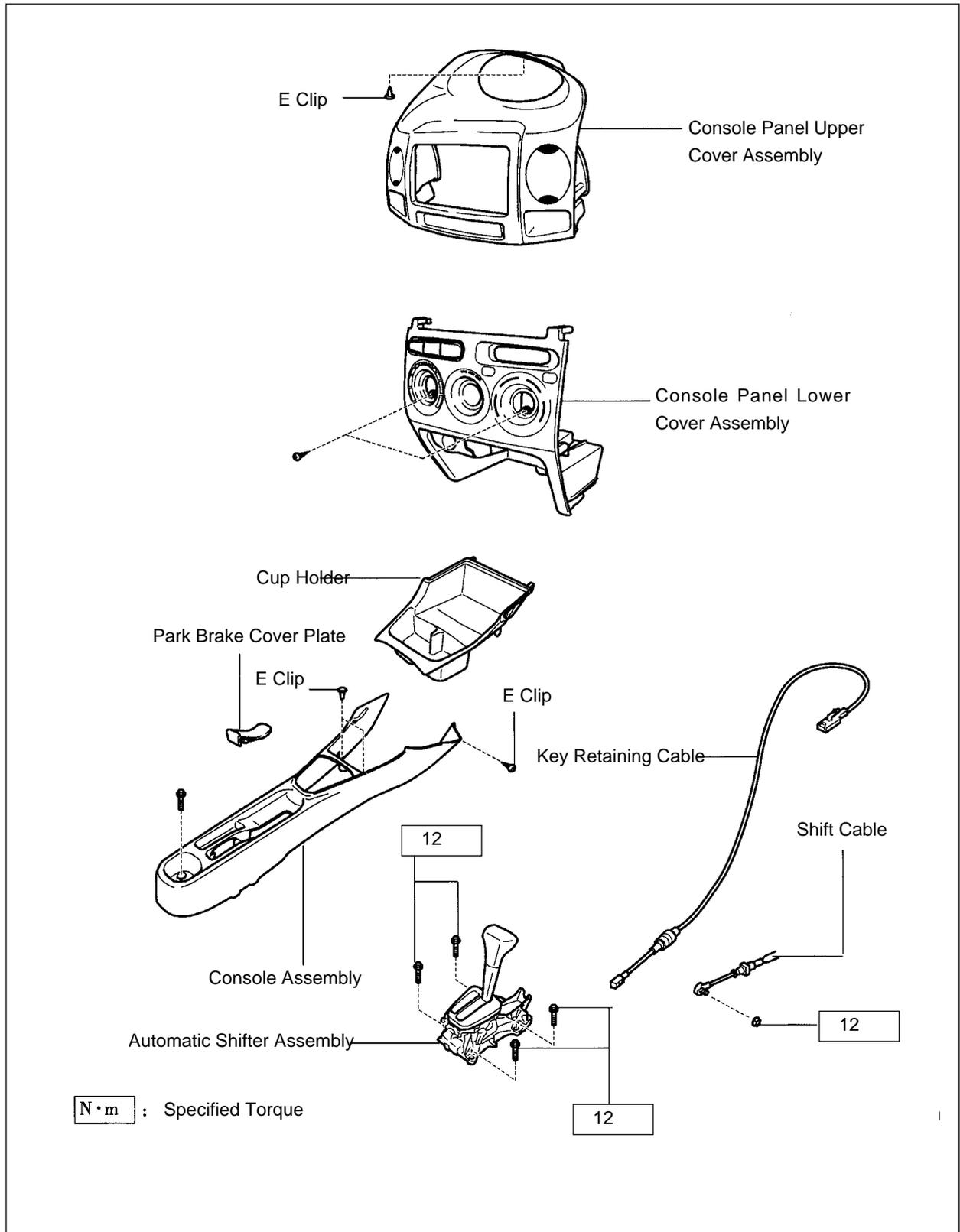
## 14. Install the cup-holder.

## 15. Install the lower cover in dashboard panel.

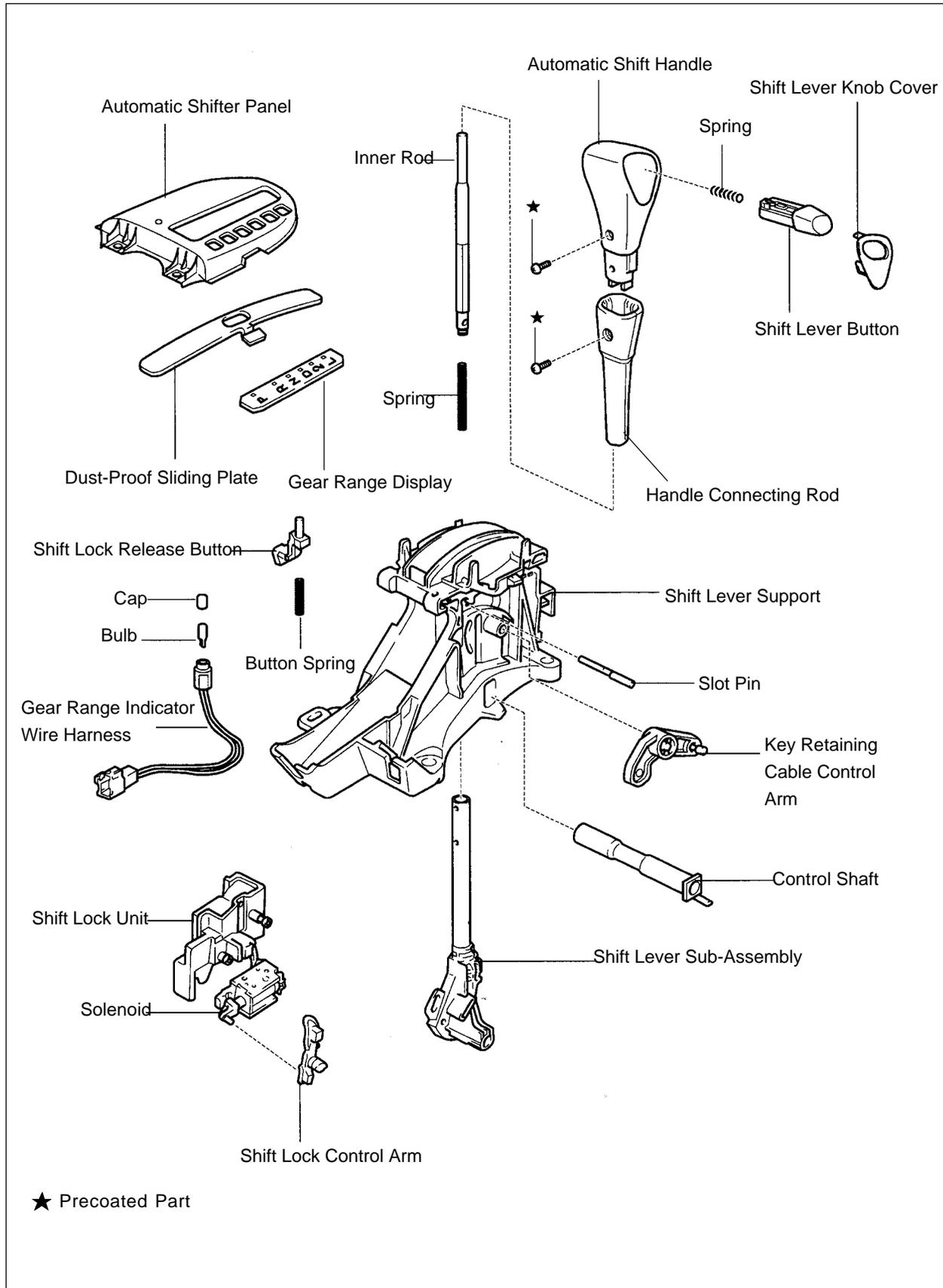
## 16. Install the upper cover in dashboard panel.

## Section 4 Automatic Transmission Shift Mechanism

### Component View



### Component View



## Replacement

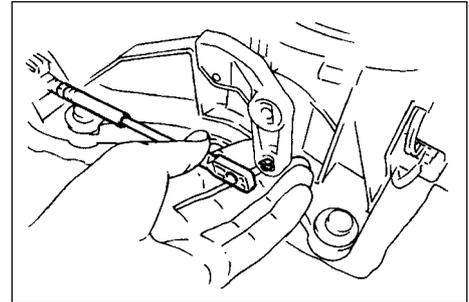
1. Remove CD cover
2. Remove console panel lower cover assembly
3. Remove cup holder
4. Remove console assembly
5. Remove key retaining cable.

(1) loosen the adjustment locking cap.

Tip:

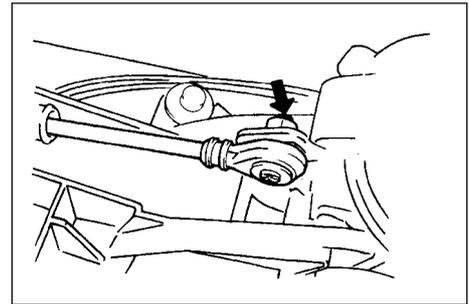
Face the vehicle front and turn rotate it clockwise by 90° .

(2) Use screwdriver to remove the key retaining cable

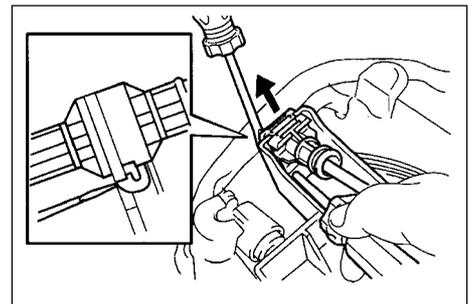


6. Disconnect shift cable assembly

(1) Remove the nut, disconnect the shift cable from the shifter assembly



(2) Use screwdriver to disconnect the shift cable from the shift lever tray.

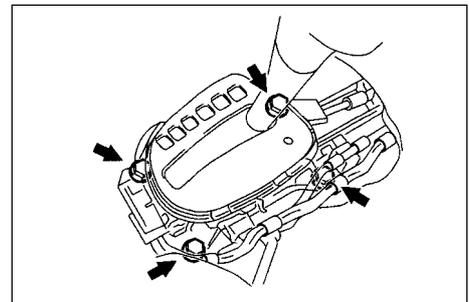


7. Remove automatic shifter assembly

(1) Remove the four bolts.

(2) Disconnect the two connectors.

(3) Remove the shifter assembly.



## 8. Install the automatic shifter assembly

Install it in place in the reverse order of removal.

## 9. Check and adjust the shift lever position

- (1) Check that the starter works only when the shift lever is in P position, but doesn't work in other positions.
- (2) Move the shift lever, check whether the display of the gear range indicator is consistent with the actual gear range.
- (3) Check that the key can be pulled out in P position.
- (4) Except the P position, the ignition key can not be turned to LOCK position with the shift lever in other positions.
- (5) Check that when shift release button is pressed down, the shift lever can be transferred to other positions from the P position.

## 10. Adjustment

- (1) When moving shift lever among the positions, make sure to move the shift lever in a stable way, operate properly and the positive display is correct.

Gear positions able to be operated without pressing down the knob button are:

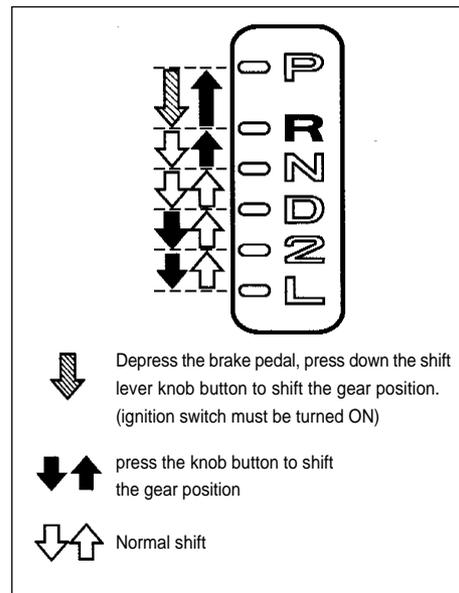
$R \rightarrow N \rightarrow D$ ,  $L \rightarrow 2 \rightarrow D \rightarrow N$

Gear positions able to be operated only when the knob button is pressed down are:

$2 \rightarrow L$ ,  $N \rightarrow R \rightarrow P$

- (2) Gear positions able to be operated only when the knob button is pressed down, the ignition switch is turned ON and the brake pedal is depressed are:
 

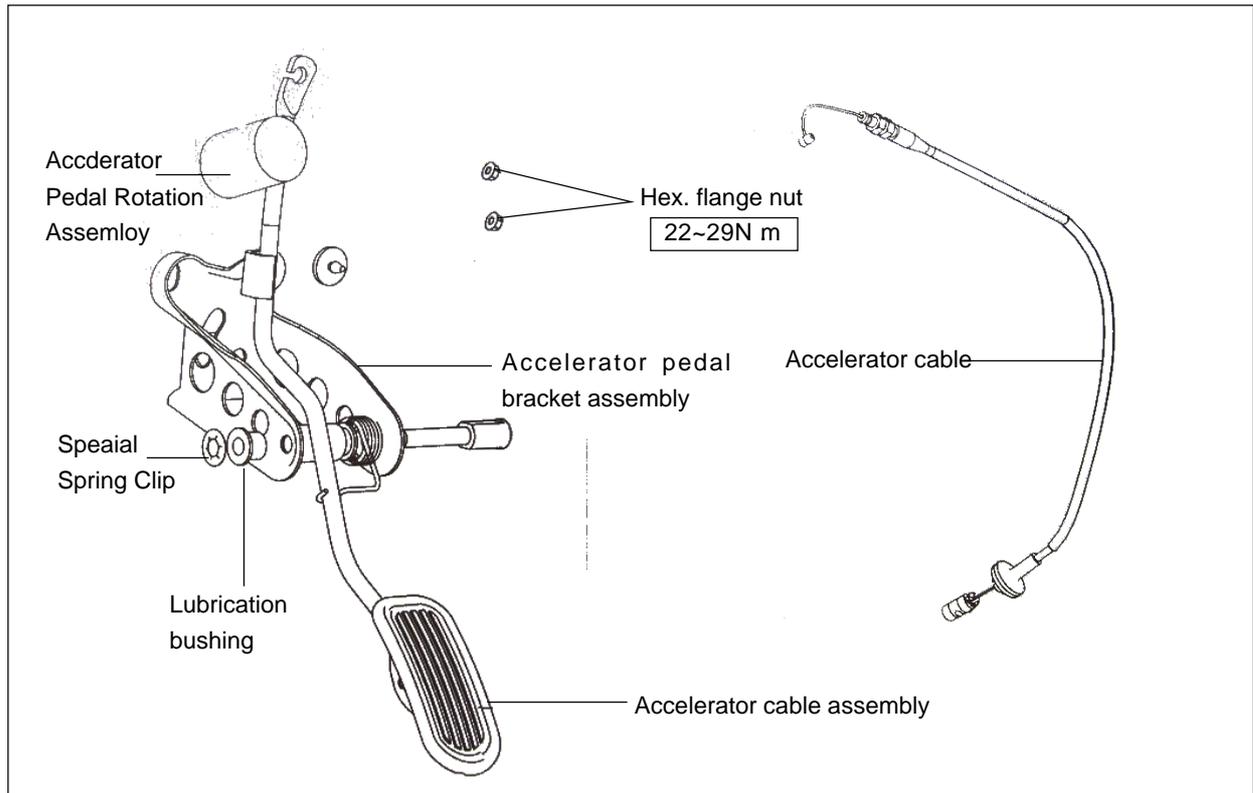
$P \rightarrow R$
- (3) Start the engine, make sure the vehicle drives ahead when the shift lever is moved from N position to D position, and back up when the shift lever is set to R position.



## Chapter 2 Accelerator Pedal Device

### Section 1 Introduction of Accelerator Pedal

#### Component View



#### Replacement

1. Disconnect the accelerator cables.

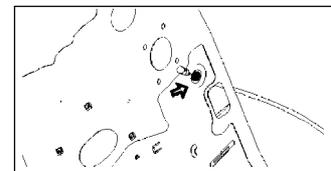
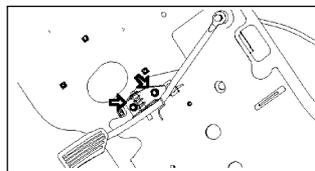
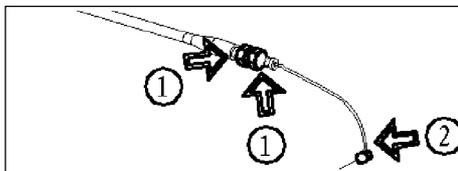
Loosen the accelerator cables and the bolts on the accelerator cable frame of the engine, and then disconnect the accelerator cables from the rocker of the motor restrictor.

2. Remove the accelerator pedal.

(1) Remove the two bolts that connect the accelerator pedal and the body.

(2) Disconnect the accelerator cables.

3. Remove the accelerator cables.



4. Install the accelerator cables and accelerator pedal assembly in a reverse order.

Note:

(1) The torque of the bolt is 20~25N.m.

(2) Adjust the position of the accelerator cables properly to obtain a proper tension.

(3) Check that the acceleration runs freely and reliably.

# Chapter 3 Clutch Control System

## Section 1 Introduction of Clutch Control

### I. Description

A hydraulic clutch control system is equipped which can be used in cars with various displacements (including 1.3L, 1.5L and 1.6L).

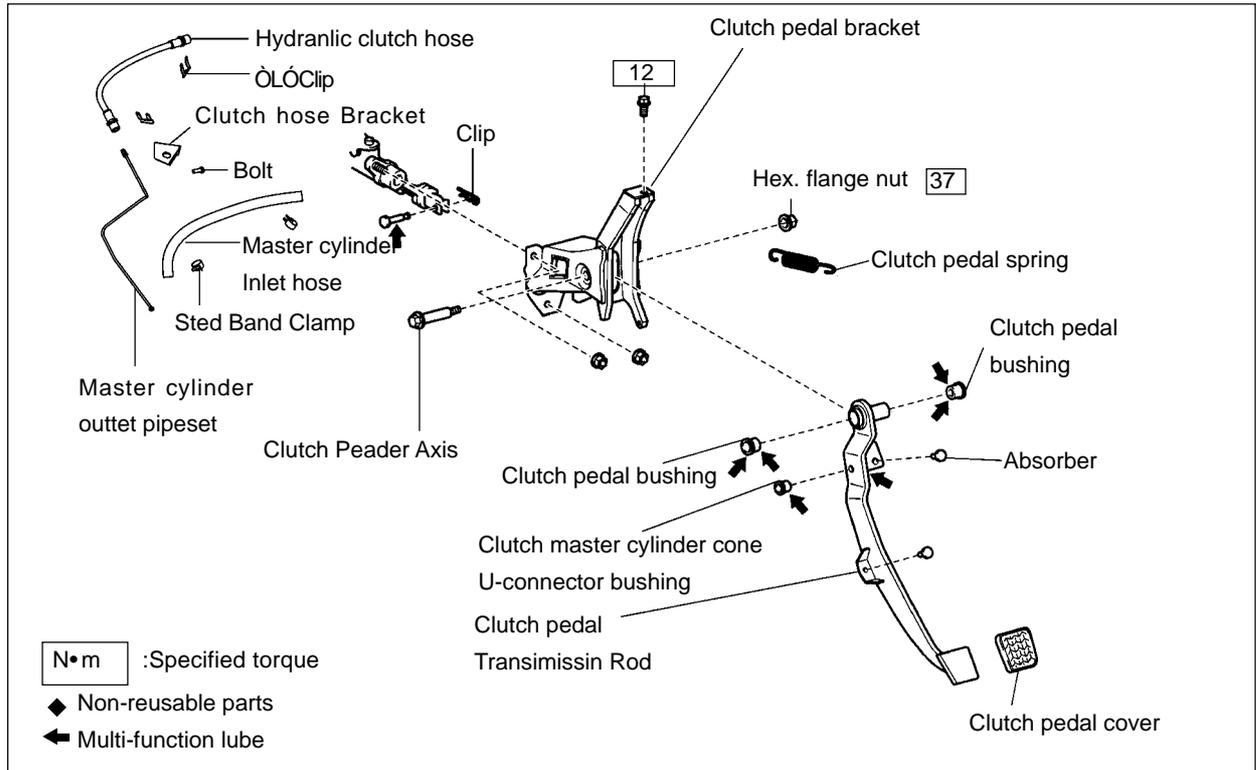
### II. Symptom Table

The table below lists the common symptoms and possible causes of the failures. The number means the possible sequence of the causes. Check the parts, and replace the corresponding parts if necessary.

Symptom	Suspected area
Clutch is trapped or shaken.	<ol style="list-style-type: none"> <li>1. Engine fixture is loosened.</li> <li>2. Clutch disc shakes seriously.</li> <li>3. Clutch disc is contaminated by oil or wore down.</li> <li>4. Torque spring of the clutch disc is damaged.</li> <li>5. Clutch disc is hardened.</li> <li>6. Diaphragm spring is not aligned on the top.</li> </ol>
Clutch pedal is loosened.	<ol style="list-style-type: none"> <li>1. There is air in the clutch oil pipe.</li> <li>2. Cup of the master cylinder is damaged.</li> <li>3. Cup of the wheel cylinder is damaged.</li> </ol>
Abnormal noise occurs.	<ol style="list-style-type: none"> <li>1. Clutch release bearing is worn out, contaminated or damaged.</li> <li>2. Torque spring of the clutch disc is damaged.</li> </ol>
Clutch skids.	<ol style="list-style-type: none"> <li>1. Clutch pedal has maladjusted free stroke.</li> <li>2. Clutch disc is contaminated by oil.</li> <li>3. Clutch disc is worn.</li> <li>4. Diaphragm spring is damaged.</li> <li>5. Platen is deformed.</li> <li>6. Flywheel is deformed.</li> </ol>
Clutch can not be separated.	<ol style="list-style-type: none"> <li>1. Clutch pedal has maladjusted free stroke.</li> <li>2. There is air in the clutch oil pipe.</li> <li>3. Cup of the master cylinder is damaged.</li> <li>4. Cup of the wheel cylinder is damaged.</li> <li>5. Clutch disc is deformed or wiggled.</li> <li>6. Clutch disc is worn out.</li> <li>7. Clutch disc is contaminated or burned out.</li> <li>8. Clutch disc is contaminated by oil.</li> <li>9. Clutch disc has no lube on its spline.</li> </ol>

## Section 2 Clutch Pedal

### Component View



### Adjustment

#### 1. Check and adjust the clutch pedal.

- (1) Lift the carpet on the floor.
- (2) Check the pedal's height is proper.  
 Pedal's height from oil felt: 134.3-144.3mm

#### (3) Adjust the pedal's height.

Loosen the lock nut, and turn the bolt till the correct pedal's height is reached, and then tighten the lock nut.

Torque: 16N.m

#### (4) Check whether the pedal's free travel and push bar travel are proper.

- a. Step the pedal down till a resistance appears.

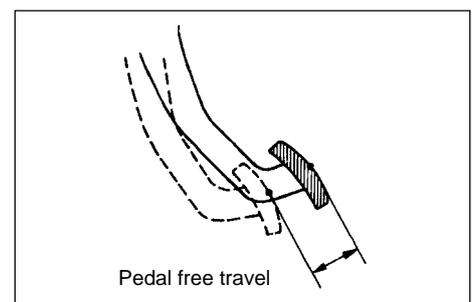
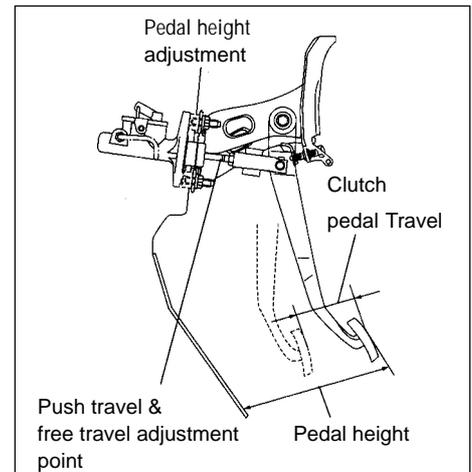
Pedal's free stroke: 5-15mm

- b. Step the pedal down lightly till the resistance increase a little.

Push bar (on the pedals top) travel: 1.0-5.0mm

#### (5) Adjust the pedal's free travel and push bar travel.

- a. Loosen the lock nut, and turn the push bar till the pedal's free travel and push bar travel are proper.



b. Tighten the lock nut.

Torque: 12N.m

c. Check the pedal's height after adjusting the pedal's free travel.

(6) Check the clutch's separating point.

a. Tension the parking brake device and install a wheel stopper.

b. Start the motor and make it run idly.

c. Don't step the clutch pedal, and put the gear shift lever to the reverse gear slowly till the gears engage.

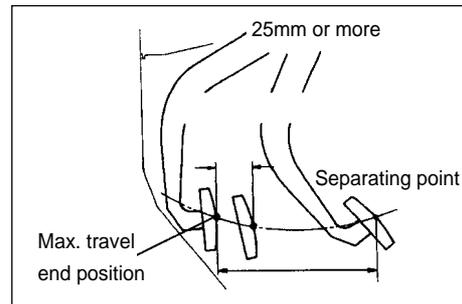
d. Step the clutch pedal down slowly, and measure the travel distance between the separating point to the pedal travel end position.

Standard distance: 25mm or above (pedal travel end position to separating point)

If the distance doesn't meet standard, carry out the following steps:

- Check the pedal's height.
- Check the push par stroke and pedal's free travel.
- Discharge the air in the clutch fluid pipe.
- Check the clutch cover and clutch disc.
- Check the pedal's travel.

Pedal travel: 120-130mm



## Replacement

1. Remove the battery negative terminal.
2. Remove the upper cover in dashboard panel.
3. Remove the lower cover in dashboard panel.
4. Remove the pane of the control board.
5. Remove the clutch pedal spring.
6. Remove the U-connector with pin on the clutch master cylinder push bar.

Remove the clips and pins.

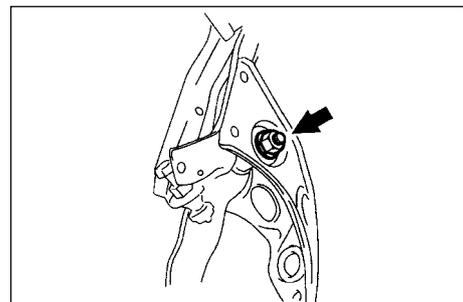
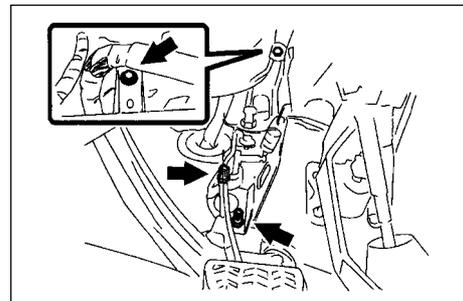
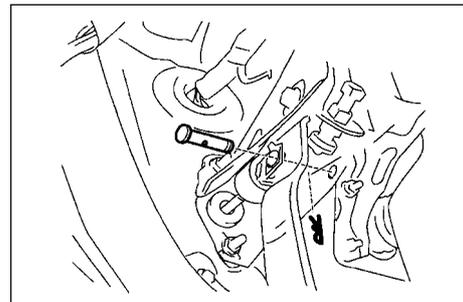
7. Remove the clutch pedal bracket.

Remove the two nuts and bolts, and then remove the clutch pedal bracket.

8. Remove the clutch pedal.

(1) Remove the bolts and nuts.

(2) Remove the clutch pedal from the clutch pedal bracket.



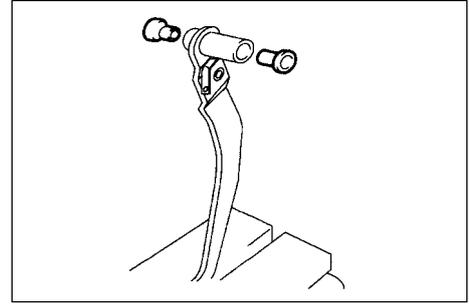
9. Remove the clutch pedal gasket.

10. Remove the clutch pedal absorber.

Remove absorber from the clutch pedal.

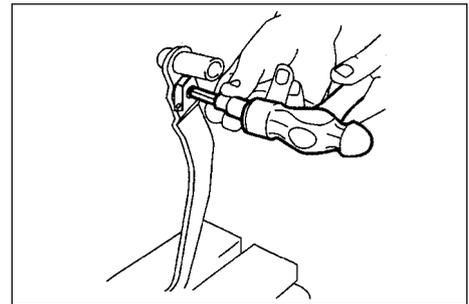
11. Remove the clutch pedal bushing.

Remove the two bushings from the clutch pedal.



12. Remove the U-connector bushing on the clutch master cylinder's push bar.

Remove the U-connector bushing from the clutch pedal with an 8mm hexagon wrench and hammer.

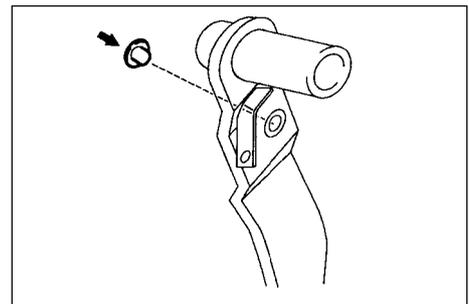


13. Install the U-connector bushing on the clutch master cylinder push bar.

(1) Apply multi-function lube inside the new U-connector bushing.

(2) Install the U-connector bushing on the clutch pedal.

Tips: Install the U-connector bushing from the right side.



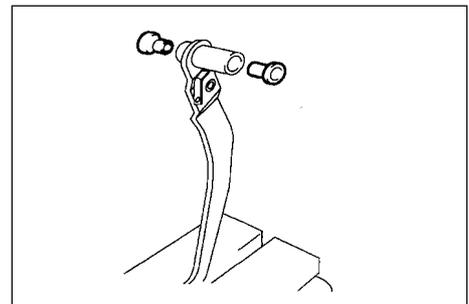
14. Install the clutch pedal bushing.

(1) Apply multi-function lube on both sides of the two new bushings.

(2) Install the two bushings on the clutch pedal.

15. Install absorber on the clutch pedal.

Put absorber on the clutch pedal.

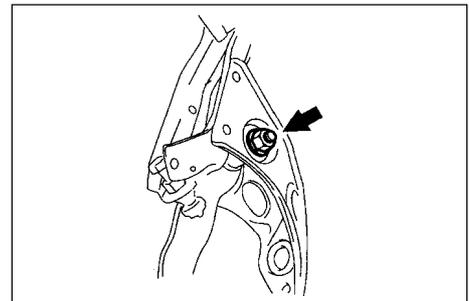


16. Install the clutch pedal.

Install the clutch pedal on the clutch pedal bracket with bolts and nuts.

Torque: 37N.m

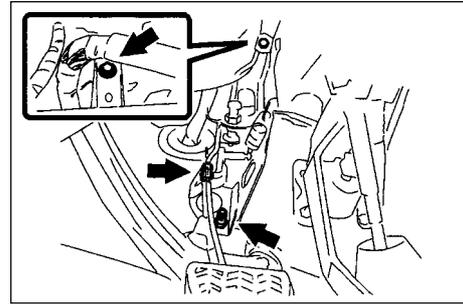
Tips: Install the bolts from the left side.



17. Install the clutch pedal bracket.

Install the clutch bracket with two bolts and nuts.

Torque: 12N.m



18. Install the U-connector with pin on the clutch master cylinder push bar.

(1) Apply multi-function lube on the surfaces of the pin and the U-connector bushing.

(2) Connect the U-connector to the clutch pedal with clip.

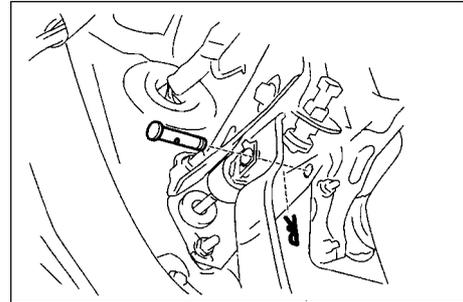
Tips: Install the pin from the right side.

(3) Install the clip on the pin.

19. Install the clutch pedal spring.

20. Check and adjust the clutch pedal.

21. Connect the battery negative terminal.



# Chapter 4 Propeller Shaft/Driveshaft

## Section 1 Propeller Shaft, Driveshaft and Transaxle

### I. Symptom Table

The table below can help find the causes of the problem. The numbers indicate the priority of the causes of the problem. Replace the parts if necessary.

Symptom	Inspection Area	Reference
Deviation	<ol style="list-style-type: none"> <li>1. Wheel</li> <li>2. Front wheel alignment</li> <li>3. Rear wheel alignment</li> <li>4. Front wheel hub bearing (worn)</li> <li>5. Rear wheel hub bearing (worn)</li> <li>6. Front shock absorber with coil spring</li> <li>7. Steering linkage (loose or damaged)</li> <li>8. Stabilizer bar</li> </ol>	
Front wheel vibration	<ol style="list-style-type: none"> <li>1. Wheel balance</li> <li>2. Wheel hub bearing (worn)</li> <li>3. Front shock absorber with coil spring</li> </ol>	
Noise (drive shaft)	<ol style="list-style-type: none"> <li>1. Outer joint (worn)</li> <li>2. Inner joint (worn)</li> </ol>	

### II. On-board Inspection

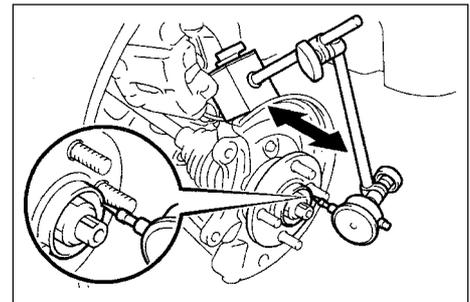
#### 1. Check front wheel hub bearing

- (1) Remove front wheel.
- (2) Remove front brake caliper assembly.
- (3) Remove front brake disc.
- (4) Check the bearing backlash.

Set a dial indicator near the front wheel hub center to check the backlash.

Maximum: 0.05mm

If the backlash exceeds the maximum value, replace the front wheel hub bearing.

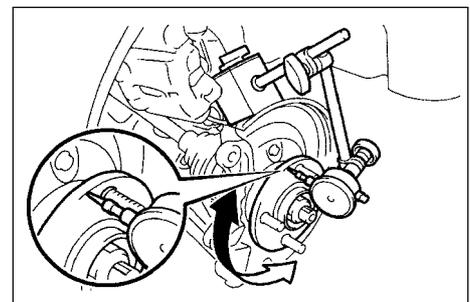


- (5) Check the front wheel hub deviation

Using a dial indicator, check the deviation of the surface of the wheel hub outside the hub bolt.

Maximum: 0.07mm

If the backlash exceeds the maximum value, replace the front wheel hub subassembly.



- (6) Install front brake disc.
  - (7) Install front brake caliper assembly
  - (8) Install front wheel.
- Torque: 103N.m

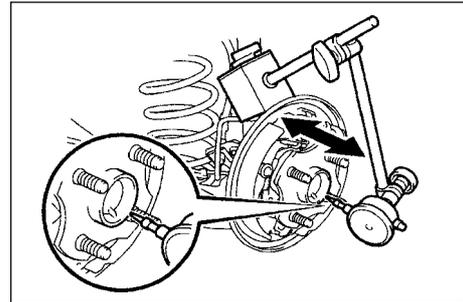
## 2. Check back wheel hub bearing

- (1) Remove rear wheel.
- (2) Remove rear brake drum subassembly.
- (3) Check bearing backlash.

Set a dial indicator near the rear wheel hub center to check the backlash.

Maximum: 0.05mm

If the backlash exceeds the maximum value, replace the rear wheel hub and bearing assembly.



- (4) Check rear wheel hub deviation

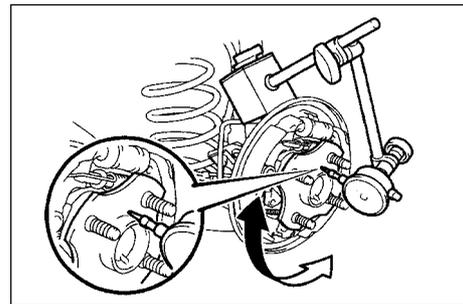
Using a dial indicator, check the deviation of the surface of the rear wheel hub inside the hub bolt.

Maximum: 0.07mm

If the backlash exceeds the maximum value, replace the rear wheel hub and bearing assembly.

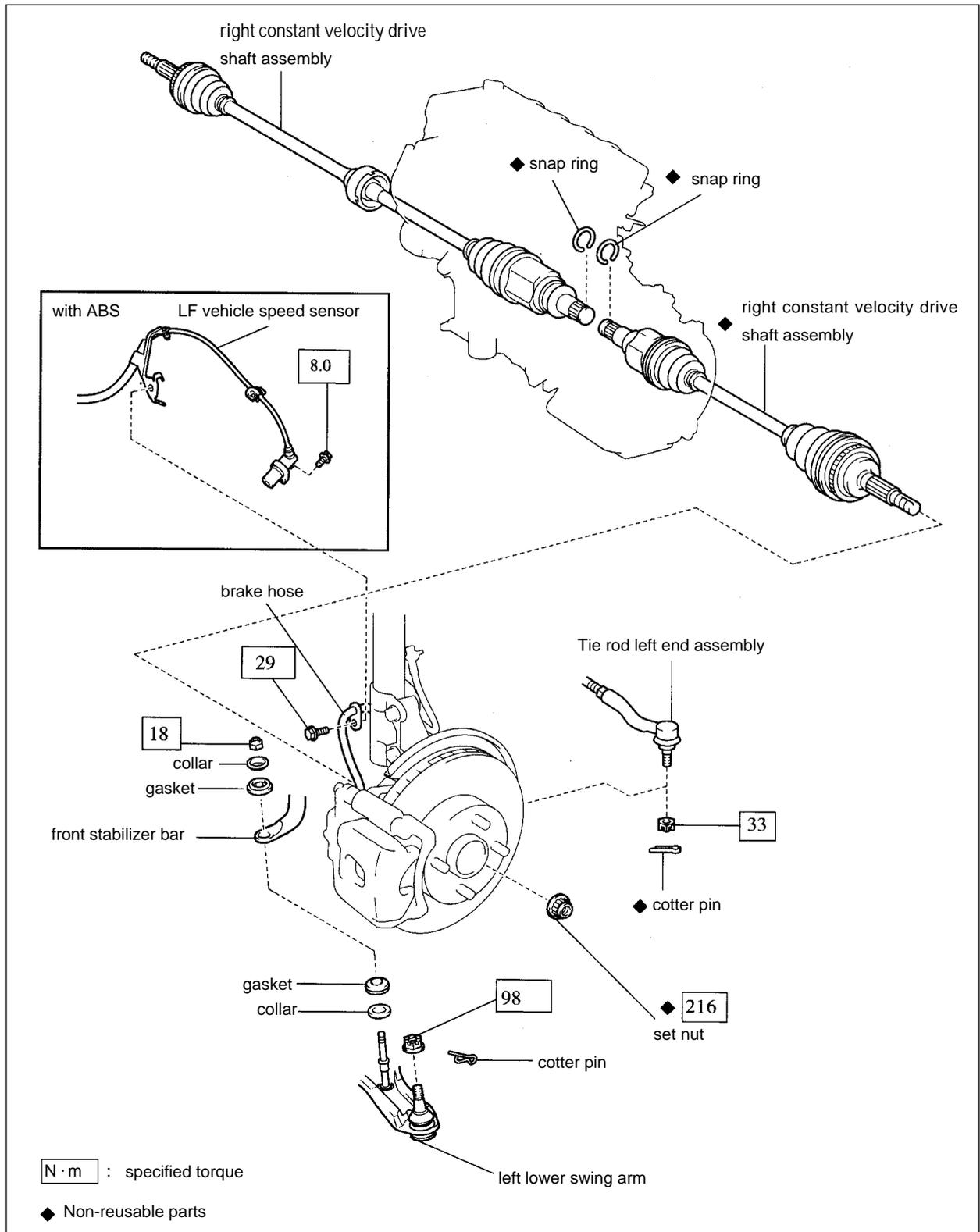
- (5) Install rear brake subassembly
- (6) Install rear wheel

Torque: 103N.m

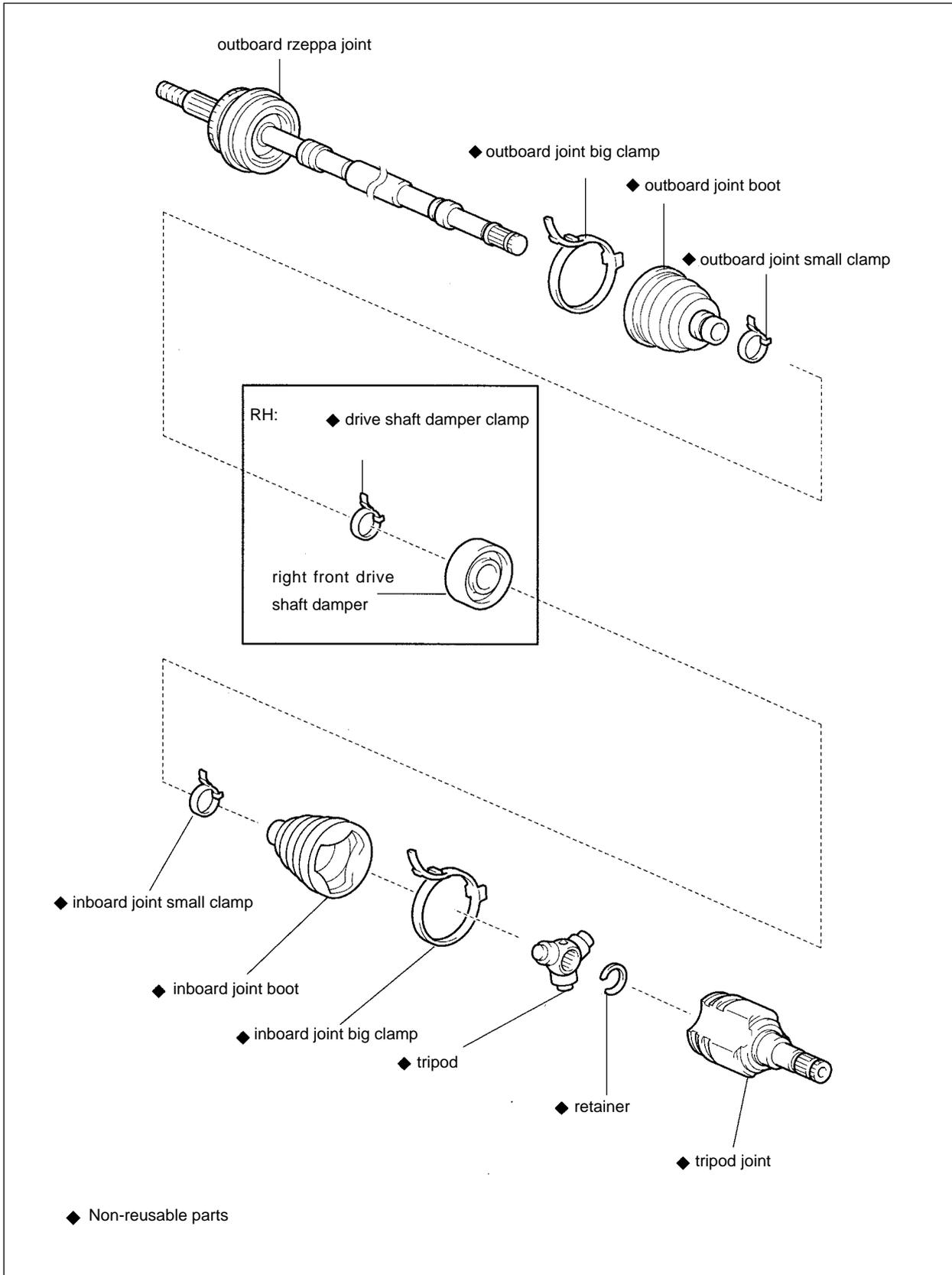


## Section 2 Front Driveshaft

### Component View



### Component View

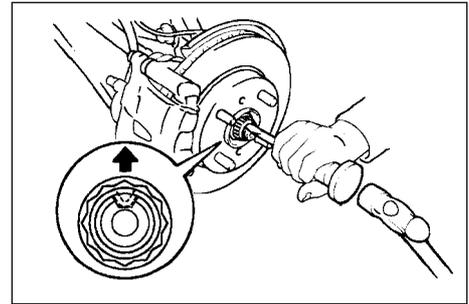


## Overhaul

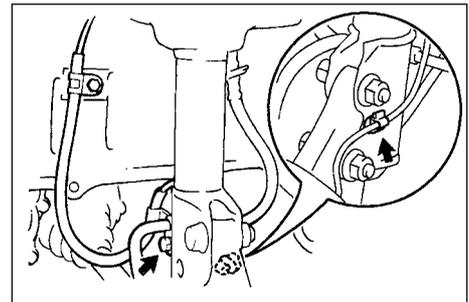
1. Drain manual transmission oil (M/T transmission)  
Torque: 39N.m
2. Drain automatic transmission oil (A/T transmission)  
Torque: 25N.m
3. Remove front wheel
4. Remove engine bottom left shield (M/T transaxle)
5. Remove engine bottom right shield (M/T transaxle)
6. Remove engine bottom shield assembly (A/T transaxle)
7. Remove front wheel hub left bolt

- (1) Using a hammer and a drive shaft nut chisel, unstake the staked part of the left wheel hub nut.
- (2) While applying the brake pedal, remove the left wheel hub nut.

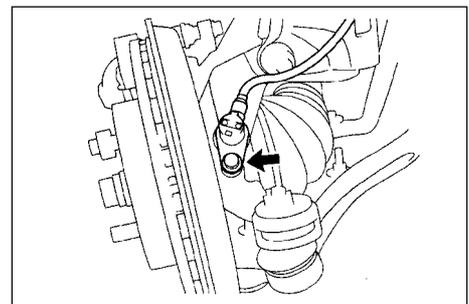
Notice: the staked part of the nut should be fully unstaked, otherwise it may damage the thread of the drive shaft.



8. Remove left front vehicle speed sensor (with ABS)
  - (1) Remove the bolt and clip, remove vehicle speed sensor and brake hose from left front shock absorber assembly.

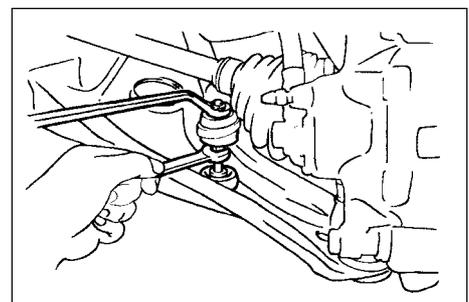


- (2) Remove the bolt, separate the left front vehicle speed sensor from steering knuckle.



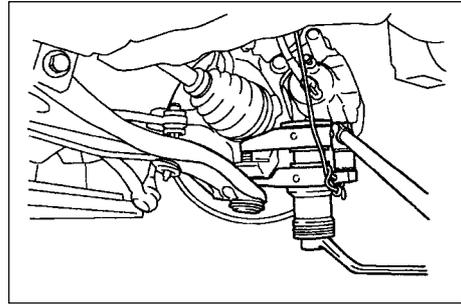
9. Remove front stabilizer bar

- (1) Use a 10mm wrench to hold the bolt, remove the nut
- (2) Remove two collars, No.1 and No.2 gaskets, remove front stabilizer bar



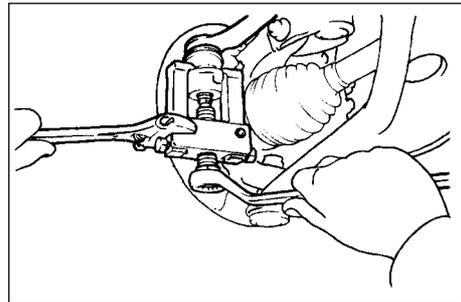
## 10. Separate left lower swing arm assembly

- (1) Remove cotter pin and nut
- (2) On steering knuckle, remove the left lower swing arm assembly with ball joint puller.



## 11. Separate steering gear with tie rod assembly

- (1) Remove cotter pin and nut
- (2) On steering knuckle, remove the steering gear with tie rod assembly with ball joint puller.



## 12. Separate LF steering knuckle assembly

Using a plastic hamper, separate left front drive shaft assembly from left front steering knuckle assembly

Notice:

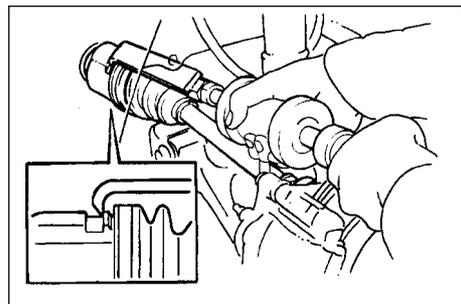
- Do not damage the boot.
- With ABS:  
Be careful not to damage the vehicle speed sensor rotor.

## 13. Remove left constant velocity drive shaft assembly

Using a differential side gear shaft remover, remove the left constant velocity drive shaft assembly.

Notice:

- Do not damage the boot and oil seal.
- Be careful not to drop the drive shaft assembly.

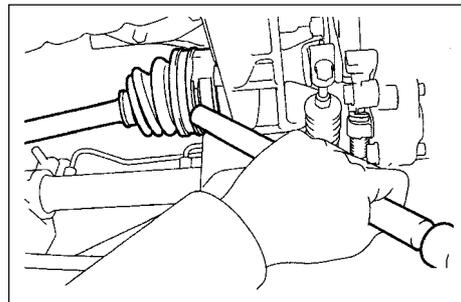


## 14. Remove right constant velocity drive shaft assembly

Using a brass bar and a hammer, remove the right constant velocity drive shaft assembly.

Notice:

- Do not damage the boot and oil seal.
- Be careful not to drop the drive shaft assembly.

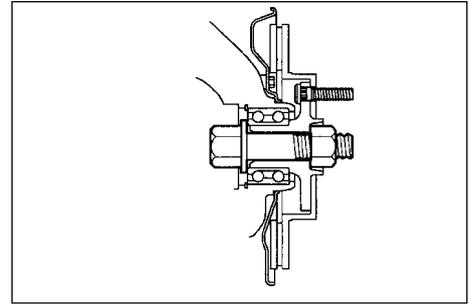


## 15. Install LF steering knuckle assembly

## Notice:

The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft bearing removed.

Therefore if it is absolutely necessary to place the vehicle weight on the hub bearing, first support it with the special service tool for front hub bearing.

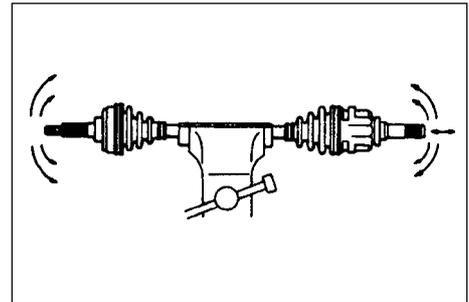


## 16. Check left constant velocity drive shaft assembly

- (1) Check the outboard joint for apparent looseness.
- (2) Check that the inboard joint slide smoothly.
- (3) Check the inboard joint for radial looseness.
- (4) Check the boot for damage.

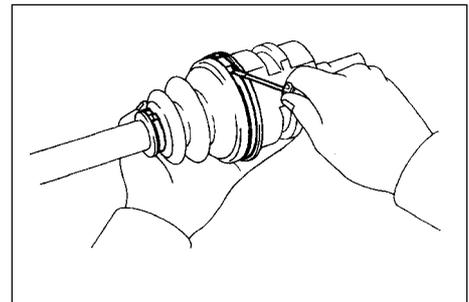
## Notice:

Place the drive shaft assembly on level surface during the inspection.



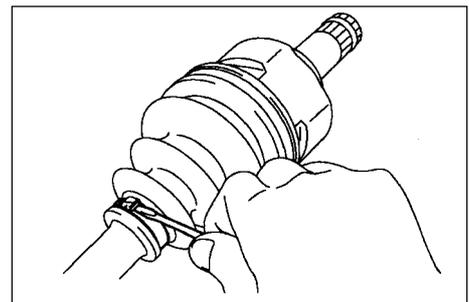
## 17. Remove inboard joint big clamp

Using a screw driver, loosen the inboard joint big clamp.



## 18. Remove inboard joint small clamp

Using a screw driver, loosen the inboard joint small clamp.



## 19. Separate inboard joint boot

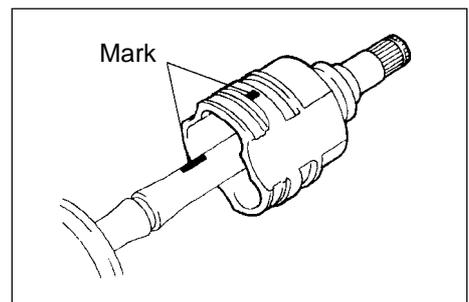
Separate the outboard joint boot from the outboard Rzeppa joint assembly.

## 20. Remove left tripod joint assembly

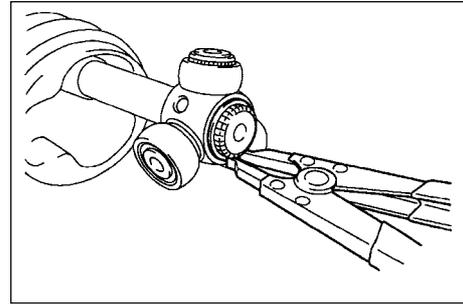
- (1) Wipe off the old grease from the tripod joint assembly.
- (2) Place the matchmarks between the tripod joint assembly and the outboard Rzeppa joint.

## Notice:

Do not punch the matchmarks.



- (3) Remove the tripod joint assembly from the Rzeppa joint assembly.
- (4) Using a snap ring plier, remove the left drive shaft inner snap ring.



- (5) Place matchmarks on the tripod joint assembly and outboard Rzeppa joint assembly.

Notice:

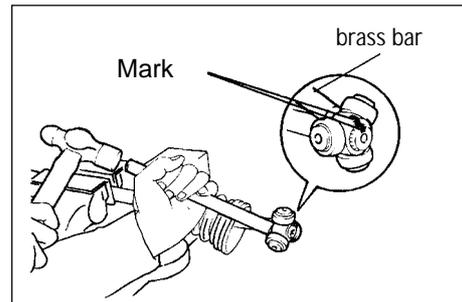
Do not punch the matchmarks.

- (6) Using a brass bar and a hammer, remove the tripod joint from the outboard Rzeppa joint assembly.

Notice:

Do not tap the roller.

- (7) Remove the inboard joint boot clamp, boot, inner boot and left boot small clamp.

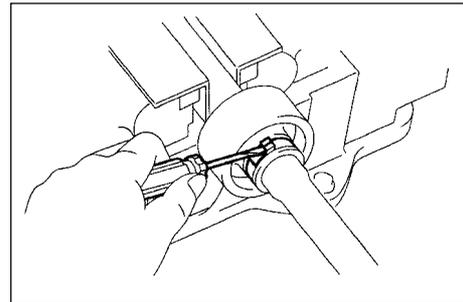


21. Remove drive shaft damper clamp

Hint:

Perform the following operations only when disassembling the right drive shaft.

Using a screwdriver, loosen the damper clamp.



22. Remove right drive shaft damper

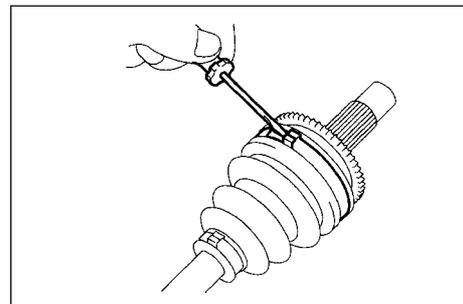
Hint:

Perform the following operations only when disassembling the right drive shaft.

Remove the right driver shaft damper clamp.

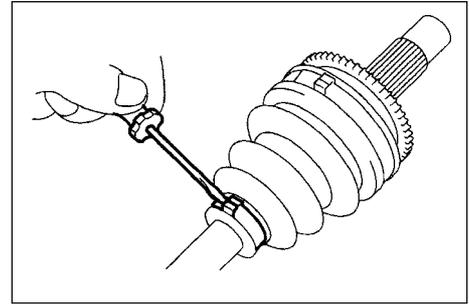
23. Remove left constant velocity outboard joint boot big clamp

Using a screwdriver, loosen the left constant velocity drive shaft outboard joint boot big clamp.



**24. Remove outboard joint boot small clamp**

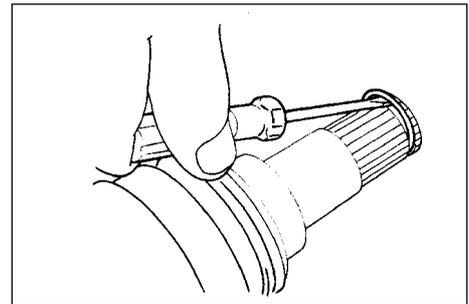
Using a screw driver, loosen the outboard joint boot small clamp.

**25. Remove outboard joint boot**

- (1) Remove the outboard joint boot from the outboard Rzeppa joint assembly.
- (2) Wipe off the old grease from the Rzeppa joint assembly.

**26. Remove left front drive shaft tripod retainer**

Using a screw driver, loosen the left front drive shaft tripod retainer.

**27. Install left front tripod retainer**

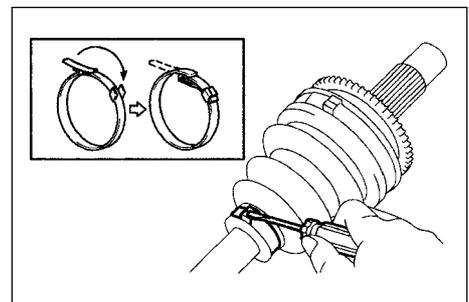
Install the new tripod retainer.

**28. Install outboard joint boot**

- (1) Wrap vinyl tape around the spline of the Rzeppa joint to prevent damaging the boots.
- (2) Install the new parts on the tripod joint in the following sequence.
  - a. Outboard joint boot big clamp
  - b. Outboard joint boot
  - c. Outboard joint boot small clamp
- (3) Coat the left Rzeppa joint assembly with grease.  
Grease amount: 69-79g
- (4) Install the outboard joint boot on the Rzeppa joint assembly.

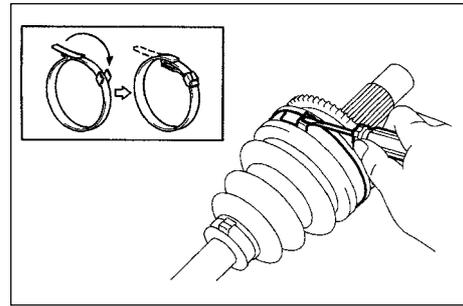
**29. Install outboard joint boot small clamp**

As shown in the illustration, use a screwdriver to install the outboard joint boot clamp.



## 30. Install outboard joint boot big clamp

As shown in the illustration, use a screwdriver to install the outboard joint boot big clamp.



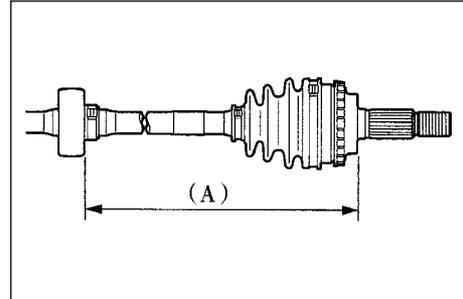
## 31. Install right front drive shaft damper

Hint:

Perform the following operations only when disassembling the right drive shaft.

Set the following distance:

Distance (A)	$470 \pm 4.0\text{mm}$
--------------	------------------------



## 32. Install drive shaft damper clamp

Hint:

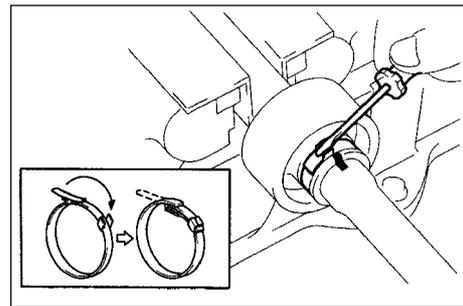
Perform the following operations only when disassembling the right drive shaft.

(1) Slide the damper clamp on the shaft.

Notice:

Make sure the clamp is correctly installed.

(2) As shown in the illustration, use a screwdriver to install the damper clamp.



## 33. Install tripod joint assembly

Before installing the boot, wrap vinyl tape around the spline of the Rzeppa joint to prevent damaging the boots.

(1) Install the new parts on the tripod joint in the following sequence.

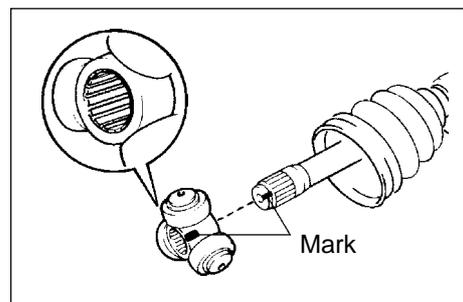
- a. Inboard joint boot small clamp
- b. Inboard joint boot
- c. Inboard joint boot big clamp

(2) Align the matchmarks, install the tripod assembly on the tripod joint outer shaft assembly.

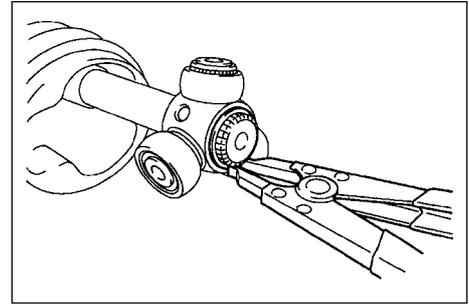
(3) Using a brass bar and a hammer, install the tripod assembly.

Notice:

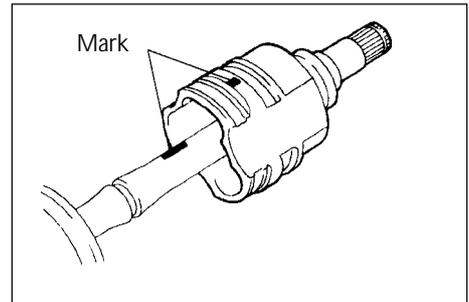
- Do not tap the roller.
- Make sure the tripod is correctly installed.



- (4) Using a snap ring plier, install the new retainer.
- (5) Coat the tripod joint assembly with grease.  
Grease amount: 99-109g



- (6) Align the matchmarks, install the left intermediate shaft assembly on the tripod joint assembly.

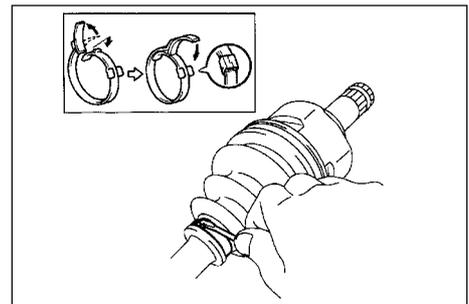


34. Install inboard joint boot

Install the inboard joint boot on the intermediate shaft and tripod joint outer shaft.

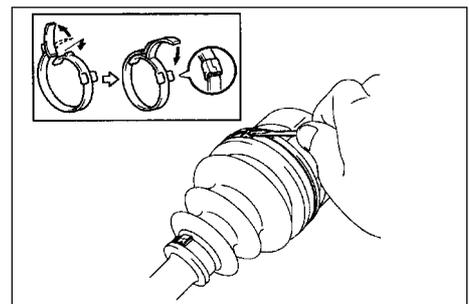
35. Install inboard joint boot small clamp

As shown in the illustration, use a screwdriver to install the inboard joint boot small clamp.



36. Install inboard joint big clamp

As shown in the illustration, use a screwdriver to install the inboard joint big clamp.

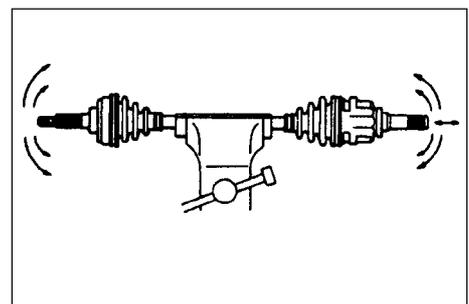


37. Check front drive shaft

- (1) Check the outboard joint for apparent looseness.
- (2) Check that the inboard joint slide smoothly.
- (3) Check the inboard joint for radial looseness.
- (4) Check the boot for damage.

Notice:

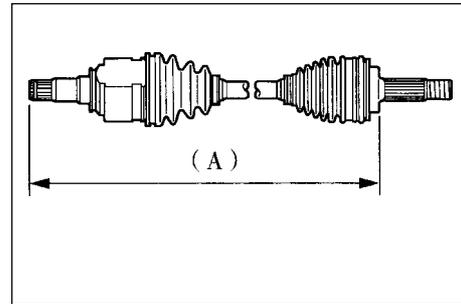
Place the drive shaft assembly on level surface during the inspection.



Hint:

Please refer to the following table for dimension (A).

	LH mm	RH mm
M/T manual transmission	528.3± 5.0	859.3± 5.0
A/T automatic transmission	527.0± 5.0	860.0± 5.0



### 38. Install left constant velocity drive shaft assembly

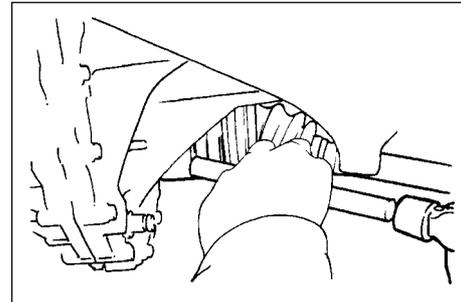
#### (1) M/T

Coat the spline of the tripod joint assembly with gear oil.

#### (2) A/T

Coat the spline of the tripod joint assembly with ATF (Automatic Transmission Fluid).

#### (3) Align the spline, use a brass bar and hammer to install the left drive shaft assembly.



Notice:

- Face the retainer open end downward.
- Be careful not to damage the boot and oil seal.

Hint:

You can find out whether the tripod joint shaft contact the pinion shaft by rotating the shaft assembly, listening to the sound and feeling.

### 39. Install right constant velocity drive shaft assembly

Hint:

The installation of the right side is the same as that of the left side.

Notice:

- Install the retainer with its open end facing downward.
- Be careful not to damage the boot and oil seal.

### 40. Install left steering knuckle assembly

Install the left constant velocity drive shaft assembly on the left steering knuckle assembly.

Notice:

- Be careful not to damage the outboard joint boot.
- With ABS:  
Be careful not to damage the vehicle speed sensor rotor.

### 41. Install left steering gear with tie rod assembly

#### (1) Install the steering gear with tie rod assembly on the steering knuckle assembly with nuts.

Torque: 33N.m

#### (2) Install the new cotter pins.

Notice:

If the pin holes are not aligned, further tighten the nut by 60° .

### 42. Install left lower swing arm assembly

#### (1) Install the left lower swing arm assembly on the steering knuckle assembly with nuts.

Torque: 98N.m

- (2) Install the new cotter pins.

Notice:

If the pin holes are not aligned, further tighten the nut by 60° .

43. Install front stabilizer bar

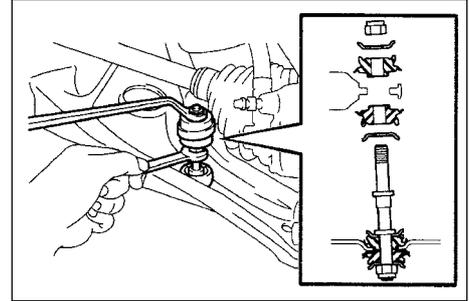
- (1) As shown in the illustration, install the stabilizer bar with two No.1 collars and two gaskets and nuts.

Notice:

Make sure the gaskets and collars are correctly installed.

- (2) Tighten the nut with a 10mm wrench.

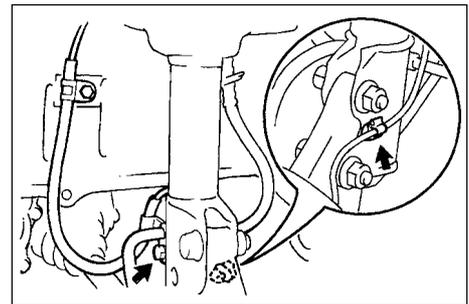
Torque: 18N.m



44. Install left front vehicle speed sensor (with ABS)

- (1) Install the left front vehicle speed sensor and brake hose on the front shock absorber with bolts and clips.

Torque: 29N.m

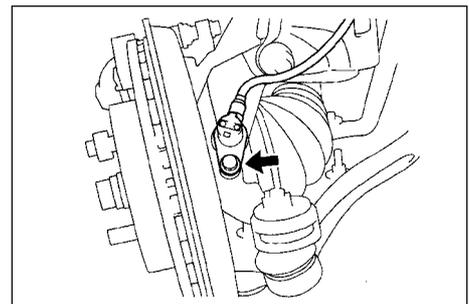


- (2) Install the vehicle speed sensor on the steering knuckle with bolts.

Torque: 8.0N.m

Notice:

- Be careful not to damage the wheel speed sensor.
- Keep the vehicle speed sensor clean.
- When installing the sensor, do not twist the sensor wire harness.

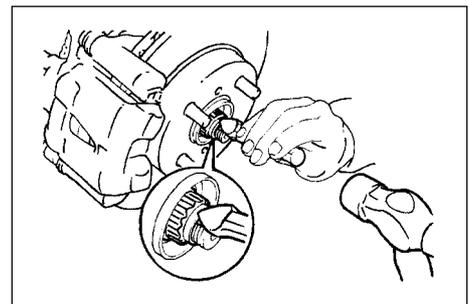


45. Install left steering knuckle wheel hub nut

- (1) Install new left steering knuckle hub nuts

Torque: 216N.m

- (2) Using a chisel and hammer, stake the hub locking nut.



46. Install engine bottom left shield

47. Install engine bottom right shield

48. Install engine bottom shield assembly

49. Install front wheel

Torque: 103 N.m

50. Add oil into manual transmission

51. Check and adjust the manual transmission fluid

52. Refill automatic transmission fluid

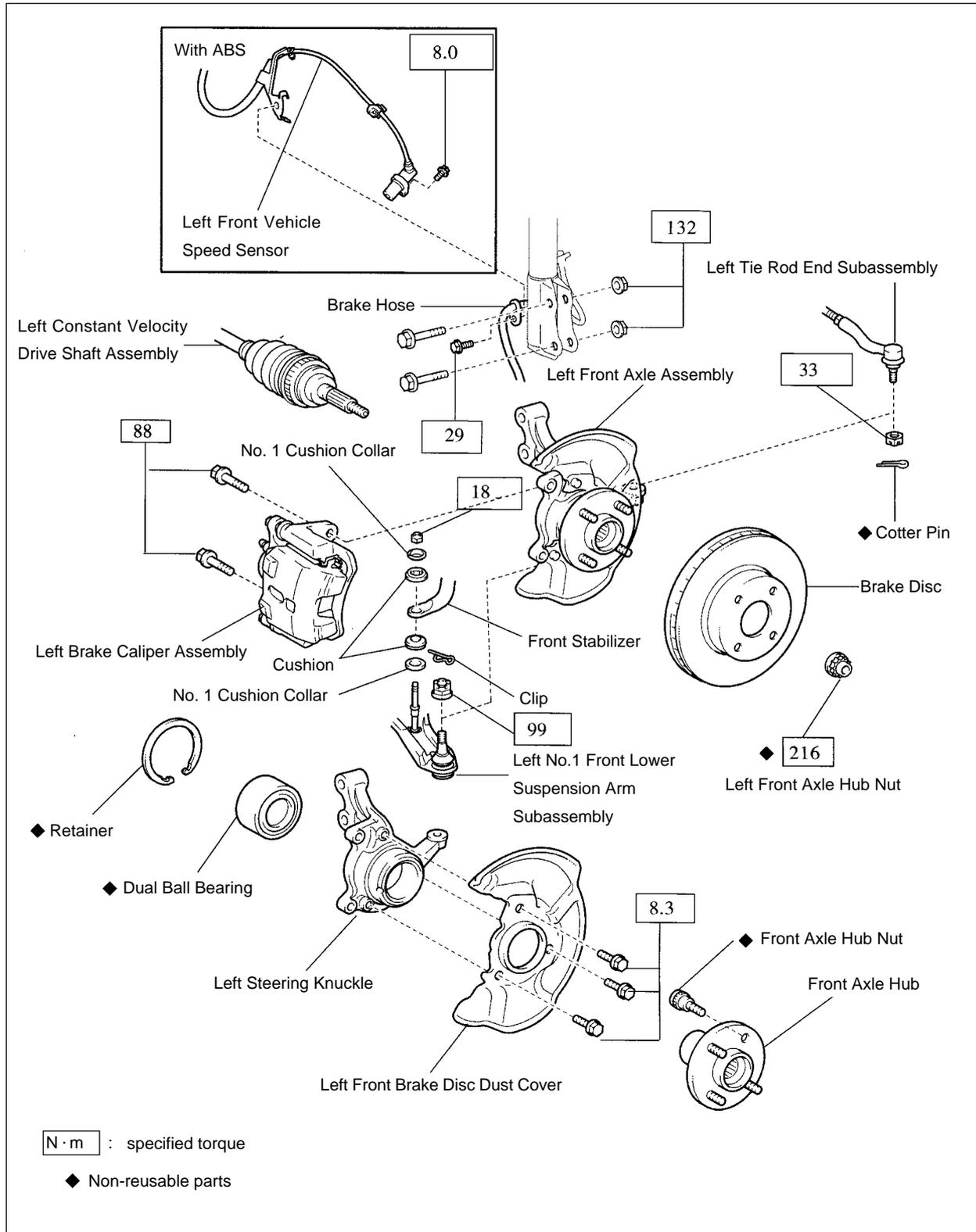
53. Check and adjust the automatic transmission fluid

54. Check and adjust front wheel alignment

55. Check ABS vehicle speed signal (with ABS)

### Section 3 Front Wheel Hub

#### Component View



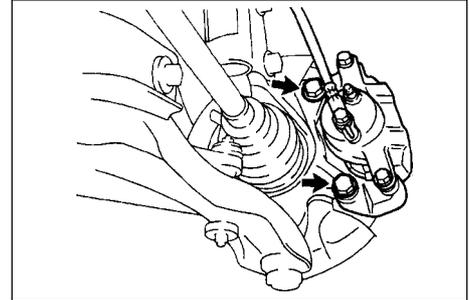
## Replacement

1. Remove front wheel
2. Using a drive shaft nut chisel, remove the front axle hub left nut

3. Remove left front vehicle speed sensor (with abs)

4. Remove left front brake caliper assembly

Remove 2 bolts, remove the left front brake caliper assembly from the steering knuckle.



5. Remove front brake disc

6. Remove front stabilizer

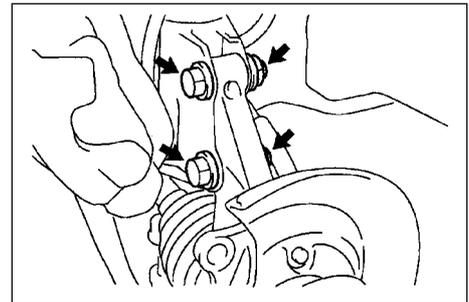
7. Remove left no.1 front lower suspension arm subassembly with a ball joint puller

8. Remove left tie rod end subassembly with a ball joint puller

9. Remove left front axle assembly

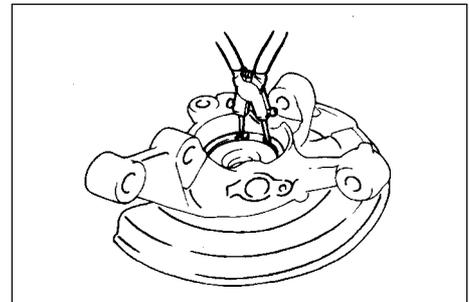
10. Remove left front shock absorber assembly

Remove 2 sets of bolts and nuts, remove the left front shock absorber from the left front axle assembly.



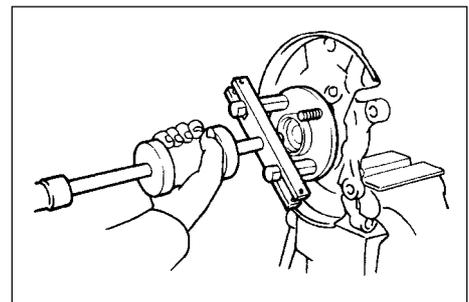
11. Remove left front axle hub snap ring

Using a snap ring plier, remove front axle hub left snap ring.

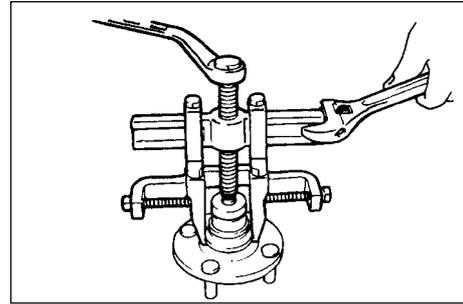


12. Remove left front axle hub subassembly

(1) Remove the left front axle hub subassembly with rear axle puller.



- (2) Using sst, remove inner race of the left axle hub bearing from the left axle hub sub assembly.

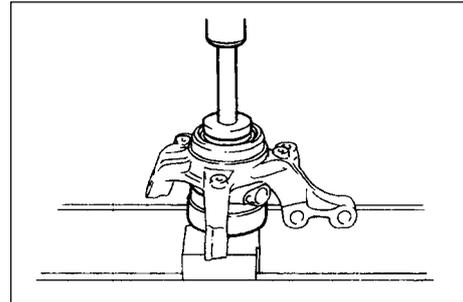


13. Remove front left brake disc boot  
Remove 3 bolts and front left boot.

14. Remove left front axle hub bearing

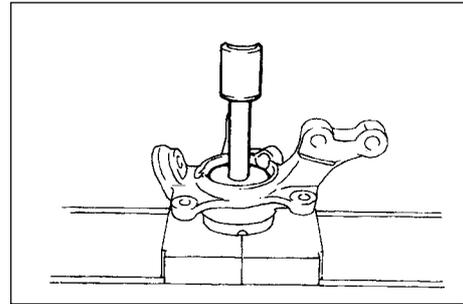
- (1) Place the left axle hub bearing inner race into the left axle hub bearing outer race.

- (2) Remove the left axle hub bearing from the steering knuckle with press and sst



15. Install left front axle hub bearing

- Install the new left axle hub bearing on the steering knuckle with press and sst



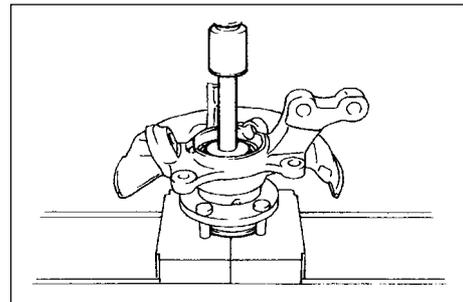
16. Install front left brake disc boot

- Install the front left boot with 3 bolts.

Torque: 8.3N.m

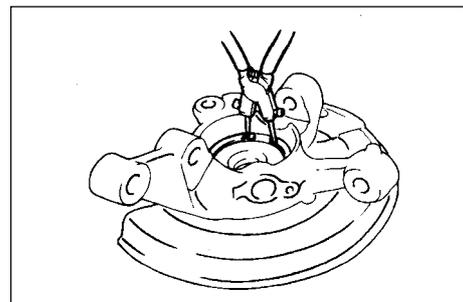
17. Install left front axle hub subassembly

- Install left axle hub assembly with press and sst.



18. Install left front axle hub snap ring

- Install the new left snap ring with snap ring plier.



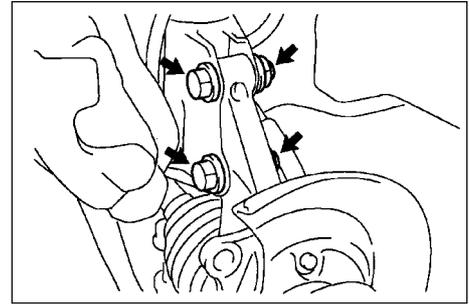
## 19. Install left front shock absorber assembly

Install the front left shock absorber assembly on the left front axle assembly with 2 sets of bolts and nuts

Torque: 132N. m

Notice:

Only coat the thread parts of the new bolts and nuts with engine oil.



## 20. Install left front axle assembly

## 21. Install left tie rod end subassembly

## 22. Install left no.1 front lower suspension arm subassembly

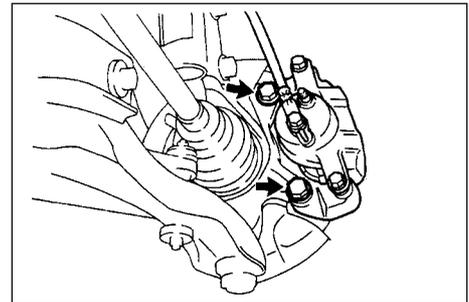
## 23. Install front stabilizer

## 24. Install front brake disc

## 25. Install left front brake caliper assembly

Install the front brake caliper assembly on the steering knuckle with 2 bolts.

Torque: 88N. m



## 26. Install left front axle hub nut

Install new left axle hub nut.

Torque: 216N. m

## 27. Remove left front brake caliper assembly

## 28. Remove front brake disc

## 29. Check bearing backlash

## 30. Check axle hub deviation

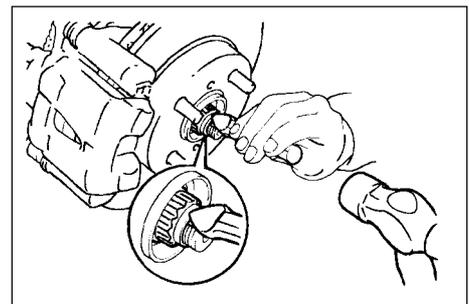
## 31. Install front brake disc

## 32. Install left front brake caliper assembly

## 33. Install left front vehicle speed sensor (with ABS)

## 34. Install left front axle hub nut

Using a chisel and hammer, stake the left axle hub nut.



## 35. Install front wheel

Torque: 103N. m

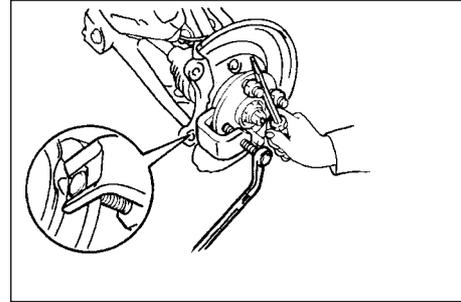
## 36. Check and adjust front wheel alignment

## 37. Check abs vehicle speed sensor signal (with ABS)

## Replacement

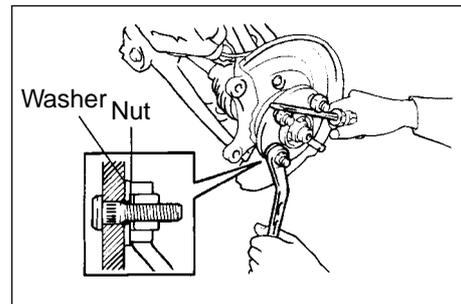
1. Remove front wheel
2. Remove left front brake caliper assembly
3. Remove front brake disc
4. Remove left front axle hub bolt

Using a ball joint puller and a screwdriver or similar, remove the left axle hub bolt.



5. Install left front axle hub bolt

- (1) As shown in the illustration, install the gasket and nut on the new left axle hub bolt.
- (2) Using a screwdriver or similar, hold the left axle hub subassembly, install the left axle hub bolt by tightening the nut.



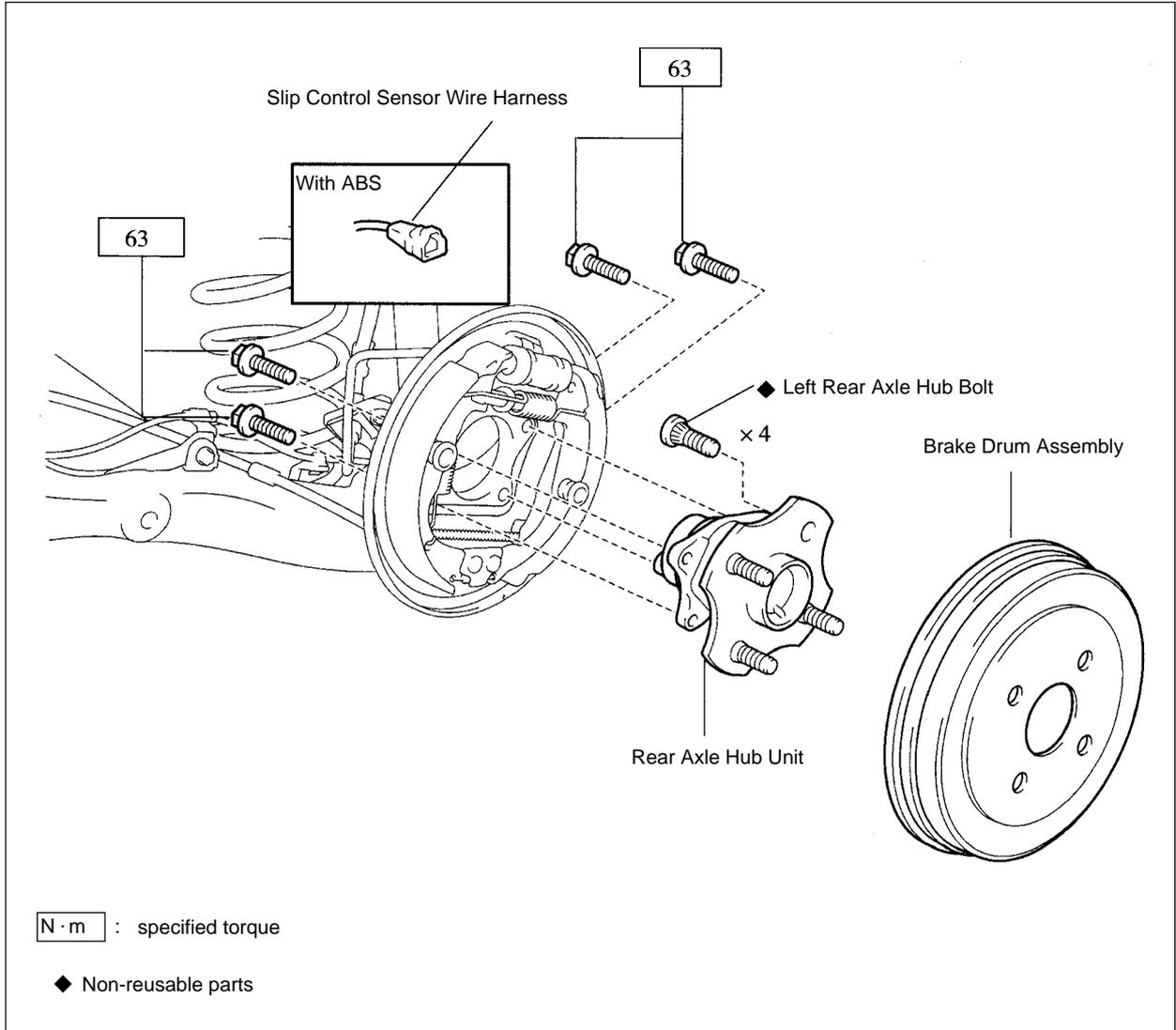
6. Install front brake disc
7. Install left front brake caliper assembly
8. Install front wheel

Torque: 103N.m

The replacement of the right front axle hub subassembly is the same as that of the left one.

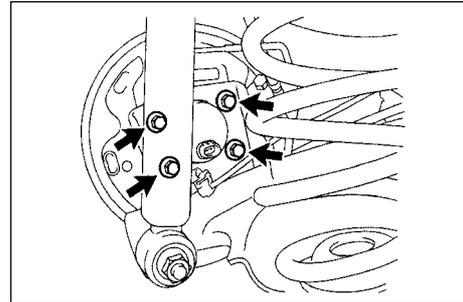
## Section 4 Rear Wheel Hub and Bearing Assembly

### Component View

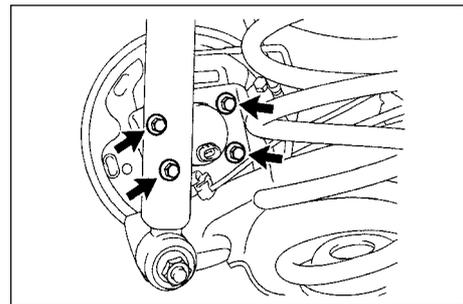


## Replacement

1. Remove rear wheel
2. Remove rear wheel brake drum subassembly
3. Remove slip control sensor wire harness (with ABS)
4. Remove left rear axle hub and bearing assembly  
Remove 4 bolts and left axle hub and bearing assembly.



5. Install left rear axle hub and bearing assembly  
Install left axle hub and bearing assembly with 4 bolts  
Torque: 63N. m

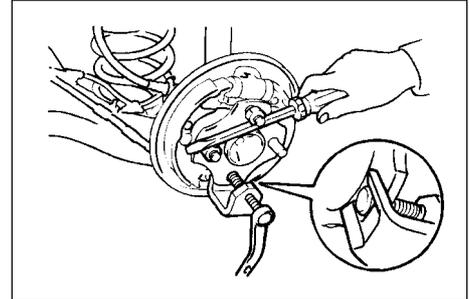


6. Connect slip control sensor wire harness (with ABS)  
Notice:  
Do not twist the sensor wire harness during connection.
7. Check bearing backlash
8. Check axle hub deviation
9. Install rear wheel brake drum subassembly
10. Install rear wheel  
Torque: 103N. m
11. Check as vehicle speed sensor signal (with ABS)

## Replacement

1. Remove rear wheel
2. Remove rear wheel brake drum subassembly
3. Remove left rear wheel axle hub bolt

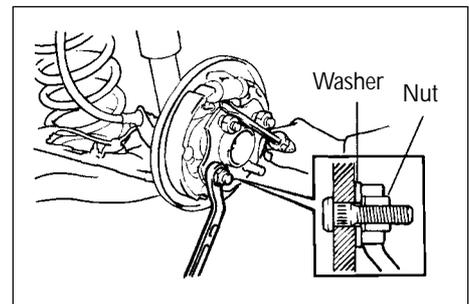
Using a ball joint puller and a screwdriver or similar, remove the left axle hub bolt.



4. Install left rear wheel axle hub bolt

(1) As shown in the illustration, install the gasket and nut on the new left axle hub bolt.

(2) Using a screwdriver or similar, hold the left axle hub subassembly, install the left axle hub bolt by tightening the nut.



5. Install rear brake drum subassembly

6. Install rear wheel

Torque: 103N. m

The replacement of the right rear axle hub and bearing assembly is the same as that of the left one.

# Chapter 5 Front Suspension System

## Section 1 Front Suspension System

### Description on front suspension structure

This model uses strut swing arm independent suspension with stabilizer bar.

The shock absorber upper end is flexibly connected to the body through the shock absorber mounting seat, the lower end is rigidly connected to the steering knuckle. The coil spring encloses the shock absorber (coil spring geometrical axial line does not coincide with that of the shock absorber piston rod), and is supported between the upper and lower spring seats.

Both ends of the stabilizer bar are connected to the shock absorber through the strut bar ball pin and the intermediate part is supported on the lower front body by the rubber bushing and support frame.

The front cushion sleeves the shock absorber piston rod head to restrict the wheel jump limit position and plays the role of buffer.

The thrust ball bearing, installed between the spring upper seat and the shock absorber mount, is used for the relative rotation upon steering of the shock absorber rigidly connected to the steering knuckle to the shock absorber mount flexibly connected to the body.

"L" type lower swing arm is secured to the lower engine compartment with the press plate through elastic rubber bushing and hinge, and its outer end is connected to the steering knuckle through the ball stud pin which is attached to the lower swing arm by 3 high intension bolts. The ball stud pin can be removed and replaced when it is worn. The ball seat material is saturated polyester containing oil, featured in comparatively high intensity and wearability and good self-lubrication performance. Proper amount of grease has been added during the assembly and there is no need for additional filling during the normal operation.

See the table for the front suspension technical parameters

Item	Parameter
Shock absorber operating cylinder diameter /mm	45
Shock absorber piston rod diameter /mm	20
Shock absorber stroke/mm	160
Wheel camber	$-0^{\circ} 30' \pm 45'$
Wheel toe-in/mm	$1 \pm 2$
King pin inclination	$10^{\circ} 0' \pm 45'$
King pin caster	$2^{\circ} 0' \pm 45'$
Remark: the wheel alignment parameter in the table is at free load.	

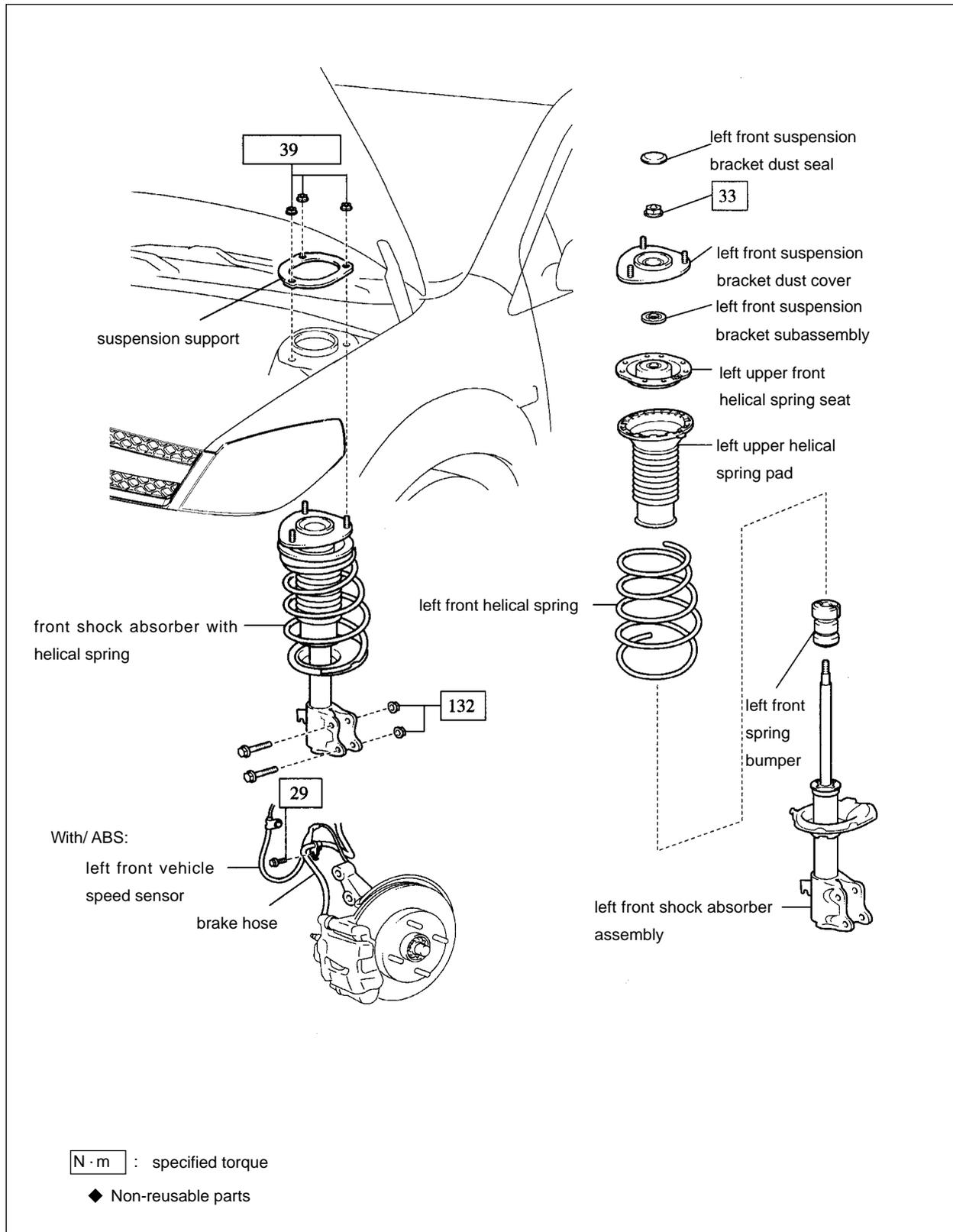
## Symptom Table

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace parts.

Symptom	Suspected Area
Off track	<ol style="list-style-type: none"> <li>1. Tires (Worn or improperly inflated)</li> <li>2. Wheel alignment (Incorrect)</li> <li>3. Steering system joint (Loose or worn)</li> <li>4. Hub bearing (Worn)</li> <li>5. Steering gear (Out of adjustment or worn)</li> <li>6. Suspension parts (Worn or damaged)</li> </ol>
Body Descent	<ol style="list-style-type: none"> <li>1. Vehicle (Overloaded)</li> <li>2. Spring (stiffness not comply with or damage)</li> <li>3. Shock absorber (Worn)</li> </ol>
Sways	<ol style="list-style-type: none"> <li>1. Tire (Worn or improperly inflated)</li> <li>2. Steering linkage (Loose or damaged)</li> <li>3. Stabilizer bar (Bent or broken)</li> <li>4. Shock absorber (Worn or damaged)</li> </ol>
Front wheel shimmy	<ol style="list-style-type: none"> <li>1. Tire (Worn or improperly inflated)</li> <li>2. Tire (Dynamic balance is not as specified)</li> <li>3. Shock absorber (Worn or damaged)</li> <li>4. Wheel alignment (Incorrect)</li> <li>5. Ball stud pin (Worn or damaged)</li> <li>6. Hub bearing (Worn or damaged)</li> <li>7. Steering linkage (Loose or worn)</li> <li>8. Steering gear (Out of adjustment or worn)</li> </ol>
Abnormal tire wear	<ol style="list-style-type: none"> <li>1. Tire (Worn or improperly inflated)</li> <li>2. Wheel alignment (Incorrect)</li> <li>3. Shock absorber (Worn or damaged)</li> <li>4. Suspension parts (Worn or damaged)</li> </ol>

## Section 2 Front Suspension

### Component View







## Section 3 Front Wheel Alignment

### Adjustment:

1. Check tire
2. Measure the vehicle height

Vehicle height:

Tire size	Front <sup>1</sup> (mm)	Rear <sup>2</sup> (mm)
175 / 65R14	82H191	265
185 / 60R15	84H192	265

1. front measure point

Measure the distance between the ground and the front underside suspension mounting bolt center

2. rear measure point

Measure the distance between the ground and the rear axle beam mounting bolt center

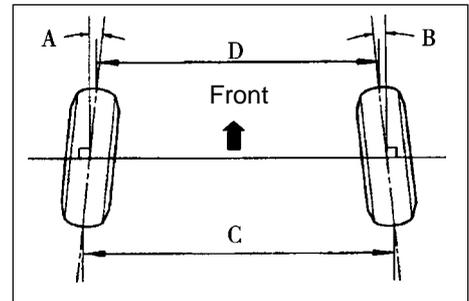
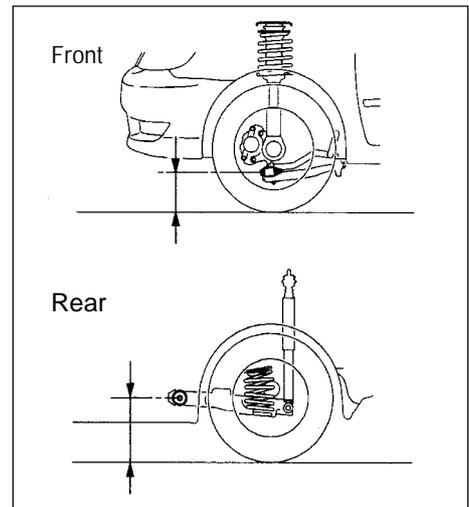
Notice:

Before the wheel alignment, adjust the body to the specified height. If the body height is out of spec, adjustment shall be done by pressing or raising vehicle body.

3. Check the Toe-in

Toe-in:

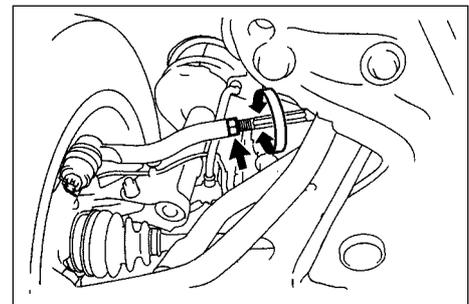
If the toe-in is out of spec, adjust the ends of rack.



4. Adjust the Toe-in

- (1) Remove the clamp of the rack boot
- (2) Loose the jam nut of tie rod
- (3) Adjust the Toe-in by rotating the same turns of both ends of rack.

Tips: Adjust the toe-in to the intermediate value of spec.



- (4) Make sure the same length for both ends

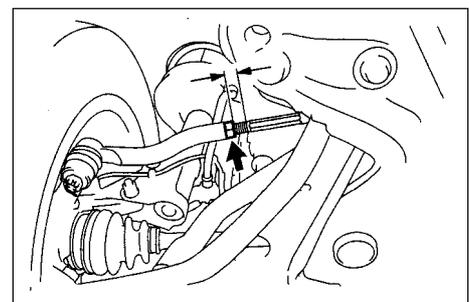
The length difference of left and right: 1.5mm or smaller

- (5) Tighten the jam nut of the tie rod

Torque: 47N.m

- (6) Seat the boot and crimp the clamp

Tips: rack boot must not be twisted

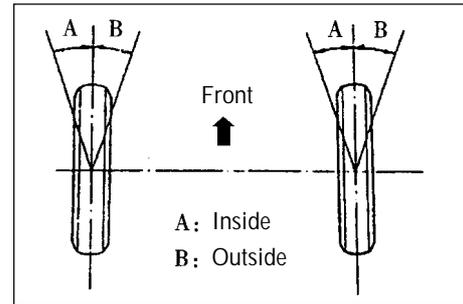


5. Check the steering angle of wheel

Fully steer the wheel and measure the angle

The angle of wheel:

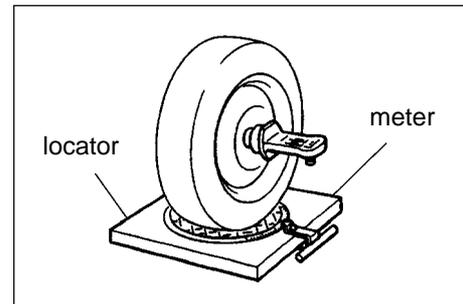
	Manual steering	Power steering
Inside wheel	9-1	$37.2^\circ \pm 2^\circ$
Outside wheel	$32^\circ \pm 2^\circ$	$32^\circ \pm 2^\circ$



If there is deviation with spec for right and left wheel angle, check the rack length of left and right ends.

6. Check the camber, caster and steering axle inclination angle

Camber angle	$-0^\circ 30' \pm 45'$ ( $-0.5^\circ \pm 0.75^\circ$ )
Left-right wheel deviation	45' (0.75°) or smaller
Caster angle	9-1
Manual steering	$1^\circ 46' \pm 45'$ ( $1.76^\circ \pm 0.75^\circ$ )
Power steering	45' (0.75°) or smaller
Left-right wheel deviation	
Kingpin inclination	
Manual steering	$9^\circ 54' \pm 45'$ ( $9.90^\circ \pm 0.75^\circ$ )
Power steering	45' (0.75°) or less
Left-right wheel deviation	



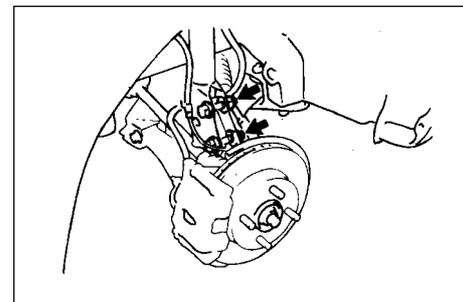
If the kingpin caster angle and the kingpin inclination be out of spec, check the damage and abrasion of suspension parts after the correct adjustment of camber angle.

7. Adjust the camber angle

Notice:

Check the toe-in after adjust the camber angle

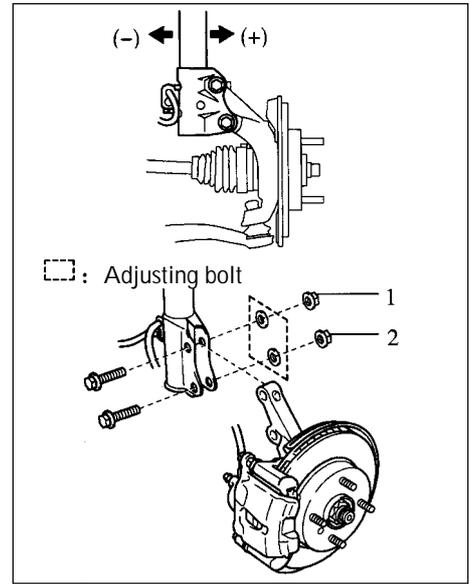
- (1) Remove the front wheel
- (2) Remove the two nuts under the shock absorber  
If you need to reuse the bolts and nuts, apply the engine oil on the nut thread
- (3) Clear the mounting surface of the knuckle and shock absorber.



- (4) Mount 2 nuts temporarily.
- (5) Adjust the camber angle by pushing or pulling the underside of shock absorber in the direction of required adjustment.
- (6) Tightening the nuts  
Torque: 132N.m
- (7) Mounting the front wheel  
Torque: 103N.m
- (8) Check the camber

Tips:

- Adjust the camber to the median of spec.
- Adjustment value of positioning the bolts: 6' ~ 30'.  
(0.1° ~ 0.5° )



Refer to the table below to fix the correct adjustment if the camber is out of spec, then select the bolts for camber adjustment.

Notice: Tighten the adjustment nuts with washer and new nuts.

bolt	Location bolt		Adjusting bolt			
	A		B		C	
Adjustment value			1 point 		2 point 	
	1	2	1	2	1	2
15'	●			●		
30'	●					●
45'			●			●
1° 00'			●		●	●

- (9) Repeat the steps above, replace 1 or 2 bolts

Tips:

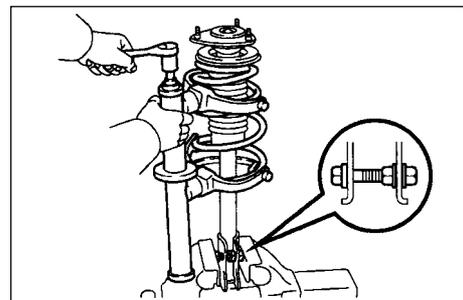
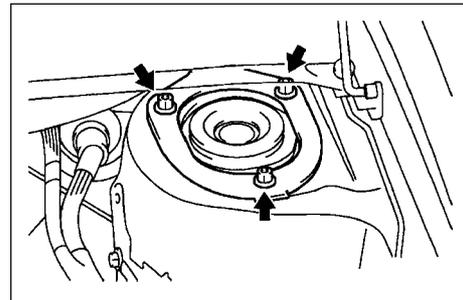
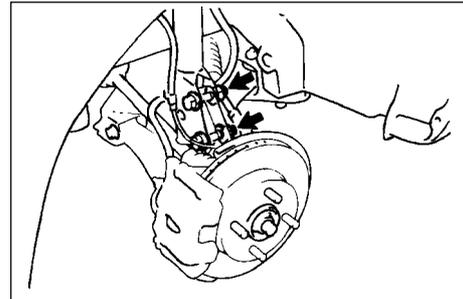
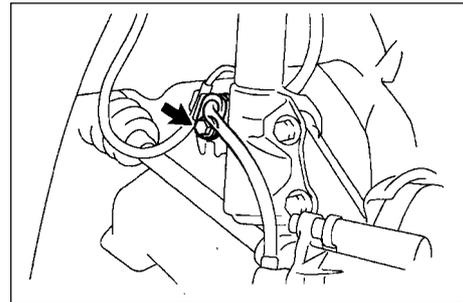
Only replace 1 bolt if 2 bolts are needed to be replaced.

## Section 4 Front Strut Assembly

### Replacement

1. Remove screen wiper arm cover
2. Remove right screen wiper
3. Remove left screen wiper
4. Remove hood and seals of vehicle neck
5. Remove upper right ventilation shield of vehicle neck
6. Remove upper left ventilation shield of vehicle neck
7. Remove the wiper linkage assembly of windscreen
8. Remove the hood of vehicle neck
  - (1) Remove the bolt and 2 clips, disconnect the harness
  - (2) Remove the hose and harness (wiper)
  - (3) Remove the 8 bolts of ventilation shield of vehicle neck
9. Remove the front wheel
10. Remove the brake hose
  - (1) Remove the bolts, brake hose and the clamp of ABS sensor harness from the shock absorber bracket (with ABS)
  - (2) Remove the bolts and brake hose from the shock absorber (without ABS)
11. Remove the front shock absorber with helical spring
  - (1) Remove the shock absorber from knuckle after remove the two nuts and bolts.
  - (2) Remove the front shock absorber with helical spring, remove the three bolts mounting suspension bracket
12. Fix the front shock absorber with helical spring
  - (1) Mount the two bolts and one bolt onto the bracket of shock absorber underside, and fix it onto the vise
  - (2) Hold down the helical spring
 

Notice: Don't use the impact wrench which can damage the special tool



13. Remove the duct cover of the bracket for left front suspension

Remove the end cap from the bracket of suspension

14. Remove the front bracket after removing the nuts of left front shock absorber

Hold it by the two nuts and a screwdriver or analogue, then remove centre nut

Notice: Don't damage the stud of suspension bracket.

15. Remove the bracket assembly of the left front suspension  
16. Remove the seals of bracket dust hood for left front suspension

17. Remove the left upper front helical spring seat

18. Remove the left upper front helical spring insulator

19. Remove the left front helical spring

20. Remove the left front spring bumper

21. Remove the left front shock absorber assembly bumper

22. Check the left front shock absorber assembly

Check the abnormal resistance and noise in the operation by compressing and extending the pushrod, replace it if abnormal.

23. Mount the left front shock absorber assembly

24. Mount the left front spring shock absorber pad

25. Mount the left front helical spring

- (1) Compress the helical spring with special tool

Notice: Don't use the impact wrench which may damage the special tool

- (2) Load the helical spring into the shock absorber

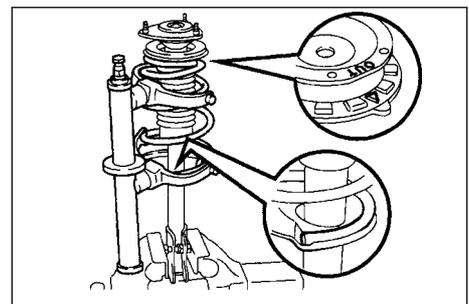
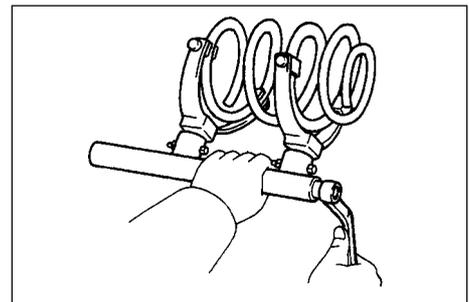
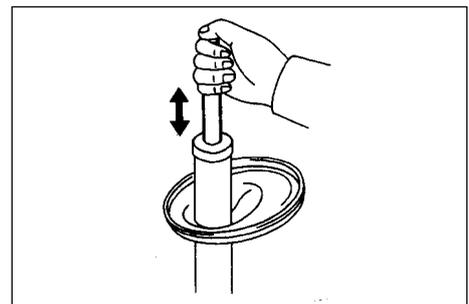
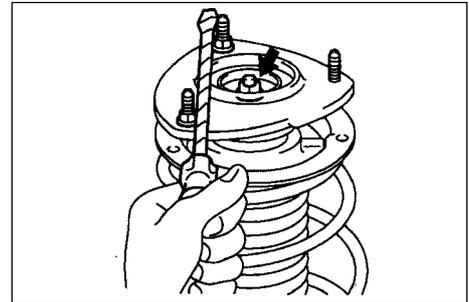
Attention: tighten the helical spring lower side to the gap of spring lower seat.

26. Mount the left upper front helical spring insulator

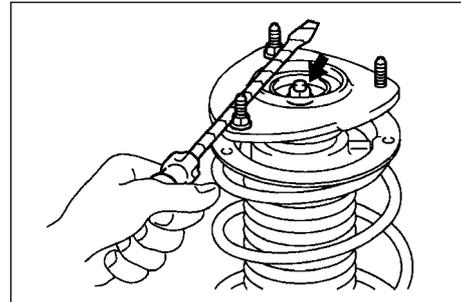
Mount the upper insulator, mark "  $\triangle$  " toward vehicle outside.

27. Mount the upper seat of left front helical spring

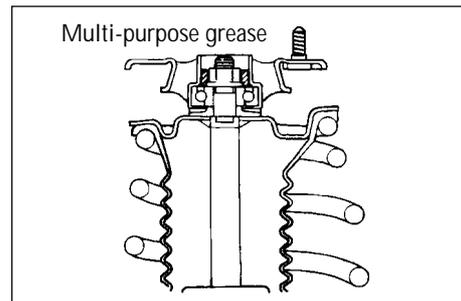
Mount the upper seat, mark "  $\triangle$  " toward vehicle outside



28. Mount the dust seals of left front suspension bracket  
 29. Mount the left front suspension bracket sub-assembly  
 30. Mount the front bracket onto the left front shock absorber nuts  
 (1) Hold the bracket by two bolts and a screwdriver or analogue.  
 Mount the new centre nut  
 Torque: 33N. m  
 Notice: Don't cause damage to the stud of suspension bracket.



- (2) The special tool for remove  
 (3) Apply the multipurpose grease onto the suspension bracket

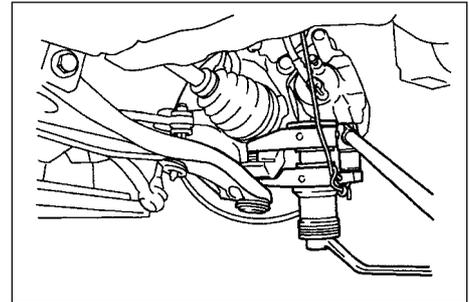


31. Mount the dust cap of left front suspension bracket  
 32. Mount the front stud assembly  
 (1) Mount the #2 suspension bracket  
 (2) Mount the front stud assembly by three nuts  
 Torque: 39N.m  
 (3) Mount the shock absorber onto the knuckle  
 (4) Film the engine oil onto the thread of two nuts  
 (5) Mount the two bolts and nuts  
 Torque: 132N. m  
 33. Mount the brake hose  
 Torque: 29N. m  
 34. Mount the front wheel  
 Torque: 103N. m  
 35. Mount the outside cover of vehicle neck  
 (1) Mount the outside cover of vehicle neck by 8 bolts  
 Torque: 5N. m  
 (2) Connect hose and harness (screen wiper)  
 (3) Mount the harness by bolts and two clips  
 36. Mount the linkage assembly of windshield wiper  
 37. Mount the ventilation hood of left vehicle neck  
 38. Mount the ventilation hood of right vehicle neck  
 39. Mount the engine hood and seals of vehicle neck  
 40. Mount the left front wiper arm  
 41. Mount the right front wiper arm  
 42. Check and adjust the front wheel alignment

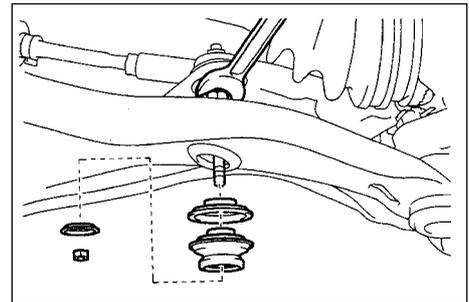
## Section 5 Front Lower Swing Arm Assembly

### Disassemble

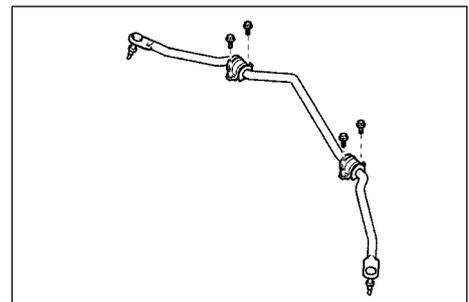
1. Remove the front wheel
2. Remove the subassembly of the engine #1 cover
3. Remove the engine hood
4. Sling the engine assembly
5. Remove the left front suspension cross beam  
Remove the two bolts and left front suspension cross beam
6. Remove the right front suspension cross beam  
Remove the two bolts and right front suspension cross beam
7. Disassemble the left lower subassembly of the front suspension arm
  - (1) Remove the clips and nuts
  - (2) Remove the suspension arm from the knuckle by special tool



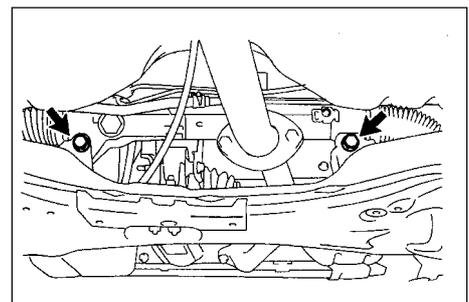
8. Disassemble the front stabilizer bar
  - (1) Remove the nuts, three retainers and two pads (left side) when tightening the bolts of stabilizer rod
  - (2) Take the same steps on the other side as above.



- (3) Remove the front stabilizer rod after removing four bolts

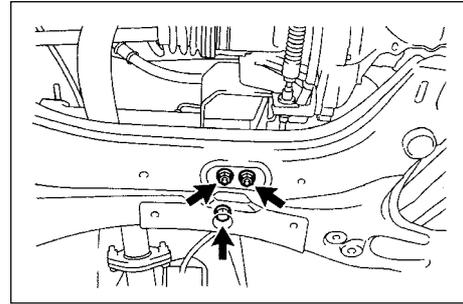


9. Disassemble the power rack & pinion gear assembly  
Disassemble the power rack & pinion gear assembly by removing two bolts  
Tips: Pull up the power rack & pinion gear assembly.



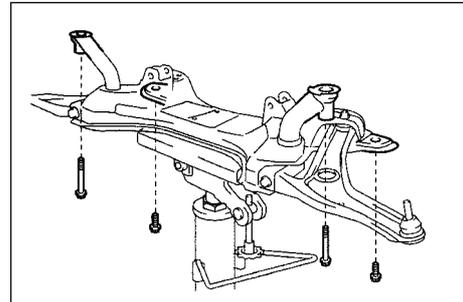
## 10. Disassemble the subassembly of the front suspension beam

(1) Remove the bolt and two nuts.



(2) Lift the front suspension beam subassembly by lifting jack

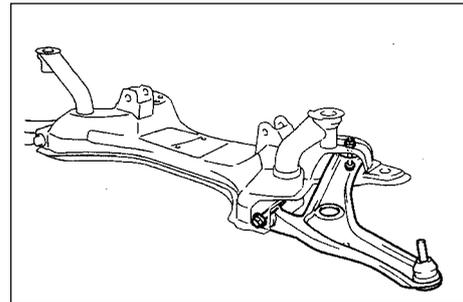
(3) Disassemble the front suspension subassembly by removing the four bolts.



## 11. Remove left lower front suspension subassembly

Remove left lower front suspension subassembly by removing two bolts and nuts

Notice: Don't rotate the nuts

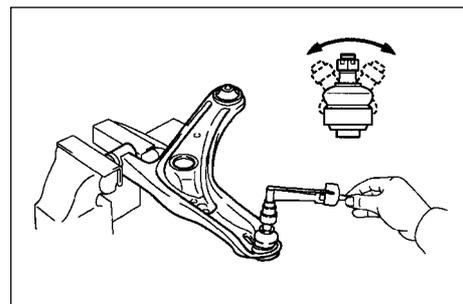


## 12. Check the left lower front suspension subassembly

(1) Swing the ball joint stud for 5 times before mounting the nuts, as show in the figure.

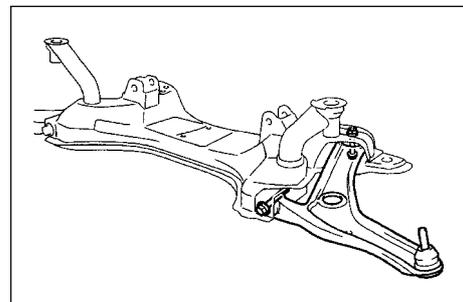
(2) Continuously rotate the nuts with a speed of 2-4 seconds per turn with the torque wrench, record the torque value at the 5th turn.

Torque: 0.78~3.43 N.m



## 13. Temporarily tighten left lower front suspension subassembly

Temporarily tighten left lower front suspension subassembly with two bolts and nuts.



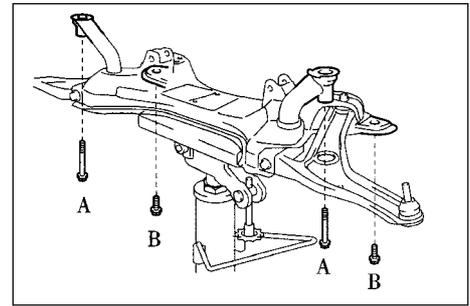
## 14. Connect the front suspension beam subassembly

(1) Mount the front suspension beam subassembly by four bolts

Torque:

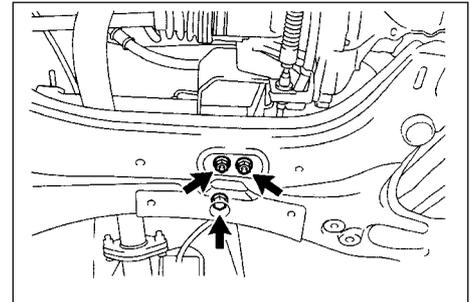
Bolt A: 70N. m

Bolt B: 116N. m



(2) Mount the bolt and two nuts

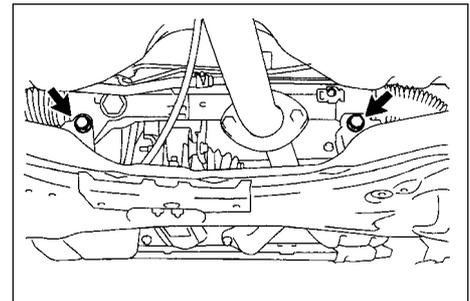
Torque: 52N.m



## 15. Mount the rack and pinion gear assembly

Mount the rack and pinion gear assembly with 2 bolts

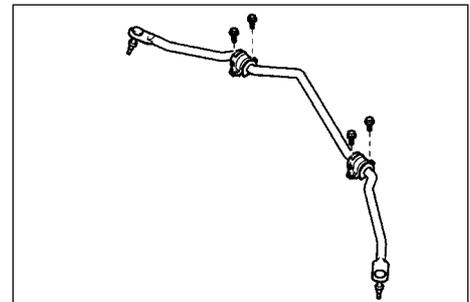
Torque: 127N.m



## 16. Mount the front stabilizer bar

(1) Mount the front stabilizer rod with four bolts

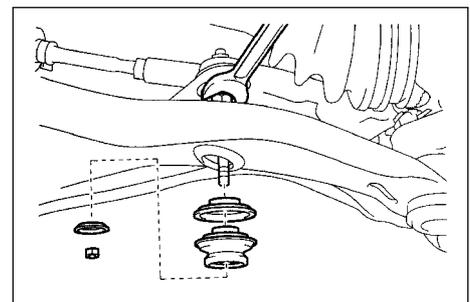
Torque: 37N.m



(2) Mount the nuts, three retainers and two pads (left) when tightening stabilizer rod bolts

Tip: Lift the lower controller arm by lifting jack

(3) Take the same steps on other side as above



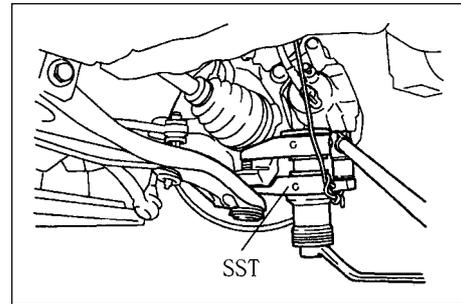
## 17. Mount left lower front suspension subassembly

- (1) Mount the lower suspension arm onto the knuckle by nuts

Torque: 98N.m

- (2) Mount a new clip

Notice: Further tighten nuts for 60° if the holes are not in the correct alignment



## 18. Mount the left front suspension cross beam

Mount the left front suspension cross beam with two bolts.

Torque: 47N.m

## 19. Mount the right front suspension cross beam

Mount the right front suspension cross beam with two bolts

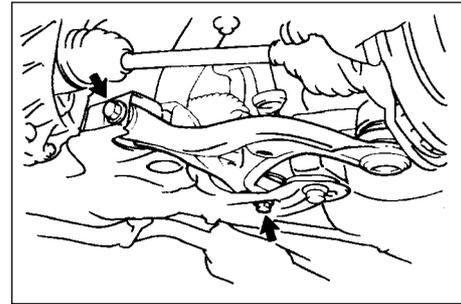
Torque: 47N.m

## 20. Mount the front wheel

Torque: 103N.m

## 21. Stabilize the suspension

Stabilize the front suspension



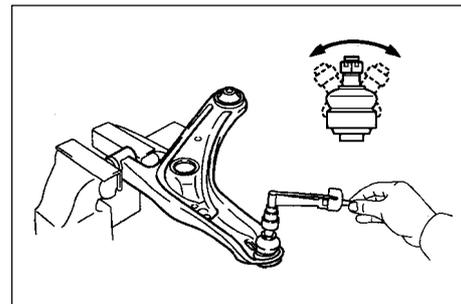
## 22. Sufficiently tighten left front lower suspension arm subassembly

Tighten the lower suspension arm with two bolts

Bolt A: 88N.m

Bolt B: 132N.m

Attention: Don't rotate the nuts



## 23. Install engine hood.

## 24. Check and adjust front wheel alignment

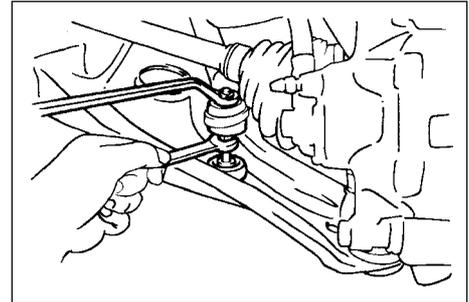
## Section 6 Front Stabilizer Bar and Link Rod Assembly

### Disassemble

1. Remove the front wheel
2. Remove the front stabilizer bar bolts
  - (1) Remove two nuts, five retainers, four pads and stabilizer bolts when fixing bolts
  - (2) Take the same steps on other side as above.

3. Remove the front stabilizer bar

Remove four bolts and #1 front stabilizer bar bracket.



4. Mount the front stabilizer bar

Mount the stabilizer bar, two bushings, bracket and four bolts.

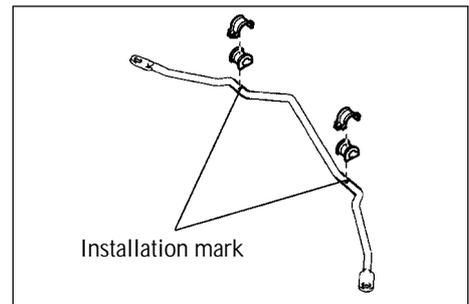
Torque: 37N.m

Notice:

Make the groove toward the vehicle rear

Tip:

Keep the bushing outside the paint line

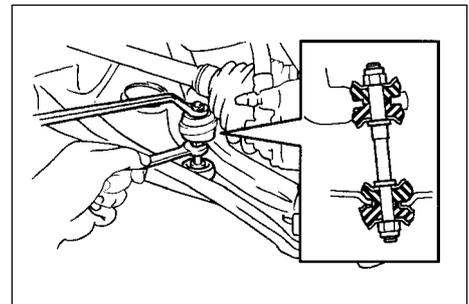


5. Mount the front stabilizer bolts

- (1) Mount the front stabilizer bolts, four pads and five retainers

Torque: 18N.m

- (2) Take the same operations on other side as above process



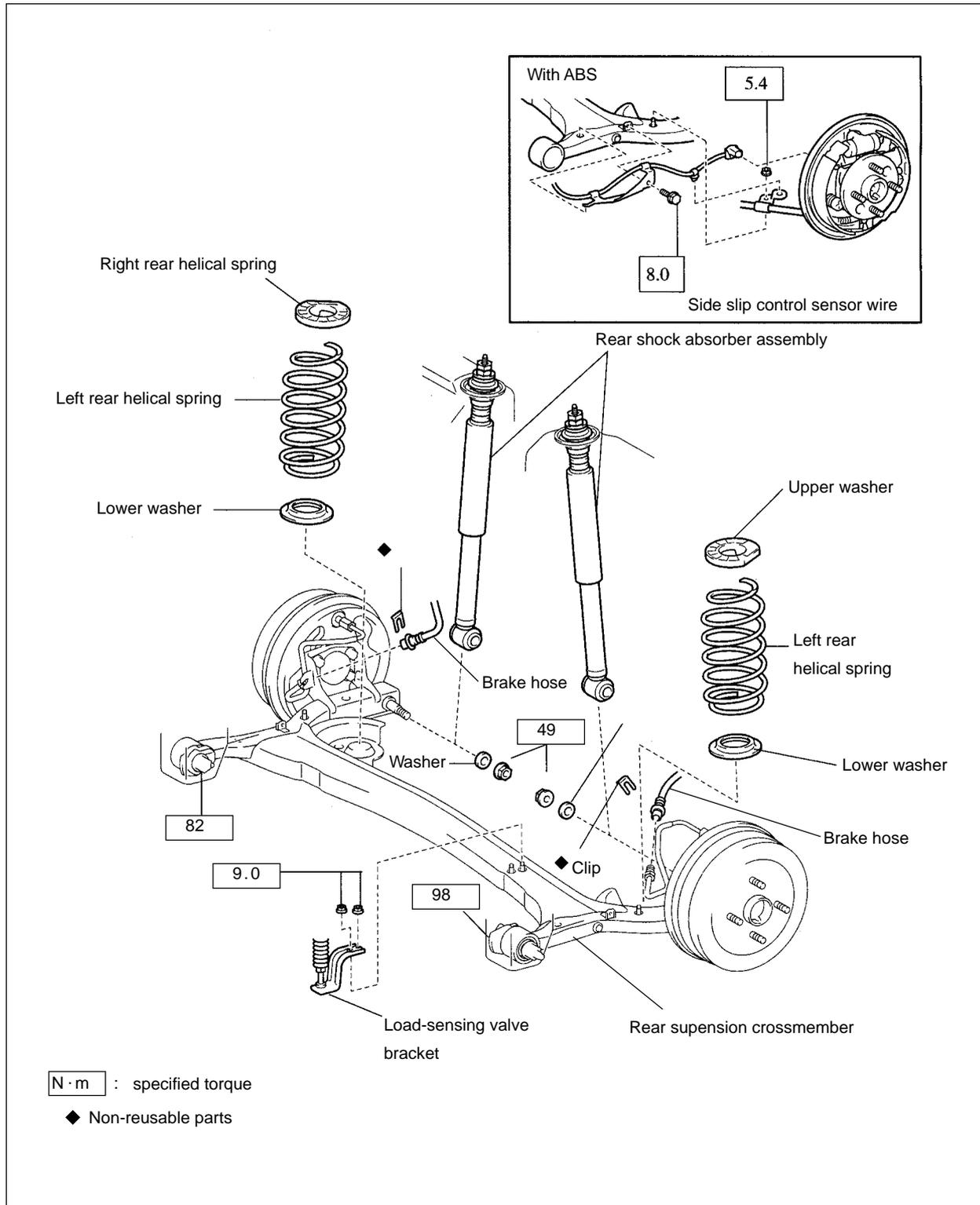
6. Mount the front wheel

Torque: 103N.m

# Chapter 6 Rear Suspension System

## Section 1 Rear Suspension System

### Component View



## I. Rear suspension structure description

This model uses strut independent rear suspension with stabilizer bar.

Rear suspension consists of the parallel front and rear double transverse arms, trailing rod, rear stabilizer bar and rear strut assembly. The shock absorber and cone coil spring are arranged eccentrically.

See the table below for the major technical parameters of the rear suspension

Item	Parameter
Shock absorber operating cylinder diameter /mm	38
Shock absorber piston rod diameter/mm	12.4
Shock absorber stroke /mm	250
Camber	$-0^{\circ} 56' \pm 45'$
Toe in/mm	$3 \pm 3$
Remark: Wheel alignment parameter is at free load	

## II. Symptom Table

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area
Off track	<ol style="list-style-type: none"> <li>1. Tires (Worn or improperly inflated)</li> <li>2. Wheel alignment (Incorrect)</li> <li>3. Hub bearing (Worn or damaged)</li> <li>4. Suspension parts (Worn or damaged)</li> </ol>
Body descent	<ol style="list-style-type: none"> <li>1. Vehicle (Overloaded)</li> <li>2. Spring (Stiffness small)</li> <li>3. Shock absorber (Worn)</li> </ol>
Sways	<ol style="list-style-type: none"> <li>1. Tire (Worn or improperly inflated)</li> <li>2. Wheel (not within specification)</li> <li>3. Shock absorber (Worn)</li> </ol>
Rear wheel shimmy	<ol style="list-style-type: none"> <li>1. Tire (Worn or improperly inflated)</li> <li>2. Wheel alignment (Incorrect)</li> <li>3. Shock absorber (Worn)</li> <li>4. Wheel (not within specification)</li> </ol>
Abnormal tire wear	<ol style="list-style-type: none"> <li>1. Tire (Worn or improperly inflated)</li> <li>2. Wheel alignment (Incorrect)</li> <li>3. Shock absorber (Worn)</li> <li>4. Suspension parts (Worn or damaged)</li> </ol>

## Section 2 Rear Wheel Alignment

### Check

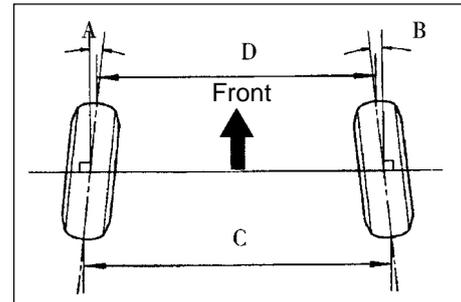
1. Check the tire
2. Measure the vehicle height

Notice:

Adjust the vehicle height to specified value before check the wheel alignment

3. Check the rear toe-in

Toe in	A+B: $0^{\circ} 19' \pm 19'$ ( $0.31 \pm 0.31^{\circ}$ )
(assembly)	C+D: $3.0 \pm 3.0\text{mm}$



Check and replace the related suspension parts if the toe in out of spec.

4. Check the camber

(1) Mount the camber-caster-kingpin measuring device, place the vehicle on the wheel position device

(2) Check camber

Camber	$-0^{\circ} 56' \pm 45'$ ( $-0.93^{\circ} \pm 0.75^{\circ}$ )
Left-right deviation	$45'$ ( $0.75^{\circ}$ ) or smaller

Check the damage and performance decline of suspension parts and replace if necessary, if measurement out of spec.

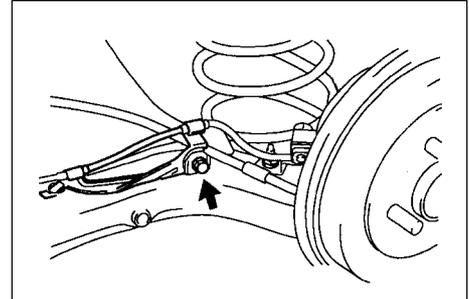
## Section 3 LH/RH Rear Suspension Coil Spring

### Replacement

1. Remove rear wheel
2. Remove the wire of the wheel speed sensor(with ABS)
  - (1) Remove the connector of wheel speed sensor.
  - (2) Remove bolts and wheel speed sensor from rear axle frame.

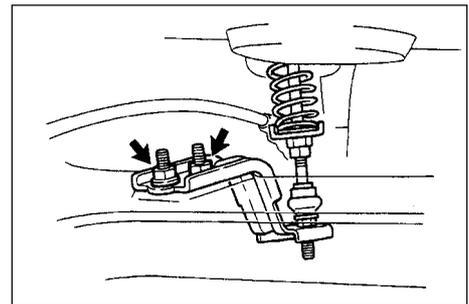
Notes:

Remove the right sensor wire by using same process as left.



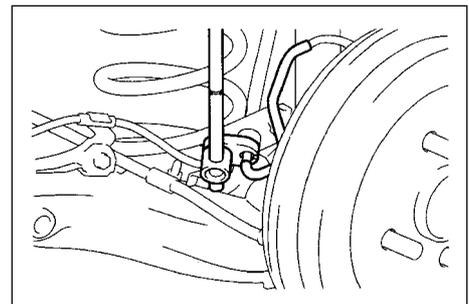
3. Remove the load-sensing valve bracket (without ABS)
 

Remove two nuts and load-sensing valve bracket from the axle bracket



4. Remove the proportioning valve and rear right brake tube
  - (1) Remove the proportioning valve and rear right brake tube by the special tool
  - (2) Remove the clips

Notes: Don't reuse the clips

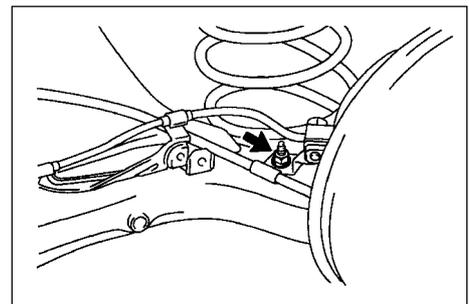


5. Remove the proportioning valve and rear left brake tube
 

Notes: use the same operations of the proportioning valve and rear right brake tube to remove #3 rear brake tube.

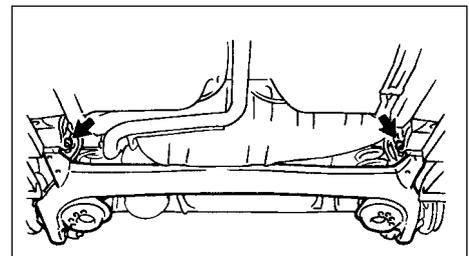
6. Remove right parking brake cable assembly
 

Remove nuts and right parking brake cable assembly assembly from rear axle frame
7. Remove left parking brake cable assembly



8. Loose the rear axle assembly
 

Loose two 2 bolts



## 9. Remove the left rear shock absorber assembly

(1) Lift the rear axle at left sustainer by lifting jack

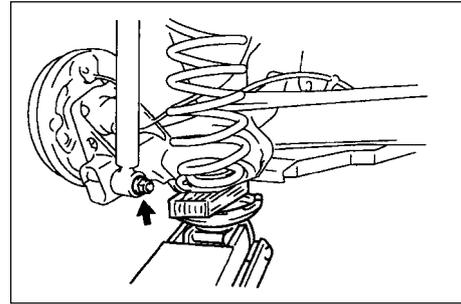
(2) Remove nuts, washers and left rear shock absorber assembly

## 10. Remove right rear shock absorber assembly

Notes: Remove right rear shock absorber assembly by using same operations as left.

## 11. Remove left rear helical spring

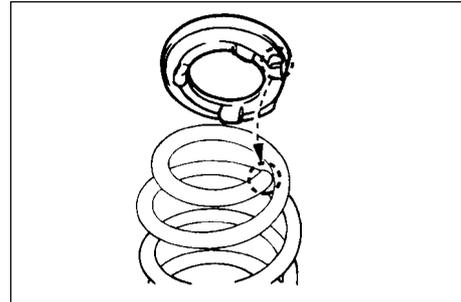
Slowly lower lifting jack, remove helical spring and upper pads and lower pads



## 12. Mount the left rear helical spring

(1) Mount the upper pad, let gap right on the helical spring.

(2) Mount lower pad, let and load the left helical spring into the rear axle.



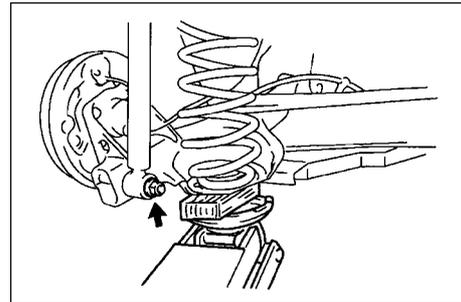
## 13. Temporarily tighten the left rear shock absorber assembly

(1) Mount the left rear shock absorber onto rear axle frame when lift jack.

(2) Temporarily tighten nut and washer.

## 14. Temporarily tighten the right rear shock absorber assembly.

Notes: Mount the right assembly by using same operations as left.



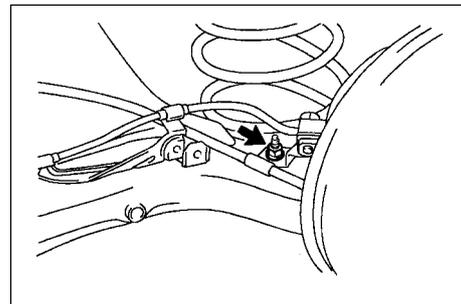
## 15. Mount right parking brake cable assembly

Mount right parking brake cable assembly by nuts

Torque: 5.4 N.m

## 16. Mount left parking brake cable assembly.

Tips: Mount the right assembly by using same operations as left.

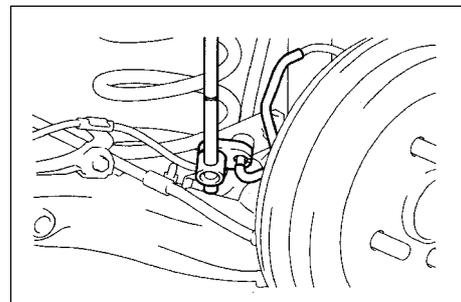


## 17. Mount the proportioning valve and rear right brake tube

(1) Connect the brake hose with brake tube by special tool.

Torque: 1.5 N.m

(2) Mount clips



## 18. Mount rear right brake tube

Tips:

Mount the right assembly by using same operations as left.

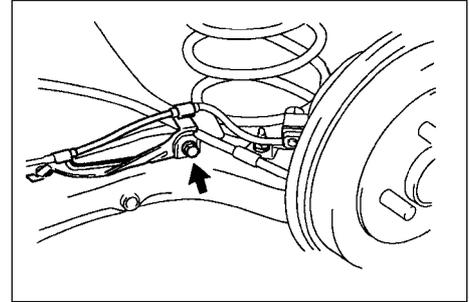
## 19. Mount sideslip control sensor wire (with ABS)

(1) Tighten sideslip control sensor wire by bolts

Torque: 8.0 N.m

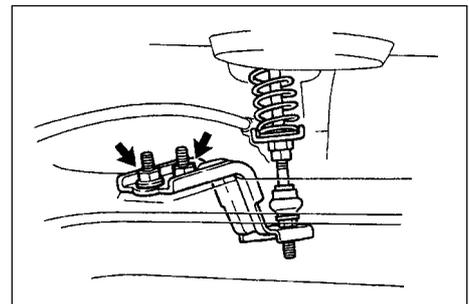
(2) Mount sideslip control sensor wire

Attention: Mount the right wire by using same operations as left.



## 20. Mount load-sensing valve bracket (without ABS)

Mount load-sensing valve bracket by two bolts



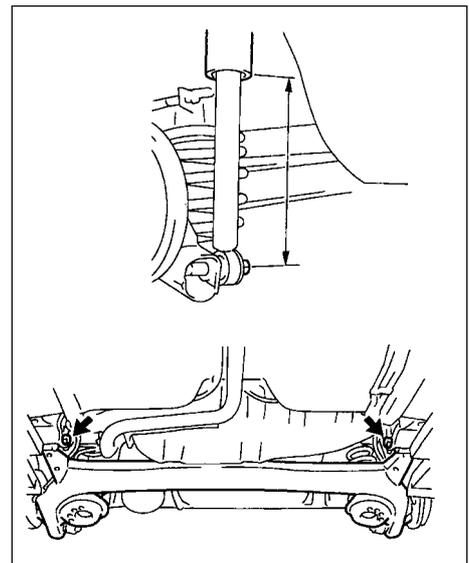
## 21. Sufficiently tighten the rear axle frame assembly

(1) Stabilize the shock absorber assembly

Use the lifting jack and add 90Kg force on rear luggage carrier if bolts can not be tightened at this point.

(2) Sufficiently tighten bolts

Torque: 82 N.m



## 22. Sufficiently tighten the left rear shock absorber assembly

Sufficiently tighten nuts

Torque: 49 N.m

## 23. Sufficiently tighten the right rear shock absorber assembly

Tips: Mount the right rear shock absorber by using same operations as left.

## 24. Release the air in the brake hose

## 25. Mount the rear wheel

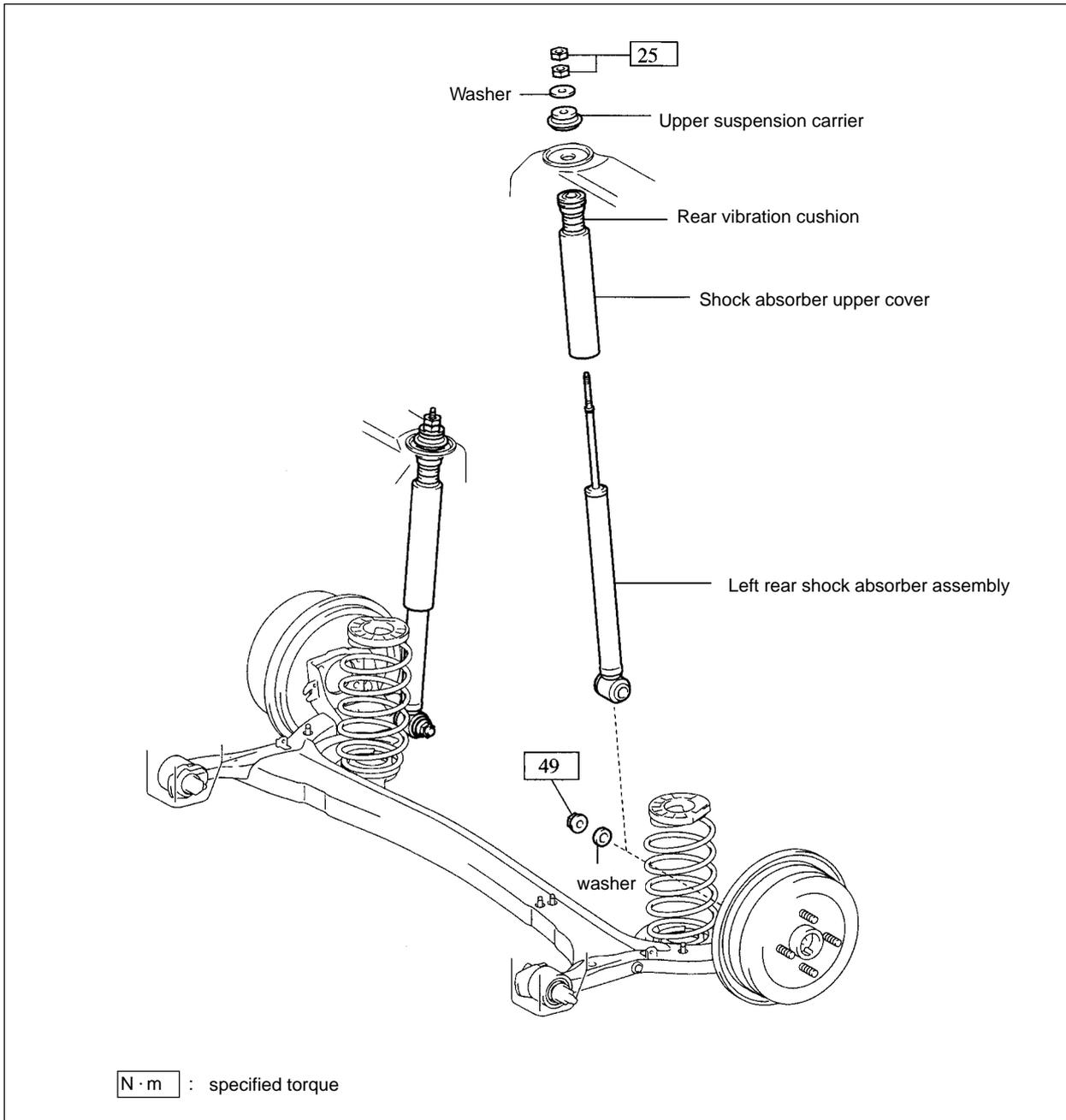
Torque: 103 N.m

## 26. Check rear the wheel alignment

## 27. Check the wheel speed sensor signal of ABS( with ABS)

## Section 4 Rear Absorber Installation Assembly

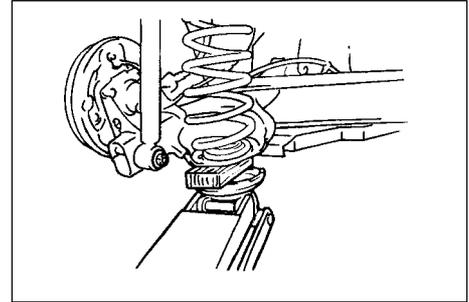
### Component View



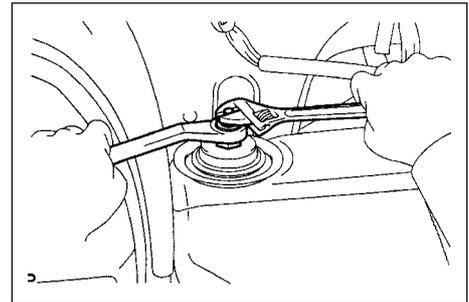
### Replacement

1. Remove the rear seat cushion assembly
2. Remove divided rear seat back assembly
3. Remove LH & RH rear seat back hinge (2 pieces)
4. Remove rear seat belt assembly
5. Remove left rear door molding

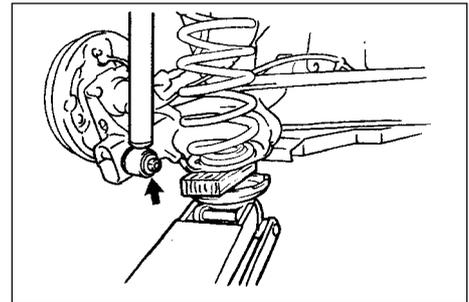
6. Remove rear left lower pillar interior panel
7. Remove the lower rear shelf interior panel
8. Remove rear left upper pillar interior pane
9. Remove rear right lower pillar interior pane
10. Remove the high brake lamp
11. Remove the rear shelf interior panel
12. Remove rear wheel
13. Remove the rear left shock absorber assembly
  - (1) Lift the rear axle frame by lifting jack (see right figure)



- (2) Remove two nuts by clamping the piston push rod
- (3) move the washer and upper suspension bracket



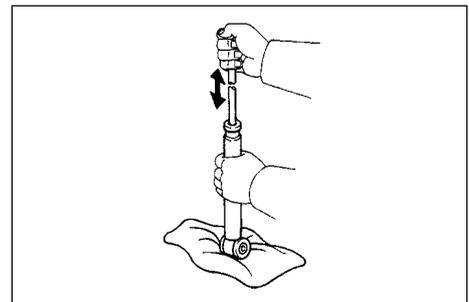
- (4) Remove nut, washer and left rear shock absorber assembly
- (5) Remove shock absorber upper cover



14. Check rear left shock absorber assembly
 

Check the abnormal resistance and noise in the operation by compressing and extending the push rod, replace it if any abnormal.

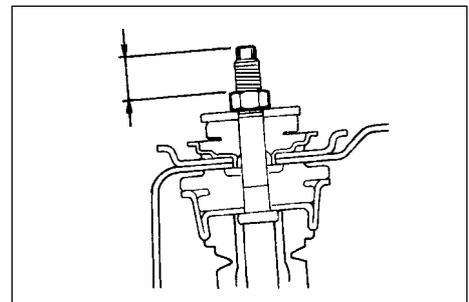
15. Mount rear left shock absorber assembly
  - (1) Mount shock absorber upper cover
  - (2) Mount shock absorber, upper suspension bracket and washer onto vehicle body
  - (3) After clamp piston push rod, mount lower nut and let piston push rod higher 15-18mm than nut (see right figure)



- (4) Mount upper nut according lower nut
 

Torque: 25N.m
- (5) Mount shock absorber onto rear axle frame by washer and nut at lifting jack
 

Torque: 49N.m

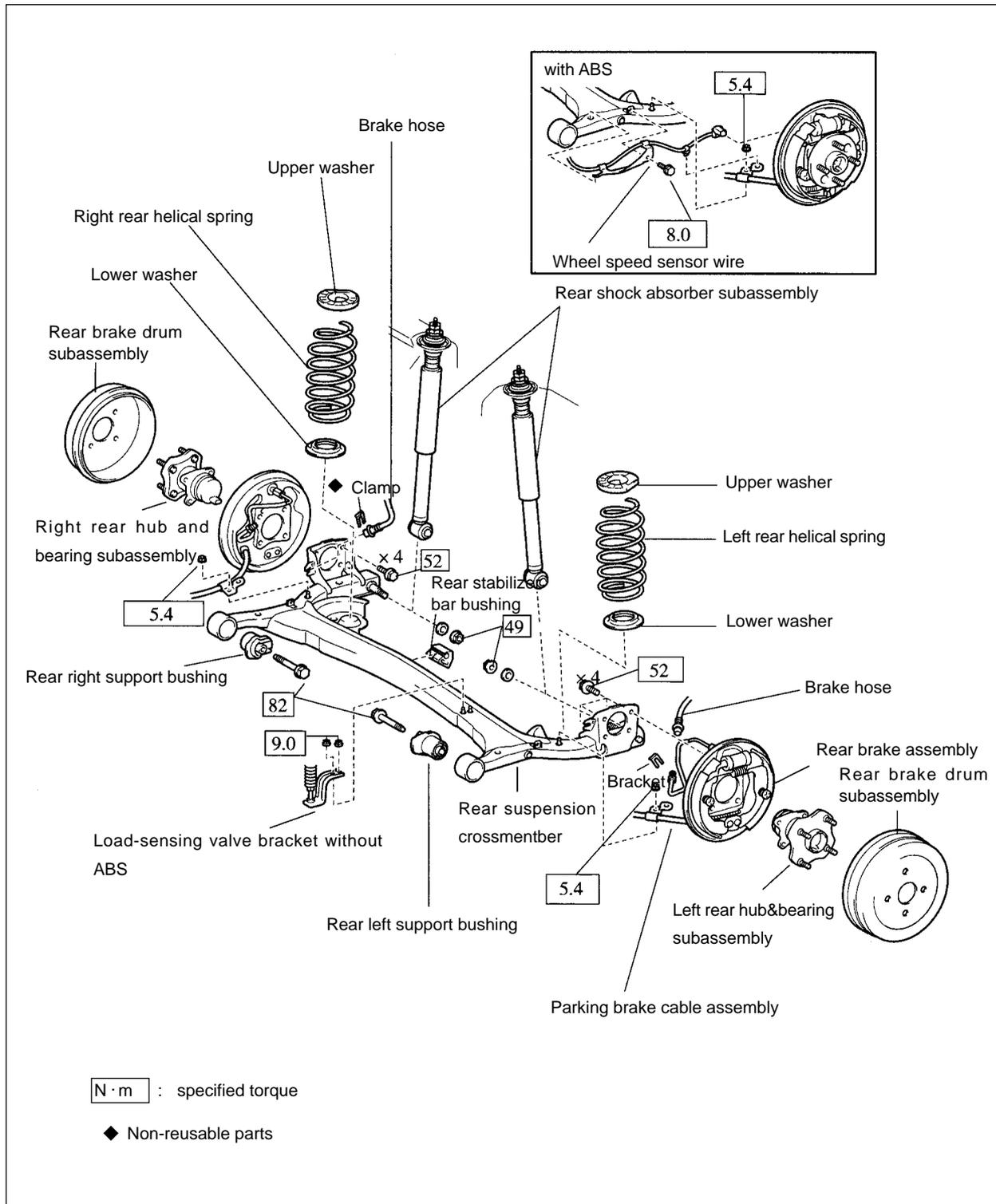


16. Mount rear wheel
 

Torque: 103N.m
17. Check rear wheel alignment

## Section 5 Rear Suspension Crossmember

### Component View

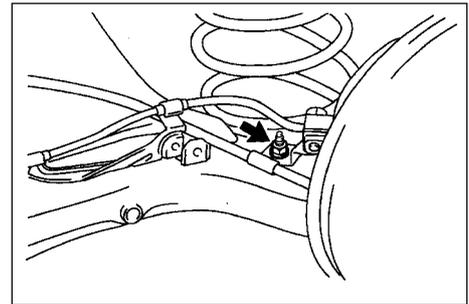


**Disassemble:**

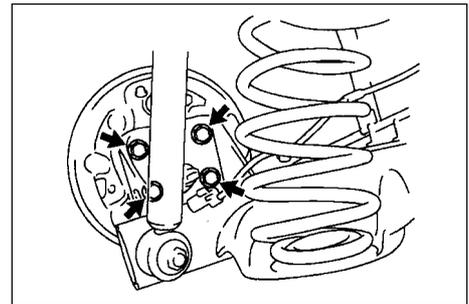
1. Remove rear wheel
2. Remove sideslip control sensor wire (with ABS)
3. Remove load-sensing valve bracket (without ABS)
4. Remove proportioning valve and right rear brake tube
5. Remove proportioning valve and left rear brake tube
6. Remove right parking brake cable assembly
7. Remove left parking brake cable assembly

Tips: Remove right parts by using same operations as left

8. Remove rear brake drum subassembly
9. Remove left rear hub and bearing assembly
  - (1) Remove nuts and right parking brake cable assembly from rear axle frame



- (2) Remove four bolts and left rear hub and bearing assembly
- (3) Remove rear brake assembly from rear axle frame



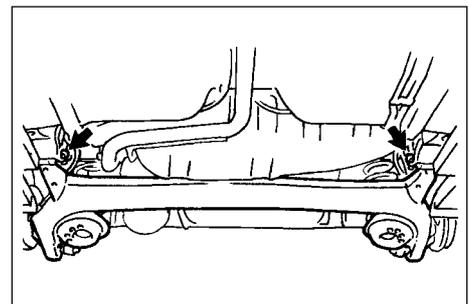
10. Remove rear right hub and bearing assembly
 

Tips: Remove right parts by using same operations as left
11. Loosen rear axle frame assembly
12. Disassemble rear left shock absorber assembly
13. Disassemble rear right shock absorber assembly
 

Tips: Remove right parts by using same operations as left
14. Remove rear left helical spring
15. Remove rear right helical spring
 

Tips: Remove right parts by using same operations as left
16. Remove rear axle assembly

- (1) Lift rear axle assembly by lifting axel
- (2) Remove two bolts and rear axle frame assembly



17. Remove rear stabilizer bar bushing

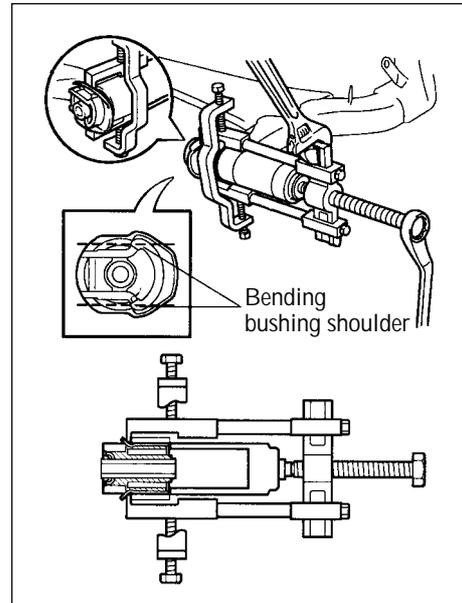
18. Remove left rear axle frame bushing

(1) Bend two bushing shoulders by chisel and hand hammer

Tips: Bend bushing shoulder till hooked by special tool

(2) Remove bushing from axle by special tool

Tips: Apply protective paint if axle frame scratched

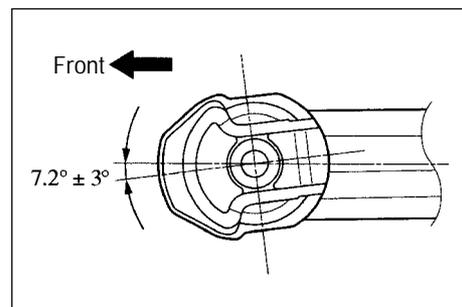


19. Remove rear right axle frame bushing

Tips: Remove right parts by using same operations as left

20. Mount rear left axle frame bushing

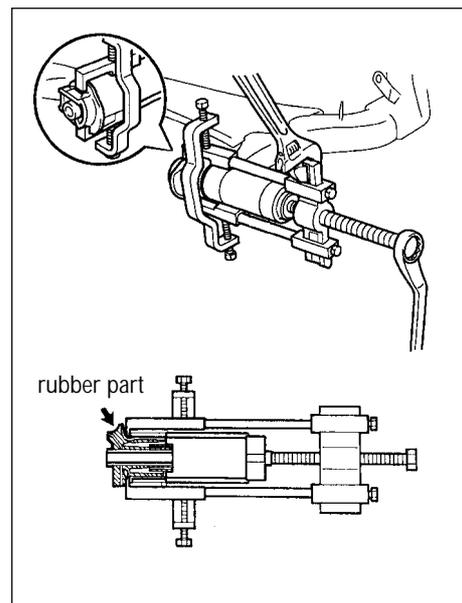
(1) As showed in graphic, Mount left rear axle carrier onto rear axle frame



(2) Mount bushing onto axle frame

Tips:

- fix the jaw of special tool onto bushing
- Don't chafe rubber of bushing
- Don't deform the shoulder of bushing



21. Mount rear right axle carrier bushing

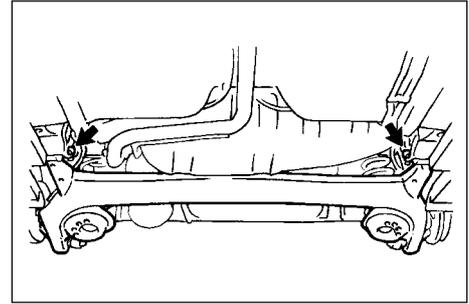
Tips: Mount right parts by using same operations as left

22. Mount rear stabilizer bar bushing

23. Temporarily fasten the rear axle frame assembly

(1) Lift rear axle frame by lifting jack

(2) Mount the rear axle frame by temporarily tightening two bolts



24. Mount rear left helical spring

25. Mount rear right helical spring

Tips:

Mount right parts by using same operations as left

26. Temporarily tighten rear left shock absorber assembly

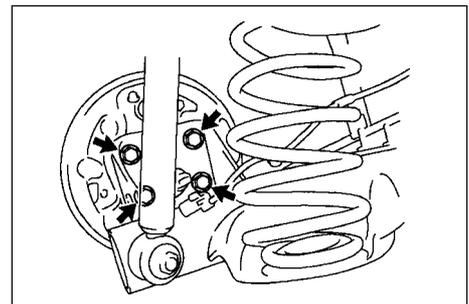
27. Temporarily tighten rear right shock absorber assembly

Tips:

Mount right parts by using same operations as left

28. Mount rear left hub and bearing assembly

Mount rear brake assembly, rear left hub and bearing assembly by four bolts



29. Mount rear right hub and bearing assembly

Tips: Mount right parts by using same operations as left

30. Mount rear brake drum subassembly

31. Adjust the gap between brake drum and brake shoe

32. Mount #3 parking brake cable assembly

Tips: Mount right parts by using same operations as left

33. Mount #2 parking brake cable assembly

34. Mount #4 rear brake tube

35. Mount #3 rear brake tube

Tips: Mount right parts by using same operations as left

36. Connect sideslip control sensor wire(with ABS)

37. Connect load-sensing valve bracket(without ABS)

38. Sufficiently tighten rear axle frame assembly

39. Sufficiently tighten rear left shock absorber assembly

40. Sufficiently tighten rear right shock absorber assembly

Tips: Mount right parts by using same operations as left

41. Release air from brake tube

42. Mount rear wheel

Torque: 103N.m

43. Check rear wheel alignment

44. Check the speed signal of ABS sensor( with ABS).

# Chapter 7 Wheel

## Section 1 Tire Inspection and Wheel Replacement

### Check

#### 1. Check tire

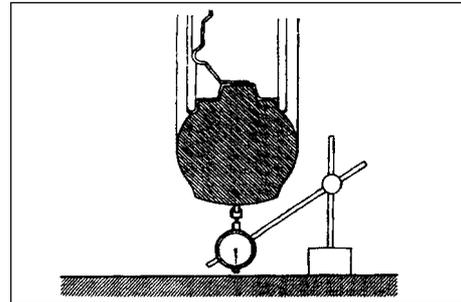
(1) Check appearance of tire and its pressure

Cool tire pressure:

Tire size	Front (KPa)	Rear (KPa)
175/65 R14 82H	230	210
185/60 R15 84H		

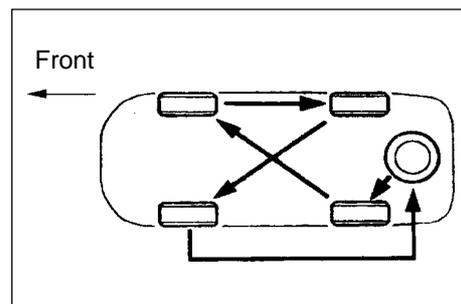
(2) Check the runout of tire by dial indicator

Runout of tire: less than 3.0mm



#### 2. Tire replacement

Notes: As showed in graphic, replacement position of every tire including and not including the spare tire.

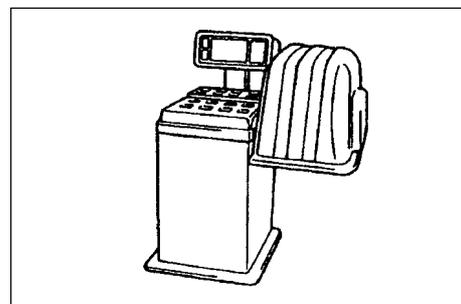


#### 3. Check tire dynamic balance

(1) Check and adjust wheel on the tire dynamic machine beside vehicle

(2) Check and adjust wheel on the tire dynamic machine loaded beside vehicle

Balance deviation after adjustment: less than 8.0g.



#### 4. Check bearing gap

#### 5. Check hub deviation.

# Chapter 8 Power Steering System

## Section 1 Power Steering System

### 1. Power Steering System Description

Power Steering System consists of the steering wheel, steering transmit device, power steering fixed device and steering pipelines. The steering gear is rack and pinion type.

### 2. Major parameters for steering system:

Item		Parameter
Steering Wheel total revolutions		3.58±0.1
Maximum Front Wheel Turn Angle	Inner	37.2° ± 2° / 32° ± 2°
	Outer	37.2° ± 2° / 32° ± 2°
Minimum Turning Diameter		≤ 10.4 m

### 3. Precaution:

#### (1) Precaution for steering system

Make sure of the correct replacement of parts, incorrect replacement might affect the performance of the steering system and lead to driving accidents.

#### (2) Precaution for SRS System

This vehicle is equipped with SRS (Supplemental Restraint System), driver side air bag and front passenger side air bag.

Failure to carry out service operations in the correct sequence could cause the unexpected deployment of the air bag during servicing, possibly leading to a serious accident.

### 4. Symptom Table

The table below is helpful to find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. Repair or replace these parts or assemblies if necessary.

Symptom	Suspected Area
Heavy steering	<ol style="list-style-type: none"> <li>1. Tire (improperly inflated)</li> <li>2. Power steering fluid (insufficient)</li> <li>3. Front wheel alignment (incorrect)</li> <li>4. Steering knuckle (worn)</li> <li>5. Swing arm ball stud pin joint (worn)</li> <li>6. Steering column (bent or binding)</li> <li>7. Power steering pump assembly</li> <li>8. Power steering gear assembly</li> </ol>
Poor return	<ol style="list-style-type: none"> <li>1. Tire (improperly inflated)</li> <li>2. Front wheel alignment (incorrect)</li> <li>3. Steering column (bent or binding)</li> <li>4. Power steering gear assembly</li> </ol>

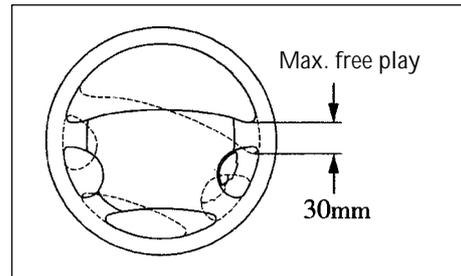
Symptom	Suspected Area
Excessive clearance and play	1. Steering knuckle (worn) 2. Swing arm ball stud pin joint (worn) 3. Intermediate shaft, sliding yoke (worn) 4. Front wheel bearing (worn) 5. Power steering gear assembly (worn)
Abnormal noise	1. Power steering pump fluid level (low) 2. Steering system ball joint (worn) 3. Power steering pump assembly (damaged) 4. Power steering gear assembly (damaged)

5. On-vehicle inspection

1 Check steering wheel free play

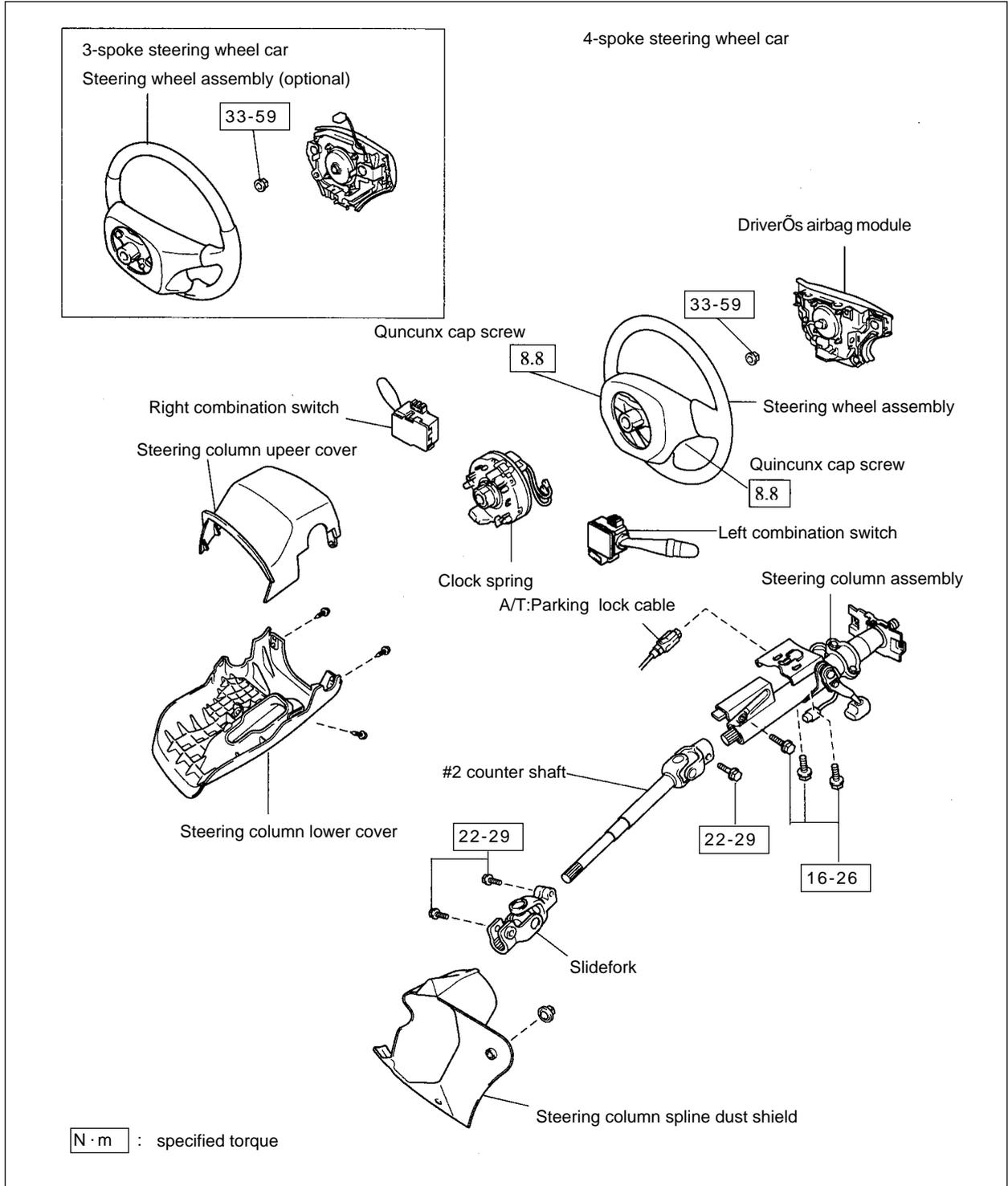
- (1) Stop vehicle and keep the tires straight ahead.
- (2) Rotate the steering wheel slightly, check the steering wheel free stroke.

Maximum free play: 30mm

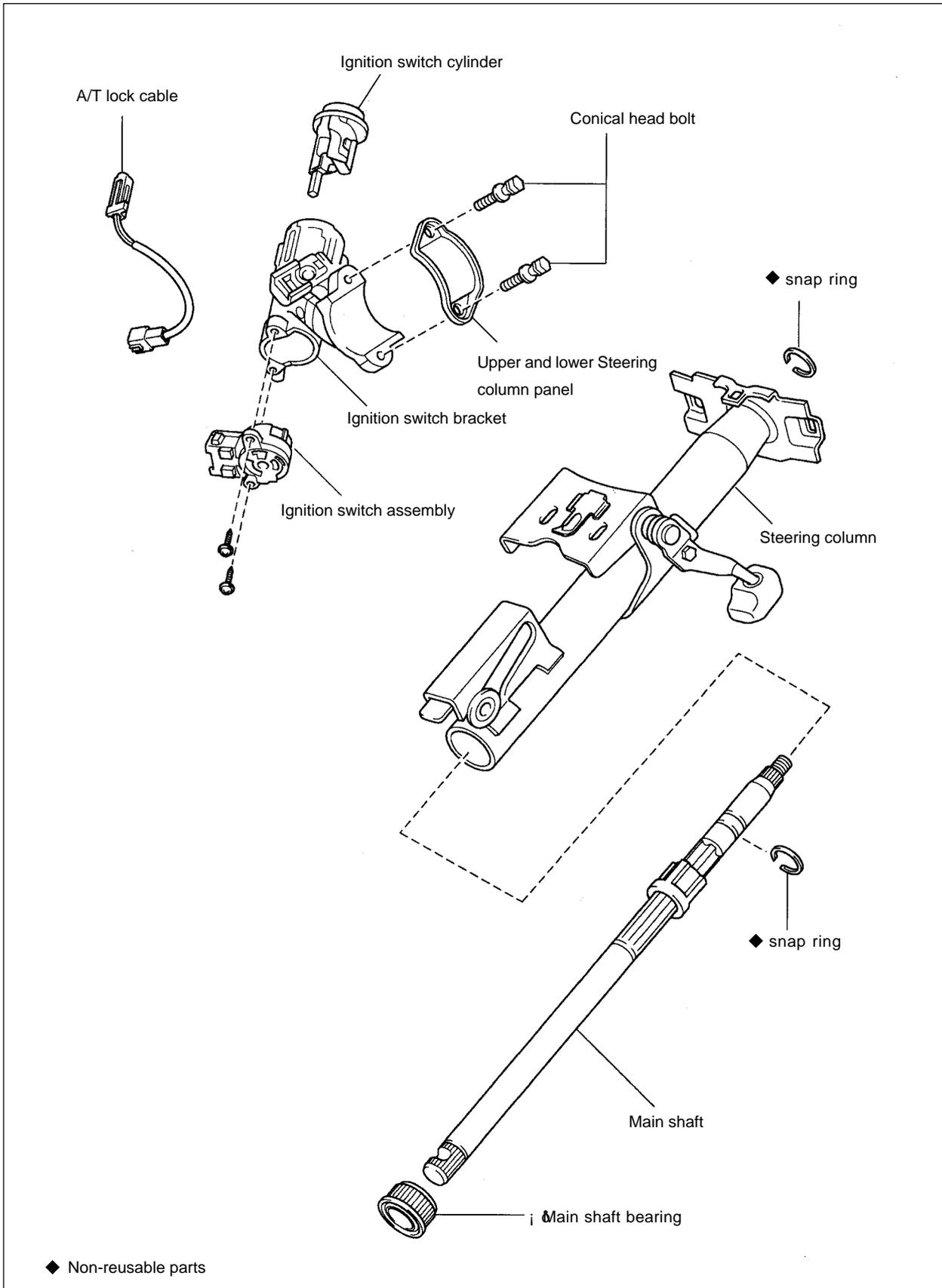


## Section 2 Steering Drive and Control Mechanism

### Component View



### Component View



## Replacement

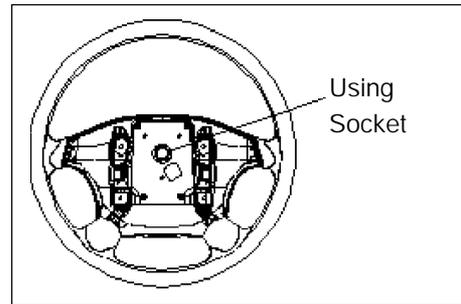
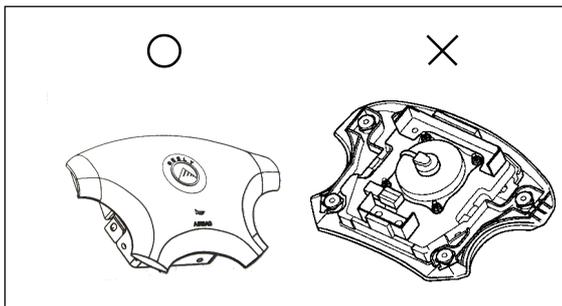
1. Precaution (refer to the steering system precaution)
2. Confirm that the wheel stays at a straight line running status.
3. Unfix the storage battery cathode terminal.
4. Remove the airbag assembly.

Remove the two screws on both sides, and pull out the cable connector.

Note: When removing the airbag assembly, never pull the airbag cables.

Caution: ◆ When put down the airbag assembly, make sure its top surface stays upward.

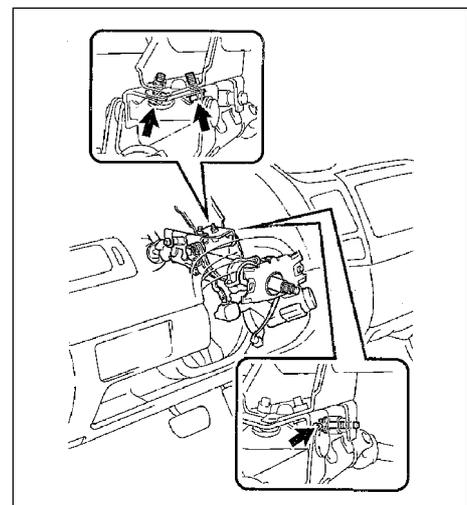
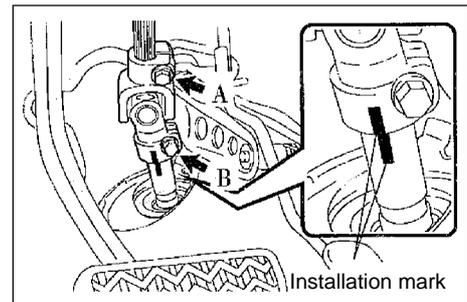
◆ Never disassemble the airbag assembly.



5. Remove the steering wheel assembly.
  - (1) Unfix the connector.
  - (2) Remove the set bolts of the steering wheel.
  - (3) Make a fit mark on the steering wheel assembly and main shaft assembly.
  - (4) Remove the steering wheel with special tool.
6. Remove the top shells and bottoms shell of the steering column shield.
  - (1) Remove the three screws.
  - (2) Remove the top part and bottom part of the steering column shield.
7. Remove clock spring.
8. Remove the left combination switch assembly.
 

Separate the connector and remove the left combination switch assembly.
9. Remove the right combination switch assembly.
 

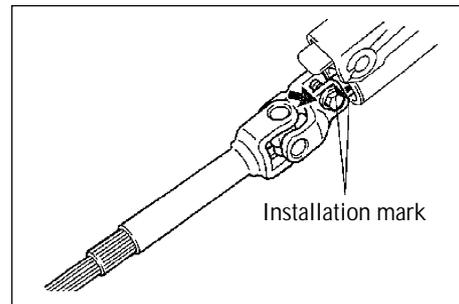
Separate the connector and remove the right combination switch assembly.
10. Remove the splined tube cover.
11. Detach No. 2 steering countershaft (see right figure)
  - (1) Make a mark on the fit between slide splined tube and countershaft.
  - (2) Loosen bolts A and B.



12. Remove the steering column pipe assembly.
  - (1) Remove the cable connector on the steering column pipe assembly.
  - (2) Remove the 3 bolts and steering column assembly.

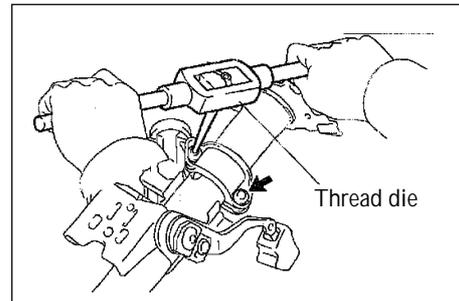
## 13. Remove the No.2 steering countershaft assembly.

- (1) Make a mark on the fit between main shaft and countershaft.
- (2) Remove bolt and countershaft.



## 14. Remove the ignition switch bracket.

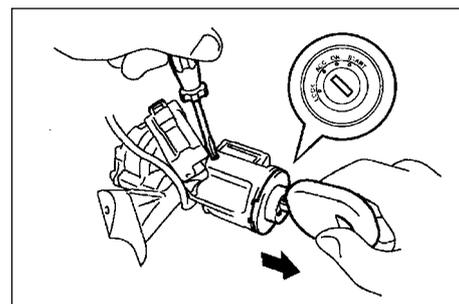
- (1) Use the punch pin to make a mark on the 2 conical head bolt.
- (2) Drill the 2 conical head bolts with the diameter of 3-4mm drill bit.
- (3) Remove the bolts and bracket for the ignition switch with the thread die.



## 15. Remove fixing panel on the steering column.

## 16. Remove the ignition switch lock core assembly.

- (1) Turn the ignition switch to "ACC" position.
- (2) press the stop pin and pull the lock core out.



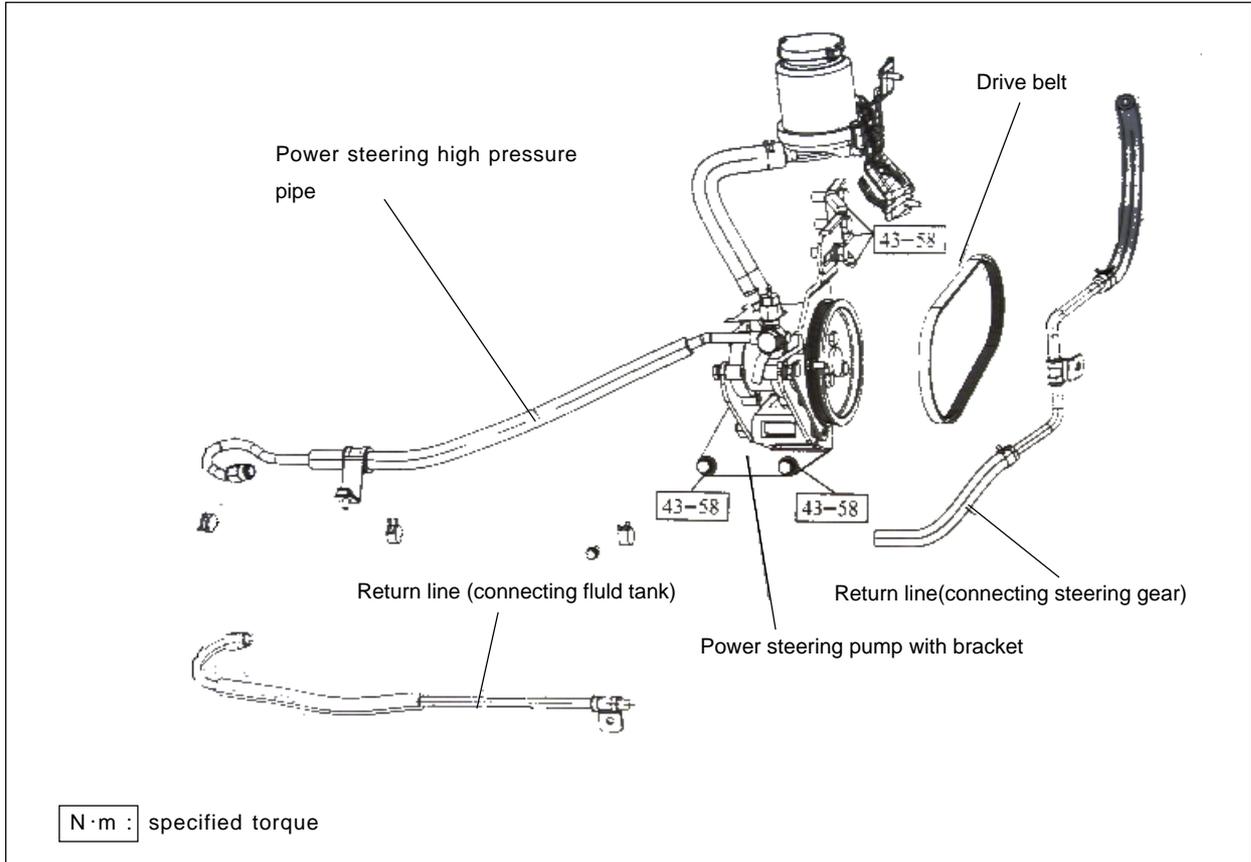
## 17. After checking or replacing the steering column pipe assembly, install all parts in a reverse order.

## Note:

- (1) After installing the ignition switch lock core, check the operation of the steering locking function: when pulling out the key, the steering device is locked; when the key is inserted and turned to ACC position, the steering device is unlocked.
- (2) Tighten the 3 bolts.
- (3) Make sure all cables are connected reliably.
- (4) After adjusting the combination switch as well as the top shell and bottom shell of the steering pipe shield, fasten the three screws connecting the combination switch and the steering column assembly.
- (5) Tighten the set bolt between the universal joint fork and the steering gear assembly with a torque of 22~39N. m.
- (6) Install dust cover and its press plate.
- (7) When installing the steering wheel assembly, align the steering wheel assembly and the fit mark of the steering main shaft assembly. Tighten the special quincunx bolt with a torque of 33~59N. m.
- (8) Check the airbag. It is not allowed to use a airbag part removed from another vehicle.
- (9) Check the SRS warning lamp.

## Section 3 Steering Pipeline Component

### Component View



### I. Onboard Check

#### 1. Check the transmission strap.

Check the transmission strap whether it is worn out. If necessary, replace a new transmission strap.

Tips: Crack at the edge of the strap teeth is acceptable. If the strap teeth fall, replace a new strap.

#### 2. Discharge the air in the power steering system.

(1) Check the liquid level.

(2) Lift the front part of the vehicle with a jack in a safety manner.

(3) Rotate the steering wheel.

After the motor is shut down, rotate the steering wheel to the left/right limit position lightly. Repeat such operation several times.

(4) Loosen the jack, and put down the vehicle.

(5) Start the motor, and make it run idly for several minutes.

(6) Rotate the steering wheel to one side limit position for 2-3 seconds, and then rotate it to the other side limit position for 2-3 seconds. Repeat such operations several times.

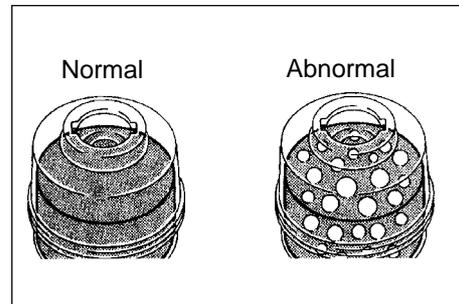
(7) Shut down the motor, and check whether there is any foam or emulsification in the oil storage. If so, discharge the air repeatedly.

(8) Check the level height, and check whether there is any leakage.

2. Check the level height.

(1) Park the vehicle on the horizontal road.

(2) When the motor stops running, check the level height in the oil tank. If necessary, add some more ATF DEXRONII steering liquid.



Tips: The level shall stay between the lowest level and the highest level.

(3) Check whether there is any foam or emulsification. If so, discharge the power steering liquid.

## Replacement

1. Discharge the steering liquid in the power steering system.

2. Remove the power steering high & low pressure oil pipes.

3. Loosen the connector screws of the high & low pressure oil pipes on the steering gear assembly, and loosen the oil pipe clip.

4. Loosen the drive belt.

5. Remove the power steering pump strap support assembly from the motor. Remove the 3 coupling bolts between the power steering pump strap support assembly and the motor.

6. Install the power steering pump strap support assembly.

Fasten the steering pump strap support assembly on the motor, and tighten the M10 bolt with a torque of 45-79N.m and M8 bolt with a torque of 16-26N. m.

7. Install the drive belt, and make sure the position is correct.

8. Install the high & lower pressure oil pipes of the power steering gear assembly.

(1) Connect the connector screw of the high and low pressure oil pipe to the steering gauge with a torque of 19-33N.m.

(2) Fasten the low pressure oil pipe on the body front baffle plate with clip.

(3) Connect the connector screw of the high pressure oil pipe to the power steering pump with a torque of 19-33N.m.

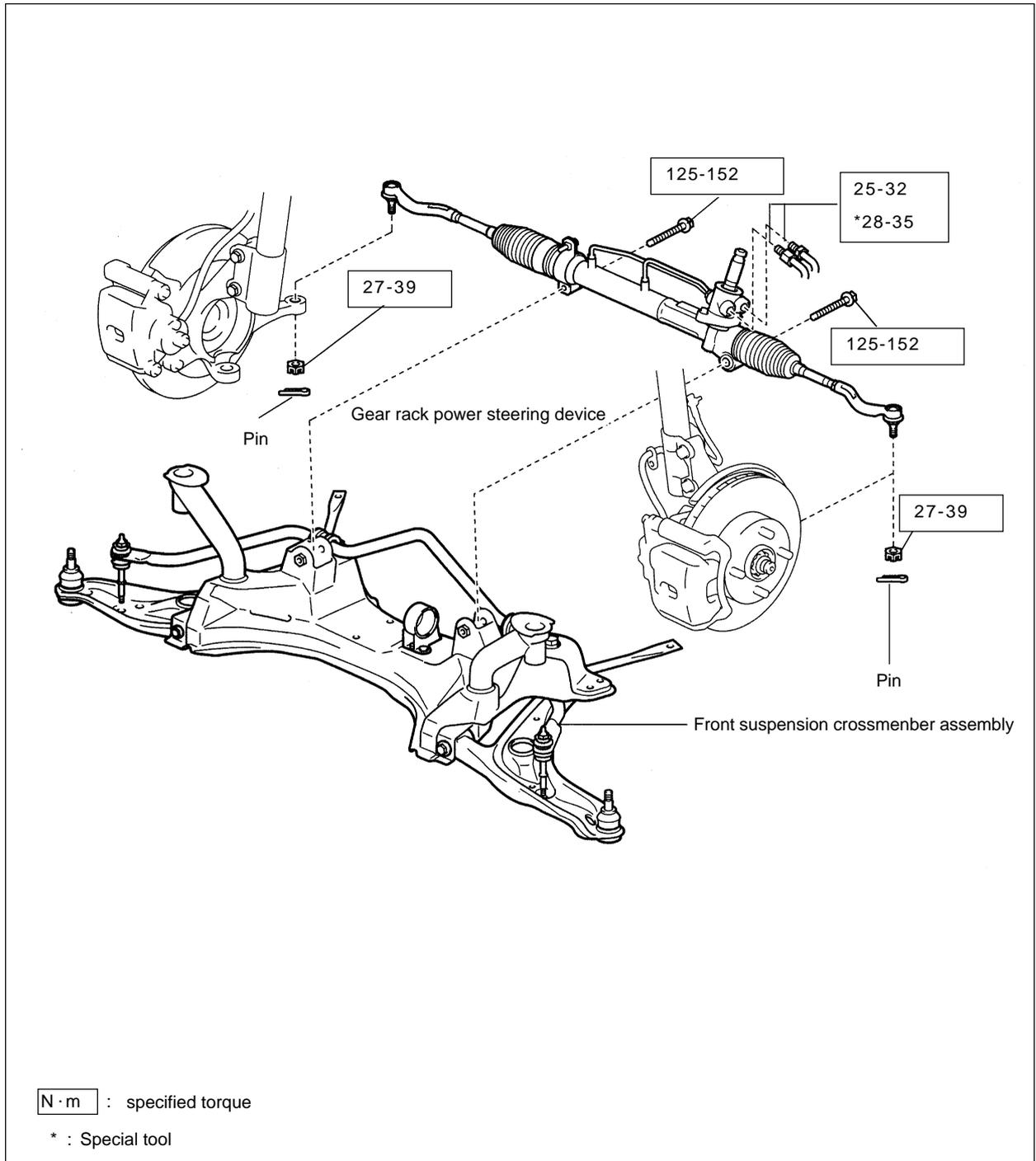
(4) Connect the connector screw of the low pressure oil pipe to the oil tank with a torque of 19-33N ·m.

9. Discharge all air in the power steering pipe system, and check the pipe system whether there is any leakage.

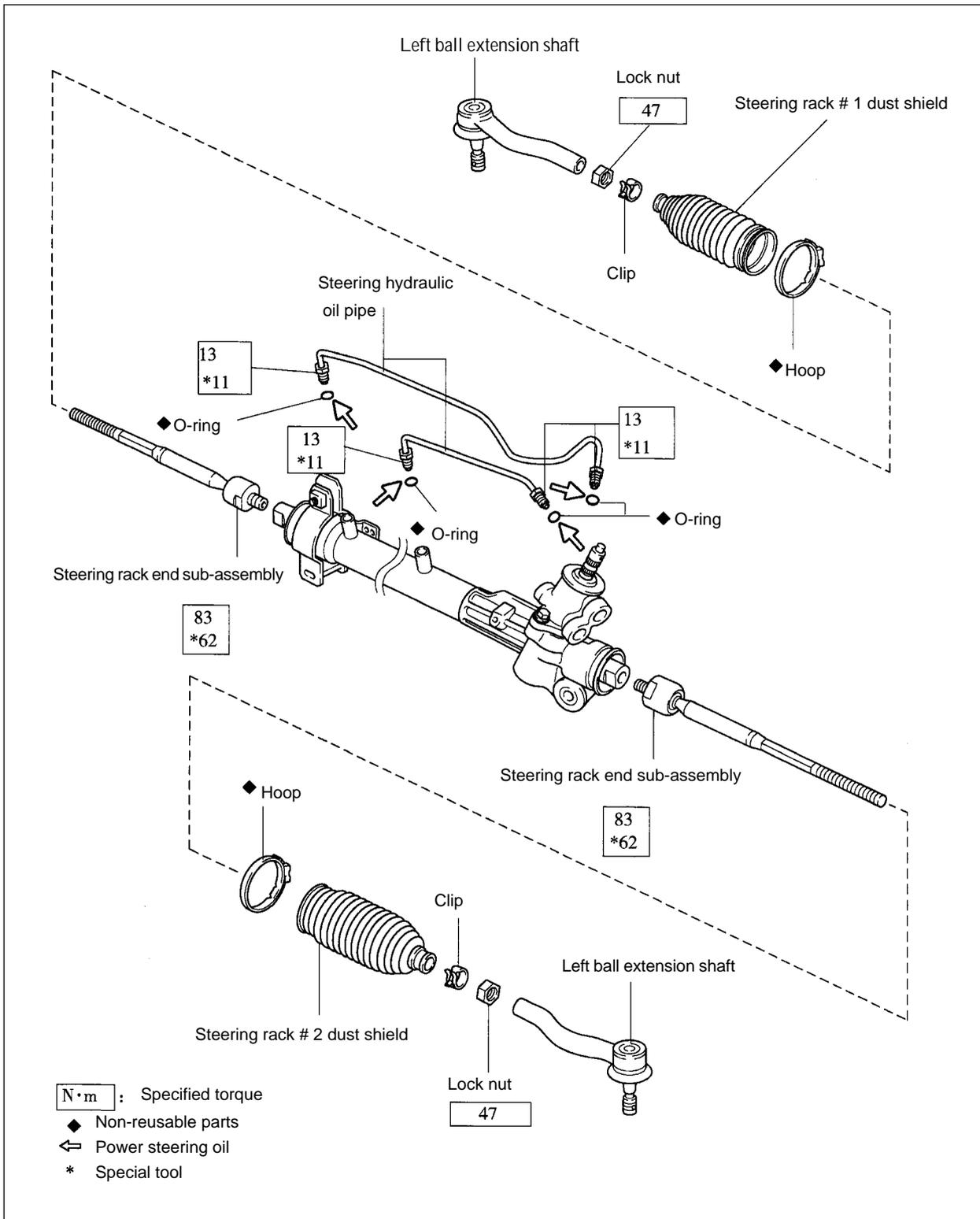
10. Check the oil reservoir inner fluid level

## Section 4 Power Steering Gear

### Component View



### Component View

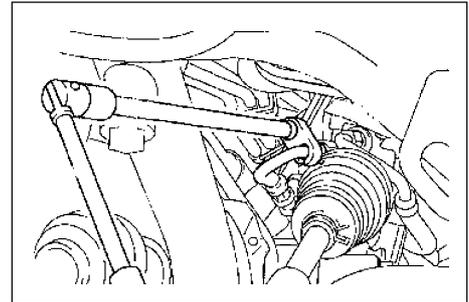


## Replacement

1. Drain the power steering system fluid

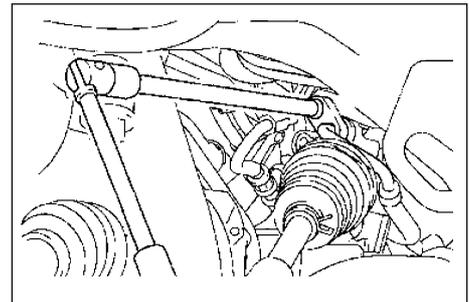
2. Loosen the high pressure pipes.

Loosen the high pressure pipes with special tool



3. Loosen the low pressure pipes

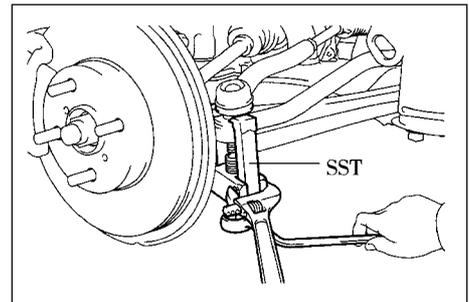
Loosen the low pressure pipes with special tool



4. Separate the tie rod from the steering knuckle

(1) Remove the cotter pin, loosen the groove type lock nut

(2) Separate the tie rod ball stud joint from the steering knuckle taper hole



5. Loosen the thread screw of the high and low pressure pipe on the steering gear assembly

6. Remove the boot and press plate

7. Disconnect the power steering gear assembly from the steering column

Remove the steering gear pinion shaft spline lock bolt on the universal joint yoke

8. Remove power steering gear assembly

Remove 2 steering gear assembly set bolts. Remove the power steering gear assembly

9. Installation is in the reverse order of the removal

Notice:

(1) Insert the steering gear pinion shaft spline into the spline hole of the universal joint yoke, make sure that the positions of the notch of the steering gear pinion shaft and the lock bolt of the universal joint yoke are correct

(2) Secure the power steering gear with 2 bolts, torque: 125~152N.m

(3) Tighten the steering gear pinion shaft spline lock bolt on the universal joint yoke, torque: 22~34N. m

(4) Install the boot and press plate

(5) Install the threaded connector of the power steering high and low pressure pipe to the power steering gear, torque: 25~32N.m

- (6) Connect the tie rod ball stud pin with the steering knuckle, make sure that the mating surface of the tie rod ball stud pin and the steering knuckle is clean, tighten the slot nut, torque: 27~39N. m. Install the cotter pin, make sure of the correct installation
- (7) Add appropriate amount of specified power steering fluid, bleed the power steering system
- (8) Check the power steering pipeline system for leakage
- (9) Check the front wheel alignment and front wheel left and right limit turn angle, adjust the toe in if necessary and tighten the tie rod lock nut
- (10) Check the position of the steering wheel. It is required that the steering wheel spokes are basically symmetrical when the vehicle is driven straight ahead, reassemble the steering wheel if necessary

# Chapter 9 Brake System

## Section 1 Brake System

### I. Precaution

1. It's very important to keep the parts and area clean when repairing the brake system.
2. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard.
3. Do not let brake fluid remain on a painted surface when repairing any parts. Wash it off immediately.
4. If any work is done on the brake system or air in the brake pipelines is suspected, bleed the system of air.
5. Check the brake system for leakage after repairing the brake system.
6. Use specified brake fluid. Do not mix with other brand of brake fluid.

### II. Symptom table

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area
Low brake pedal or recoil	<ol style="list-style-type: none"> <li>1 Brake system (fluid leaks)</li> <li>2 Brake system (air in)</li> <li>3 Piston Cup in Sub-pump (worn or damaged)</li> <li>4 Rear brake shoe clearance (out of adjustment)</li> <li>5 Master cylinder (faulty)</li> <li>6 Booster push rod (out of adjustment)</li> <li>7 Brake shoe or lining (oily)</li> <li>8 Disc/Drum scratched</li> </ol>
Brake Stagnation	<ol style="list-style-type: none"> <li>1. Brake pedal free stroke is too small</li> <li>2. Parking brake lever stroke (out of adjustment)</li> <li>3. Parking brake cable (sticking)</li> <li>4. Rear brake shoe clearance (out of adjustment)</li> <li>5. Brake pad or lining (cracked or distorted)</li> <li>6. Wheel cylinder piston (stuck or frozen)</li> <li>7. Return spring (faulty)</li> <li>8. Vacuum booster (faulty)</li> <li>9. Brake master cylinder (faulty)</li> </ol>

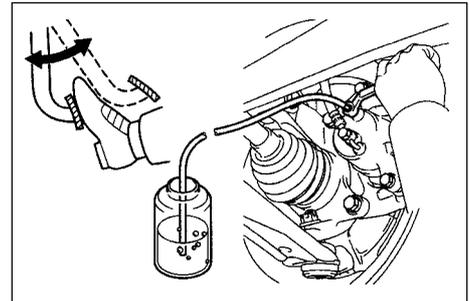
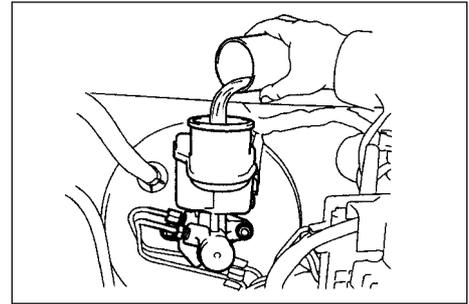
Symptom	Suspected Area
Brake Deviation	<ol style="list-style-type: none"><li>1. Wheel cylinder piston (stuck)</li><li>2. Brake shoe lining (oily)</li><li>3. Disc (scratched)</li><li>4. Brake shoes or lining (cracked or distorted)</li><li>5. Wheel hub bearing (worn or damaged)</li><li>6. Tire pressure (not as specified)</li></ol>
Noise from brake	<ol style="list-style-type: none"><li>1. Brake shoe lining (damaged)</li><li>2. Installation bolt (loose)</li><li>3. Disc (scratched)</li><li>4. Brake shoe (bad in quality)</li><li>5. Brake shoes lining (oily)</li><li>6. Sound isolating shim damaged</li><li>7. Hold spring of brake shoe (damage)</li></ol>

## Section 2 Brake Fluid

### Bleeding

#### 1. Fill brake reservoir with brake fluid

Brake fluid: HZY4 complying with GB12981



#### 2. Bleed brake pipeline system

- (1) Connect the vinyl pipe to the wheel cylinder bleeder plug port
- (2) Depress the brake pedal several times, and then loosen the bleeder plug with the pedal held down.
- (3) At the point when fluid stops flowing out, tighten the bleeder plug, and then release the brake pedal.
- (4) Repeat (2) and (3) until all the air in the fluid has been bled out.
- (5) Repeat the above procedure to bleed the brake pipeline of the air for each wheel cylinder.

Notice: Fill brake fluid into the reservoir all the time when bleeding.

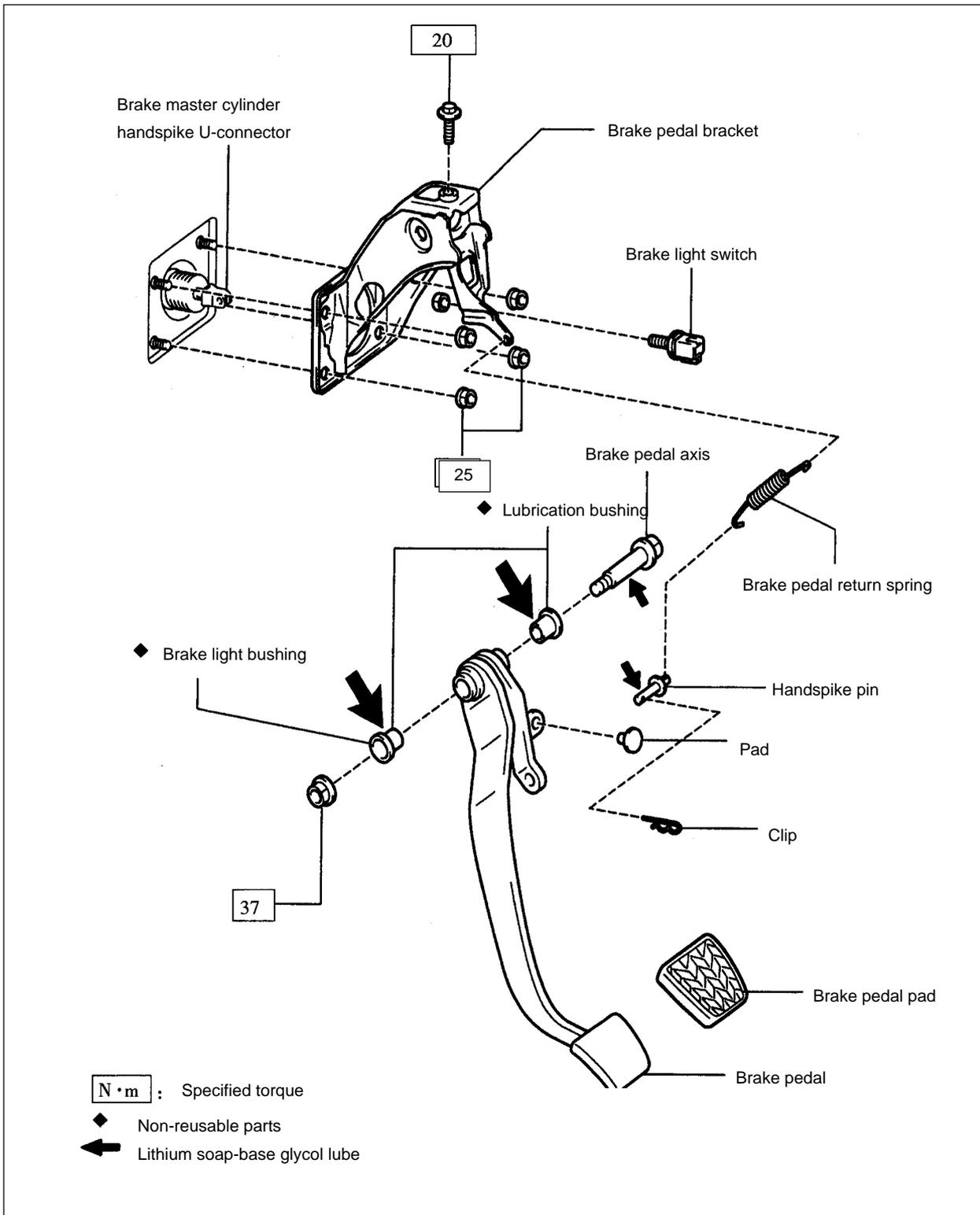
#### 3. Check fluid level in reservoir

Check the fluid level and fill fluid if necessary.

Tips: Do not mix and use with other brand of brake fluid.

### Section 3 Brake Pedal

#### Component View



## Adjustment

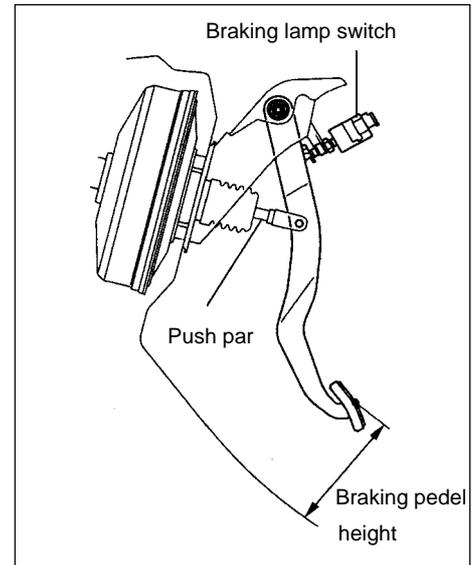
### 1. Check and adjust the height of brake pedal.

#### (1) Check the height of brake pedal.

Height from the floor: 124.3-134.3mm

#### (2) Adjust the height of brake pedal.

- a. Remove the cover of the console.
- b. Remove the coupler from the brake light switch.
- c. Loosen the lock nut of the brake light switch, and remove the brake light switch.
- d. Loosen the lock nub of the U-connector.
- e. Turn the pedal push bar to adjust the height of brake pedal.
- f. Tighten the lock nub of the push bar.  
Torque: 26N.m
- g. Install the brake light switch.
- h. Insert the connector of the brake light switch.
- i. Push the brake pedal (5-15mm), and turn the brake light switch till it goes out. Lock the nut in this position.
- j. After installation, step down the brake pedal (5-15mm), and check the brake light is bright.



### 2. Check the pedal free stroke.

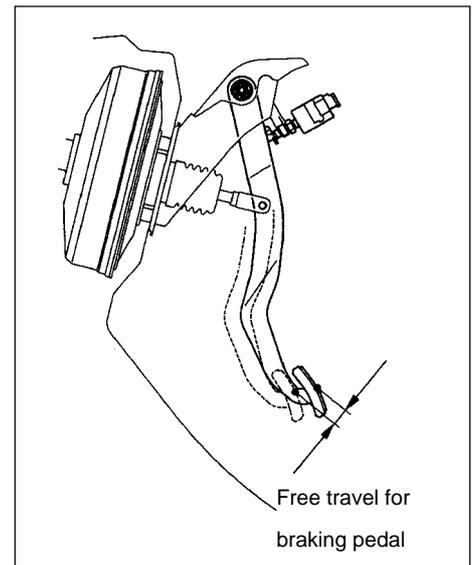
#### (1) Shut down the motor, and step on the brake pedal repeatedly till the booster is not vacuum.

#### (2) Step down the pedal till resistance appears, and measure the distance as shown in the figure.

Pedal free travel: 1-6mm

If the clearance does not meet the requirement, check the clearance of the brake light switch. If the clearance is correct, make diagnosis on the braking system.

Clearance: 0.5-2.4mm



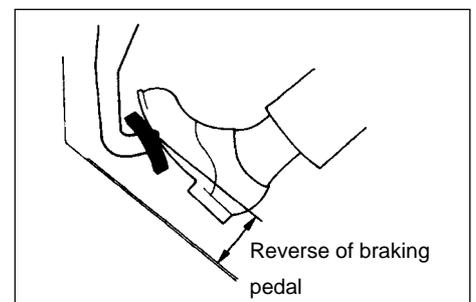
### 3. Check the pedal reserved distance.

Loosen the parking brake extension rod.

When the motor is running, step down the pedal, and measure the pedal reserved distance as shown in the figure.

When stepping on the pedal 490N, the reserved distance from the asphalt floor is larger than 55mm

If the distance doesn't meet the requirement, make diagnosis on the braking system.



## Removal

After the installation, check and adjust the height, free stroke and reserved distance of the brake pedal.

1. Remove the combination instrument component (see figure 1).

2. Unfix the brake master cylinder push bar U-connector.

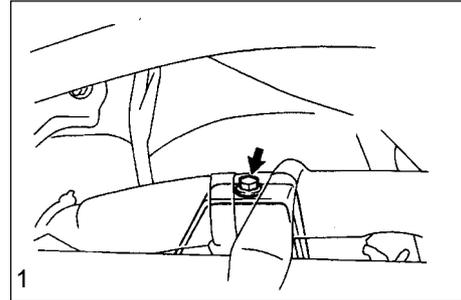
Remove the clip and pin, and unfix the master cylinder handspike from the brake pedal.

3. Remove the brake pedal bracket.

(1) Remove the bolt from the brake pedal bracket (see figure 1).

(2) Unfix the brake light coupler.

(3) Remove the four nuts and brake pedal bracket (see figure 2).



4. Remove the brake pedal sub-assembly.

(1) Remove the bolt and nut from the brake pedal bracket.

(2) Remove the brake pedal and the two bushings.

5. Remove the brake light switch component.

(1) Loosen the lock nut of the brake light switch.

(2) Remove the brake light switch from the brake pedal bracket.

6. Remove the brake pedal pad.

Remove the brake pedal pad from the brake pedal.

7. Install the brake pedal pad.

Install the brake pedal pad on the brake pedal.

8. Install the brake light switch component.

Install the brake light switch on the brake pedal bracket.

9. Install the brake pedal.

(1) Apply lithium soap-base glycol lube on the end surface and side surface of the two new bushings.

(2) Install the brake pedal and the two bushings on the brake pedal bracket with bolts and nuts.

Torque: 37N.m

10. Install the brake pedal bracket.

(1) Install the brake pedal bracket with four nuts.

Torque: 25N.m

(2) Connect the connector of the brake light switch.

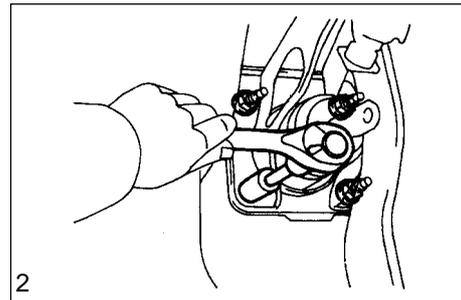
(3) Install the bolt on the brake pedal bracket (see figure 3).

Torque: 20N.m

11. Connect and install the brake cylinder push bar U-connector.

(1) Apply the lithium soap-base glycol lube on the handspike pin.

(2) Connect the master cylinder handspike with pins and clips.

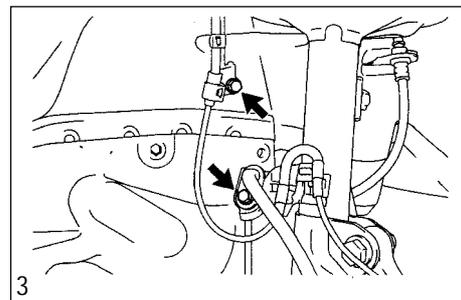


12. Install the combination instrument components.

13. Check and adjust the brake pedal height.

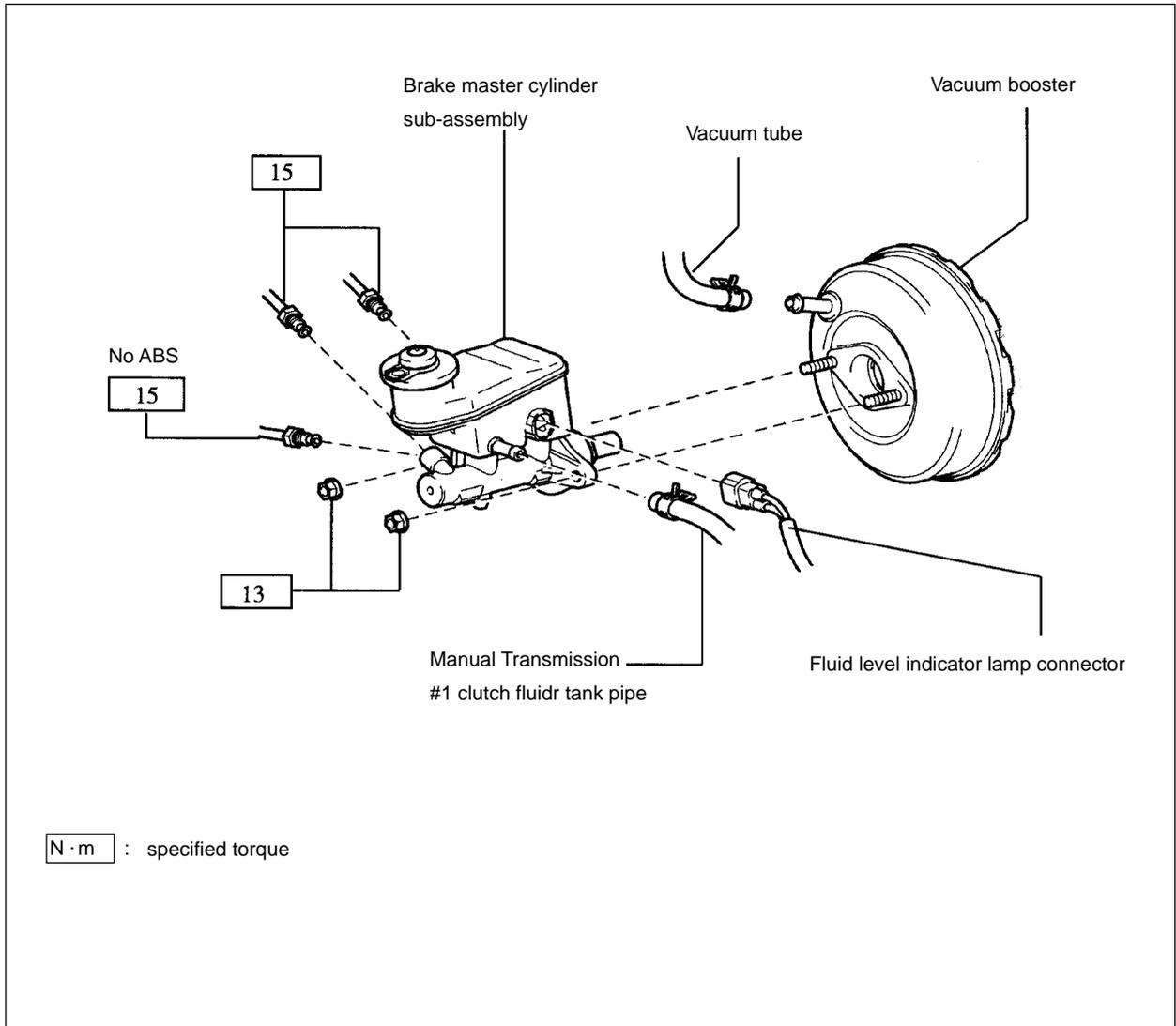
14. Check the brake pedal's free travel.

15. Check the brake pedal's reserved distance.

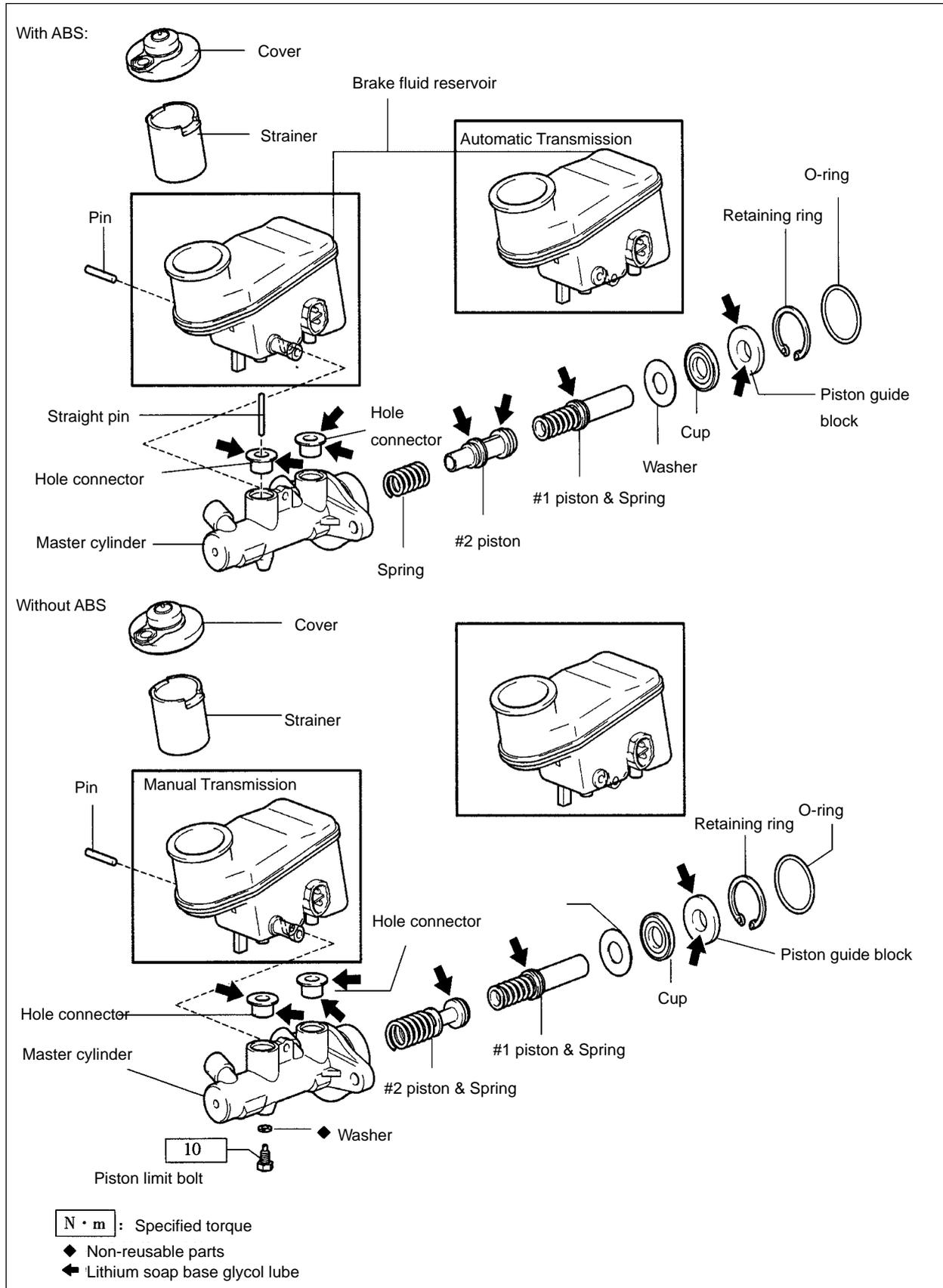


## Section 4 Brake Master Cylinder Assembly

### Component View



Component View



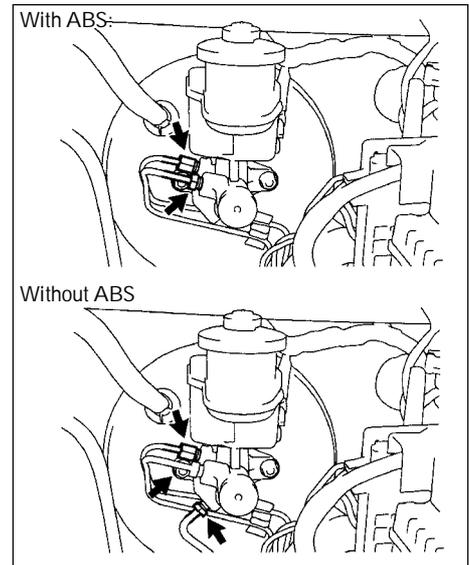
## Repair

### 1. Discharge the brake fluid.

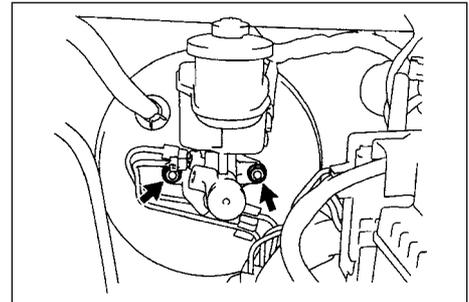
Note: Never spray the brake fluid on the paint surface, otherwise wash it immediately.

### 2. Remove the brake master cylinder.

- (1) Pull out the connector of the level alarm light switch.
- (2) Slide the clip, and pull out #1 clutch storage tank pipe (manual transaxle).
- (3) Remove the two brake pipes from the brake master cylinder with special tool. (with ABS)
- (4) Remove the three brake pipes from the brake master cylinder accessory with special tool. (without ABS)

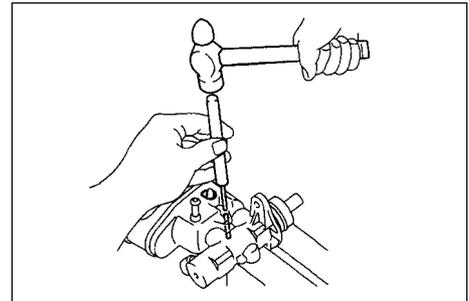


- (5) Remove the two lock nuts, and pull out the brake master pump.



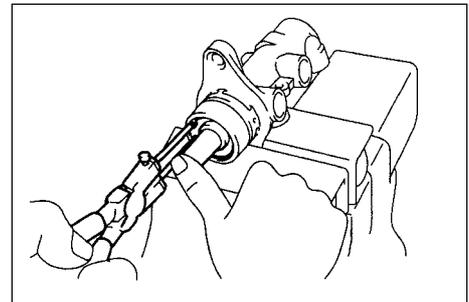
### 3. Remove the storage tank.

- (1) Put the brake master cylinder on the bench clamp.
- (2) Remove the pin from the brake master cylinder body with punch and hammer.
- (3) Pull out the Brake fluid reservoir.
- (4) Remove the cover and strainer from the storage tank.
- (5) Remove the storage tank and the two hole connectors.

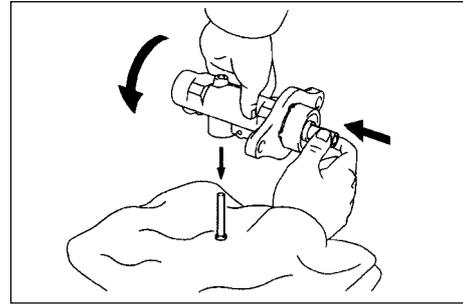


### 4. Remove the brake master cylinder.

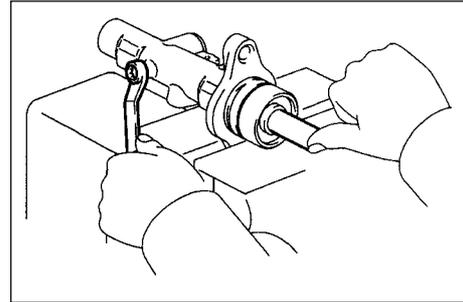
- (1) Put the brake master cylinder on the bench clamp.
- (2) Remove the O-ring.
- (3) Push the piston with hand, and remove the snap ring with snap ring pliers.



- (4) Push the piston with hand, and turn the cylinder body to remove the straight pin. (with ABS)



- (5) Push the piston with hand, and remove the piston bolt and washer. (without ABS)



- (6) Pull out #1 piston, piston guide block, spring, cup and washer straightly.

Note: If angle appears in the pulling process, it may cause damage to the cylinder wall.

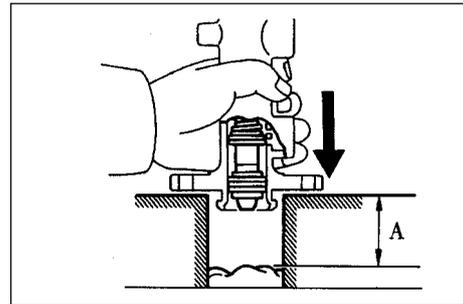
- (7) Put two blocks and cloth on the workbench. Put the flange of the master cylinder against the block edge and knock it till #2 piston and spring get out of the cylinder.

Tips:

Make sure the distance (A) between the working cloth and the block's top is at least 100mm.

Note:

If angle appears in the pulling process, it may cause damage to the cylinder wall.



#### 5. Check the brake master cylinder.

- (1) Check the cylinder wall whether there is any rust or nick.
- (2) Check the cylinder wall whether there is any abrasion or damage.

Note:

If necessary, clean or replace the brake master cylinder.

Tips:

Clean the assembled parts with compressed air.

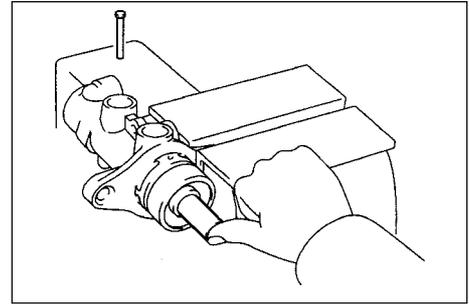
#### 6. Install the brake master cylinder.

- (1) Fix the brake master cylinder on the bench clamp.
- (2) Apply the lithium soap-base glycol lube on the rubber parts with arrow.
- (3) Install # 2 and # 1 pistons, spring, piston guide block, cup and washer.

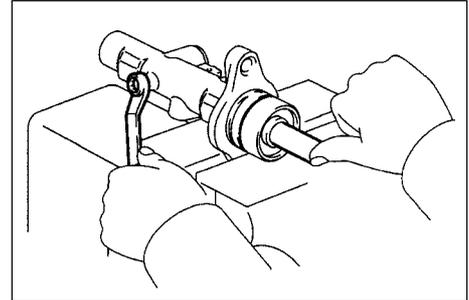
Note:

If angle appears in the installation process, it may cause damage to the cylinder wall. Be careful not to damage the edge of the cup on the piston.

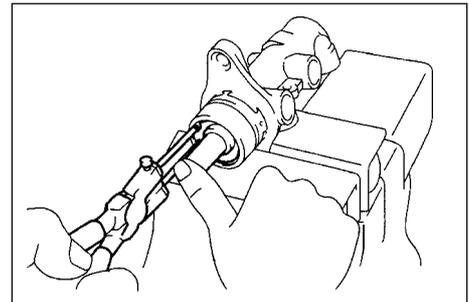
- (4) Push the piston, and install the straight pin on the cylinder body. (with ABS)



- (5) Push the piston, and install the new washer and piston bolt.  
Torque: 10N.m



- (6) Push the piston, and install the snap ring with snap ring pliers.  
(7) Install the O-ring on the brake master cylinder.

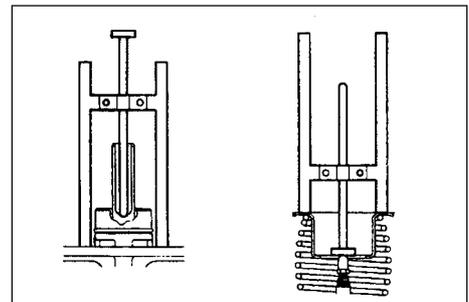


7. Install the Brake fluid reservoir.

- (1) Apply the lithium soap-base glycol lube on the Brake fluid reservoir connector, and install it on the brake master cylinder.  
(2) Install the pin on the brake master cylinder with punch and hammer.

8. Check and adjust the vacuum booster push bar.

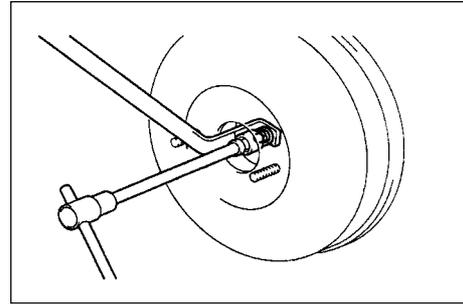
- (1) Install a special tool on the brake master cylinder, and lower the special tool mandril till it touches the piston.  
(2) Mark the mandril top surface of the special tool with chalk.  
(3) Overturn the special tool, and leave a clearance between the special tool and the vacuum booster.



Tips:

If there is clearance between the special tool body and the booster hull, it means that the clearance is standard value. If there is no chalk trace on the booster push bar, it means that the clearance exceeds the standard value.

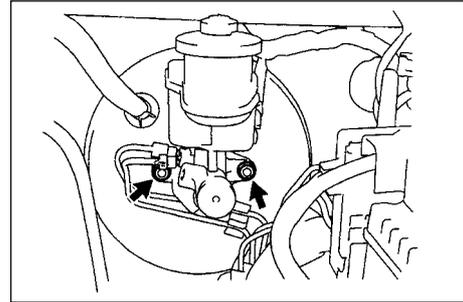
- (4) Adjust the length of the vacuum booster push bar with the special tool till the push bar touches the mandril head.



9. Install the brake master cylinder.

- (1) Install the brake master cylinder on the booster with two bolts.

Torque: 13N.m



- (2) Connect the two brake oil pipes to the brake master cylinder with a special tool. (with ABS)

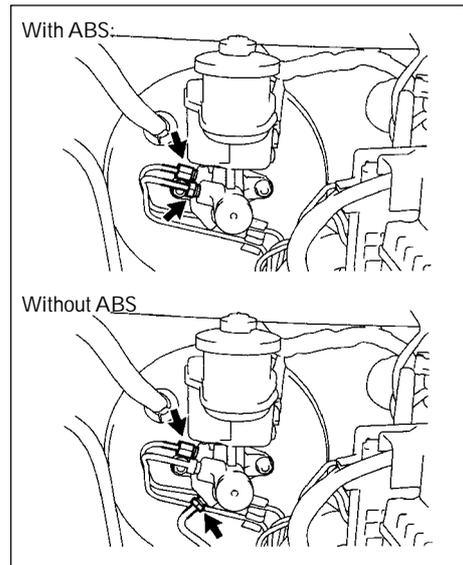
Torque: 15N.m

- (3) Connect the three brake oil pipes to the brake master cylinder with a special tool. (without ABS)

Torque: 15N.m

- (4) Connect # 1 clutch storage tank oil pipe with clip. (Manual transaxle type)

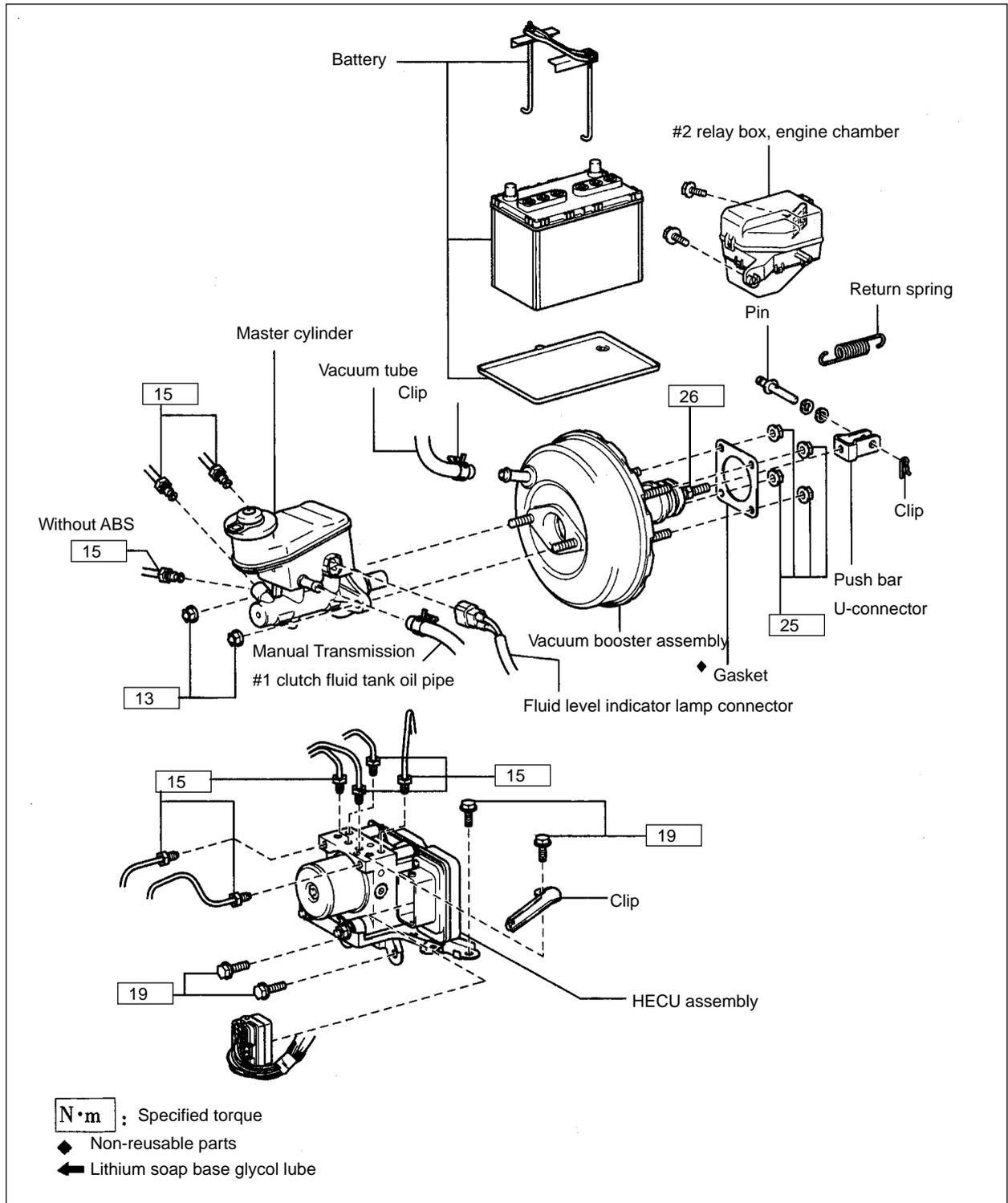
- (5) Insert the brake fluid level alarm switch connector.



10. Add the brake fluid to the Brake fluid reservoir.  
 11. Discharge the air in the brake master cylinder.  
 12. Discharge the air in the brake pipeline.  
 13. Check the level height in the Brake fluid reservoir.  
 14. Check the brake fluid whether there is any leakage.

## Section 5 Vacuum Booster

### Component View



## Check

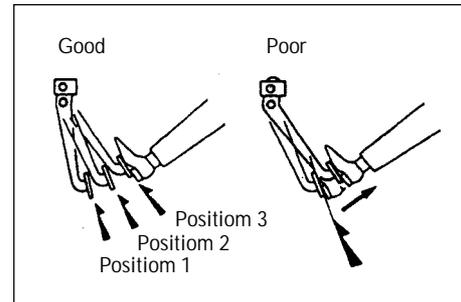
### 1. Check the brake booster.

#### (1) Air tightness check

- Start the motor, and shut it down after one or two minutes, then step on the pedal several times slowly.

Tips:

If the pedal goes down greatly at the first step, but it gradually goes up after the second and third steps, it means the air tightness is good.



- When the motor is running, step down the brake pedal, and then shut down the motor.

Tips:

If the reserved distance does not change thirty seconds after the pedal is stepped down, it means the air tightness is good.

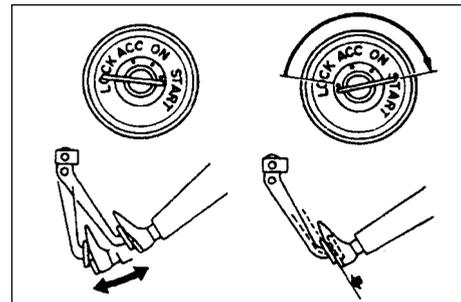
#### (2) Operation check

- When the ignition switch stays in OFF position, step on the pedal several times, and then check that the reserved distance should not change.

- Step down the pedal, and start the motor.

Tips:

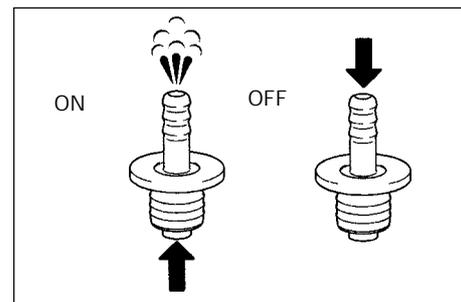
If the pedal goes down a little, it means the operation is ok.



### 2. Check the vacuum one-way valve.

#### (1) Check the vacuum one-way valve.

- Slide the clip to unfix the vacuum tube.
- Remove the vacuum one-way valve.
- Check the booster is ventilated to the motor.
- In case of any failure, replace the vacuum one-way valve.



## Replacement

1. Discharge the brake fluid.

Note:

Never spray the brake fluid on the paint surface, otherwise wash it immediately.

2. Unfix the clutch fluid tank pipe (manual transaxle).

3. Remove the brake master cylinder.

4. Remove the HECU assembly (with ABS).

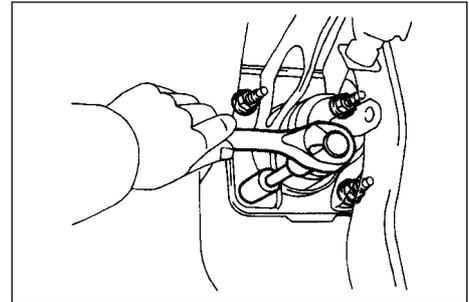
5. Remove the vacuum booster.

- (1) Unfix the vacuum tube from the brake booster.

- (2) Remove the return spring, clip and pin.

- (3) Remove the four nuts and U-clip.

- (4) Pull out the vacuum booster and washer.



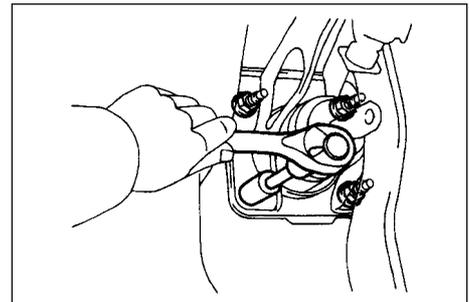
6. Install the vacuum booster.

- (1) Install the vacuum booster and new washer.

- (2) Install and fasten the vacuum booster nut.

Torque: 25N.m

- (3) Install the return spring, clip and pin.



7. Install the vacuum booster push bar.

8. Install the brake actuator. (with ABS)

9. Install the brake master cylinder.

10. Connect the clutch fluid pipe.

11. Add the brake fluid to the reservoir.

12. Discharge the air in the brake master cylinder.

13. Discharge the air in the brake pipeline.

14. Check and adjust the height of the brake pedal.

15. Check the free stroke of the pedal.

16. Check the reserved distance of the pedal.

17. Discharge the air in the clutch tank pipe (manual transmission).

18. Check and adjust the clutch pedal (manual transmission).

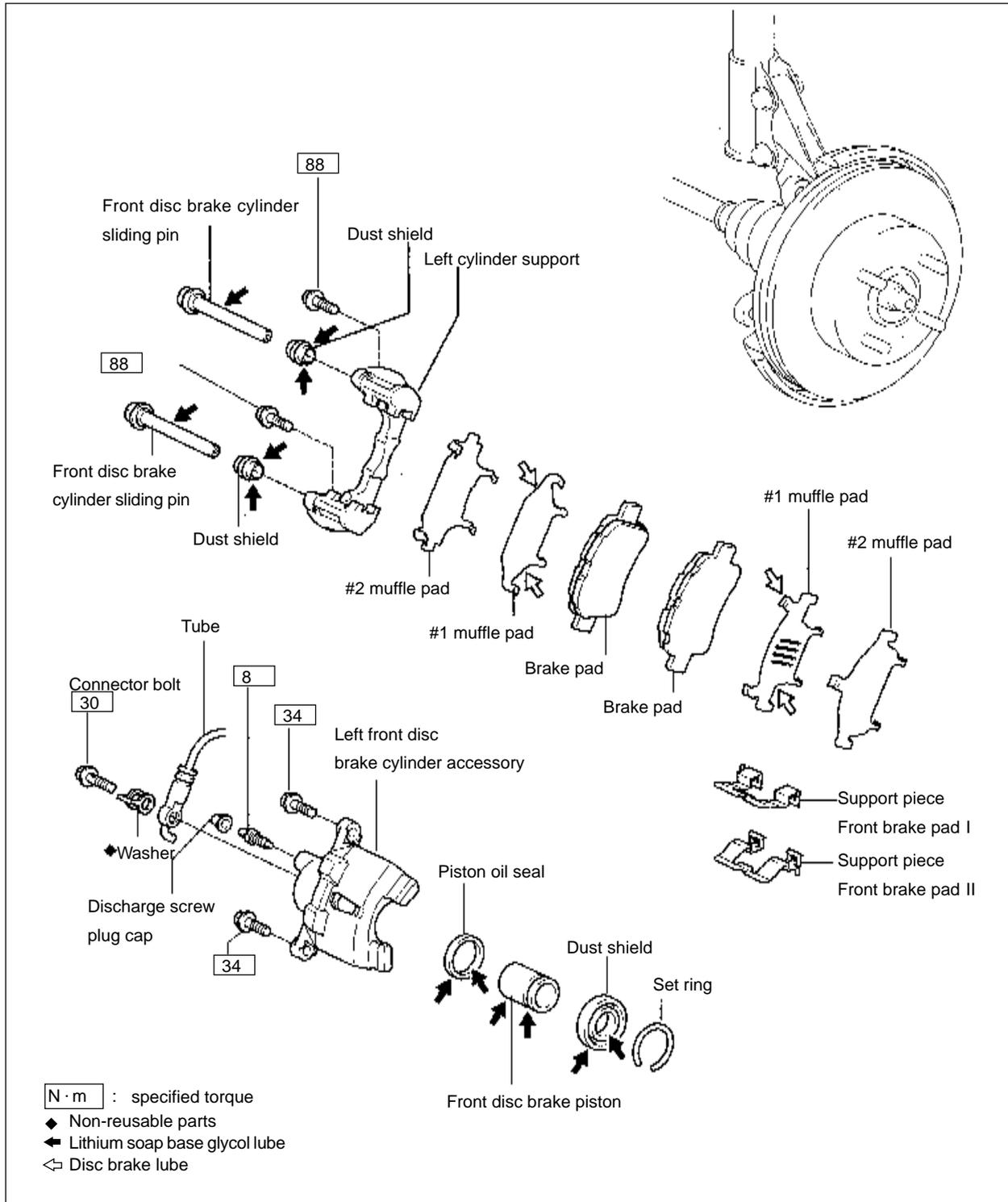
19. Check the level height in the brake reservoir.

20. Check the brake fluid whether there is any leakage.

21. Check the clutch fluid whether there is any leakage (manual transmission).

### Section 6 Front Brake Disc

#### Component View



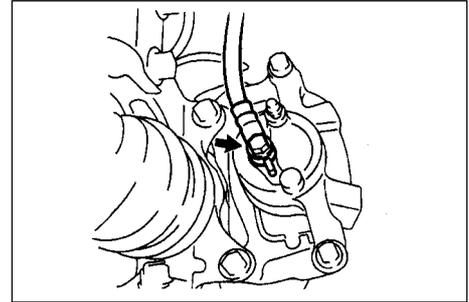
## Repair

1. Remove the front wheel.
2. Discharge the brake fluid.

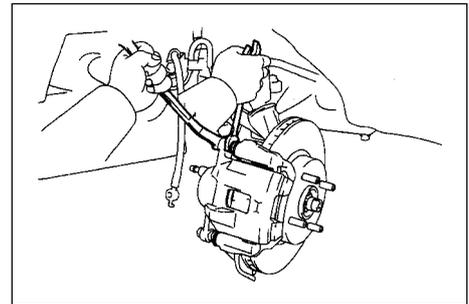
**Note:**

Never spray the brake fluid on the paint surface, otherwise wash it immediately.

3. Remove the front disc brake cylinder.
  - (1) Remove the connector bolt and washer from the front disc brake cylinder, and unfix the tube.



- (2) Fasten the sliding pin on the front disc brake cylinder, and remove the two bolts.



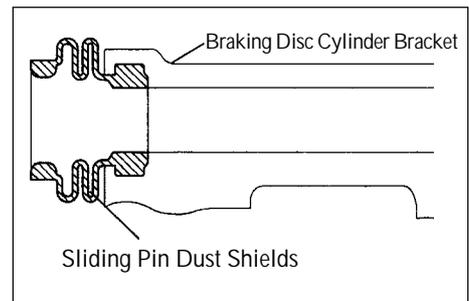
4. Remove the front brake pad package (only the pad).
  - (1) Remove the two brake pads with muffle washers.
  - (2) Remove muffle and heat isolation washers from the brake pads.

5. Remove the support pad of the front brake pad.
 

Remove the two friction block from the brake cylinder support.
6. Remove the sliding pin of the front disc brake cylinder.

7. Remove the two dust shields
 

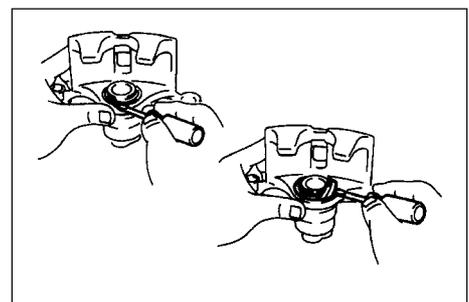
Remove the two dust shields from brake cylinder support.



8. Remove the left front disc brake cylinder support.
 

Remove the two bolts, and then take out the left front disc brake cylinder support.
9. Remove the dust shield of the brake cylinder.
 

Remove the retaining ring and dust shield with screwdriver.



## 11. Remove the front brake piston.

(1) Put a piece of cloth or equivalent between the brake cylinder and the piston.

(2) Blow the piston out of the brake cylinder with compressed air.

## Warning:

In the blowing process, the finger shall not be placed before the piston.

## Note:

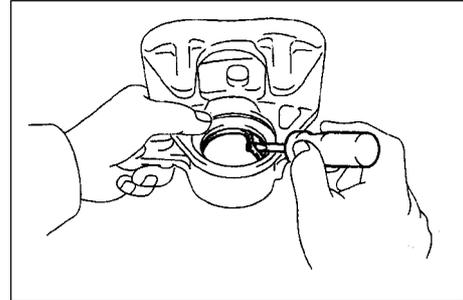
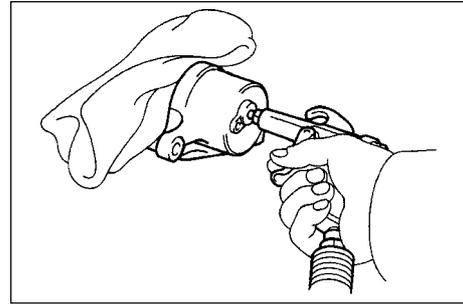
Don't spray the brake fluid.

## 12. Remove the piston oil seal.

Take out the oil seal from the brake cylinder with screwdriver.

## 13. Check the brake cylinder and piston.

Check the cylinder wall and piston whether there is rust or scar.

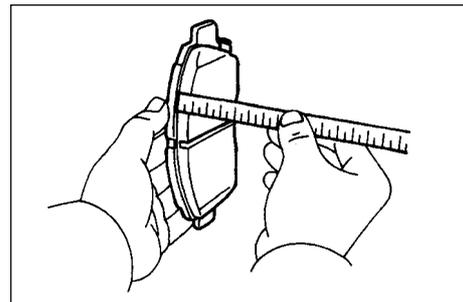


## 14. Check the lining thickness of the brake pad.

Measure the lining thickness with ruler.

Standard Thickness: 10.0mm

Minimum Thickness: 1.0mm



## 15. Check the abrasion indicator steel strap of the front brake.

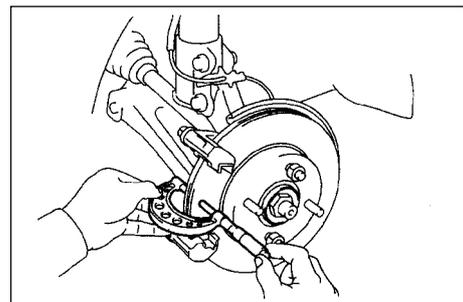
Make sure the abrasion indicator steel strap has adequate flexibility and has no deformation, crack or damage. All rust, dirt and other impurities shall be cleaned out.

## 16. Check the thickness of the brake disc.

Measure the thickness of the brake disc with screw micrometer.

Standard Thickness: 20.0mm

Minimum Thickness: 18.0mm



## 17. Remove the front brake disc.

(1) Make mark on the brake disc and wheel hub.

(2) Remove the brake disc.

## 18. Install the brake disc.

## Tips:

Install the disc at the minimum swing position.

## 19. Check the swing of the brake disc.

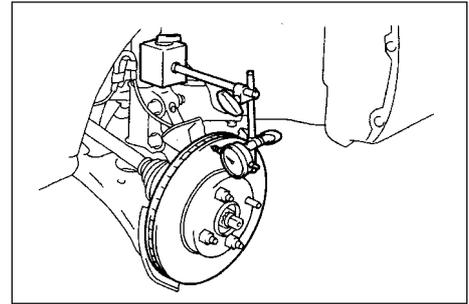
- (1) Fasten the brake disc temporarily.

Torque: 103N.m

- (2) Measure the swing of the brake disc at the 10mm from the disc edge with a dial test indicator.

Maximum Swing: 0.05 mm

- (3) If the swing of the brake disc reaches or exceeds the limit, check the bearing's axial clearance and the wheel hub's swing. If the bearing and wheel hub run normally, adjust the swing of the brake disc, or finish it with onboard finishing machine.



## 20. Tighten the brake discharge bolt temporarily.

Tighten the brake discharge screw plug on the front brake cylinder temporarily.

## 21. Install the piston oil seal.

- (1) Apply the lithium soap-base glycol lube on the new piston oil seal.
- 
- (2) Install the new piston oil seal on the brake cylinder.

## 22. Install the brake piston.

- (1) Apply the lithium soap-base glycol lube on the brake piston.
- 
- (2) Install the piston on the front disc brake cylinder.

Note:

Don't tighten the piston into the brake cylinder forcefully.

## 23. Install the dust shield of the brake wheel cylinder.

- (1) Apply the lithium soap-base glycol lube on the dust shield of the new brake wheel cylinder, and install it on the brake cylinder.

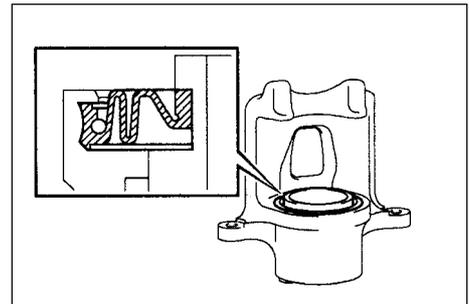
Tips:

Install the dust shield in the groove of the brake wheel cylinder and piston reliably.

- (2) Install the set ring with screwdriver.

Note:

Be careful not to damage to the dust shield of the brake wheel cylinder.



## 24. Install the left front disc brake wheel cylinder support.

Fasten the front disc brake wheel cylinder support with two bolts.

Torque: 88N.m

## 25. Install the dust shield of the front disc brake bushing.

Apply the lithium soap-base glycol lube on the surface of the two new dust shields.

Install the two dust shields on the front disc brake cylinder support.

## 26. Install the sliding pin of the front disc brake cylinder.

Apply the lithium soap-base glycol lube on the surface of the two sliding pin and oil seal.

Install the two sliding pins on the front disc brake cylinder support.

27. Install the support piece of the front brake pad.

Remove the two support pieces of the brake pad from the front disc brake cylinder support.

28. Install the brake lining block component.

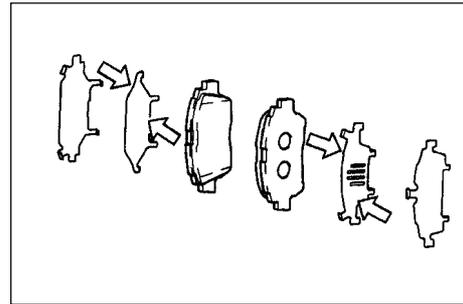
Note:

When replace the abrasion brake lining block, replace the muffle pad simultaneously.

- (1) Apply the disc brake lube on both sides of all muffle pads
- (2) Install muffle pads on all brake lining blocks.
- (3) The abrasion indicator face upwards. Install a inner brake lining block, then install a outer lining block.

Note:

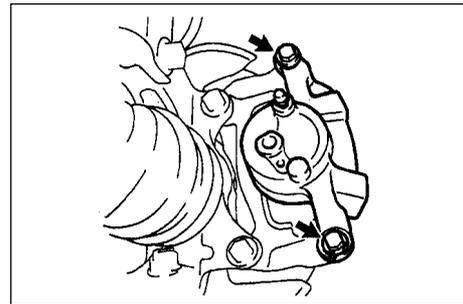
Don't apply the oil or lube on the friction surface of the brake pad and brake disc.



29. Install the front disc brake wheel cylinder.

- (1) Install the front disc brake wheel cylinder with two bolts.

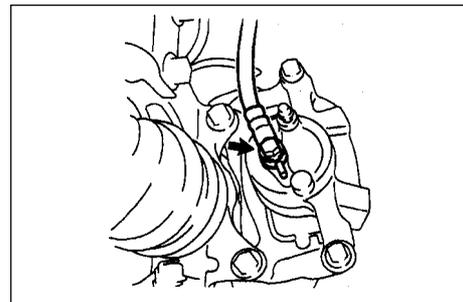
Torque: 34N.m



- (2) Install the new washer and tube with bolt.

Torque: 30N.m

Tips: Fasten the tube in the lock hole of the brake wheel cylinder reliably.



30. Add the brake fluid to the storage tank.

31. Discharge the air in the brake cylinder.

32. Discharge the air in the brake pipeline.

33. Check the level height in the storage tank.

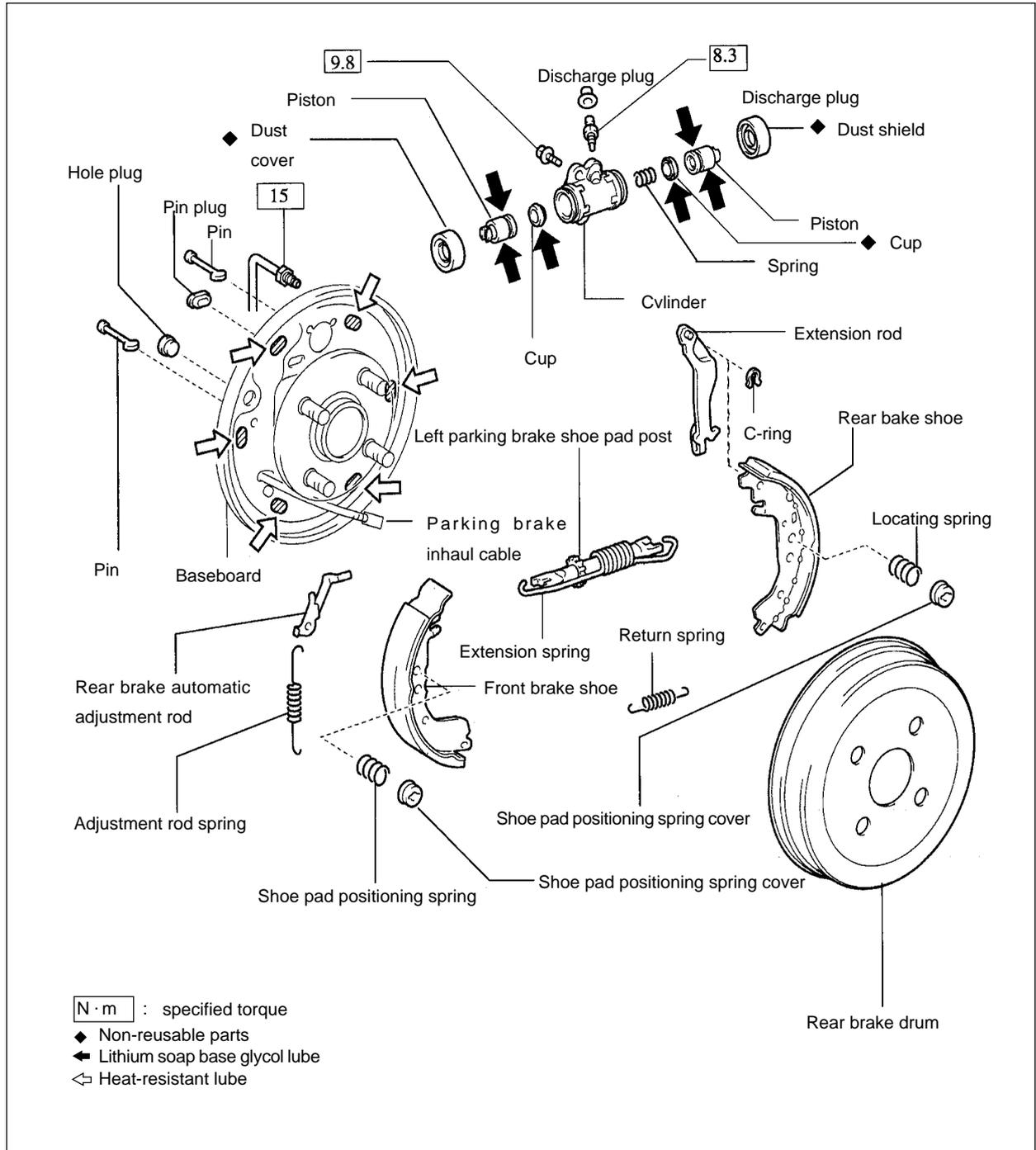
34. Check the brake fluid whether there is any leakage.

35. Install the front wheel.

Torque: 103N.m

## Section 7 Rear Brake Drum

### Component View



## Repair

Repair the right side as the steps in the left side.

### 1. Check the thickness of the brake shoe lining.

Remove the hole plug, and check the thickness of the brake shoe lining through the hole.

If the thickness is less than the minimum thickness, replace a new brake shoe.

Minimum Thickness: 1.0mm

### 2. Remove the rear wheel.

### 3. Discharge the brake fluid.

Note:

Never spray the brake fluid on the paint surface, otherwise wash it immediately.

### 4. Remove the rear brake drum.

(1) Loosen the parking brake rod, and remove the brake drum.

Tips: If the brake drum can't be removed easily, carry out the following steps.

(2) Remove the hole plug, and insert a screwdriver through the backboard to separate the brake automatic adjustment rod and the adjuster.

(3) Rotate the adjustment wheel to reduce the length of the adjuster with another screwdriver.

### 5. Check the inner diameter of the brake drum.

Measure the inner diameter of the brake drum with a brake drum gauge or equivalent.

Standard Inner Diameter: 200.0mm

Maximum Inner Diameter: 201.0mm

### 6. Separate the left positioning post of the parking brake shoe.

Remove the extension spring from the front/rear brake shoe with a special tool, and separate the left positioning post of the parking brake shoe.

Note:

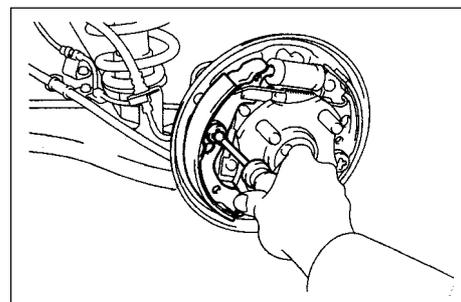
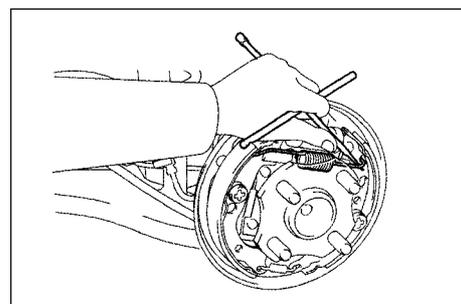
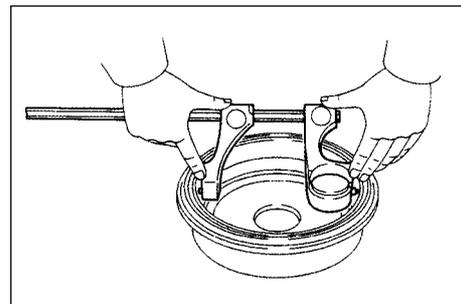
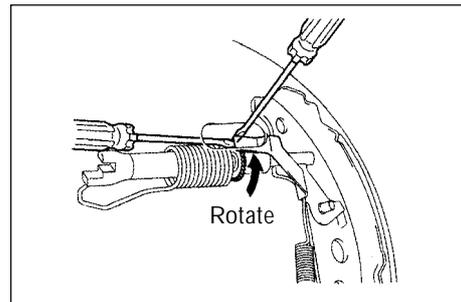
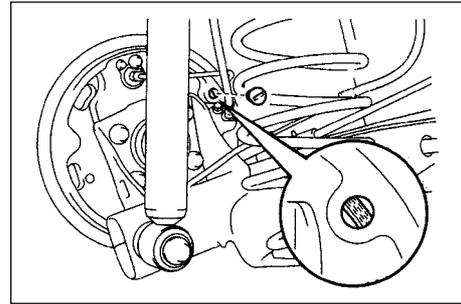
Be careful not to damage to the dust shield of the brake cylinder.

### 7. Remove the front brake shoe.

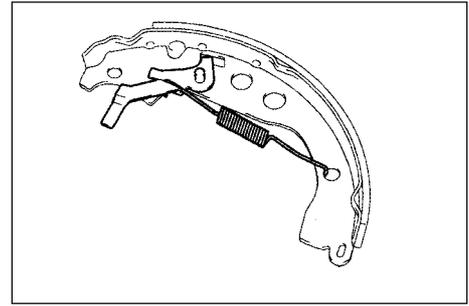
(1) Remove the end cap, set spring and pin with a special tool.

(2) Unfix the return spring, and remove the front brake shoe.

(3) Remove the left positioning post of the parking brake shoe.



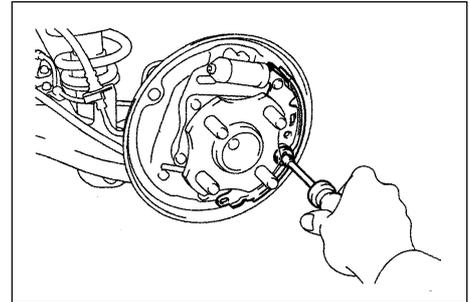
8. Remove the left brake automatic adjustment rod.  
Remove the brake adjustment rod and its spring.



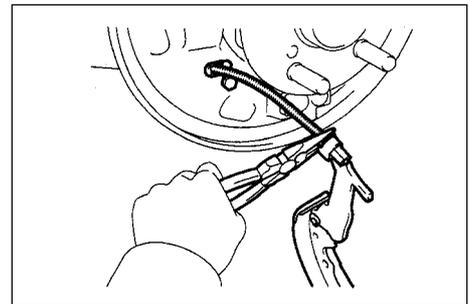
9. Remove the return spring of the brake shoe.  
Remove the return spring from the brake shoe.

10. Remove the rear brake shoe.

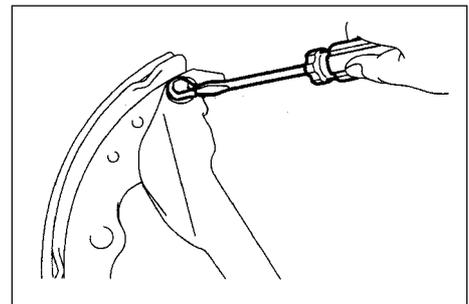
- (1) Prize the end cover with a special tool, and remove the set spring and pin.



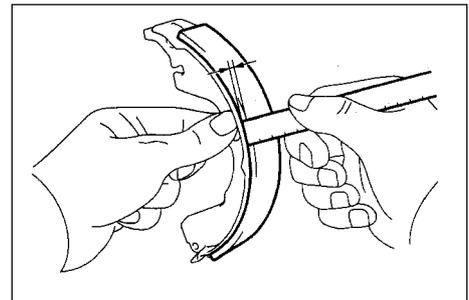
- (2) Remove the parking brake cable from the parking brake extension rod with a pair of pinchers.



11. Remove the parking brake shoe extension rod accessory.  
Remove the C-washer and parking brake shoe extension rod with screwdriver.



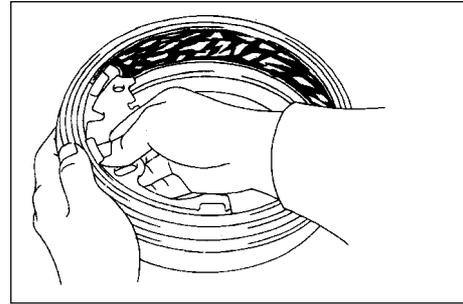
12. Check the thickness of the brake shoe lining.  
Measure the thickness of the brake shoe lining with ruler.  
Standard Thickness: 5.0mm  
Minimum Thickness: 1.0mm  
If the thickness reaches the minimum thickness or below, or serious/uneven abrasion occurs, replace a new brake shoe.



13. Check the brake shoe and the brake shoe lining whether they touch normally.

Mark the inner surface of the brake drum with chalk, joint and abrade the brake shoe and the inner surface.

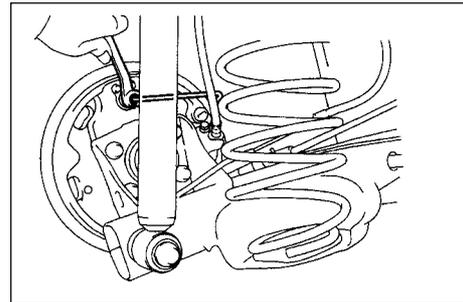
If the drum and the lining touch poorly, abrade the brake shoe or replace a new one.



14. Remove the left front or top brake wheel cylinder.

(1) Unfix the brake oil pipe with a special tool, and collect the brake fluid with a container.

(2) Remove the bolt and brake wheel cylinder.



15. Remove the brake cup.

(1) Remove the two dust shields from the brake cylinder.

(2) Remove the two pistons and springs.

(3) Remove the two brake cylinder caps from every piston.

16. Check the brake cylinder.

Check the cylinder wall and piston whether there is any rust or nick.

17. Remove the rear discharge screw plug of the brake drum.

18. Tighten the rear discharge screw plug of the brake drum temporarily.

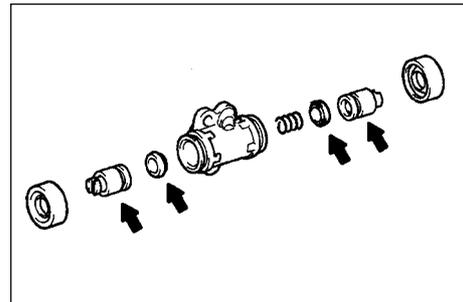
19. Install the brake wheel cylinder cup.

(1) Apply the lithium soap-base glycol lube on the two brake wheel cylinder cups and the piston.

(2) Install two brake cylinder caps on every piston.

(3) Install the compression spring and the two pistons on the brake wheel cylinder.

(4) Install two new dust shields on the brake wheel cylinder.



20. Install the left front or top brake cylinder.

(1) Install the brake cylinder with bolt.

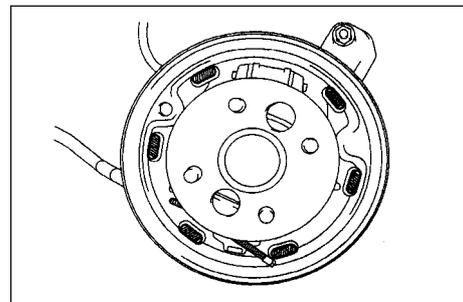
Torque: 9.8N.m

(2) Connect the brake oil pipe with a special tool.

Torque: 15N.m

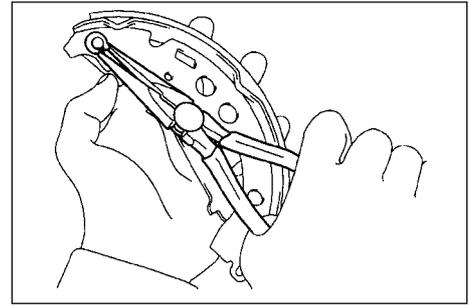
21. Apply the heat-resistant lube.

Apply the heat-resistant lube on the touch surface of the brake backboard and the brake shoe.



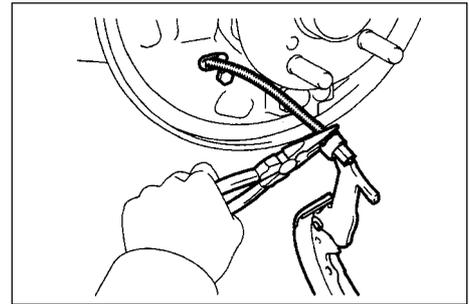
22. Install the parking brake shoe extension rod accessory.

Install a new C-washer, and install the parking brake shoe extension rod.

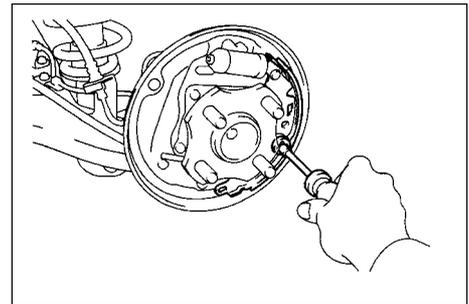


23. Install the brake shoe.

- (1) Connect the parking brake cable to the parking brake extension rod with a pair of pinchers.



- (2) Install the brake shoe, pin, set spring and set spring cap with a special tool.

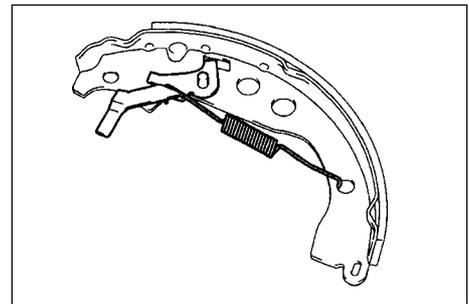


24. Install the return spring of the brake shoe.

Install the return spring on the brake shoe.

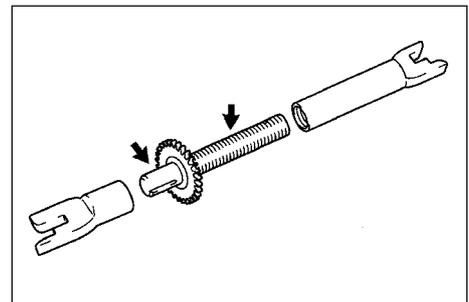
25. Install the left brake automatic adjustment rod.

Install the automatic adjustment rod and its spring on the front brake shoe.

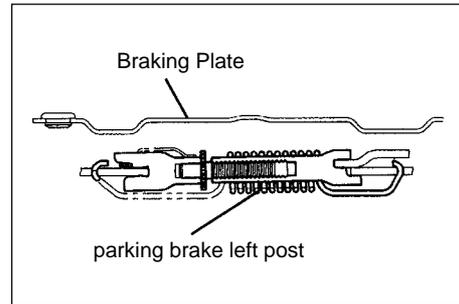


26. Install the parking brake shoe post.

- (1) Apply the heat-resistant lube on the adjustment bolt.



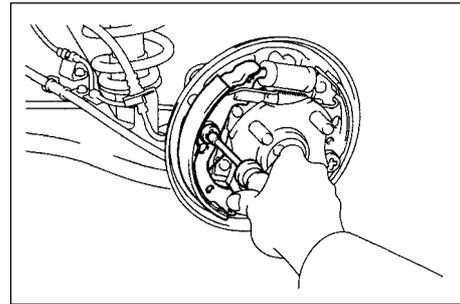
(2) As shown in the figure, install the parking brake left post.



27. Install the front brake shoe.

(1) Install the return spring on the front brake shoe.

(2) Install the front brake shoe, pin, set spring and set spring cap with a special tool.

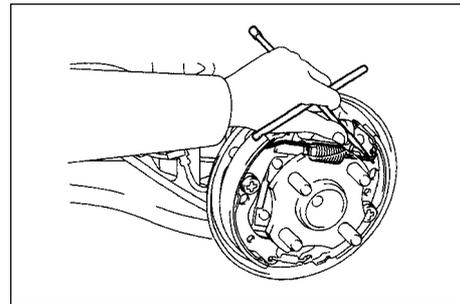


28. Connect the parking brake shoe left post.

Connect the extension spring to the front/rear brake shoe with a special tool.

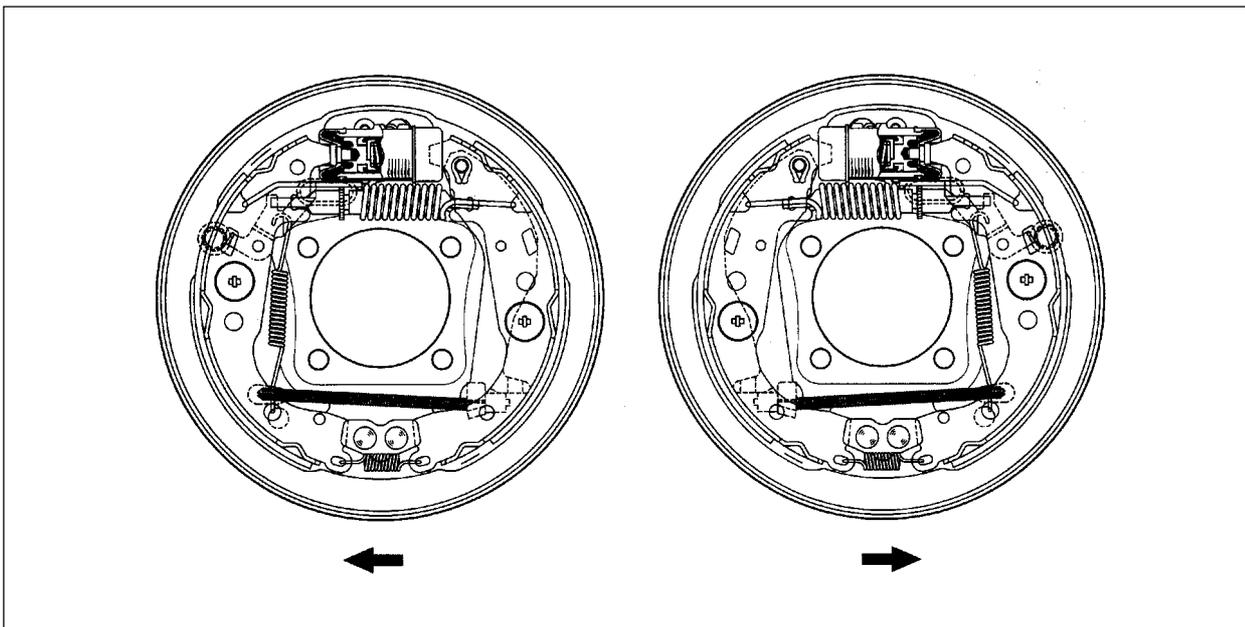
Note:

Be careful not to damage to the dust shield of the brake wheel cylinder.



29. Check the installation of the brake drum.

(1) Check all parts whether they are installed properly.

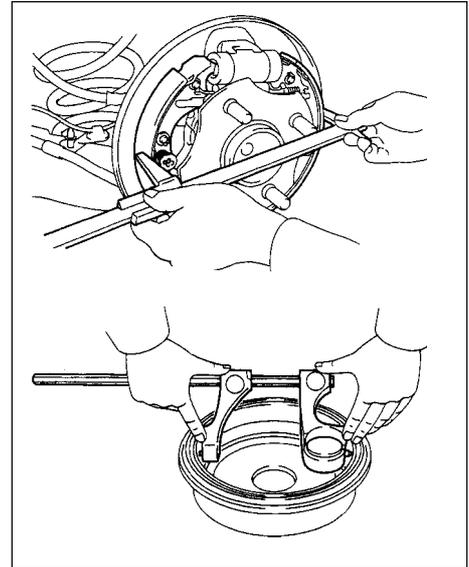


- (2) Measure the inner diameter of the brake drum and the diameter of the brake shoe, and check the difference of them whether it is a proper brake shoe clearance.

Brake Shoe Clearance: 0.3mm

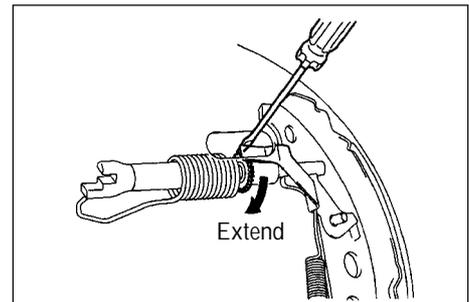
Note:

Don't apply the oil or lube on the friction surface of the brake shoe lining and brake drum.



30. Adjust the shoe clearance of the brake drum.

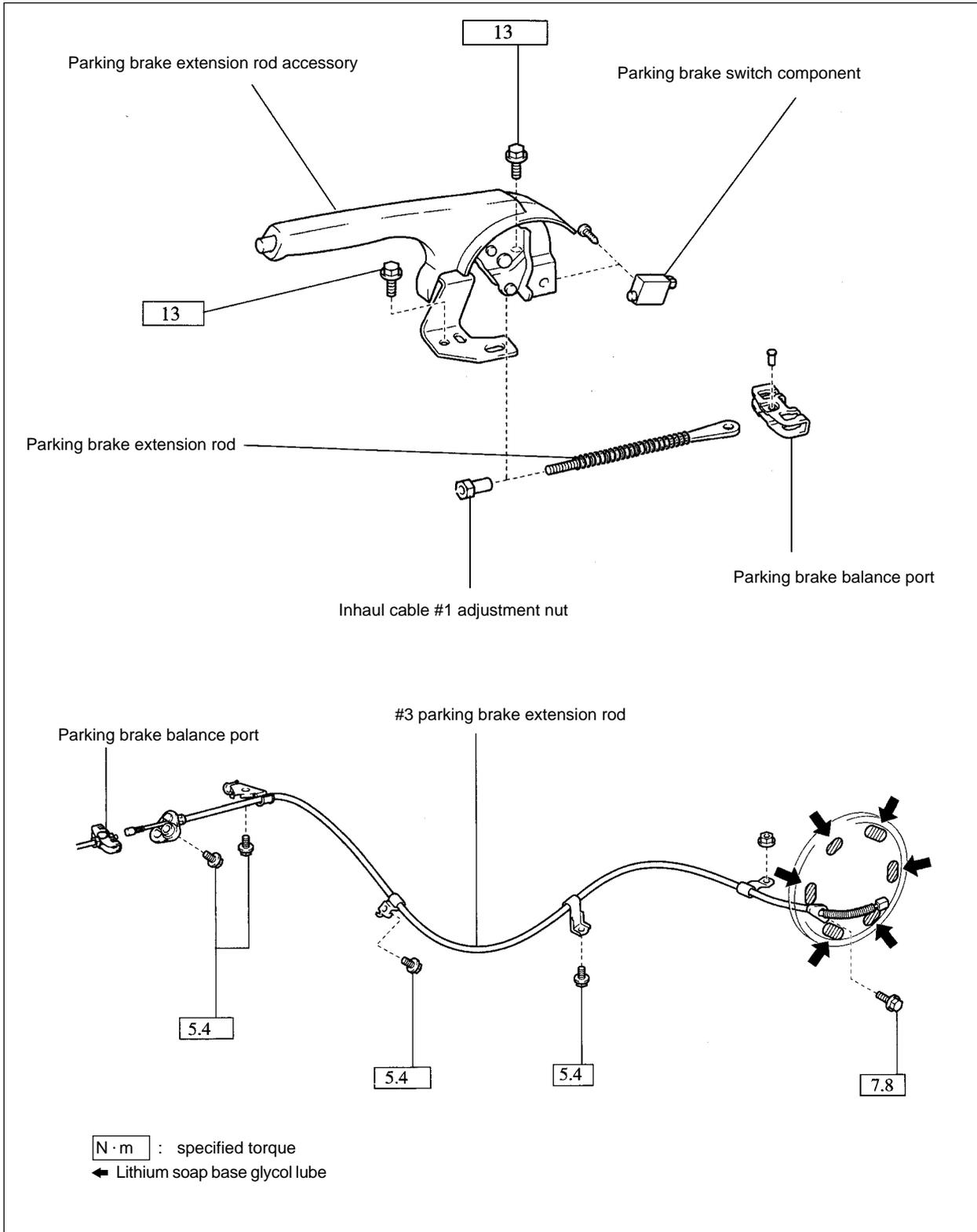
- (1) Install two wheel hub nuts temporarily.
- (2) Turn around eight teeth of the adjuster.
- (3) Install the hole plug.



31. Install the rear brake drum sub-assembly.
32. Add the brake fluid to the storage tank.
33. Discharge the air in the master cylinder.
34. Discharge the air in the brake pipeline.
35. Check the level height in the storage tank.
36. Check the brake fluid whether there is any leakage.
37. Install the rear wheel.  
Torque: 103N.m
38. Check the stroke of the parking brake extension rod.
39. Adjust the stroke of the parking brake extension rod.

# Section 8 Parking Brake System

## Component View



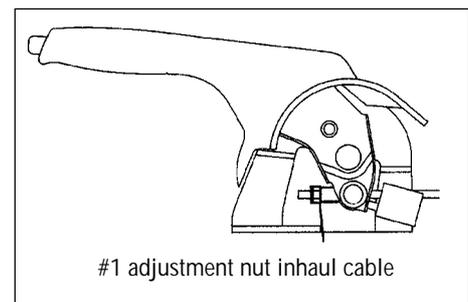
## Parking Brake System

The table below can help you find out the possible failure reasons. The number means the possible sequence of the reasons. Check the parts, and replace the corresponding parts if necessary.

Symptom	Suspected location
Brake is blocked.	<ol style="list-style-type: none"> <li>1. The stroke of the parking brake extension rod is misadjusted.</li> <li>2. The parking brake inhaul cable is trapped.</li> <li>3. The clearance of the parking brake shoe is misadjusted.</li> <li>4. The parking brake lining is cracked or deformed.</li> <li>5. The return or extension spring is damaged.</li> </ol>

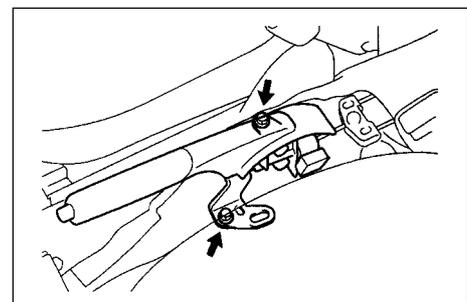
## Adjustment

1. Remove the rear wheel.
2. Adjust the clearance of the brake shoe.
3. Install the rear wheel.  
Torque: 103N.m
4. Check the stroke of the parking brake extension rod.  
Pull the parking brake extension rod, and count the number of sound.  
Parking Brake Extension Rod Stroke: Pull with 196N force till 6-9 clicks.
5. Adjust the stroke of the parking brake extension rod.
  - (1) Remove the glove box cover.
  - (2) Turn #1 adjustment nut inhaul cable till the stroke is ok.
  - (3) Install the glove box cover.



## Parking Brake Tension Rod Component

1. Remove the accessories of the console.
2. Remove the middle console.
3. Remove #1 adjustment nut wire.  
Remove #1 adjustment nut wire.
4. Remove the accessories of the parking brake extension rod.
  - (1) Remove the connector of the parking brake extension rod switch.
  - (2) Remove the two bolts, and remove the parking brake extension rod.
5. Remove the parking brake switch component.  
Remove the screw and parking brake switch component.



## 6. Install the parking brake switch component.

Install the parking brake switch component with screw.

## 7. Install the accessories of the parking brake extension rod.

(1) Install the extension rod on the parking brake inhaul cable, and install #1 adjustment nut wire.

(2) Fasten the parking brake extension rod with two bolts.

Torque: 13N.m

(3) Connect the connector of the parking brake switch.

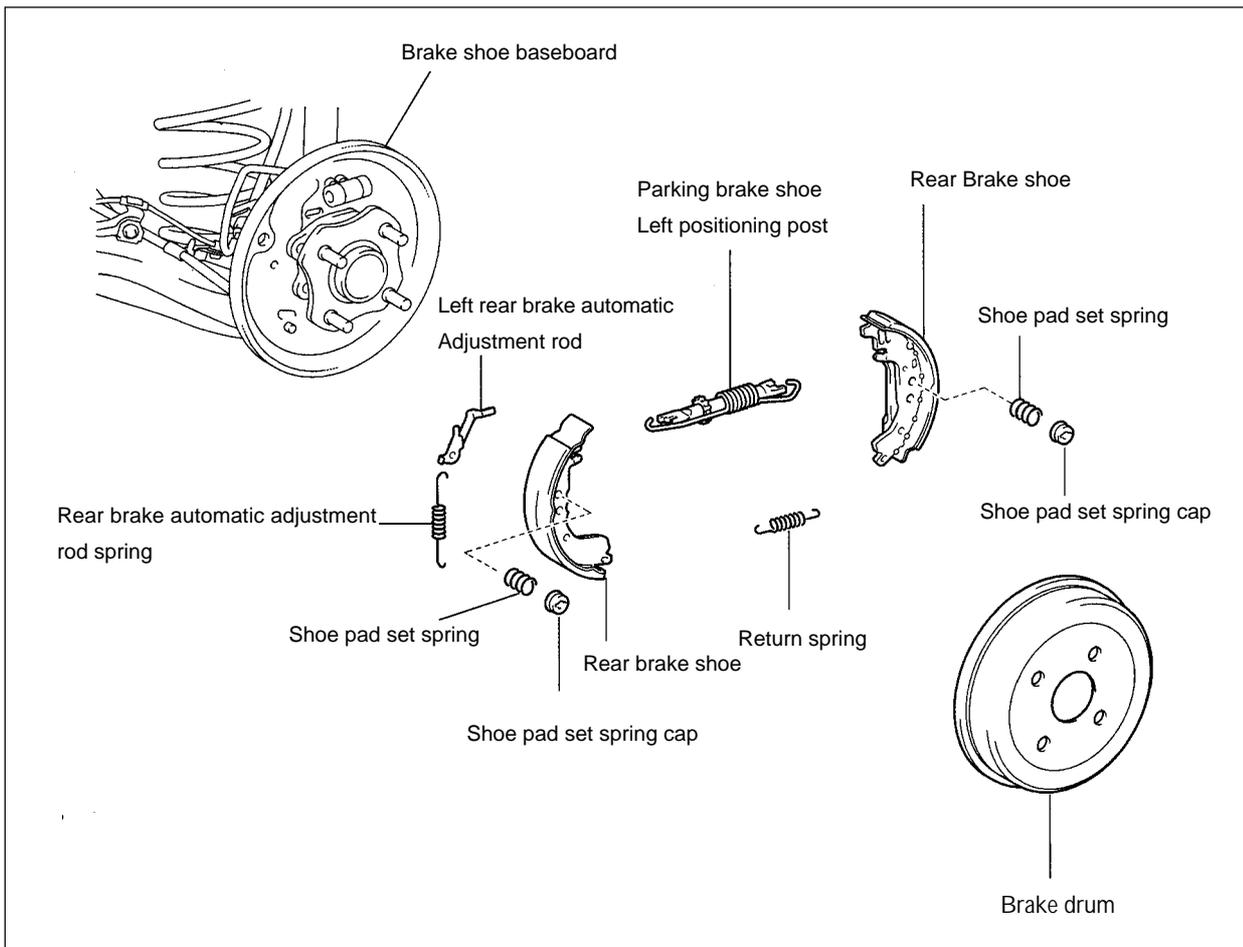
## 8. Install the accessories of the console.

## 9. Install the middle console.

## 10. Check the stroke of the parking brake extension rod.

## 11. Adjust the stroke of the parking brake extension rod.

## Parking System Component

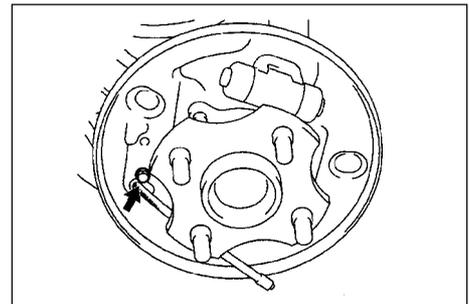


## Replacement

For left parking brake inhaul cable component, carry out the same steps as the right side.

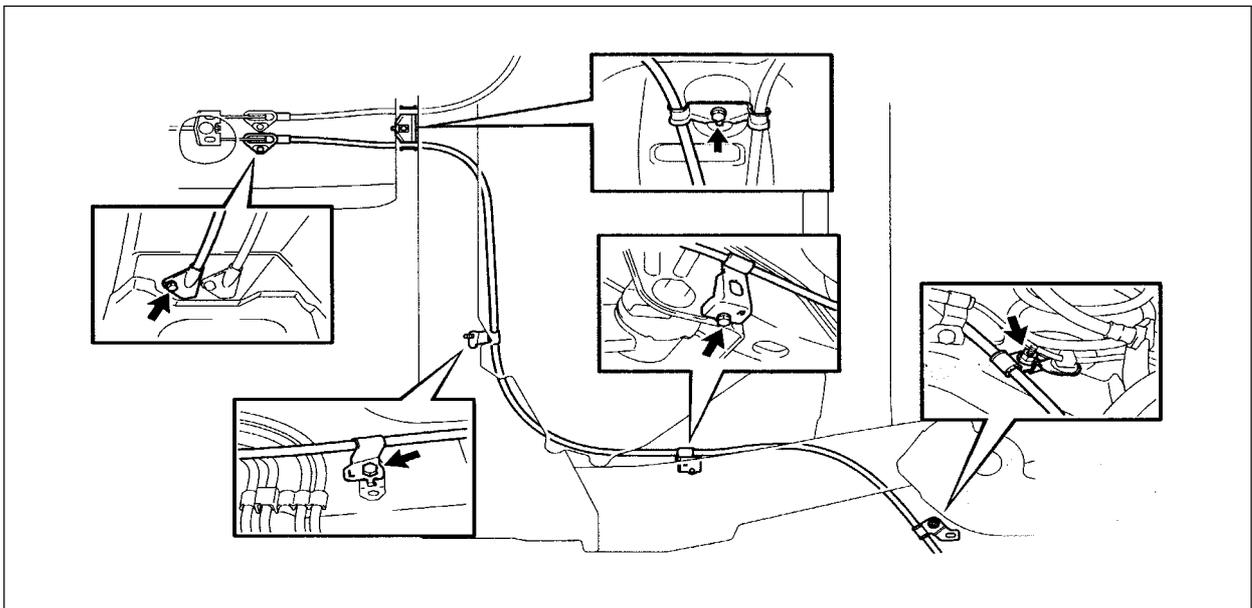
## 1. Remove the accessories of the console.

2. Remove the middle console.
3. Loosen # inhaul cable adjustment nut.  
Remove # inhaul cable adjustment nut.
4. Remove the front floor extension rod.  
Remove the two bolts to take out the front floor extension rod.
5. Remove the front exhaust pipe component.
6. Remove # front floor hot pad.  
Remove the two bolts to take out the front floor hot pad.
7. Remove # parking brake inhaul cable component.
  - (1) Remove the four bolts to remove # parking brake inhaul cable from the body.
  - (2) Remove # parking brake inhaul cable component from the parking brake balancer, and remove the inhaul cable component.
8. Remove the rear wheel.
9. Remove the accessories of the brake drum.
10. Remove the front brake shoe.
11. Remove the left rear automatic adjustment rod.
12. Remove the rear brake shoe.
13. Remove parking brake inhaul cable component.  
Remove the bolt, and remove parking brake inhaul cable component from the baseboard.



14. Install parking brake inhaul cable component.
  - (1) Install parking brake inhaul cable component on the parking brake inhaul cable balancer.
  - (2) Fasten parking brake inhaul cable with four bolts.

Torque: 5.4N.m



15. Install #3 parking brake inhaul cable component.

Fasten #3 parking brake inhaul cable component to the baseboard.

Torque: 7.8N.m

16. Apply the heat-resistant lube.
17. Install the brake shoe.
18. Install the return spring of the brake shoe.
19. Install the left rear brake automatic adjustment rod.
20. Install the front brake shoe.
21. Check the installation of the brake drum.
22. Install the accessories of the brake drum.
23. Adjust the clearance of the brake shoe.
24. Install the rear wheel.

Torque: 103N.m

25. Fasten #1 adjustment nut wire temporarily.

Install #1 adjustment nut wire.

26. Install #2 front floor hot pad.

Fasten #2 floor hot pad with two bolts.

Torque: 5.5N.m

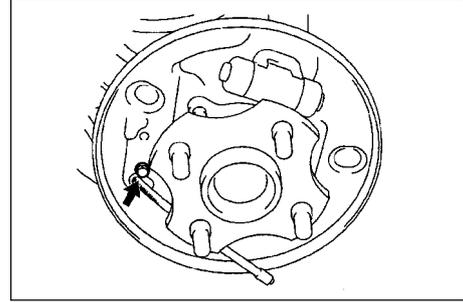
27. Install the front exhaust pipe component.

28. Install the front floor extension rod.

Install the front floor extension rod with two bolts.

29. Check the stroke of the parking brake extension rod.

30. Adjust the stroke of the parking brake extension rod.



# Part V Electric System & Accessory

## Chapter 1 Starting and Charging System

### Section 1 Starting System (MR479Q MR479QA MR481QA)

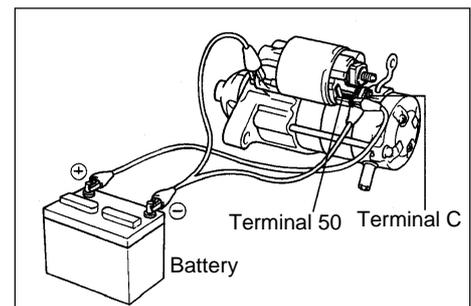
#### I. Starter inspection

Note:

These tests must be completed within 5s, so as to prevent coil from burning out.

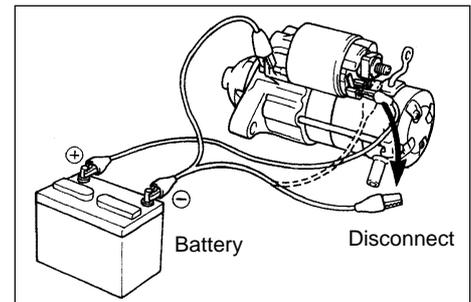
##### 1. Electromagnetic switch test

- (1) As shown in the figure, use wire to connect starter.
- (2) As shown in the figure, connect electromagnetic switch with storage battery.
- (3) Disconnect exciting coil from binding post A.
- (4) Check whether clutch pinion moves outboard.  
If clutch pinion does not move, replace electromagnetic switch.



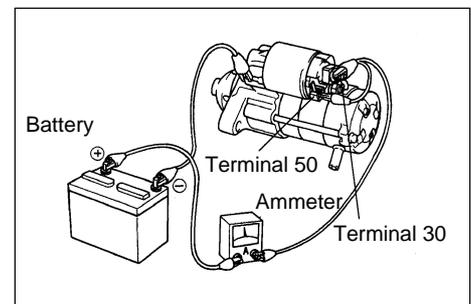
- (5) As shown above, connect battery, disconnect positive pole (+) of battery from binding post, disengage clutch pinion.

- (6) Check whether clutch pinion returns.  
If clutch pinion does not return, replace electromagnetic switch.



##### 2. Starter no-load test

- (1) Connect field coil and binding post.
- (2) As shown in the figure, connect ammeter and battery to starter.
- (3) When check whether clutch pinion moves outwards, starter should rotate slowly and smoothly.
- (4) Check whether current reading of ammeter is normal or not.  
Normal current: less than 90 A at 11.5 V  
If current is abnormal, replace starter.



### 3. Wiring

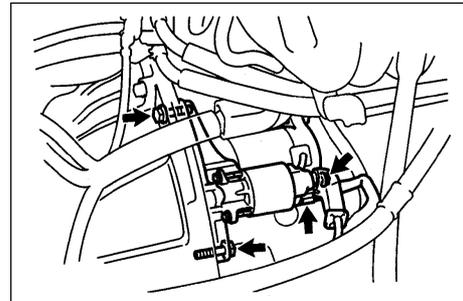
Please Refer to "MK WIRING DIAGRAM"

- (1) Check that connecting wire between positive pole of storage battery and starter must be firm and reliable, outside shroud must be in good condition, so as to prevent generating electric spark and causing fire.
- (2) Check whether wire is conducted, whether sheath is broken, if wiring harness is damaged, replace wiring harness.

## II. Starter assembly replacement (MR479Q, MR479QA, MR481QA)

### 1. Remove starter assembly

- (1) Disconnect starter connector.
- (2) Remove nuts, disconnect starter cable.
- (3) Remove 2 bolts and starter assembly.



### 2. Install starter assembly

Installation should be conducted in reversed direction of removal

Torque:

Bolt 37N.m

Wire harness 9. 8N.m

## Section 2 Charging system (MR479Q MR479QA MR481QA)

### I. Battery

Maintenance-free battery is applied in this vehicle. Its termination voltage is 12V. It is connected inline by six 2V single cell in tandem with walls between every pole.

#### 1. Battery warning signs



##### 1- Danger of corrosion

The battery electrolyte is very corrosive. DO NOT overturn the battery.

##### 2- Read the instructions for battery

##### 3- Children are forbidden to touch the battery

##### 4- Avoid fire, electromagnetic wave and strong light.

Avoid electric spark while repair; avoid short.

##### 5- Wear protecting glasses

##### 6- Danger of explosion

The explosive mixed gas will be produced while charging.

##### 7- How to deal with a scrapped battery

The scrapped battery should be delivered to the collection station.

#### 2. Battery removal and installation

Hint:

(1) The battery is not allowed to contact lubricating grease.

(2) The battery terminal is only allowed to be softly pulled out, in order to void damaging the battery.

Removal

(1) Remove the negative (-) ground cable

(2) Remove the battery positive (+) cable

(3) Loosen the fixing clamp on the battery.

Installation

Install according to the inverted order of removal.

Tighten the torque

Tighten the battery cable clip to 6N · m

Tighten the fixing clamp to 12N · m

## II. Charging system inspection

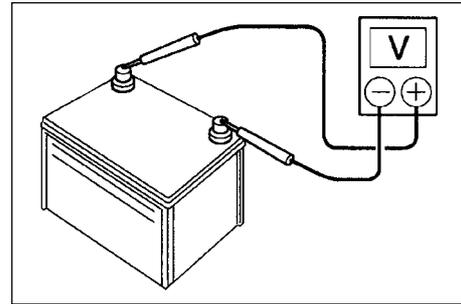
### 1. Check battery working voltage

- (1) After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlight, blower motor) for 60 seconds to remove the surface charge.
- (2) Turn the ignition switch OFF and turn off the electrical systems. Then measure the battery voltage between the negative and positive terminals of the battery.

Standard voltage: 12.5-12.9V at 20° C

Hint:

If the voltage is less than specification, charge the battery.



### 2. Check battery terminals, fuse box and fuse

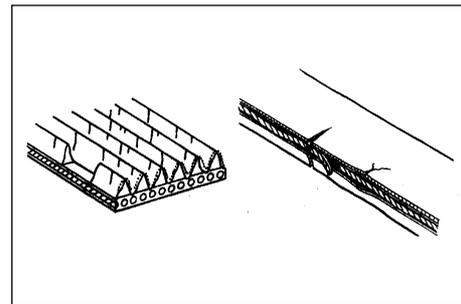
- (1) Check that the battery terminals are not loose or corroded.
- (2) Check if fuse box and fuse for continuity.

### 3. Inspect drive belt

- (1) Check the belt for excessive wear, frayed cords etc.

Hint:

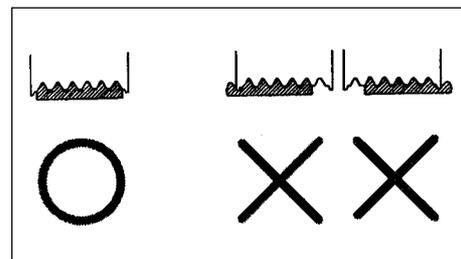
- If any defect has been found, replace the drive belt.
- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



- (2) Check that the belt fits properly in the ribbed grooves.

Hint:

Check with your hand to confirm that the belt has not slipped out of the groove on the pulley.



### 4. Check alternator wiring

- Check that the wiring is in good condition.

### 5. Listen for abnormal noises from alternator

- Check that there is no abnormal noise from the alternator while the engine is running.

### 6. Inspect charge warning light circuit

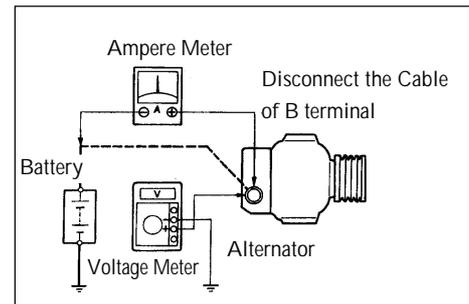
Turn the ignition ON. Check that the charge warning light comes on. Start the engine. Check that the light goes off.

Hint:

If the light does not work as normal, troubleshoot the charge warning light circuit.

## 7. Inspect charging circuit without load

- (1) If a battery/starter tester is available, connect the tester to the charging circuit as per instructions.
- (2) If a tester is not available, connect an ammeter and voltmeter to the charging circuit as follows.
  - a. Disconnect to the wire from terminal B of the alternator and connect it to the negative (-) pole of the ammeter.
  - b. Connect the positive (+) pole of the ammeter to terminal B of the alternator.
  - c. Connect the positive (+) pole of the voltmeter to terminal B of the alternator.
  - d. Ground the negative (-) pole of the voltmeter.



## (3) Check the charging circuit

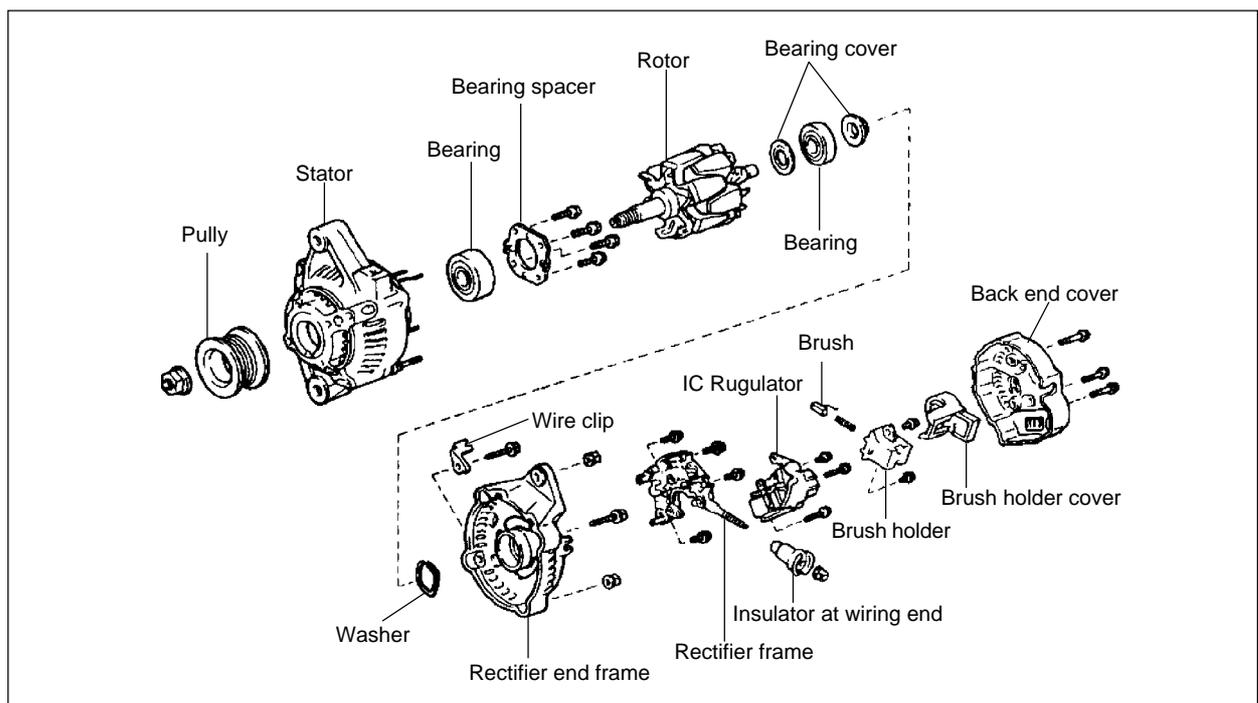
- With the engine running from idle to 2,000 rpm, check the reading on the ammeter.  
Standard amperage: 10A or less  
Standard voltage: 12.9V-14.9V

## 8. Inspect charging circuit with load

- (1) With the engine running at 2,000 rpm, turn on the high beam headlights and place the blower switch at "4".  
Check the reading on the ammeter.  
Standard amperage: 20A or more
- (2) Hint:
  - If the ammeter reading is less than standard amperage, repair the alternator.
  - If the battery is fully charged, the indication value will sometimes be less than standard amperage.

## III. Alternator inspection

## 1. Inspection of alternator



## (1) Inspection of rotor winding

- a. Check resistance value of rotor winding

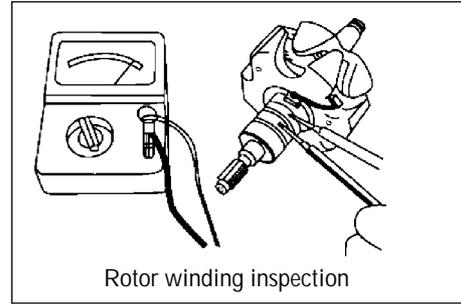
Set multimeter on R x 1 position, so two meter pens may contact with two slip rings of rotor.

Standard: 2.7 - 3.1 ohm

- b. Rotor bow inspection:

Standard: radial wobble is less than 0.5 mm

If abnormal, correct or replace rotor.



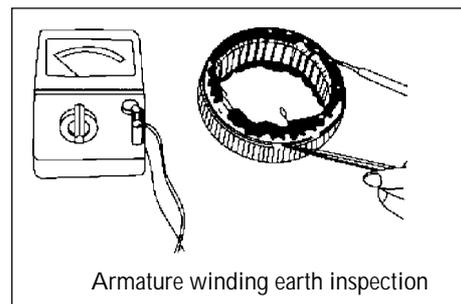
## (2) Stator winding inspection

- a. Winding resistance value inspection

Set multimeter to R x 1 position, connect two meter pens with any two leads of armature winding respectively. They should be powered on, if resistance is infinitely great, there is open circuit.

- b. Winding earth inspection

Set multimeter on R x 1 position, connect a meter pen with any lead of armature winding respectively, contact one meter pen with stator core, if resistance is infinitely great, it shows that armature winding insulation is good. Otherwise repair or replace.



## IV. Alternator assembly replacement (MR479Q, MR479QA, MR481QA)

## 1. Removal of Alternator

- (1) Disconnect generator connector
- (2) Loosen bolts A, B, C
- (3) Loosen V-belt, remove generator.

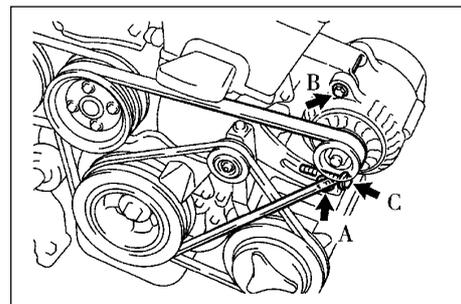
## 2. Install generator assembly

Torque:

M 10 x 1.25 bolt 15 N.m

Tension adjustment of V-belt:

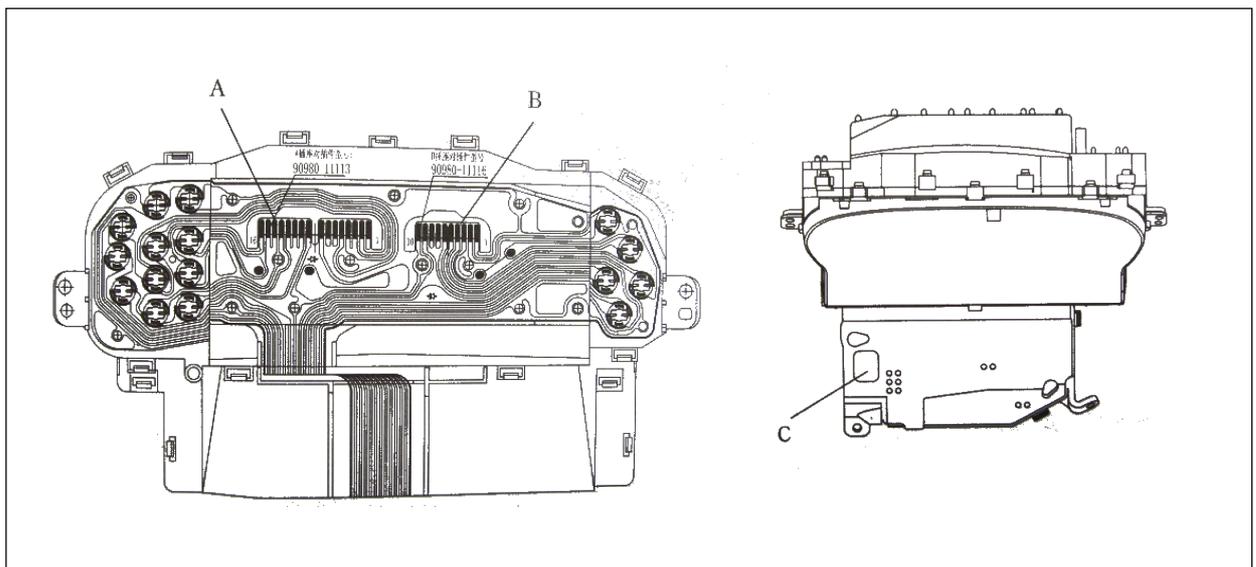
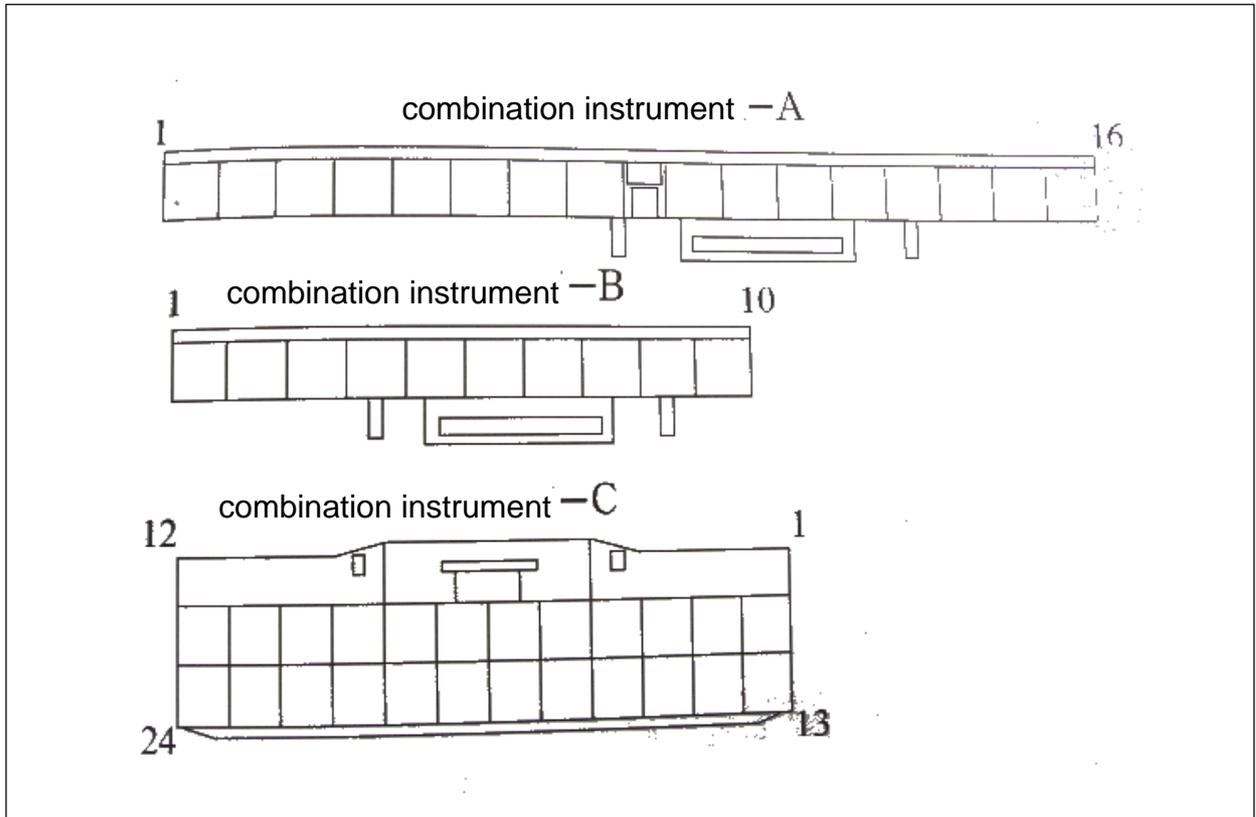
Deflection is about 10mm when belt middle part bears pressure of about 50N.



## Chapter 2 Combination Instrument System

### Section 1 Wiring diagram of Combination Instrument and Location of Multi-pin Plug-in Terminal

1. Schematic circuit diagram of combination instrument (see the figure)
2. Distribution of digital combination instrument plug-in unit terminals



## Wiring diagram of Combination Instrument

Please Refer to "MK WIRING DIAGRAM"

### 3. Definition of multi-pin plug-in unit terminal

Terminal number	Definition of terminal	Conductor Color	Terminal number	Definition of terminal	Conductor Color	
A	1	MIL	C	10	NA	
	2	Engine oil pressure switch	YG	1	P	
	3	Brake fluid	GR	2	R	
	4	Park	G	3	N	
	5	Right turn light	GB	4	D	
	6	NA		5	2	
	7	EBD		6	L	
	8	Charge	WR	7		
	9	NA		8	NA	
	10	NA		9	Sidelight	GW
	11	Safety belt	YR	10	Start	BR
	12	NA		11	B+	
	13	Engine	GY	12	IG(+)	Y
	14	Safety gasbag	RY	13	GND	
	15	NA		14	NA	
	16	IG(+)		15	Speed sensor earthing	B
B	1	NA		16	Speed signal input	YR
	2	Left turn light	GW	17	Speed sensor power supply	RY
	3	High beam (+)	RB	18	Key (ODO/TRIP)	G
	4	High beam (-)	RW	19	Key (adjust brightness)	YG
	5	Foglight	Gr	20	Key COM	B
	6	Rear defrost	YB	21	Fuel gauge	V
	7	NA		22	ABS	R
	8	NA		23	Tachometer	BBL
	9	Door-lock warning lamp	RBL	24	Coolant temperature gauge	YW
			C			

#### 1. Prompt:

R- red    Bl- blue    Y - yellow    B- black    P- pink    G- green    W- white

O- orange    Gr - gray    Br- brown    V- purple    Lg- olive drab

The first letter indicates primary color

The second letter indicates stripe color

## Section 2 Malfunction Symptom Table and Troubleshooting

### I. Symptom table

The table below lists the typical malfunction symptoms of the combination meter. These malfunctions can be troubleshot step by step in the section of the malfunction diagnosis.

Serial No.	Symptom
1	The whole combination meter does not work
2	Speedometer fault
3	Tachometer fault
4	Water temperature gauge fault
5	Fuel gauge fault
6	Odometer fault
7	Instrument illumination fault
8	Instrument warning light fault

### II. Specific troubleshooting steps

The entire combination instrument does not work (1) Check safety wire (refer to schematic diagram of combination instrument)

- a. Check GAUGE (10 A) safety wire in fuse box of instrument desk is on
- b. Check AM 1 (30 A) safety wire in fuse box of engine room is on
- c. Check MAIN (80 A) safety wire in fuse box is on

Result and measures: if there is any blowout, replace with a safety wire of the same capacity

(2) Check team whole instrument socket connector

a. Inspect continuity

- Disconnect connector from combination instrument assy.
- Check connection between terminals

Standard:

Tester connection	Condition	Standard condition
C13 - ground	Normal	ON

b. Check voltage

- Disconnect connector from combination instrument assy.
- Turn ignition switch to ON
- Check voltage between terminals

Standard:

Tester connection	Conditions	Standard condition
C 12- ground	Turn ignition switch to ON position	10-14 V

Result and measures:

Normal, replace combination instrument assy.

Abnormal, repair or replace wiring harness or connector

2. Speedometer fails

Check

(1) Check combination instrument assy.

a. Remove combination instrument assy. , keep connection of connector.

b. Check on state

- Check connection between terminals

Standard:

Tester connection	Condition	Standard condition
C 15-ground	Normal	ON

c. Check voltage between terminals

Standard:

Tester connection	Conditions	Standard condition
C 17- ground	Turn ignition switch to ON position	7. 5-9V

Result and measures:

Abnormal, go to (2) Check combination instrument assy. speed input signal

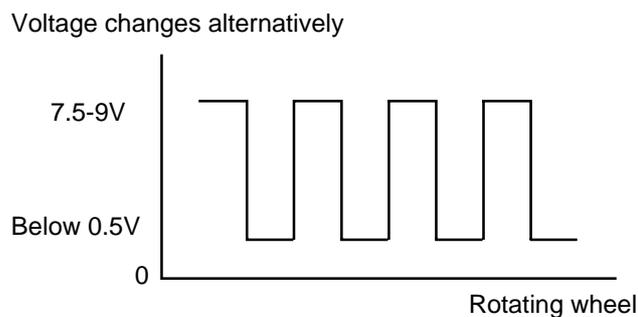
Normal, go to (3) Check combination instrument assy.

(2) Check combination instrument assy. speed input signal

a. Check voltage

- Prop up two front wheels
- Push transmission lever to neutral position
- Turn on ignition switch
- turn front wheel slowly, measure the voltage between terminal C15 and terminal C16

Standard voltage is shown in the figure below:



Result and measures:

Normal, replace combination instrument assy.

Abnormal, check speed sensor

b. Check speed sensor

- Check on state

Check connection between terminals

Standard:

Tester connection	Condition	Standard condition
2- ground	Normal	ON

- Check voltage between terminals

Standard:

Tester connection	Conditions	Standard condition
3- ground	Turn ignition switch to ON position	7.5-9V

Result and measures:

Abnormal, repair or replace wiring harness or connector

Normal, check speed sensor output signal

c. Check speed sensor output signal

Check voltage

- Prop up two front wheels
- Push transmission lever to neutral position
- Turn on ignition switch
- Turn front wheel slowly, measure the voltage between terminal 1 and terminal 2

Standard voltage is shown in the figure below:



Result and measures:

Normal, repair or replace wiring harness or connector

Abnormal, replace speed sensor

(3) Check combination instrument assy.

a. Remove combination instrument assy. , disconnect connector.

b. Check on status

- Check connection between terminals

Standard:

Tester connection	Condition	Standard condition
C 13- ground	Normal	ON

c. Check voltage between terminals

Standard:

Tester	connectionConditions	Standard condition
C 12- ground	Turn ignition switch to ON position	7. 5-9V

Result and measures:

Abnormal, repair or replace wiring harness or connector

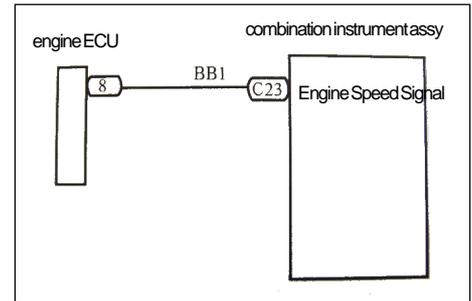
Normal, replace combination instrument assy.

3. Tachometer fails

Checkout procedure

(1) Check combination instrument assy. rotating speed input signal

- a. Remove combination instrument assy. , keep connection of connector.
- b. Connect oscillograph to terminal C23 and ground.
- c. Start up engine



d. Check signal waveform

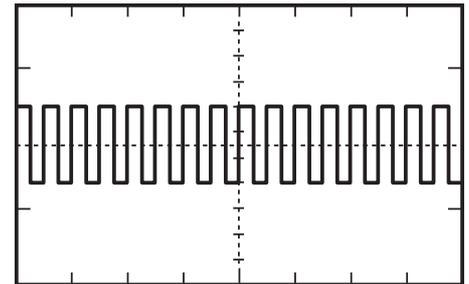
Standard:

Display correct waveform

Result and measures:

Normal, check and replace combination instrument assy.

Abnormal, check engine ECU rotating speed output signal



(2) Check engine ECU rotating speed output signal

- a. Remove engine ECU ware, keep connection of connector.
- b. Connect oscillograph to terminal ECU 8# pin and ground.
- c. Start up engine
- d. Check signal waveform

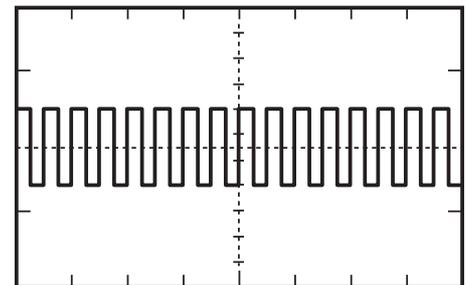
Standard:

Display correct waveform

Result and measures:

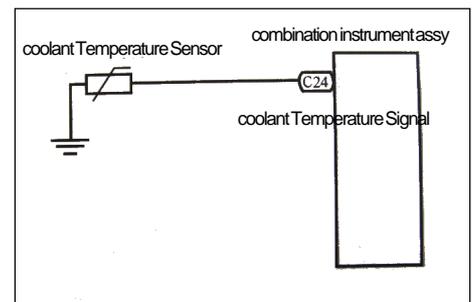
Normal, repair or replace wiring harness or connector

Abnormal, check revolution speed transducer and engine control system



4. Water thermometer fails

Circuit diagram



- (1) Use diagnostic instrument to read engine water temperature value
  - a. Connect diagnostic instrument to diagnostic interface
  - b. Turn on ignition switch
  - c. Read water temperature value displayed on diagnostic instrument  
 Standard: the same as actual engine cooling water temperature  
 Result and measures:  
 Normal, water thermometer does not fail  
 Abnormal, check combination instrument assy.

(2) Check combination instrument assy.

- a. Check resistance
  - Remove combination instrument assy. , disconnect connector.
  - Check connection between terminals
 Standard:

Tester connection	Conditions	Standard state
C 24- ground	C(60° C)	164.5± 5 ohm
	1/2C(90° C)	56± 3 ohm
	H(115° C)	28.7± 2 ohm

Result and measures:

Normal, replace combination instrument assy.

Abnormal, check water temperature sensor

- b. Check water temperature sensor
  - Remove water temperature sensor and put it in thermostat.
  - Adjust temperature of thermostat and measure resistance value of water temperature sensor
 Standard:

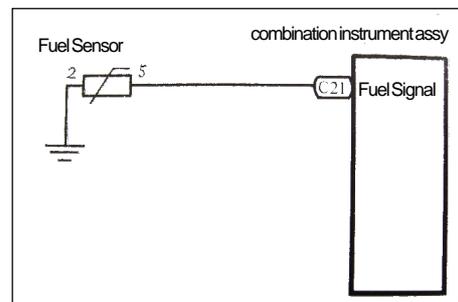
Conditions	Standard state
C(60° C)	164.5± 5 ohm
1/2C(90° C)	56± 3 ohm
H(115° C)	28.7± 2 ohm

Result and measures:

Normal, repair or replace wiring harness and connector

Abnormal, replace water temperature sensor

5. Fuel gauge fails  
Circuit diagram



(1) Check combination instrument assy.

a. Check resistance

- Remove combination instrument assy. , disconnect connector.
- Check connection between terminals

Standard:

Tester	connectionConditions	Standard state
C 21- ground	E	110± 6 ohm
	1/2	32.5± 3 ohm
	F	3± 2 ohm

Result and measures:

Normal, replace combination instrument assy.

Abnormal, check fuel sensor

b. Check fuel sensor

- Remove fuel sensor.
- Adjust the height of fuel sensor and measure its resistance value.

Standard:

Conditions	Standard state
C(60° C)	164.5± 5 ohm
1/2C(90° C)	56± 3 ohm
H(115° C)	28.7± 2 ohm

Result and measures:

Normal, repair or replace wiring harness and connector

Abnormal, replace fuel sensor

6. Odometer fails

Firstly check according to speedometer problem, if speedometer is normal, odometer fails, replace combination instrument assy.

7. Illuminating lamp fails

Symptom	Suspected area
All illuminating lamps do not illuminate	1. Brightness control switch 2. Wiring harness or connector 3. Combination instrument
Only one illuminating lamp does not illuminate	1. Combination instrument assy.

8. Warning lamp fails

Symptom	Suspected area
Check that engine warning lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. ECM</li> <li>3. Combination instrument assy.</li> </ol>
Charge warning lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Alternator</li> <li>3. Combination instrument assy.</li> </ol>
Park braking warning lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Manual brake switch</li> <li>3. Combination instrument assy.</li> </ol>
Brake failure warning lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Brake fluid level switch</li> <li>3. Combination instrument assy.</li> </ol>
ABS warning lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. ABS ECU or ABS warning lamp driving module</li> <li>3. Combination instrument assy.</li> </ol>
SRS warning lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Airbag ECU controller</li> <li>3. Combination instrument assy.</li> </ol>
Passenger's airbag indicator lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Airbag ECU controller</li> <li>3. Combination instrument assy.</li> </ol>
High beam indicator lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Front head light dimmer switch</li> <li>3. Combination instrument assy.</li> </ol>
Rear foglight indicator lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Front head light dimmer switch</li> <li>3. Combination instrument assy.</li> </ol>
Rear defrost indicator lamp does not illuminate	<ol style="list-style-type: none"> <li>1. Wiring harness or connector</li> <li>2. Rear defrost switch</li> <li>3. Combination instrument assy.</li> </ol>

## Combination Instrument System - Malfunction Symptom Table and Troubleshooting 5-17

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Symptom	Suspected area
Front fog switch lamp does not illuminate	<ol style="list-style-type: none"><li>1. Harness or connector.</li><li>2. Front fog switch</li><li>3. Combination instrument assy.</li></ol>
Water temperature warning indicator lamp does not illuminate	<ol style="list-style-type: none"><li>1. Wiring harness or connector</li><li>2. Cuolant temperature sensor</li><li>3. Combination instrument assy.</li></ol>
Safety belt warning indicator lamp does not illuminate	<ol style="list-style-type: none"><li>1. Wiring harness or connector</li><li>2. Safety belt buckle switch</li><li>3. Combination instrument assy.</li></ol>

### III. Inspection on vehicle

1. Use speedometer detector to check indication error permitted by speedometer, check odometer service condition.

Analog instrument (Km/h)	
Instrument indication	Displayed value of detector
20	17 - 23
40	35 - 40
60	55 - 60
80	75 - 80
100	95 - 100
120	114 - 120
140	133 - 140
160	152 - 160
180	171 - 180

Note:

Insufficient or too high tire pressure will increase error.

2. Check input signal

(1) Connect positive pole (+) of voltmeter with terminal C 16, connect negative pole (-) with terminal C15.

(2) When vehicle runs at 10km/h, check the voltage between terminal C15 and C16 of combination instrument assy.

Standard: 7 high low level fluctuation waveforms per second.

Note:

To check, keep ignition switch in ON position, connector in on state

3. Check tachometer

Check service condition

Start up engine, use hand revolution counter for comparison.

Displayed value of hand revolution counter and indicated value of tachometer are shown in the table on next page.

Analog instrument

Tachometer (r/min)	Hand revolution counter (r/min)
800	740-860
1000	900-1100
2000	1850-2150
3000	2800-3200
4000	3800-4200
5000	4800-5200
6000	5750-6250

4. Check fuel gauge

(1) Check resistance

Check resistance between C21 terminal and C13 terminal on combination instrument connector.

Standard:

Standard indication	Resistance (ohm)
E	104-116
Reminder point	90-100
1/2F	29-35
F	1-5

Note:

To measure, disconnect the connector.

5. Check water thermometer

(1) Check resistance

When water thermometer indicates water temperature to red area, check the resistance between C24 terminal and C13 terminal on combination instrument connector.

Standard

Standard indication	Resistance (ohm)
C	159. 5-169. 5
1/2H	53-59
Alarm point	26. 7-30. 7
H	20-24

Note:

To measure, disconnect the connector.

6. Check water temperature warning lamp

(1) Disconnect water temperature sensor connector.

(2) Turn ignition switch to ON, water temperature warning lamp should go out.

(3) Ground instrument connector C24 terminal, water temperature warning lamp should illuminate.

7. Check engine oil pressure warning lamp

Disconnect engine oil pressure transducer connector.

Turn ignition switch to ON, engine oil pressure warning lamp should go out.

Use conductor to short connector terminal to earth, engine oil low pressure warning light should illuminate.

8. Check engine oil pressure transducer

Disconnect connector from engine oil pressure transducer

Check connection between terminal and ground

Engine stall: on state

Engine running: off state.

9. Check park warning lamp

- (1) Disconnect connector from park switch
- (2) Turn ignition switch to ON, park brake warning lamp should go out.
- (3) Use conductor to short connector terminal to ground, park brake warning lamp should illuminate.

10. Check park switch

- (1) Disconnect connector from park switch
- (2) Pull up manual brake, check whether its terminal is connected with ground  
Pull up manual brake: on  
Manual brake release: off

11. Brake fluid level warning lamp

- (1) Disconnect connector from brake fluid level sensor
- (2) Turn ignition switch to ON, brake fluid level warning lamp should go out.
- (3) Use conductor to connect its connector terminal wiring harness terminals directly, brake fluid level warning lamp should illuminate.

12. Check brake fluid level warning switch

- (1) Remove tank cap
- (2) Disconnect connector from tank
- (3) Check whether terminals are connected.  
Floater on top: off
- (4) Use sucker to suck out liquid from tank
- (5) Check whether terminals are connected.  
Floater down: on state
- (6) Pour liquid back into tank

13. Rear defrost indicator lamp

- (1) Turn ignition switch to ON, and start up engine
- (2) Push down defrost switch, now rear defrost indicator lamp should illuminate
- (3) Turn ignition switch to OFF, rear defrost indicator lamp should go out

14. Rear foglight indicator lamp

When rear foglight illuminates, rear foglight indicator lamp should illuminate, now A5 terminal should be high potential.

15. Safety belt warning indicator lamp

- (1) Disconnect safety belt switch connector from driver side, now safety belt warning indicator lamp should go out.
- (2) Short connector terminal to ground, safety belt warning indicator lamp should illuminate.

## Chapter 3 Wiper and Washer System

### Section 1 Wiper and Washer System Inspection

#### Remark:

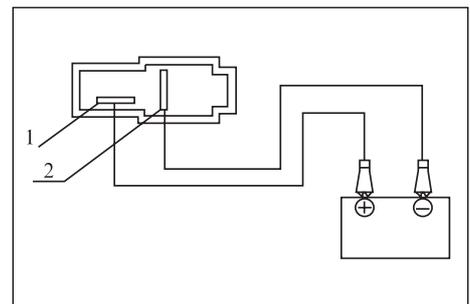
The table below can help you find the causes of malfunction. These figures show the most possible malfunctions in order of priority. Inspect each part in the order given. If necessary, repair or replace these parts.

Symptom	Suspected Area
Front wiper does not work.	1. Wiper fuse 2. Wiper switch assembly 3. Harness
Front wiper in intermittent shift does not work.	1. Wiper switch assembly 2. Wiper motor assembly 3. Harness 4. Central controller
Front washer motor does not work	1. Wiper fuse 2. Wiper switch assembly 3. Wiper motor assembly 4. Harness
When the washer switch is placed ON, front wiper does not work	1. Wiper switch assembly 2. Wiper motor assembly 3. Harness 4. Central controller
Washer fluid dose not jet out	1. Washer hose and nozzle
1. When the washer switch places on OFF, wiper blade can not return, or stay in a wrong place. 2. The wiper blade scratches the body	1. Wiper motor assembly (The position of wiper arm)

## II. Trouble shooting

### 1. Check work of washer pump

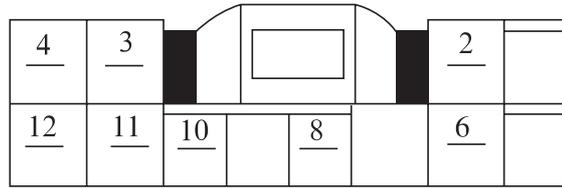
- (1) Install washer pump on tank system, pour cleaning fluid into the tank.
- (2) Disconnect connector of washer pump.
- (3) As shown in the figure below, connect No. 1 terminal of washer pump with positive pole (+) of storage battery; connect No. 2 terminal with negative pole (-) of storage battery. Check whether cleaning fluid flows from tank.
- (4) If there is no outflow, replace washer pump.



2. Wiper, washer switch assembly

(1) Channel check

- Check whether terminals on connector are on.



Standard:

Front wiper switch

Switch motion	Testing terminal	Specified state
MIST	8 - 1 0	ON
OFF	3 - 1 0	ON
INT	8 - 6 3 - 1 0	ON
LO	8 - 1 0	ON
HI	8 - 1 1	ON

Note: No. 2. and No. 4 terminals are always ON.

Front washer switch

Switch motion	Testing terminal	Specified state
OFF		OFF
ON	8 - 7	ON

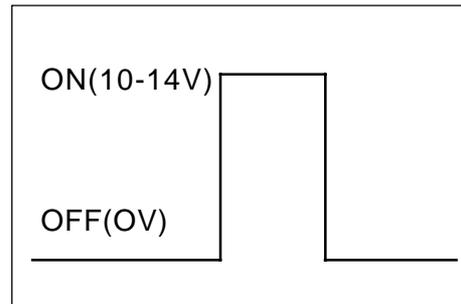
If in OFF state, replace switch

(2) Check work (washer switch)

- Turn washer switch to OFF position.
- Connect positive pole (+) of storage battery with No. 8 terminal of connector, connect negative pole (-) with No. 2 terminal of wiper connector. Turn washer switch to ON and OFF, measure the voltage between No. 8 terminal and wiper motor connector No. 2 terminal.

Standard: see the figure in the left

If it does not meet stipulation, replace the switch.

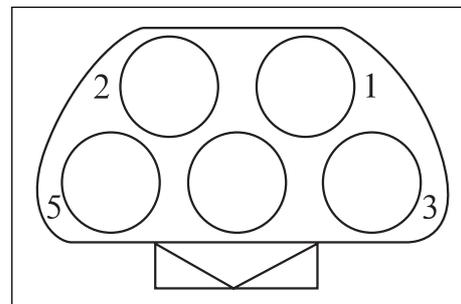


3. Wiper motor assembly

(1) Low speed gear inspection

- Connect positive pole (+) of storage battery and No. 3 terminal of connector, connect negative pole (-) and No. 2 No. 2 terminal (E) of connector, check motor speed at low speed gear.

If it does not meet stipulation, replace the motor.



## (2) High gear inspection

- Connect positive pole (+) of storage battery with No. 4 terminal of connector, connect negative pole (-) with No. 2 terminal (E) of connector, check motor speed at high speed gear.

If it does not meet stipulation, replace the motor.

## (3) Automatic reset inspection

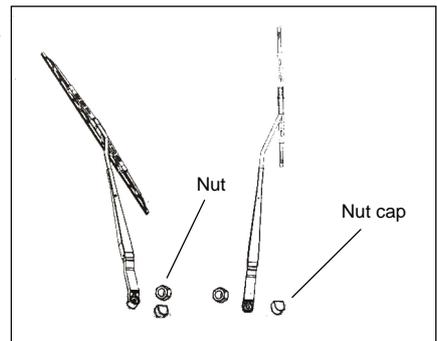
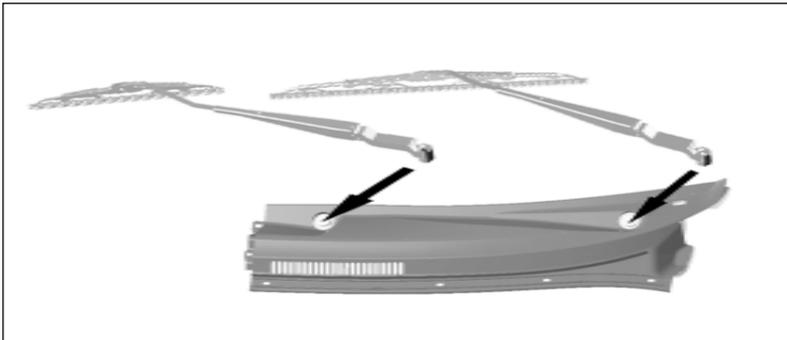
- Connect positive pole (+) of storage battery with No. 3 terminal of connector, connect negative pole (-) with No. 2 terminal (E) of connector. Rotate motor at low speed gear, disconnect No. 3 terminal (+) to stop motor at any position.
  - Connect No. 5 terminal and No. 3 terminal, connect positive pole (+) of storage battery with No. 1 terminal, restart the motor at low speed gear.
  - Check whether automatic reset works normally.
- If it does not meet stipulation, replace the motor.

## Section 2 Replacement and Adjustment

### I. Replace wiper motor assembly

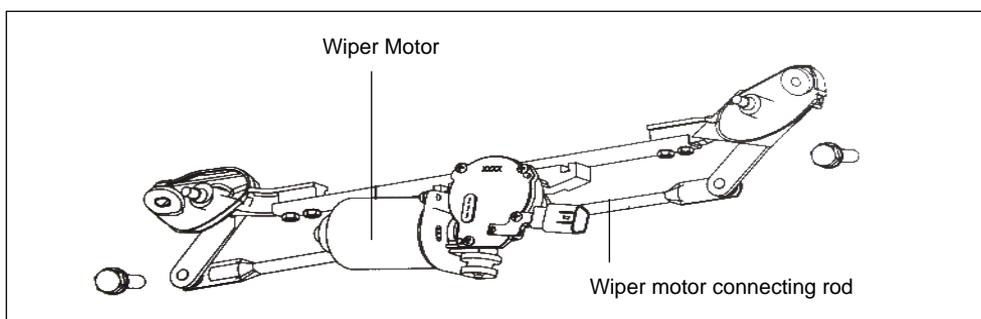
#### 1. Remove wiper motor

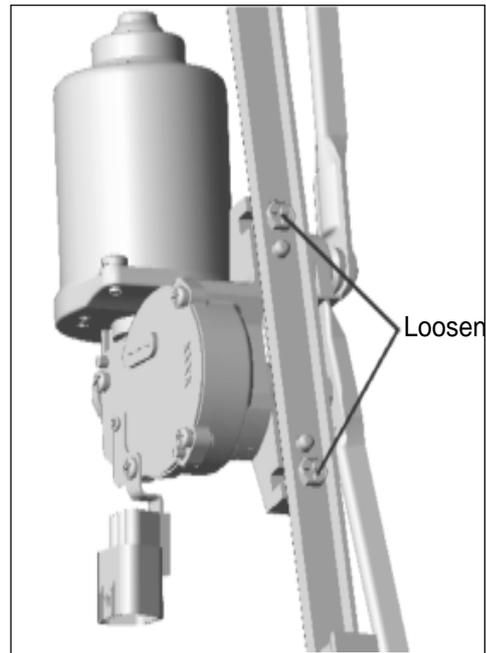
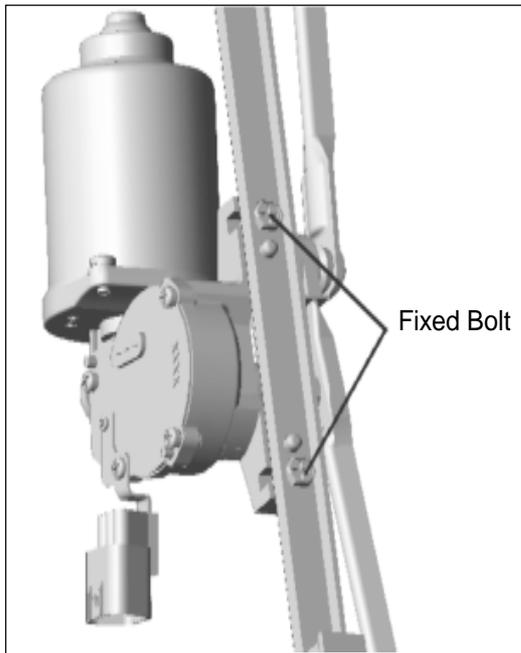
- Remove wiper arm doctor blade assembly
- Remove ventilation cover board



## (3) Disconnect socket connector

## (4) Remove wiper motor connecting rod assembly





(5) Remove 2 fixed bolts on wiper connecting rod

(6) Use special tool to uncouple motor crank arm shaft and wiper connecting rod

2. Replace with new wiper motor

(1) Use special tool to press motor crank arm shaft and wiper connecting rod into right position

(2) Fasten 4 bolts according to specified torque

(3) Connect socket connector

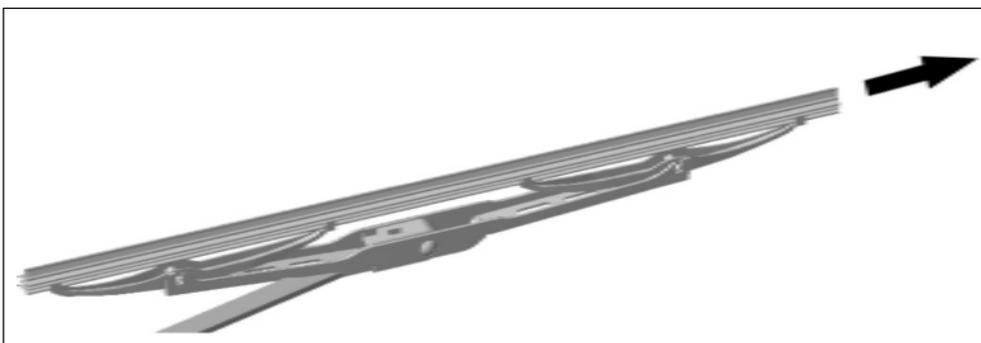
(4) Start wiper, spray cleaning fluid onto glass, check wiping state, whether original position of wiper arm is normal, Otherwise remove wiper arm doctor blade assembly and make appropriate adjustment

Notes: crank arm shaft head of newly replaced wiper motor must always be filled with lubricating oil

## II. Wiper blades replacement

1. Remove doctor blade of No. 1 and 2 wiper arm blade assembly

- Remove doctor blade from No. 1 and 2 wiper arm blade assembly respectively



2. Replace new blade

- Replace new blade No. 1 and 2 wiper arm blade assembly respectively

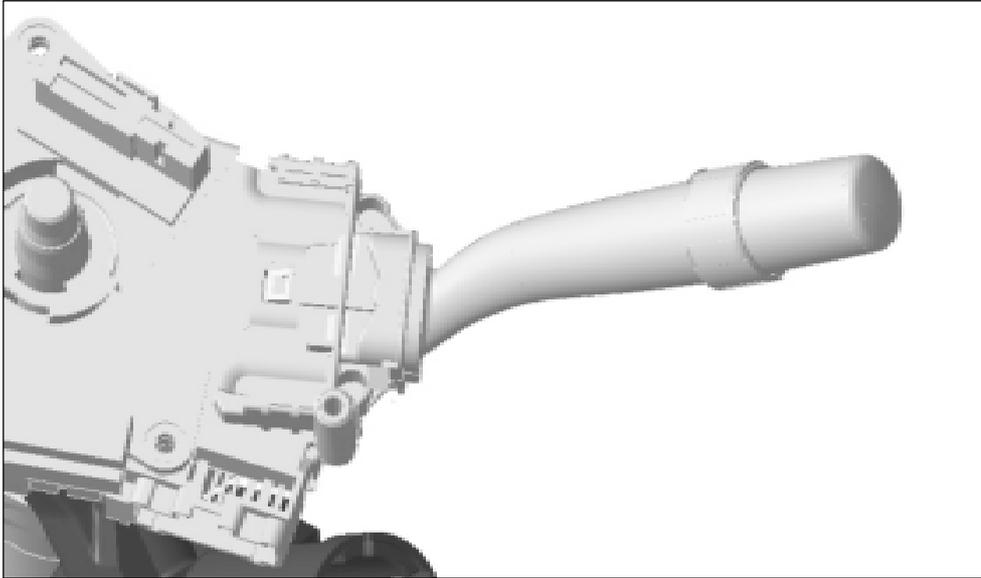
### III. Wiper switch assembly

#### Replacement

##### 1. Detach steering wheel assembly

- (1) Disconnect the main power source of the vehicle.
- (2) Remove the passenger SRS module assembly, and cautiously put it in a safe place.
- (3) Loosen steering wheel lock-bolts and remove the assembly.

##### 2. Remove wiper switch



- (1) Disconnect the connector.
- (2) Remove the 2 tapping screws that are for mounting the wiper switch, take out the wiper switch from the bracket of the combination switch.

### IV. Washer nozzle

#### Adjustment

##### 1. Inspect washer nozzle

- (1) Start the engine, check if the position where the washer fluid from the nozzle sprays the windshield is in the upper center wiped by the blades.
- (2) Change the height (left/right) of the nozzle hole to adjust the point where washer fluid sprays the windshield.

# Chapter 4 Light System

## Section 1 Light System Introduction

### I. Composition

Light system comprises external illumination and signal system and internal illumination system.

The function of the external illumination and signal system is to illuminate the road ahead and send signals to other vehicles.

The internal illumination system provides internal illumination for driver and passengers.

### II. Precaution for service

#### 1. Precaution when repairing electrical equipments

Disconnect the battery ground cable.

#### 2. Precaution when replacing a headlamp bulb

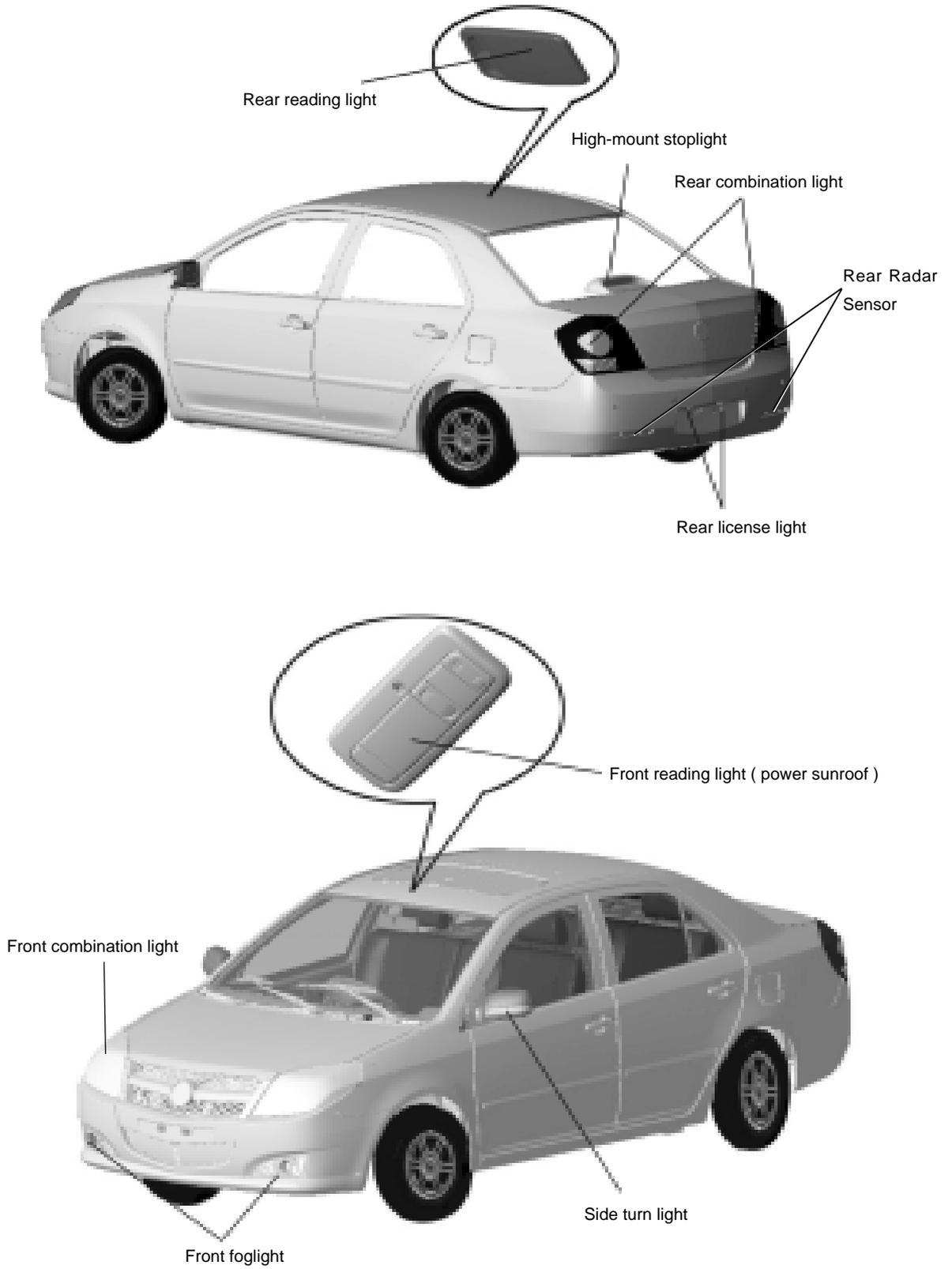
- (1) Before replacing a halogen bulb, turn the headlamp OFF to make it cool.
- (2) When installing a new halogen bulb, do not touch the glass part of the bulb with bare hands.
- (3) If there is oil stain on the surface of halogen bulb (headlamp and front fog lamp) when the lamps are turned ON, its service life will be shortened.
- (4) Halogen bulbs (headlamp and front fog lamp) have pressurized gas inside and require special handling. They can explode if dropped to ground. The glass fragments will splash up.
- (5) When replacing, make sure to use the bulbs with the same power, same model.
- (6) After the bulb is installed, make the lamp holder tight.

### III. Bulb specifications

Name	Specifications
Headlamp (High beam and Low beam)	H1 12V 55W
Turn signal lamp	PY21W 12V 21W
Position lamp	W5W 12V 5W
Front fog lamp	H3 12V 55W
Rear combination lamp (Turn signal lamp)	PY21W 12V 21W
Rear combination lamp (Brake / Position lamp)	P21/5W 12V 21/5W
Rear combination lamp (Rear fog lamp)	P21W 12V 21W
Rear combination lamp (Back-up lamp)	P21W 12V 21W
Interior lamp (dome lamp)	R5W 12V 5W
Rear row reading lamp	C5W 12V 5W
Side turn signal lamp	W5W 12V 5W
High mounted stop lamp (incl. rear trunk lamp)	W5W 12V 5W
License plate lamp	W5W 12V 5W
Door courtesy lamp	W5W 12V 5W

Remark: All bulbs are made by Philips Corp..

#### IV. Location of light system



## Section 2 Light System Malfunction Inspection

### I. Light system problem symptoms table:

Description:

The table below can help you find the causes of malfunction. These figures show the most possible malfunctions in order of priority. Inspect each part in the order given. If necessary, repair or replace these parts.

#### 1. Headlamp and tail lamp

Symptom	Suspected Area
"Low beam" dose not light (One side)	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. LH or RH headlamp fuse</li> <li>3. Harness</li> </ol>
"Low beam" dose not light (All)	<ol style="list-style-type: none"> <li>1. Lamp switch assembly</li> <li>2. Harness</li> </ol>
"High beam" dose not light (One side)	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. LH or RH headlamp fuse</li> <li>3. Harness</li> </ol>
"High beam" dose not light (All)	<ol style="list-style-type: none"> <li>1. Lamp switch assembly</li> <li>2. Harness</li> </ol>
Light dose not flash (Dimmer)	<ol style="list-style-type: none"> <li>1. Lamp switch assembly</li> <li>2. Harness</li> </ol>
Headlamp is dim	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Harness</li> </ol>
Only one side tail lamp lights	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Harness</li> </ol>
Tail lamps on both sides do not light (Headlamp is normal)	<ol style="list-style-type: none"> <li>1. Fuse</li> <li>2. Light control switch</li> <li>3. Harness</li> </ol>
Tail lamps on both sides do not light (Headlamp is abnormal)	<ol style="list-style-type: none"> <li>1. Beam control switch</li> <li>2. Harness</li> </ol>

#### 2. Front fog lamp system

Symptom	Suspected Area
Front fog lamp dose not light up with light control switch HEADLAMP (Head lamp is normal).	<ol style="list-style-type: none"> <li>1. Fog lamp fuse</li> <li>2. Front fog lamp relay</li> <li>3. Light switch assembly</li> <li>4. Harness</li> </ol>
Only one side front fog lamp dose not light	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Harness</li> </ol>

## 3. Rear fog lamp system

Symptom	Suspected Area
Rear fog lamp dose not light up with light control switch on FRONT FOG LAMP (Small lamp is normal).	1. Bulb 2. Light switch assembly 3. Harness
Rear fog lamp dose not light up with light control switch on FRONT FOG LAMP (Small lamp is abnormal).	1. Bulb 2. Tail lamp fuse 3. Harness
Only one side rear fog lamp dose not light	1. Bulb 2. Harness

## 4. Turn signal and hazard warning system

Symptom	Suspected Area
"Hazard" and "Turn" does not work	1. HAZARD Fuse 2. Central controller 3. Harness
Hazard warning lamp does not work (Turn is normal)	1. Hazard warning switch 2. Harness
Hazard warning lamp is abnormal (Hazard is abnormal)	1. Turn signal switch 2. Harness
Turn signal dose not light up in one direction	1. Turn signal switch 2. Harness
Only one bulb dose not light up	1. Bulb 2. Harness

## 5. Brake lamp system

Symptom	Suspected Area
Brake lamps on both sides do not light up	1. Brake lamp fuse 2. Brake lamp switch 3. Harness
Brake lamp remains always ON	1. Brake lamp switch 2. Harness
Brake lamp dose not light (One side)	1. Bulb 2. Harness
High mounted Brake lamp dose not light up (Stop lamp is normal)	1. Bulb 2. Harness

## 6. Back-up lamp system

Symptom	Suspected Area
Back-up lamps on both sides do not light up	<ol style="list-style-type: none"> <li>1. Back-up lamp fuse</li> <li>2. Back-up lamp switch assembly</li> <li>3. Harness</li> </ol>
Back-up lamps on both sides remains always ON	<ol style="list-style-type: none"> <li>1. Back-up lamp switch assembly</li> <li>2. Harness</li> </ol>
Back-up lamp dose not light (One side)	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Harness</li> </ol>

## 7. Interior light system

Symptom	Suspected Area
Interior lamp dose not light (All)	<ol style="list-style-type: none"> <li>1. ROOM Fuse</li> <li>2. Harness</li> </ol>
Room lamp dose not light up Rear row reading lamp assembly is normal	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Room lamp assembly</li> <li>3. Harness</li> </ol>
One door is ajar, room lamp dose not light up on DOOR, (It is normal on ON)	<ol style="list-style-type: none"> <li>1. Door courtesy lamp switch</li> <li>2. Central controller</li> <li>3. Harness</li> </ol>
Central LH/RH room lamps do not light up	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Switch</li> </ol>
Rear row reading lamp is abnormal (Room lamp assembly is normal)	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Rear row reading lamp assembly</li> <li>3. Harness</li> </ol>

## 8. License light

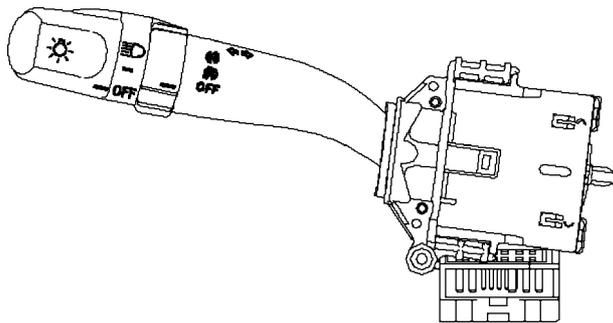
Fault symptom	Possible parts
License light does not illuminate (taillight is normal)	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Wire harness</li> </ol>

## 9. Trunk lamp

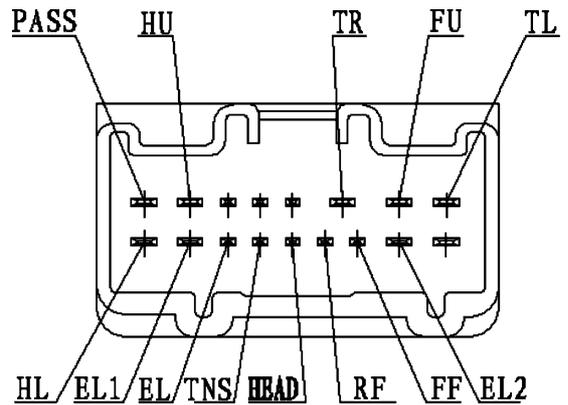
Fault symptom	Possible parts
Trunk lamp does not illuminate (room lamp is normal)	<ol style="list-style-type: none"> <li>1. Bulb</li> <li>2. Trunk lamp switch</li> <li>3. Wireharness</li> </ol>

## II. Lighting system troubleshooting

### 1. Headlight combination switch assembly



Headlight combination switch position drawing



Headlight combination switch shifting diagram

Turn light switch	Terminal	FU	TL	TR
	Handle position			
R		○	○	
NL				
L		○	○	

Foglight switch	Terminal	EL2	FF	RF
	Handle position			
OFF				
FF		○	○	
RF		○	○	○

Light switch	Terminal	EL1	HL	HU	PASS
	Handle position				
PASS		○		○	○
		○	○	○	
HL		○	○		
		○	○	○	
HU		○		○	

Headlight, small light switch	Terminal	EL	TNS	HEAD
	Handle position			
OFF				
P		○	○	
		○	○	
H		○	○	○

(1) Check whether headlight light control switch is ON

Check whether terminals are connected when switch is in each position according to the table.

Switch position	Testing terminal	Status
OFF	EL-TNS	OFF
Position light	EL-TNS	ON
Headlight	EL-HEAD	ON

If it does not meet stipulation, replace the switch.

(2) Check whether headlight dimmer switch is connected

Check whether terminals are connected when switch is in each position according to the table.

Switch position	Testing terminal	Status
Low beam	EL1-HL	ON
High beam	EL1-HU	ON
PASSING	EL1-HU-PASS	ON

If it does not meet stipulation, replace the switch.

(3) Check whether direction indicator switch is connected

Check whether terminals are connected when switch is in each position according to the table.

Switch position	Testing terminal	Status
Left turn	FU-TL	ON
Straight ahead	FU-TL-TR	OFF
Right turn	FU-TR	ON

If it does not meet stipulation, replace the switch.

(4) Check whether front and rear foglight switch is connected

Check whether terminals are connected when switch is in each position according to the table.

Switch position	Testing terminal	Status
OFF	EL2-FF-RF	OFF
Front foglight	EL2-FF	ON
Rear foglight	EL2-FF-RF	ON

If it does not meet stipulation, replace the switch.

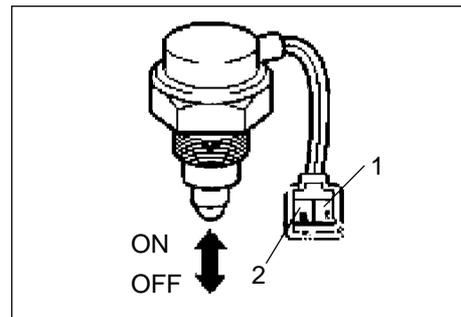
2. Reversing light switch assembly

Check whether reversing light switch assembly is connected

Check whether two terminals are connected when switch works according to the table

Switch motion	Testing terminal	Status
ON (gear lever is in reverse gear)	1-2	ON
OFF	1-2	OFF

If it does not meet stipulation, replace the switch.



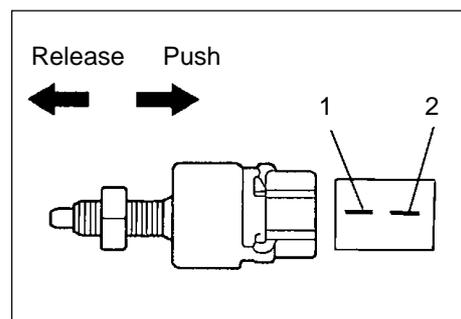
3. Brake lamp switch assembly

Check whether brake lamp switch assembly is connected

Check whether two terminals are connected when brake lamp switch works

Switch motion	Testing terminal	Status
Step down brake pedal	1-2	ON
Release brake pedal	1-2	OFF

If it does not meet stipulation, replace the switch.



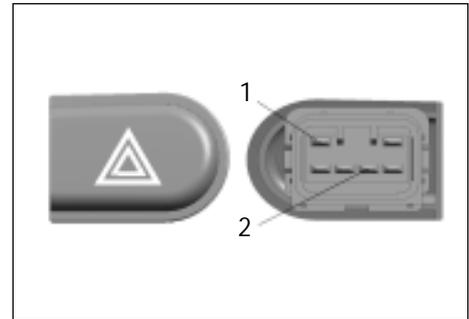
4. Danger alarm lamp switch assembly

Check whether danger alarm lamp switch is connected.

Check whether two terminals are connected when switch works.

Switch motion	Testing terminal	Status
ON	1-2	ON
OFF	1-2	OFF

If it does not meet stipulation, replace the switch.



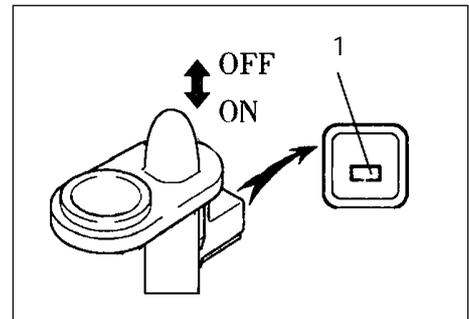
5. Door lamp switch (on fastener)

Check whether door lamp switch is connected

When switch works, check whether connection is established between terminal and bodywork earthing.

Switch motion	Testing terminal	Status
ON (door is closed)	1- GND	ON
OFF (door is not closed)	1- GND	OFF

If it does not meet stipulation, replace the switch.



6. Trunk lamp switch assembly

Check whether trunk lamp switch is connected

When switch works, check whether connection is established between terminal and bodywork earthing.

Switch motion	Testing terminal	Status
ON	1- GND	ON
OFF	1- GND	OFF

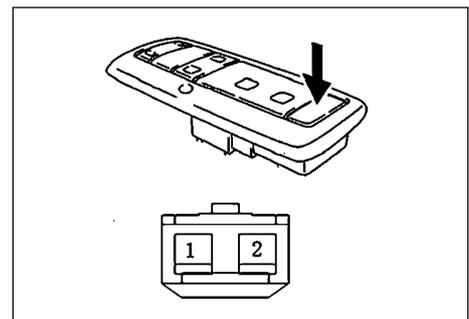
If it does not meet stipulation, replace the switch.

7. Front reading light assembly (with power sunroof)

Check whether terminals of indoor roof lamp assembly are connected

Switch motion	Testing terminal	Status
ON	1-2	ON
OFF	1-2	OFF

If it does not meet stipulation, replace roof lamp or switch.



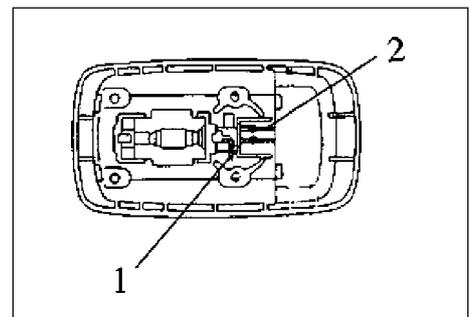
8. Rear reading light assembly

Check whether back row reading light assembly is connected

When switch works, check whether two terminals are connected

Switch motion	Testing terminal	Status
ON	1- 2	ON
OFF	1- 2	OFF

If it does not meet stipulation, replace the switch.



### 9. Front foglight relay

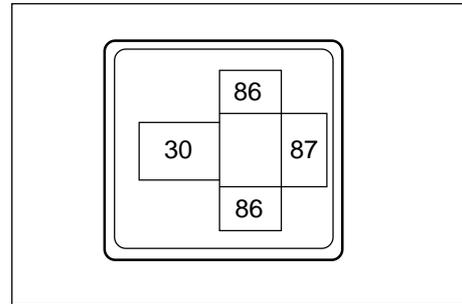
Check whether front foglight relay is connected

(1) Check whether terminals are connected

check terminal	Testing terminal	Status
	86-85	ON
	30-87	OFF

If it does not meet stipulation, replace the relay.

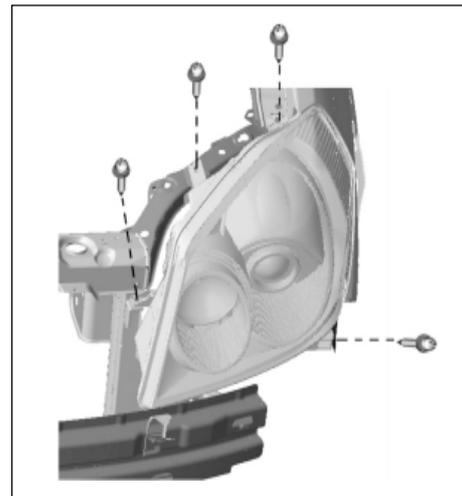
(2) Apply storage battery voltage (10V-14V) between terminal 86 and 85, then check whether terminal 30 and 87 are connected, if not connected, replace the relay.



## Section 3 Headlamp Replacement

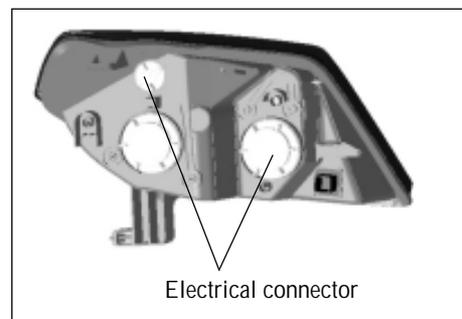
### I. Removal

1. Remove front bumper (see bumper replacement).
2. Remove 4 setscrews of front head light (as shown in the figure).



3. Remove electrical connector.

4. Move carefully forward, upward, remove front head light assembly.

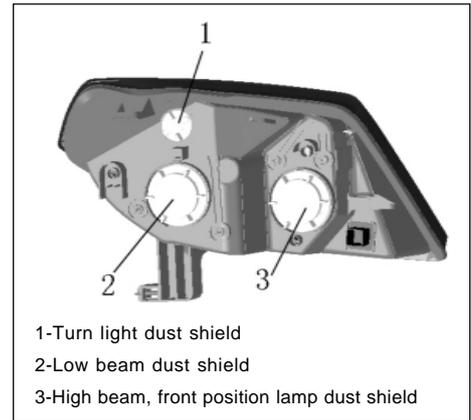


### II. Installation

1. Install electrical connector of front head light assembly.
2. Install front head light assembly and 4 setscrews.
3. Install front bumper.
4. Adjust vehicle state.
5. Adjust front head light beam.

### III. Replacement of front head light bulb

- Remove dust shield by rotating anticlockwise
- Pull out bulb plug
- Press and loosen steel wire clip
- Pull out lamp holder, take off bulb
- Replace bulb



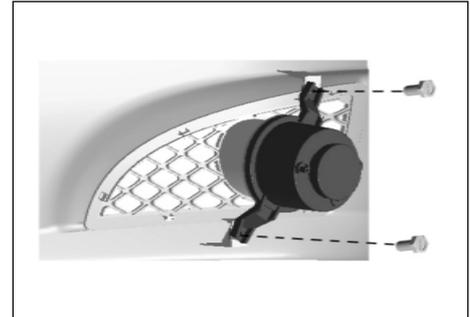
## Section 4 Front Fog Lamp Replacement

### I. Removal

1. Remove front bumper. (see bumper replacement)
2. Remove electrical connector.
3. Remove fixed bolt (as shown in the figure).
4. Remove front foglight assembly.

### II. Installation

1. Install front foglight assembly.
2. Mount fixed bolt.
3. Mount electrical connector.
4. Mount front bumper.
5. Adjust vehicle state.
6. Adjust front foglight beam.



### III. Replacement of front foglight bulb

1. Press and rotate anticlockwise, take off dust hood
2. Take out bulb
3. Replace bulb

### IV. Adjustment of front foglight beam

1. Adjust tire pressure in standard value
2. Start up engine
3. Turn on foglight switch
4. Adjust foglight beam turn screw to adjust foglight beam in the vertical direction.

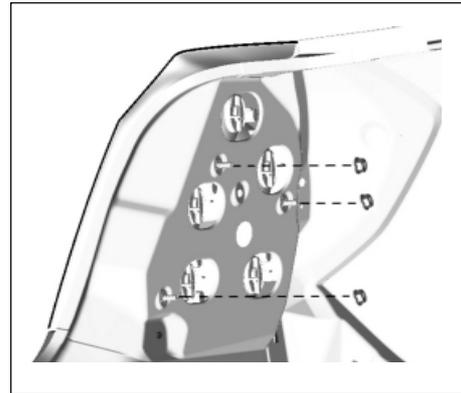
Description:

Turn screwdriver anticlockwise to make beam upward, or turn screwdriver clockwise to make it downward.

## Section 5 Rear Combination Lamp Replacement

### I. Removal

1. Remove trunk weather strip and trim.
2. Remove 3 installation nuts (as shown in the figure).
3. Remove rear combination light electrical connector.
4. Pull out rear combination light assembly towards vehicle backside.

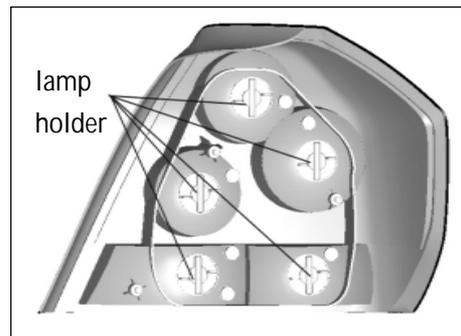


### II. Installation

1. Mount rear combination light, mount 3 installation nuts.
2. Mount electrical connector.
3. Mount trunk trim.
4. Mount weatherstrip.

### III. Replacement of rear combination light bulb

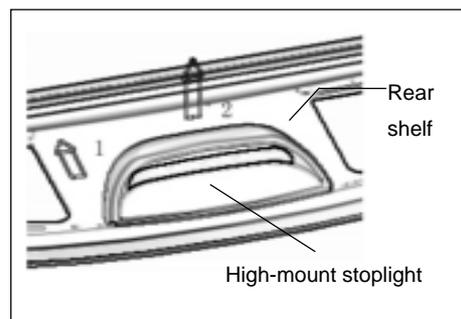
1. Take off seal ring
2. Turn lamp holder anticlockwise, take off lamp holder
3. Take off bulb, replace bulb



## Section 6 High-mounted Stop light Replacement

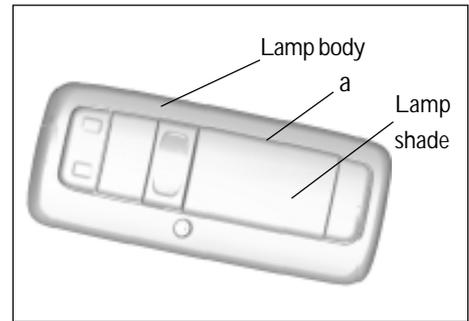
Disconnect the connector.

Remove the High mounted stop lamp in direction 1 and 2. (as shown above in the illustration)

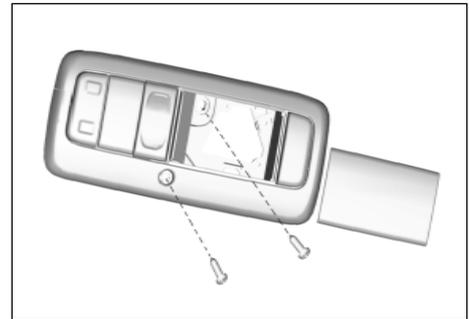


## Section 7 Front Reading Lamp Replacement

1. Use a screwdriver to slightly pry off lamp shade at position a (gap)

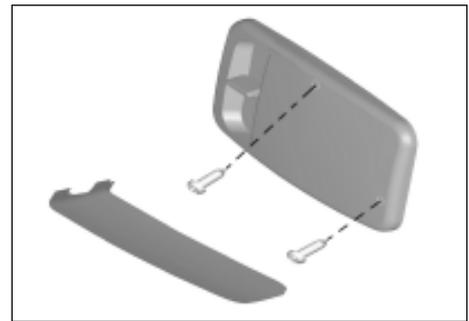


2. Use a screwdriver to remove two screws (be careful not to contact bulb)
3. Disconnect the connector



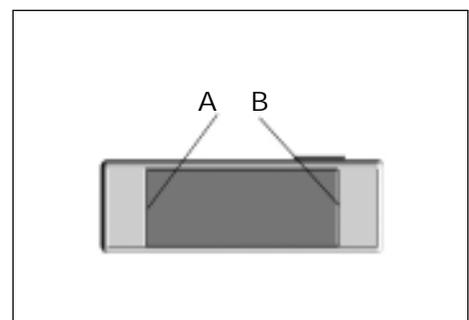
## Section 8 Rear Reading Lamp Replacement

1. Use a screwdriver to slightly pry off rear reading light
2. Use a screwdriver to remove two screws (be careful not to contact bulb)
3. Remove the connector



## Section 9 License Plate Lamp Replacement

1. Remove license light with a screwdriver from A & B point as shown in the figure
2. Change bulb



# Chapter 5 Audio System

## Section 1 Audio System Description

Description:

### 1. Radio wave band

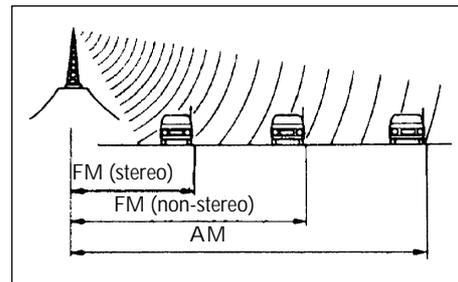
Wave bands used in radiobroadcast are as follows:

Frequency	30KHZ	300KHZ	3MHZ	30MHZ	300MHZ
Wave band	LF	MF	HF	VHF	
Radio wave		AM		FM	
Modulation	Amplitude modulation			Frequency modulation	

LF: low frequency    MF: medium frequency    HF: high frequency    VHF: very high frequency

### 2. Area coverage

Scope of AM and FM broadcasting coverage area differs greatly. Sometimes although AM broadcast may be received clearly, FM binaural broadcasting cannot be received. Not only listening zone of FM binaural broadcasting is small, but also static noise or other cacophony (noise) tends to occur.



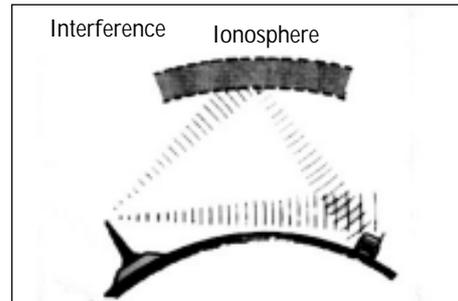
### 3. Receiving problem

Notes:

Besides static noise problem, there is also interference, multiplex and attenuation. These problems are not caused by electric cacophony, but the problem of radio wave itself.

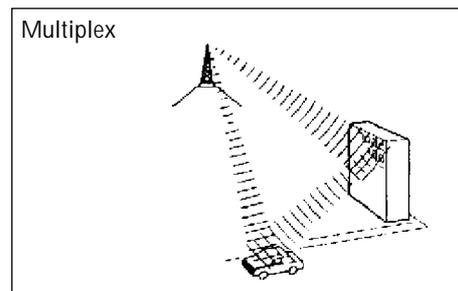
#### (1) Interference

Besides static noise problem, AM broadcast tends to receive other types of noise, especially at night. This is because ionosphere reflects AM radio wave at night, these interference electric waves interfere with signals from the same signal source while entering into vehicle antenna directly, this kind of noise is called "interference".



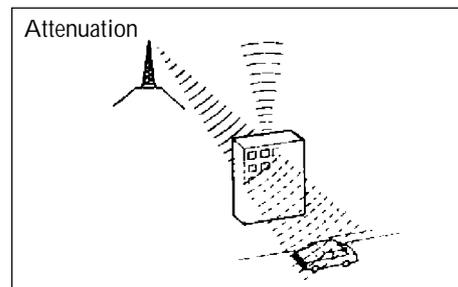
#### (2) Multiplex

Noise caused by radio wave reflected from barrier is called "multiplex". When radio signal emitted by broadcast antenna is reflected by high buildings or high mountains, and disturbs directly received other signals, multiplex phenomenon occurs.



#### (3) Attenuation

Since its frequency is higher than AM, FM wave is more easily reflected by high buildings or high mountains. Therefore, FM signal often disappears gradually, or when vehicle is blocked by barrier, it cannot receive any signal, such phenomenon is called "attenuation".



#### 4. Noise problem

Detailed description of noise problem fed back by customers is of great importance for analyzing and eliminating noise interference, the table below may be used for diagnosis.

Radio wave	Noise condition	Cause
AM	Noise occurs in special position	Most probably external noise
	Noise occurs when receiving small signal	Broadcast from local station might broadcast the same program. If program is the same, one of them might be disturbed
FM	Noise only occurs at night	Most probably from remote interference
	Noise occurs in special position during driving	Most probably is multiplex interference due to FM frequency change

#### Notes:

If noise occurred does not belong to any of the above-mentioned situations, please find out the cause according to "receiving problem".

#### 5. CD phonograph

CD phonograph (hereafter referred to as CD) uses laser beam to read digital signals recorded on CD, then revert to analog signal of music.

#### Notes:

Don't attempt to break down or apply oil to any component of the phonograph. Do not insert anything other than a CD into optical disk cartridge.

#### Notes:

CD phonograph uses invisible laser beam, could generate harmful radiation, always operate phonograph according to instructions.

#### 6. Maintenance

(1) Cleaning of magnetic tape phonograph, magnetic head:

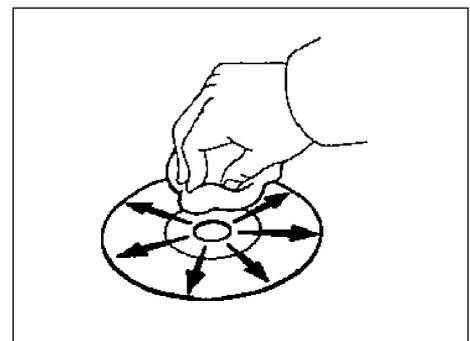
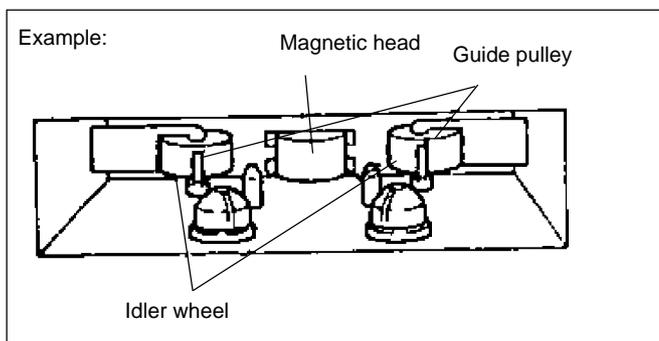
- a. Open tape cartridge gate with your finger, use a pencil or a similar article to insert guider.
- b. use cleaning pen or cotton swabs with detergent to wipe magnetic head surface, idler wheel or guide pulley.

(2) CD phonograph, CD cleaning:

If CD is dirty, use soft cloth to wipe the surface from CD center radially outwards.

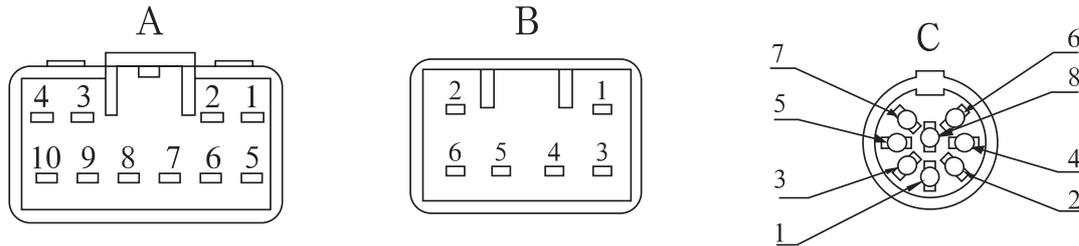
#### Notes:

Don't use ordinary recorder detergent or antistatic protectant.



## Section 2 Audio System Connector Terminal Layout

### 1. Connector terminal layout on wire harness



Terminal	No	Function	Wire color	Condition	Standard Voltage
A1		FR+	Lg	The audio system is on	Wave form is synchronized with the output sound
A2		FL+	WB	The audio system is on	Wave form is synchronized with the output sound
A3		ACC	RY	Ignition switch turned to ACC	10~14V
A4		B+	R	Constant Status	10~14V
A5		FR-	LgR	The audio system is on	Wave form is synchronized with the output sound
A6		FL-	W	The audio system is on	Wave form is synchronized with the output sound
A7		GND	B	Normal Status	ON
A8		Null			
A9		Mute	V		
A10		TAIL	G W	Position lamp switch turned to ON	10~14V
B1		RR+	PB	The audio system is on	Wave form is synchronized with the output sound
B2		RL+	YR	The audio system is on	Wave form is synchronized with the output sound
B3		RR-	P	The audio system is on	Wave form is synchronized with the output sound
B4		Null			
B5		Null			
B6		RL-	Y W	The audio system is on	Wave form is synchronized with the output sound
C1		B+		Normal Status	10~14V
C2		BUS		Audio system is On	Pulse Signal
C3		GND		Normal Status	ON
C4		ACC		Ignition switch ACC	10~14V
C5		Null			
C6		R-OUT		The audio system is on	Wave form is synchronized with the output sound
C7		L-OUT		The audio system is on	Wave form is synchronized with the output sound
C8		GND(Audio Frequency)		Normal Status	ON

### 2. Connect terminal definition

## Section 3 Audio System Inspection

### I. Symptom analysis

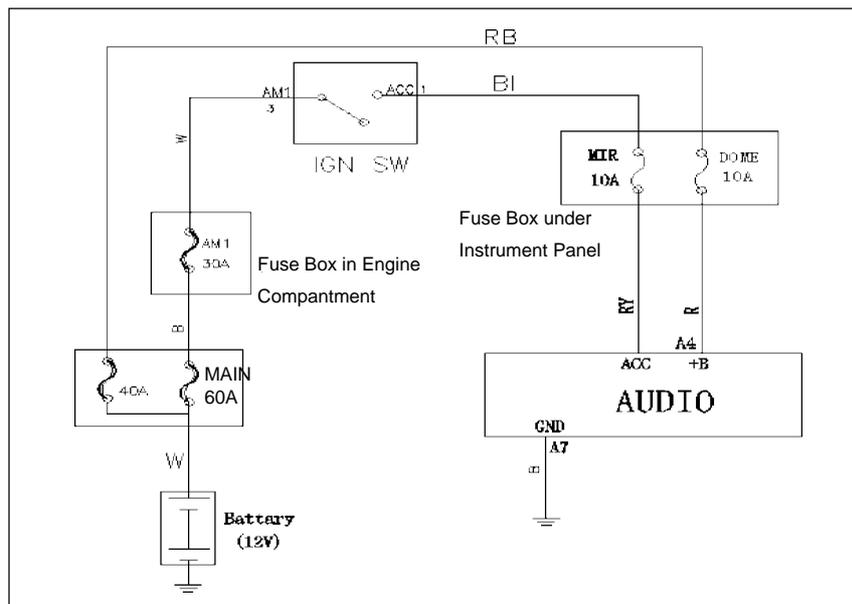
Symptom	Suspected Area
The system doesn't work when power is ON.	<ol style="list-style-type: none"> <li>1. Radio assembly circuit faulty</li> <li>2. Radio assembly</li> </ol>
The radio backlight does not light up with the illumination switch ON	<ol style="list-style-type: none"> <li>1. Radio assembly backlight terminal</li> <li>2. Radio assembly</li> </ol>
Speaker soundless in all modes	<ol style="list-style-type: none"> <li>1. Speaker circuit</li> <li>2. Radio assembly power circuit faulty</li> <li>3. Radio assembly</li> </ol>
Poor sound quality in all modes (Volume faint)	<ol style="list-style-type: none"> <li>1. Speaker circuit</li> <li>2. Radio assembly power circuit faulty</li> <li>3. Radio assembly</li> </ol>
Unable to receive radio broadcast (poor reception)	<ol style="list-style-type: none"> <li>1. Antenna circuit</li> <li>2. Radio assembly</li> </ol>
The cassette could not be inserted or played	<ol style="list-style-type: none"> <li>1. Tape</li> <li>2. Radio assembly power circuit faulty</li> <li>3. Radio assembly</li> </ol>
Cassette tape will not be ejected	<ol style="list-style-type: none"> <li>1. Tape</li> <li>2. Radio assembly</li> </ol>
Poor sound quality only when playing cassette tape	<ol style="list-style-type: none"> <li>1. Tape</li> <li>2. Radio assembly</li> </ol>
Tape jammed, malfunction with tape speed or auto-reverse	<ol style="list-style-type: none"> <li>1. Tape</li> <li>2. Radio assembly</li> </ol>
CD could not be inserted or ejected after inserted	<ol style="list-style-type: none"> <li>1. Wire between CD box and main unit</li> <li>2. CD Player main unit power supply circuit fault</li> <li>3. CD box</li> <li>4. CD Player main unit</li> </ol>
CD player doesn't work even if power is on	<ol style="list-style-type: none"> <li>1. Wire between CD box and main unit</li> <li>2. CD box</li> <li>3. CD bag</li> <li>4. CD Player main unit</li> </ol>

Symptom	Suspected Area
CD can not be taken out	1. Wire between CD box and main unit 2. CD box 3. CD bag 4. CD PLAYER main unit
Sound quality poor only when playing CD (Volume faint)	1. Wire between CD box and main unit 2. CD box
CD sound jump	1. CD box 2. CD box installation

## II. Trouble shooting

1. Power switch system does not work

Circuit diagram



(1) Check radio assembly (+ B, ACC, GND)

a. As shown in the table below, check connection between terminals in each operating condition.

Standard:

Tester connection	Condition	Standard state
GND and vehicle earth	Normal status	ON

b. As shown in the table below, check voltage between terminals in each operating condition.

Standard:

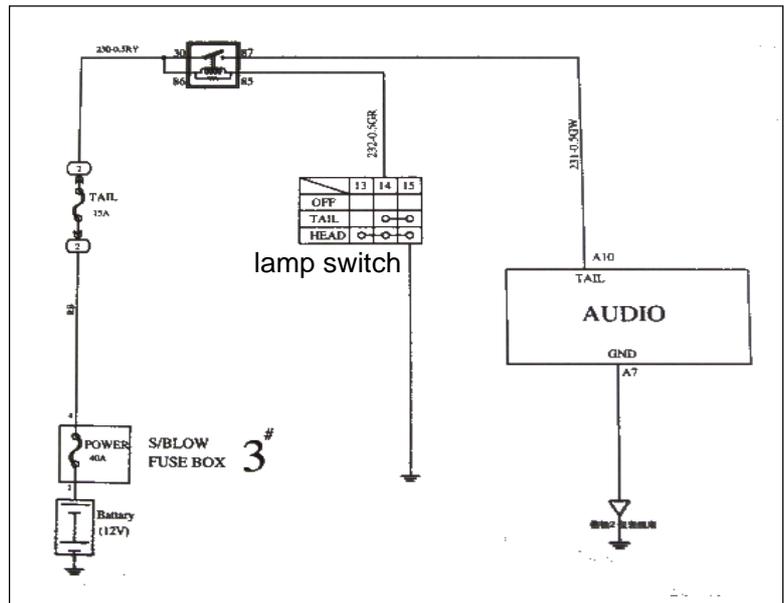
Tester connection	Condition	Standard state
+B and GND	Normal status	10-14V
ACC and GND	Ignition switch is in ACC or ON	10-14V

Abnormal, repair or replace wiring harness, connector

Normal, check and replace radio assembly

2. Turn on light switch, radio backlight does not illuminate

Circuit diagram



(1) Check radio assembly (TAIL)

As shown in the table below, check voltage between terminals in each operating condition.

Standard:

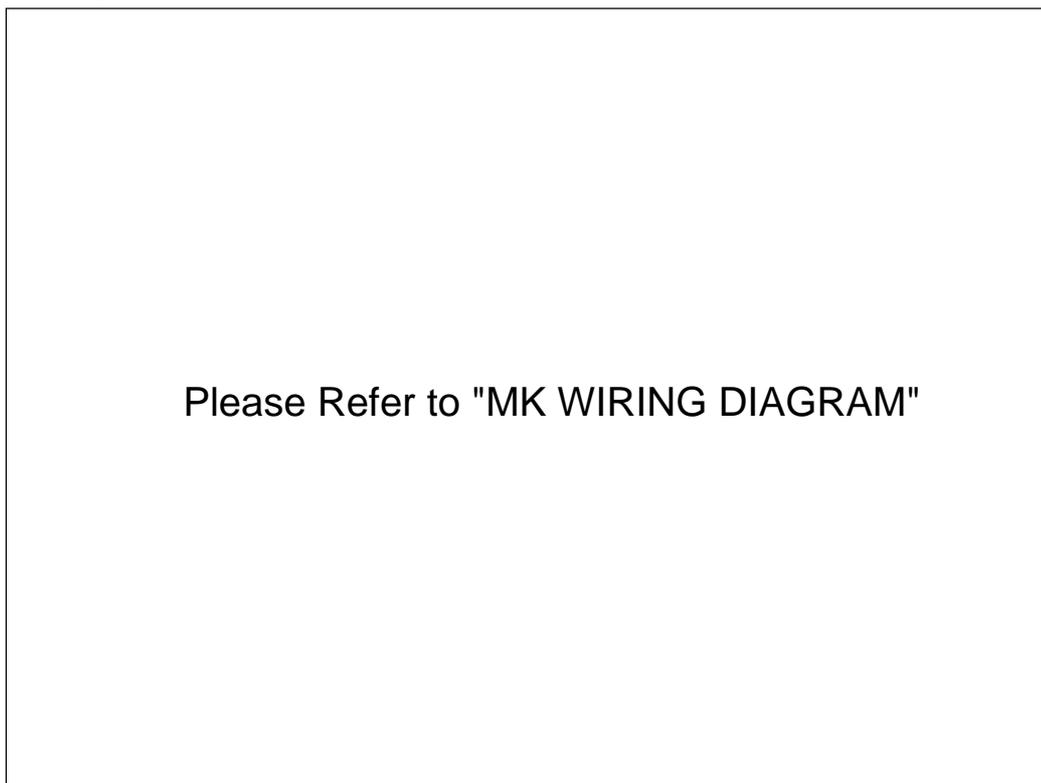
Tester connection	Condition	Standard state
TAIL and GND	Combination switch (light switch)	10-14V

Abnormal, repair or replace wiring harness, connector

Normal, check and replace radio assembly

3. Loudspeakers is silent in all modes

Circuit diagram



## (1) Check LCD Illumination

- a. Turn the ignition switch to ACC
- b. Turn on radio assembly
- c. Turn on the position light

Standard: The LCD indicator of the radio assembly goes on

Abnormal: go to step (7)

Normal: go to the next step

## (2) Control volume and adjust the volume balance

Adjust the volume and its balance of the radio assembly to find out the inaudible speaker.

If all speakers are mute, check and replace the radio assembly

If individual speaker is mute, then respectively check and replace the inaudible speaker.

## (3) Tweeter assembly inspection

- a. Disconnect the speaker connector
- b. Check the resistance

Notice:

Do not remove the speaker during inspection.

Standard Value: 4 ohm

Abnormal: Replace tweeter speaker assembly

Normal: Check wire harness and connector

## (4) Check front speaker assembly

- a. Disconnect speaker connector
- b. Check resistance

Standard Value: 4 ohm

Abnormal: Replace front speaker assembly

Normal: Check wire harness and connector

## (5) Check rear speaker assembly

- a. Disconnect speaker connector
- b. Check resistance

Standard Value: 4 ohm

Abnormal: Replace rear speaker assembly

Normal: Check wire harness and connector

## (6) Check wire harness and connector

Abnormal Repair or replace wire harness and connector

Normal Check and replace radio assembly

## (7) Check and replace radio assembly (+B, ACC, GND)

- a. Check the continuity between terminals under each operating condition as shown in the table below.

Standard:

Tester connection	Condition	Standard Status
GND	Normal	ON

b. Check the voltage between terminals under each operating condition as shown in the table below.

Standard:

Tester Connection	Condition	Standard Status
+B - GND	Normal	10~14V
ACC - GND	Ignition switch ACC or ON	10~14V

Abnormal: Repair or replace wire harness and connector

Normal: Check and replace radio assembly

#### 4. Unable to receive radio broadcast (poor reception)

##### (1) Check if the radio auto-research function works

Perform the radio auto-research function to see if it works

Normal: Check and replace radio assembly

Abnormal: Check the antenna for noise

##### (2) Check the antenna for noise

a. Turn on radio to AM with the ignition switch ACC.

b. Touch the antenna of the seated antenna assembly with the tip of the screwdriver. Check the speaker for noise.

Standard: There is noise

Normal: Check and replace radio assembly

Abnormal: Check antenna assembly

##### (3) Check antenna assembly

a. Remove the antenna plug from the antenna assembly

b. Check for noise

- Connect the radio assembly connector and turn the ignition switch to ACC.

- Turn on the radio to AM

- Insert a flat pan screwdriver or metal object similar to thin wire into the hole in the antenna coaxial cable. Check the speaker for noise.

Standard: There is noise.

Normal: Check and replace radio assembly

Abnormal: Check and replace antenna coaxial cable sub-assembly

#### 5. Cassette tape can not be inserted or played.

##### (1) Check for foreign object

- Check the radio assembly and cassette recorder for foreign object or defect.

Abnormal: Clean foreign object

Normal: Check cassette tape

##### (2) Check cassette tape

- Check if the cassette tape is used to record music or sound.

Replace the tape with another tape and re-check if it is faulty.

(3) Replace it with another tape and re-check

- Replace the faulty tape with working tape to see if the same fault will re-occur.

Standard: The function is normal

Normal: The tape is faulty

Abnormal: Check if the radio auto-research function works

(4) Check if the radio auto-research function works

- Perform the radio auto-research function to see if it works

Standard: The operation works.

Normal: Check and replace radio assembly

Abnormal: Check radio assembly (+B, ACC, GND)

(5) Check the radio assembly (+B, ACC, GND)

- a. Check the continuity between terminals under each operating condition as shown in the table below.

Standard:

Tester connection	Condition	Standard Status
GND	Nomal	ON

- b. Check the voltage between terminals under each operating condition as shown in the table below.

Standard:

Tester Connection	Condition	Standard Status
+B - GND	Nomal	10 ~ 14V
ACC - GND	Ignition switch ACC or ON	10 ~ 14V

Abnormal: Repair or replace wire harness and connector

Normal: Check and replace radio assembly

6. The tape doesn't eject

(1) Press "EJECT" and check the operation

- Press "EJECT" of the radio assembly. Check if the tape ejects.

Standard: The tape is ejected.

Abnormal: Check and replace radio assembly

Normal: Check cassette tape

(2) Check cassette tape

- Check the ejected tape for trademark peeled off or tape box distortion or other issues

Standard: There is nothing wrong with the tape

Abnormal: There is something wrong with the tape

Normal: Replace it with another tape and re-check

(3) Replace it with another tape and re-check.

- Replace the faulty tape with working tape to see if the same fault will re-occur.

Standard: The fault is cleared

Normal: There is something wrong with the tape

Abnormal: Check and replace the recorder assembly

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7. Poor sound quality only when playing tape

(1) Replace it with another tape and re-check

- Replace the faulty tape with working tape to see if the same fault will re-occur.

Standard: The fault is cleared

Normal: There is something wrong with the tape

Abnormal: Check for foreign object

(2) Check for foreign object

- Check the radio assembly and the cassette player for foreign objects or defects.

Abnormal: Clean foreign objects

Normal: Clean the magnet head and check operation

(3) Magnet Head Cleaning

- a. Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
- b. Using a cleaning pen or cotton applicator soaked in cleaner, clean the magnet head surface, pinch rollers and tape press wheel.
- c. Check if the same fault reoccurs.

Normal: The magnet head is dirty

Abnormal: Check and replace radio assembly

8. Tape jammed, malfunction with tape speed or auto-reverse

(1) Check for foreign objects

- Check the radio assembly and tape player for foreign objects and defects

Standard: No foreign objects or defects

Abnormal: Clean foreign objects

Normal: Replace it with another tape and re-check

(2) Replace it with another tape and re-check

- Replace the faulty tape with working tape (less than 90min) to see if the same fault will re-occur.

Standard: The fault is cleared.

Normal: There is something wrong with the tape

Abnormal: Clean the head

(3) Clean the magnet head

- a. Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
- b. Using a cleaning pen or cotton applicator soaked in cleaner, clean the magnet head surface, pinch rollers and capstans.
- c. Check whether the same fault re-occurs.

Normal: The magnet head is dirty

Abnormal: Check and replace radio assembly

## 9. The CD box can not eject after inserted

## (1) Check if the CD box power supply is NORMAL

- a. Turn the ignition switch to ACC
- b. Check the continuity between the CD box terminals under each operating condition as shown in the table below

Standard:

Tester connection	Condition	Standard Status
GND	Nomal	ON

- c. Check the voltage between terminals under each operating condition as shown in the table below.

Standard:

Tester Connection	Condition	Standard Status
+B - GND	Nomal	10~14V
ACC - GND	Ignition switch ACC or ON	10~14V

Normal: Replace CD, DVD box

Abnormal: Check if the head unit side C socket voltage output is NORMAL

## (2) Check if the head unit side C socket voltage output is NORMAL \_

- a. Turn the ignition switch to ACC
- b. Check the continuity between the magnet head unit C socket terminals under each operating condition as shown in the table below

Standard:

Tester connection	Condition	Standard Status
GND	Nomal	ON

- c. Check the voltage between terminals under each operating condition as shown in the table below.

Standard:

Tester Connection	Condition	Standard Status
+B - GND	Nomal	10 ~ 14V
ACC - GND	Ignition switch ACC or ON	10 ~ 14V

Normal: Replace the signal wire connecting magnet head unit and CD box

Abnormal: Check the radio assembly (+B, ACC, GND)

## (3) Check the radio assembly (+B, ACC, GND)

- a. Check the continuity between terminals under each operating condition as shown in the table below.

Standard:

Tester connection	Condition	Standard Status
GND	Nomal	ON

b. Check the voltage between terminals under each operating condition as shown in the table below.

Standard:

Tester Connection	Condition	Standard Status
+B - GND	Normal	10~14V
ACC - GND	Ignition switch ACC or ON	10~14V

Abnormal: Repair or replace wire harness and connector

Normal: Check and replace radio assembly

10. Power coming in, but CD player doesn't work.

(1) Press CD player OPEN to see if CD ejects.

No: CD does not eject for inspection after being inserted

Yes: Check if the right CD is inserted

(2) Check if the proper CD is inserted

a. Check if the proper CD is inserted

b. Make sure the working CD is music and it is not distorted, cracked, dirty, scratched or defected.

Standard: Working music CD

Description:

Semi-transparent CD or CD of strange shape can not be played.

Music CD recorded in PC CD-ROM and recorded CD-R can not be played.

Adapter is not needed to play 8cm CD.

Abnormal: There is something wrong with CD

Normal: Check and insert a proper CD

(3) Check and insert a proper CD

a. Check and insert a proper CD

b. Check if CD is installed in reverse order.

Standard: Not installed in reverse order

Abnormal: Install the disc correctly

Normal: Clean the disc

(4) Clean the CD

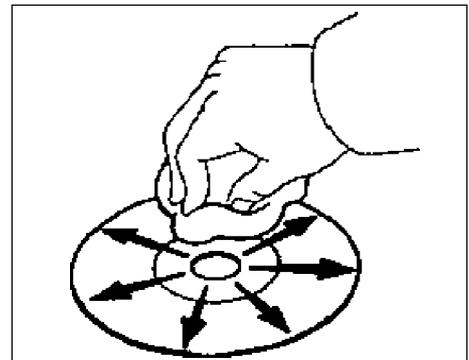
● If the CD is dirty, use soft cloth to wipe the CD surface in the arrow direction.

Notice:

Do not use cleanser for normal radio or anti-static-electricity repellent to clean the CD.

Normal: Dirty CD

Abnormal: Replace it with another CD and recheck it



(5) Replace it with another CD and re-check.

- Replace the faulty CD with working CD to see if the same fault re-occurs.

Standard: The fault is cleared

Abnormal: There is something wrong with CD

Normal: Check if the radio auto-research function works

(6) Check if the radio auto-research function works

- Perform the radio auto-research function

Standard: The fault is cleared.

Abnormal: Go to Step (9)

Normal: Has sudden temperature change occurred inside vehicle?

(7) Has sudden temperature change occurred inside vehicle

- Check if sudden temperature change has occurred inside vehicle

Standard: Sudden temperature change has occurred inside vehicle.

Description:

Formulation of dew condensation inside the CD player is due to temperature changes. CD may not play.

Abnormal: For mulation of dew condensation due to temperature changes (Leave it for a while before using it)

Normal: Check the signal wire between the radio and disc box

(8) Check the signal wire for short circuit or open circuit.

Yes Replace the signal wire

No Replace the disc box

(9) Replace the disc box

Standard: The faulty is cleared

Normal: Box faulty

Abnormal: Check the radio assembly (+B, ACC, GND)

(10) Check the radio assembly (+B, ACC, GND)

- Check the continuity between terminals under each operating condition as shown in the table below.

Standard:

Tester connection	Condition	Standard Status
GND	Nomal	ON

- Check the voltage between terminals under each operating condition as shown in the table below

Standard:

Tester Connection	Condition	Standard Status
+B - GND	Nomal	10~14V
ACC - GND	Ignition switch ACC or ON	10~14V

Abnormal: Repair or replace wire harness and connector

Normal: Check and replace radio assembly

11. Sound quality poor only when playing CD (Volume faint)

(1) Replace it with another CD and re-check

Normal: CD failure

Abnormal: Replace the disc box

(2) Replace the disc box

Normal: Box damaged

Abnormal: Check and replace radio assembly

## 12. CD sound jump

(1) Disc cleaning

- If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

Notice:

Do not use a conventional record cleaner or anti--static preservative.

Standard: The fault is cleared.

Normal: The disc is dirty

Abnormal: Replace it with another CD and re-check.

(2) Replace it with another CD and re-check. Standard: The fault is cleared.

Normal: CD failure

Abnormal: Check when it will happen

(3) Check when it will happen

- Check where sound jump will happen Standard: Drive on bumpy road

Normal: Replace CD box

Abnormal: Compare with other vehicles of the same model

(4) Compare with other vehicles of the same model

- Compare with other vehicles of the same model of no fault. Check for any difference when faulty occurs.

Standard: No difference is found.

Normal: Make sure there is no difference

Abnormal: Check CD box installation

(5) Check CD box installation

- Check CD box installation

Standard: Installation correct

Abnormal: Install CD box correctly

Normal: Has sudden temperature change occurs inside the disk cabin?

(6) Has sudden temperature change occurs inside the disk cabin?

- Check if sudden temperature change occurs inside the disk cabin?

Standard: Sudden temperature change occurs inside the disk cabin.

Description: Formulation of dew condensation inside the CD player is due to temperature changes. CD may not play.

Normal: Formulation of dew condensation due to temperature changes (Leave it for a while before using it)

Abnormal: Check and replace CD box

## Section 4 Audio System Replacement

### I. Notice on operation

Please explain to the customer that the AM/FM broadcast channel information will be cleared when removing the battery negative terminal cable. Record the channel information before removing the negative terminal cable if necessary. Reset after connecting the negative terminal cable.

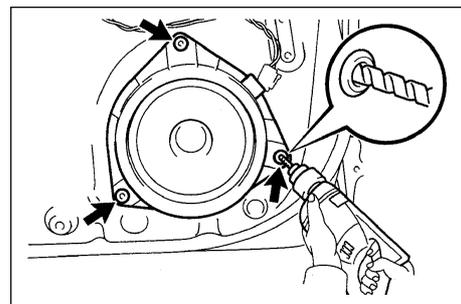
- All cassette tapes and CDs must be taken out before radio removal and installation.
- If the cassette tapes and CDs can not be taken out due to radio fault. Do not take them out by force. Drive the vehicle to Service Station.
- Make sure the grounding bolts are tightened before antenna removal and installation.
- There will be noise when receiving electric wave if the grounding bolts are not tightened.
- Don't touch the speaker cone.

### II. Radio assembly

1. Remove middle instrument board (see internal decorations)
2. Remove radio with bracket assembly
  - a. Remove four screws
  - b. Disconnect connector
3. Remove left bracket
  - a. Remove four screws
4. Remove right bracket
  - a. Remove four screws
5. Remove radio assembly

### III. Front loudspeaker assembly

1. Remove door handhold
2. Remove front door electric pivoted window switch assembly
3. Remove front door decorative internal plate assembly
4. Remove front door 5 inch loudspeaker assembly
  - a. Disconnect connector
  - b. Avert 3 rivets using a bit less than 4 mm (place bit in center of rivet to bore out flange, be careful that newly cut rivet is hot), take down loudspeaker assembly.

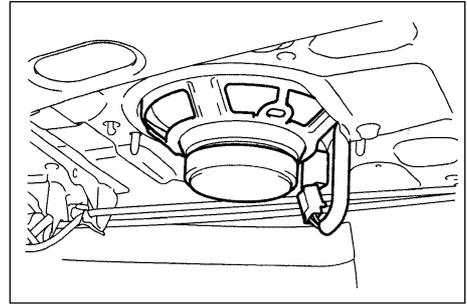


### IV. Tweeter assembly

1. Remove door handhold
2. Remove front door electric pivoted window switch assembly
3. Remove front door decorative internal plate assembly
4. Remove front door tweeter assembly
  - a. Disconnect connector
  - b. Remove two tapping screws and speaker assembly

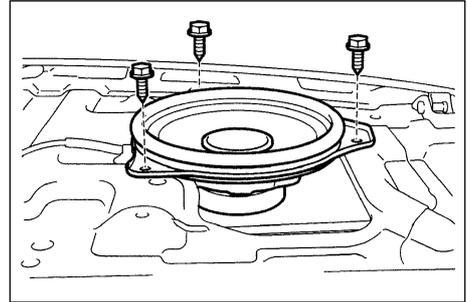
## V. Rear loudspeaker assembly

1. Remove rear loudspeaker shelf
2. Remove rear loudspeaker assembly
  - a. Disconnect connector
  - b. Remove three tapping screws and loudspeaker assembly



## VI. Remove antenna conductor (Retractable antenna)

1. Remove vehicle ceiling internal decorations
2. Remove A column decorative board
3. Disconnect connector
4. Remove instrument desk
5. Remove wire clip and antenna conductor



## VII. Multi-disc Exchanger

1. Remove left trunk internal decorations
2. Disconnect connector
3. Remove four bolts and exvhanger

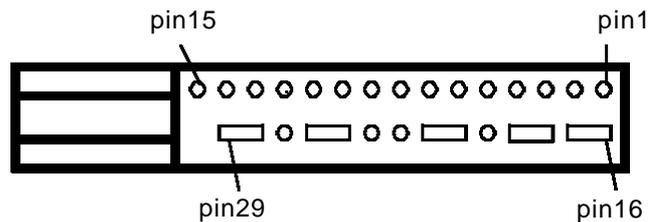
# Chapter 6 SRS (Supplemental Restraint System)

## Section 1 SRS-General Information

### I. Precaution for service

For safe reasons, read the following precaution before starting any operation.

1. When servicing the SRS, correct sequence and items are described in the following chapter.
2. Instruments and special tools recommended in this chapter shall be used for operation.
3. When servicing the following components, replace them with the new ones if there is a failure.
  - (1) SRS ECU
  - (2) Clock Spring Module
  - (3) Driver Airbag Module
  - (4) Passenger Airbag Assembly
  - (5) Front Seat Belt Pretensioner
4. If there is any abnormality in the wire harness of the SRS, replace it with a new one. Correct or replace the abnormal wire harness in accordance with Table 1.



#### ECU Terminal Description

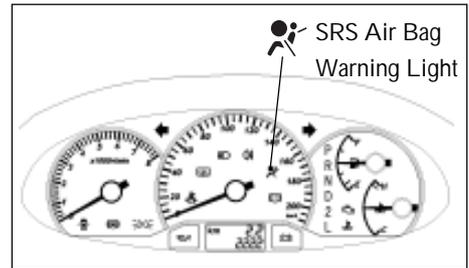
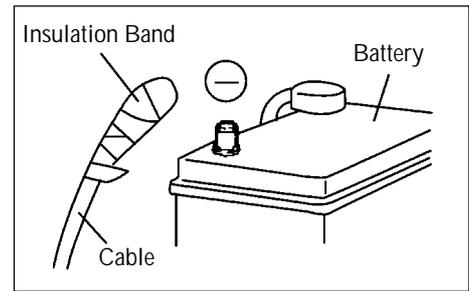
No	Designation
1	Belt-pretensioner, Driver, Low
2	Belt-pretensioner, Driver, High
3	Belt-pretensioner, Passenger, High
4	Belt-pretensioner, Passenger, Low
5	IGN
6	GND
7	W L
9	K
10	DAB Hi
11	DAB Lo
13 (Optional)	PAB Hi
14 (Optional)	PAB Lo
27	Crash Output

5. Servicing operation shall be carried out 60s after the negative(-) terminal cable is disconnected from the battery. In addition, the disconnected negative (-) terminal cable shall be protected with insulating tape for insulation. In

order to deploy an airbag within a certain time period after the battery is disconnected, condenser in the ECU shall retain some electrical energy. Otherwise, it could lead to a serious accident because of the unexpected deployment of airbag.

6. During spray paint work, ECU, airbag assembly, clock spring assembly, etc shall be removed and kept in place to avoid the effects of overheat. (Over 93)

7. When the SRS is serviced, a diagnostic scan meter is used to clear the DTC to enable the normal work of the warning light.



## II. Test instrument

Instrument	Designation	Usage
	Diagnostic detector (Hi-DS T Scan meter) Special diagnostic meter	Check system troubles of the SRS, and clear the DTC of ECU

## III. Troubleshooting

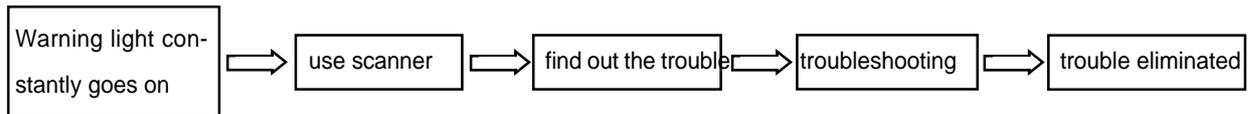
1. Basic process of trouble diagnosis

- DTC of the present fault may coexist with that of the history fault.

Notice:

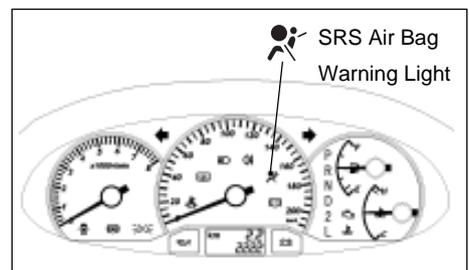
● After the new SRS ECU is installed, the warning light of the SRS, with the ignition switch ON, will be on for 4s and then go out permanently, indicating SRS works normal. In this case, no service is needed. Otherwise, system diagnosis and service shall be carried out.

● If with the ignition switch ON, the warning light of the SRS is not on, the relevant circuits of the warning light shall be serviced. Then go on with the operation and enable it to work.



Check SRS warning light (see the right figure)

- (1) Turn the ignition switch ON and find out whether the warning light is on.
- (2) 4 seconds after the process of ON-OFF, confirm that the warning light goes out permanently.
- (3) Otherwise, diagnosis and checking have to be involved in.



2. System Diagnosis

The SRS ECU will perform a series of circular diagnostic tests to check the readiness of the SRS functions. This test can avoid unexpected explosion of the restrain system and in the same time ensure the necessary explosion in a crash. If a trouble is detected, the SRS ECU will store a proper DTC and turn on the warning light indicating a trouble for service.

### 3. Trouble Identification

#### Trouble Record (DTC storage)

Each DTC consists of two bytes, indicating current problem or occurred problem. 93CX or 93DX indicates current problem while 938X or 939X indicates occurred problem. Current problem can not be cancelled, even if it is cancelled at that time, it will reoccur after initialization or a cycle of self-check. You have to make analysis on the causes and perform troubleshooting.

The DTC is transmitted by the diagnostic scan tool instructed by ECU through the serial data interface of the program.

No.	Problem Description	DTC Code
1	There are problems in the Airbag ECU	93C1
2	The power supply voltage of the Airbag ECU is too high	93C2
3	The power supply voltage of the Airbag ECU is too low	93C3
4	The drive side airbag module resistance is too high	93C4
5	The drive side airbag module resistance is too low	93C5
6	The drive side airbag module is short to ground	93C6
7	The drive side airbag module is short to power supply	93C7
8	The passenger side airbag module resistance is too high	93C8
9	The passenger side airbag module resistance is too low	93C9
10	The passenger side airbag module is short to ground	93CA
11	The passenger side airbag module is short to power supply	93CB
12	The driver side pretensioner seat belt resistance is too high	93CC
13	The driver side pretensioner seat belt resistance is too low	93CD
14	The driver side pretensioner seat belt resistance is short to ground	93CE
15	The driver side pretensioner seat belt resistance is short to power supply	93CF
16	The passenger side pretensioner seat belt resistance is too high	93D0
17	The passenger side pretensioner seat belt resistance is too low	93D1
18	The passenger side pretensioner seat belt resistance is short to ground	93D2
19	The passenger side pretensioner seat belt resistance is short to power supply	93D3
20	Airbag ECU warning light is short to ground or warning light wire harness is disconnected	93D4
21	Airbag ECU warning light is short to power supply	93D5
22	There are problems in the configuration of the airbag ECU	93D6
23	The impact signal output interface of the airbag ECU is short to ground or the impact output circuit is disconnected.	93D7

(1) The airbag controller has internal problem (DTC 93C1): when using diagnostic scan tool to test the airbag controller, if the DTC code is 93C1, it indicates that there are problems in the controller.

Step	Operation	Yes	No
1	When using the scan tool to test the controller, is the DTC 93C1?	Go to step 2	other
2	Use new controller to replace faulty controller	Go to step 3	
3	After the ignition switch is closed, the warning light shall goes off.	Go to step 4	Go to step 1
4	The fault has been removed, use the scan tool to eliminate the DTC.		

## (2) The power supply voltage is too high (DTC 93C2)

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C2?	Go to step 2	other
2	Shut off the power supply, check whether the power supply voltage is high?	Go to step 4	Go to step 3
3	Check the connection of the airbag ECU power supply wire harness.	Go to step 4	
4	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 5	Go to step 1
5	The fault has been removed, use the scan tool to eliminate the DTC.		

When using the scan tool to test the airbag ECU, the DTC is 93C2, indicating that the airbag ECU power supply voltage is too high, the voltage is higher than 18V.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C3?	Go to step 2	other
2	Shut off the power supply, check whether the power supply voltage is low?	Go to step 4	Go to step 3
3	Analyze the causes of low power supply voltage, check whether the power supply of the airbag ECU is low? (check the connection of the wire harness)	Go to step 4	
4	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 5	Go to step 1
5	The fault has been removed, use the scan tool to eliminate the DTC.		

## (3) The power supply voltage is too low (DTC 93C3)

When using the scan tool to test the airbag ECU, the DTC is 93C3, indicating that the airbag ECU power supply voltage is too low, the voltage is lower than 8.5V.

## (4) The drive side airbag module resistance is too high (DTC 93C4)

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C4?	Go to step 2	other
2	Shut off the power supply, check whether the connector of the airbag controller is well plugged (whether the wire harness connector is in good condition)?	Go to step 3	Go to step 6
3	Disconnect the battery negative cable for 30 seconds, check whether the driver side front airbag module is well connected? Whether the clock spring is well connected? (whether the wire harness connector is in good condition)	Go to step 4	Go to step 6
4	Whether the driver side front airbag module resistance is ok?	Go to step 5	Go to step 6
5	Whether the clock spring is ok?		Go to step 6
6	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 7	Go to step 1
7	The fault has been removed, use the scan tool to eliminate the DTC.		

When using the scan tool to test the airbag ECU, the DTC is 93C4, indicating that the driver side front airbag module resistance is too high, the resistance is higher than 7.0 ohm.

(5) The drive side airbag module resistance is too low (DTC 93C5)

When using the scan tool to test the airbag ECU, the DTC is 93C5, indicating that the driver side airbag module resistance is too low, the resistance is lower than 2.1 ohm.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C5?	Go to step 2	other
2	Shut off the power supply, check whether the connector of the airbag controller is well plugged (whether the wire harness connector is in good condition)?	Go to step 3	Go to step 6
3	Disconnect the battery negative cable for 30 seconds, check whether the driver side front airbag module is well connected? Whether the clock spring is well connected? (whether the wire harness connector is in good condition)	Go to step 4	Go to step 6
4	Whether the driver side airbag module resistance is ok?	Go to step 5	Go to step 6
5	Whether the clock spring is ok?		Go to step 6
6	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 7	Go to step 1
7	The fault has been removed, use the scan tool to eliminate the DTC.		

(6) The drive side airbag module is short to ground (DTC 93C6)

When using the scan tool to test the airbag ECU, the DTC is 93C6, indicating that the driver side airbag module is short to ground, the resistance is lower than 6.5K ohm.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C6?	Go to step 2	other
2	Shut off the power supply, check whether the connector wire harness of the airbag ECU is in good condition?	Go to step 3	Go to step 5
3	Disconnect the battery negative cable for 60 seconds, check whether the connector wire harness of driver side airbag module is in good condition?	Go to step 4	Go to step 5
4	Whether the clock spring is ok?		Go to step 5
5	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 6	Go to step 1
6	The fault has been removed, use the scan tool to eliminate the DTC.		

(7) The drive side airbag module is short to power supply (DTC 93C7)

When using the scan tool to test the airbag ECU, the DTC is 93C7, indicating that the driver side airbag module is short to power supply, the resistance is lower than 21K ohm.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C7?	Go to step 2	other
2	Shut off the power supply, check whether the connector wire harness of the airbag ECU is in good condition?	Go to step 3	Go to step 5
3	Disconnect the battery negative cable for 30 seconds, check whether the connector wire harness of driver side airbag module is in good condition?	Go to step 4	Go to step 5
4	Whether the clock spring is ok?		Go to step 5
5	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 6	Go to step 1
6	The fault has been removed, use the scan tool to eliminate the DTC.		

(8) The passenger side airbag module resistance is too high (DTC 93C8)

When using the scan tool to test the airbag ECU, the DTC is 93C8, indicating that the passenger side airbag module resistance is too high, the resistance is higher than 4.5 ohm.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C8?	Go to step 2	other
2	Shut off the power supply, check whether the connector of the airbag ECU is well plugged (whether the wire harness connector is in good condition)?	Go to step 3	Go to step 5
3	Disconnect the battery negative cable for 30 seconds, check whether the passenger side airbag module is well connected? (whether the wire harness connector is in good condition)	Go to step 4	Go to step 5
4	Whether the passenger side airbag module resistance is ok?		Go to step 5
5	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 6	Go to step 1
6	The fault has been removed, use the scan tool to eliminate the DTC.		

(9) The passenger side airbag module resistance is too low

When using the scan tool to test the airbag ECU, the DTC is 93C9, indicating that the passenger side airbag module resistance is too low, the resistance is lower than 1.2 ohm.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93C9?	Go to step 2	other
2	Shut off the power supply, check whether the connector of the airbag ECU is well plugged (whether the wire harness connector is in good condition)?	Go to step 3	Go to step 5
3	Disconnect the battery negative cable for 30 seconds, check whether the passenger side airbag module is well connected? (whether the wire harness connector is in good condition)	Go to step 4	Go to step 5
4	Whether the passenger side airbag module resistance is ok?		Go to step 5
5	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 6	Go to step 1
6	The fault has been removed, use the scan tool to eliminate the DTC.		

(10) The passenger side airbag module is short to ground

When using the scan tool to test the airbag ECU, the DTC is 93CA, indicating that the passenger side airbag module is short to ground, the resistance is lower than 6.5K ohm.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93CA?	Go to step 2	other
2	Shut off the power supply, check whether the connector wire harness of the airbag ECU is in good condition?	Go to step 3	Go to step 5
3	Disconnect the battery negative cable for 30 seconds, check whether the connector wire harness of passenger side airbag module is in good condition?	Go to step 4	Go to step 5
4	Whether the passenger side airbag module resistance is ok?		Go to step 5
5	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 6	Go to step 1
6	The fault has been removed, use the scan tool to eliminate the DTC.		

(11) The passenger side airbag module is short to power supply (DTC 93CB)

When using the scan tool to test the airbag ECU, the DTC is 93CB, indicating that the passenger side airbag module is short to power supply, the resistance is lower than 21K ohm.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93CB?	Go to step 2	other
2	Shut off the power supply, check whether the connector wire harness of the airbag ECU is in good condition?	Go to step 3	Go to step 4
3	Disconnect the battery negative cable for 30 seconds, check whether the connector wire harness of passenger side airbag module is in good condition?		Go to step 4
4	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 5	Go to step 1
5	The fault has been removed, use the scan tool to eliminate the DTC.		

(12) The driver side pretensioner seat belt resistance is too high (DTC 93CC)

When using the scan tool to test the airbag ECU, the DTC is 93CC, indicating that the driver side pretensioner seat belt resistance is too high, the resistance is higher than 4.5 ohm.

(13) The driver side pretensioner seat belt resistance is too low (DTC 93CD)

When using the scan tool to test the airbag ECU, the DTC is 93CD, indicating that the driver side pretensioner seat belt resistance is too low, the resistance is lower than 1.2 ohm.

(14) The driver side pretensioner seat belt resistance is short to ground (DTC 93CE)

When using the scan tool to test the airbag ECU, the DTC is 93CE, indicating that the driver side pretensioner seat belt is short to ground, the resistance is lower than 6.5K ohm.

(15) The driver side pretensioner seat belt resistance is short to power supply (DTC 93CF)

When using the scan tool to test the airbag ECU, the DTC is 93CF, indicating that the driver side pretensioner seat belt is short to power supply, the resistance is lower than 21K ohm.

(16) The passenger side pretensioner seat belt resistance is too high (DTC 93D0)

When using the scan tool to test the airbag ECU, the DTC is 93D0, indicating that the passenger side pretensioner seat belt resistance is too high, the resistance is higher than 4.5 ohm.

(17) The passenger side pretensioner seat belt resistance is too low (DTC 93D1)

When using the scan tool to test the airbag ECU, the DTC is 93D1, indicating that the passenger side pretensioner seat belt resistance is too low, the resistance is lower than 1.2 ohm.

(18) The passenger side pretensioner seat belt resistance is short to ground (DTC 93D2)

When using the scan tool to test the airbag ECU, the DTC is 93D2, indicating that the passenger side pretensioner seat belt is short to ground, the resistance is lower than 6.5K ohm.

(19) The passenger side pretensioner seat belt resistance is short to power supply (DTC 93D3)

When using the scan tool to test the airbag ECU, the DTC is 93D3, indicating that the passenger side pretensioner seat belt is short to power supply, the resistance is lower than 21K ohm.

(20) Airbag ECU warning light is short to ground or warning light wire harness is disconnected (DTC 93D4)

When using the scan tool to test the airbag ECU, the DTC is 93D4, indicating that the airbag ECU warning light is short to ground or the warning light wire harness is disconnected.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93D4?	Go to step 2	other
2	Shut off the power supply, check whether the airbag ECU wire harness connection is ok? (is there any short)	Go to step 3	Go to step 5
3	Check the connector of the warning light on airbag ECU wire harness (is there any short)?	Go to step 4	Go to step 5
4	Check the LED and wire harness for connection.		Go to step 5
5	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 6	Go to step 1
6	The fault has been removed, use the scan tool to eliminate the DTC.		

(21) Airbag ECU warning light is short to power supply (DTC 93D5)

When using the scan tool to test the airbag ECU, the DTC is 93D5, indicating that the airbag ECU warning light is short to power supply.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93D5?	Go to step 2	other
2	Shut off the power supply, check whether the airbag ECU wire harness connection is ok? (is there any short)	Go to step 3	Go to step 5
3	Check the connector of the warning light on airbag ECU wire harness (is there any short)?	Go to step 4	Go to step 5
4	Check the LED and wire harness for connection.		Go to step 5
5	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall goes off after lighting up for 4 seconds (self-check).	Go to step 6	Go to step 1
6	The fault has been removed, use the scan tool to eliminate the DTC.		

(22) There are problems in the configuration of the airbag ECU (DTC 93D6)

When using the scan tool to test the airbag ECU, the DTC is 93D6, indicating that there are problems in the configuration of the airbag ECU.

Step	Operation	Yes	No
1	When using the scan tool to test the airbag ECU, is the DTC 93D6?	Go to step 2	other
2	Check whether the configuration of the airbag ECU is consistent with the actual on-board configuration?		Go to step 3
3	After the troubleshooting, switch on the power supply, observe the status of the warning light. The warning light shall go off after lighting up for 4 seconds (self-check).	Go to step 4	Go to step 1
4	The fault has been removed, use the scan tool to eliminate the DTC.		

(23) The impact signal output interface of the airbag ECU is short to ground or the impact output circuit is disconnected. (DTC 93D7)

When using the scan tool to test the airbag ECU, the DTC is 93D7, indicating that the impact signal output interface of the airbag ECU is short to ground or the impact output circuit is disconnected.

#### IV. Diagnosis of collided vehicle

No matter airbag is unfolded or folded, inspection and maintenance of collided vehicle should be performed according to the following sequence.

##### 1. Check ECU diagnosis signal.

- (1) Connect scanner diagnosis joint
- (2) Use scanner to read out diagnosis result.

##### 2. Repair sequence

- (1) when airbag is unfolded.

The following components should be replaced with new parts

- a. Airbag assembly on passenger side
- b. ECU
- c. Airbag assembly on driver side
- d. Seat belt with pretensioner

##### Note:

due to impact, when battery power is insufficient, scanner can not communicate with ECU, now check and service instrument board wire harness or use external power supply.

- (2) Check the following components, if there is any abnormality, replace with new parts

- a. Clock spring.
- b. Steering wheel, steering column, lower steering shaft assembly

- (3) The installation status of driver airbag assembly in relation to steering wheel

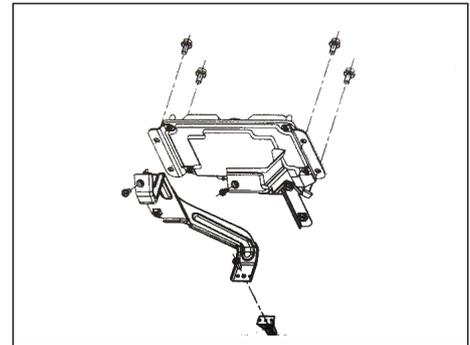
- a. Check and see if there is abnormal noise in the steering wheel, the action of the same is good, or the clearance is normal.
- b. Check the connector of the wire harness for damage and the terminal for distortion.

Notice

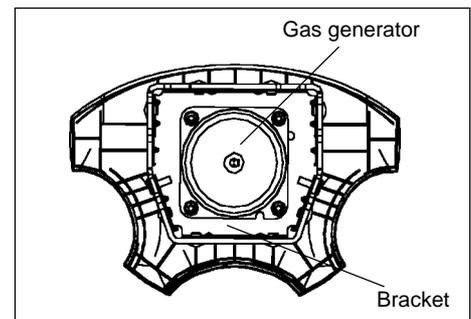
1. Work must be started 60s after the negative (-) terminal cable is disconnected from battery. The disconnected negative (-) terminal cable shall be protected with insulating tape for insulation.
2. Airbag assembly and clock spring shall not be removed or repaired. They shall be replaced if there is any trouble.
3. Pay enough attention to airbag assembly and clock spring when using, avoiding dropping them onto the ground or into water or oil. In addition, if there is any pitting, crack or distortion on them, replace with new ones.
4. When an airbag is deployed, the deployed surface should face up. It should be kept on a flat surface without any other items on it.
5. Don't keep an airbag in a place where the temperature is higher than 85° C.
6. When an airbag is deployed, it shall be replaced with a new one; simultaneously, check the clock spring, and replace it with a new one if found abnormal.
7. When deal with the deployed airbag, gloves and protective glasses are to be used.
8. When scrapping the undeployed airbag, it shall be discarded after being deployed.

3. ECU

- (1) Check the brackets of the ECU Case for recess, crack, distortion, etc.
- (2) Check the union joint for damage and terminal for distortion.
- (3) Check the installation status of the ECU brackets
- (4) Check the installation status of the airbag assembly.

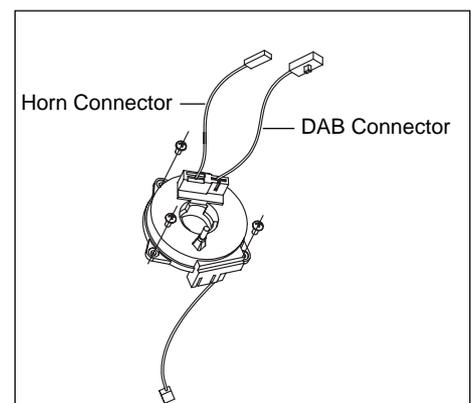


4. Driver airbag assembly (see the figure right above)



5. Clock spring (see the figure on the right)

- (1) Check the connector and protecting tube for damage and the terminal for distortion.
- (2) Check the case for distortion.



## 6. Steering wheel, steering column and steering lower shaft component.

- (1) Check the installation status of driver airbag assembly.
- (2) Check the steering wheel for any abnormal noise and see if the clearance is normal.

## 7. Check the wire harness connector (instrument panel wire harness).

Check and see if the wire harness is securely installed, if the joint is damaged and if the terminal is distorted.

## V. Warning marks

When using or maintaining an airbag, the warnings shall be indicated. When maintaining, proceed in accordance with the description of mark. In addition, if the mark is damaged or stained, it shall be replaced.

- (1) Steering wheel, see Fig. 1.
- (2) Driver airbag assembly, see Fig. 2.
- (3) Clock spring, see Fig. 3.

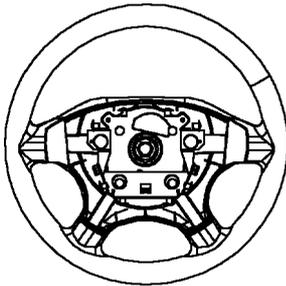


Fig. 1.

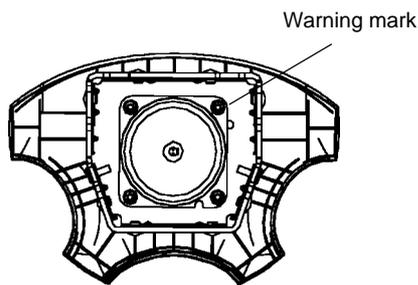


Fig. 2.

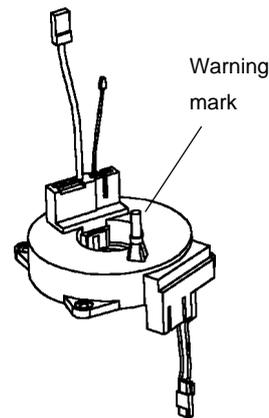


Fig. 3.

- (4) ECU, see Fig. 4.
- (5) Sunshade, see Fig. 5.

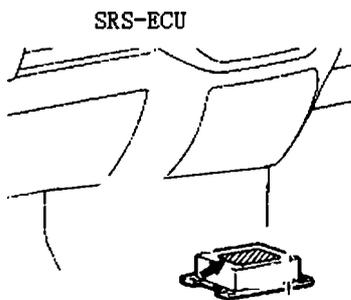


Fig. 4.

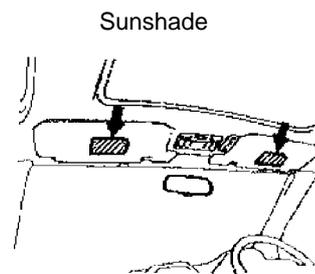


Fig. 5.

## VI. SRS electronic control unit (ECU)

### Removal and Installation

#### 1. Operations prior to Removal

- (1) Turn the ignition switch OFF.
- (2) Remove negative (-) terminal cable of the battery. Put it in a proper position or wrap it up with insulating tape.

## 2. Removal procedures:

- (1) Remove the miscellaneous box in the middle console.
- (2) Remove the connectors to SRS ECU.
- (3) Remove ECU.

## 3. Installation procedures:

- (1) Install ECU.
- (2) Install the connectors to SRS ECU.
- (3) Install the miscellaneous box in the middle console.
- (4) Connect negative (-) terminal cable of the battery.

## 4. Key points for Installation:

- (1) Install ECU.

## Notice

If the ECU cannot be installed correctly, the airbag will not act normally.

## Notice

1. Work must be started 60s after the negative (-) terminal cable is detached from battery. The detached negative (-) terminal cable shall be protected with insulating tape for insulation.
2. Never attempt to dismantle or repair an ECU. If there is any trouble, replace the ECU with a new one.
3. Prevent the ECU from shock or vibration. If pitting, crack or distortion is found, replace the ECU with a new one.
4. Every time an airbag is deployed, the ECU shall be replaced with a new one.
5. When disassembling or maintaining the parts around ECU, attention must be given to avoid contacting the ECU.

## (2) Check after installation.

- a. Turn the ignition switch ON.
- b. The warning light goes on within 4s, and then goes out.

## (3) If the light doesn't go out, check the trouble and eliminate it.

## 5. Check

- a. ECU case for pitting, crack and distortion
- b. The connector for damage and distortion.

## Notice

If pitting, crack or distortion is found on an ECU, replace it with a new one.

For other ECU inspections, see Troubleshooting.

## VII. Airbag assembly &amp; clock spring

## 1. Removal and Installation of driver airbag and clock spring

## Operations prior to removal

(1) Take out the ignition key after the steering wheel and front wheel are adjusted to straightforward direction.

(2) Remove negative (-) terminal cable from the battery.

## Removal procedures of the driver airbag assembly:

- (1) Unscrew the screws of the two sides, see fig.1

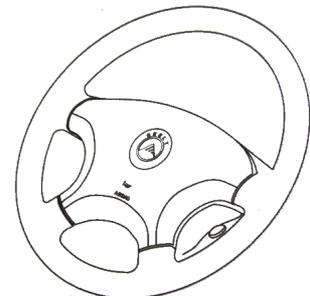


fig.1

- (2) Disconnect the connector of the wire harness.
- (3) Remove the components of airbag assembly.
- (4) Remove steering wheel.

Removal procedures of clock spring:

- (1) Remove the driver airbag assembly (disconnect the connector).
- (2) Remove steering wheel gently (see the precaution).
- (3) Remove the steering column cover and disconnect the connector of wire harness in the lower end.
- (4) Remove clock spring.

Installation procedures of the driver airbag assembly

- (1) Pre-Check
  - 1- Install steering wheel
  - 2- Connect the wire harness
  - 3- Install driver airbag assembly
  - 4- Screw up the installation screws of the two sides
- (2) Connection of the negative (-) terminal of the battery
- (3) Check after installation.

Installation procedures of clock spring:

- (1) Pre-Check
  - 1- Connection and fixation of the clock spring and combination switch
  - 2- the connector of wire harness in the lower end
  - 3- the steering column cover
  - 4-Thread the line at the upper end of the clock spring through hole on the body part of the steering wheel
  - 5-Install the steering wheel
  - 6-Connect wiring harness
  - 7-Install the airbag assembly components
- (2) Connect the negative (-) terminal cable of the battery
- (3) Check after installation

Removal of steering wheel (see the figure 2)

- (1) Remove the installation screws from the middle and remove the steering wheel.(Disconnect the horn connector)

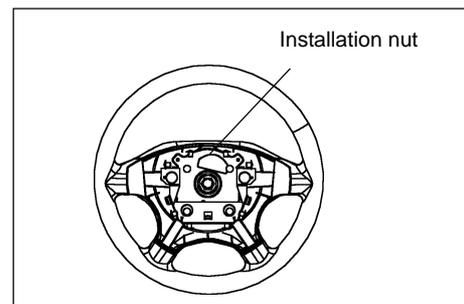


fig.2

**Notice**

Use scanner to do adiagnossis of airbag circnit, not to break down.  
Keep the removed driver airbag assembly upside down in a clean and dry place.

**Notice**

Keep the removed clock sprint in a clean and dry place.

Key points for installation

- (1)Pre-Check
  - a. The new airbag or clock spring shall be checked before being installed.

**Notice**

In case of scrapping an airbag, it shall be noted that the airbag shall be deployed according to the specified procedures before being scrapped.

- b. Connect negative (-) terminal cable of the battery.
- c. Connect the diagnostic connector (16 pins).

**Notice**

When connecting or disconnecting the turn the ignition switch OFF first.

- d. Turn the ignition switch ON.
- e. Read the diagnostic circuit and see if the other locations than the troubled area of the airbag are normal.
- f. Turn the ignition switch OFF.
- g. Remove the negative (-) terminal cable from the battery, and protect it with insulating tape for insulation.

**Notice**

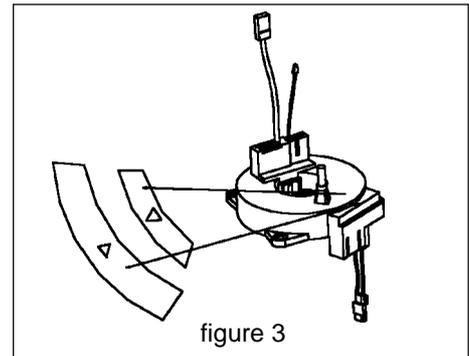
Work must be started 60s after the negative (-) terminal cable is disconnected from battery.

**(2) Installation of clock spring**

Screw up the clock spring clockwise to the end, rotate it counter-clockwise by 2.5 turns, and align it with the mark (see the figure 3).

**Notice**

If the center of the clock spring cannot be aligned, the steering wheel will not turn midway, or cause bad performance to the clock spring circuit, consequently hamper the normal action of the airbag.

**(3) Installation of the components of the steering wheel and airbag assembly**

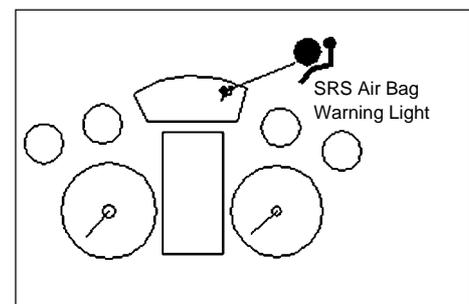
- a. When the center of the clock spring is aligned, install the components of the steering wheel and airbag assembly.
- b. After being installed, rotate the left and right sides of the steering wheel to position, and make sure there is no abnormality.

**(4) Check after installation**

- a. Slightly rotate the steering wheel left and right, make sure that there is no abnormality or noise. (Driver airbag module, clock spring)
- b. Turn the ignition switch ON.
- c. The warning light goes on within 4s, and then goes out.

**Notice**

When installing the components of the steering wheel and airbag assembly, attention should be given to protect the wire harness of the clock spring from seizure.



- d. The trouble shall be eliminated if the warning light remains on when the ignition switch is turned on or after it goes out after 4s.

## 2. Checking

### (1) Driver airbag assembly checking

Check the following items and replace the related components of the airbag assembly if any badness is found. The old components shall be deployed before scrapping.

#### Notice

The circuit resistance of the airbag assembly (squib) cannot be measured even with a designated tester. Since there is current flowing in the squib, when a tester is involved in measuring the resistance, sometimes the airbag is unexpectedly deployed in case of static electricity, leading to serious accident.

- a. Check the cover for pitting, crack and distortion.
- b. Check the connector of the wire harness for damage and the terminal for distortion.
- c. Check the case of the gas generator for pitting, crack and distortion.
- d. Check the installation status of the airbag assembly.

#### Notice

If there is pitting, crack or distortion, replace the airbag assembly with new one. The old components of the airbag shall be deployed before scrapping.

### (2) Check the clock spring

Check the following items, and replace the clock spring if any badness is found.

- a. Check the connector and protecting tube for damage and the terminal for distortion.
- b. Check the case for damage.
- c. Check and see if the joint terminal at the upper end of the clock spring are in conduction with that at the lower end.
- d. A thin probe shall be inserted from the back of the yellow connector of the clock spring.
- e. With reference to the figure below, insert thin probes into the current tester to check the conduction of the terminals.

## VIII. Key points for scrapping the airbag assembly

The airbag shall be deployed according to the following procedures before scrapping the airbag assembly or a vehicle installed with an airbag.

### 1. Scrapping of an airbag assembly prior to deployment

#### Notice

The airbag shall be deployed before being scrapped.

The airbag shall be deployed outside the vehicle before being changed.

The airbag shall be deployed in the vicinity of a smoke detector since smoke will appear when the airbag is deployed.

When being deployed, the airbag will create much noise. People nearby shall wear noise muffler to close their ears. Avoid do the job within the residential areas.

#### ● Deploy inside a vehicle

- 1) Park the vehicle in a flat area
- 2) Disconnect the positive (+) and negative (-) terminal cables from the battery and remove the battery from the vehicle.

**Notice**

Work must be started 60s after the positive (+) and negative (-) terminal cables are detached from battery.

3) The airbag assembly shall be deployed according to the following procedures.

## (1) Driver airbag assembly

- a. Remove the knee bolster.
- b. Remove the connector (yellow) that connecting the lower end of the clock spring with the wire harness of the instrument panel (see the figure below).

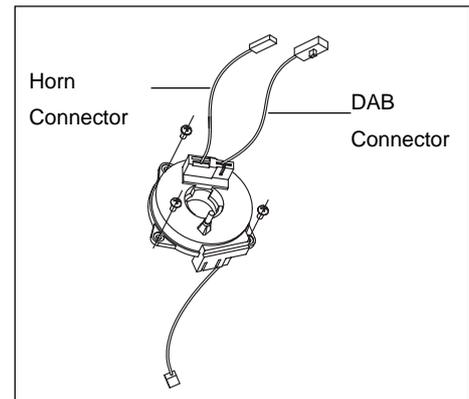
**Notice**

Remove the connector of the clock spring from the wire harness of the instrument, the connector will be short circuited automatically, which can avoid the possible serious accident resulted from the deployment of the driver airbag assembly due to static electricity.

c. Tie two 6m plus wire harnesses for deployment to the adaptor wire harness of the airbag, and wrap the connecting points with insulating tape for insulation. The other ends of the wire harness for deployment are connected to each other (short circuited). Unexpected deployment resulted from static electricity shall be prevented.

d. From the yellow connector of the clock spring, lead the airbag adaptor wire harnesses out of the vehicle by means of the wire harnesses for deployment (see the figure below).

e. To restrain the noise, close all the windows and doors and put on the vehicle cover.

**Notice**

The glass will likely break up if there is crack. Vehicle covers shall be put on.

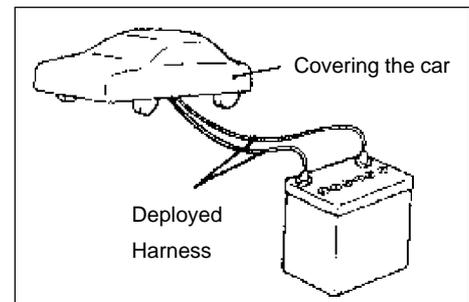
- f. Try to disconnect at a location far away from the vehicle the connector of the wire harness for deployment of the driver airbag assembly, connect them with the two terminals of the battery removed from the vehicle and deploy the airbag (see the figure below).

**Notice**

Make sure there is no man inside or near the vehicle and then carry out the operations.

After the driver airbag is deployed, the gas generator is of high temperature. Keep it for 30 minutes until it gets cool for use.

If the driver airbag assembly cannot be deployed, discuss the problem with the local Geely service station.



- g. The deployed driver airbag assembly shall be scrapped according to the scrapping procedures.

- Deploy outside the vehicle

**Notice**

Keep the airbag over 6m away from a obstacle or person and deploy the airbag in an open flat area.

Deployed the airbag outside the vehicle, avoid to do this job in the strong wind. In case of breeze, fire should be against the wind.

- 1) Disconnect the positive (+) and negative (-) terminal cables from the battery and remove the battery from the vehicle.

**Notice**

Work must be started 60s after removal of the battery.

- 2) The airbag assembly shall be deployed according to the following procedures.

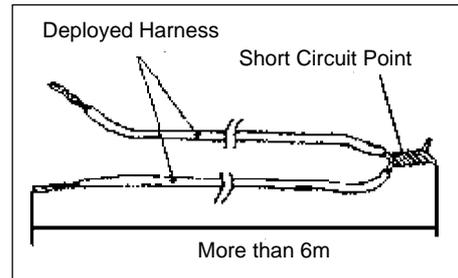
**Driver airbag assembly**

- a. Remove the driver airbag assembly from the vehicle.

**Notice**

When the connector is not connected, the terminals of the driver airbag assembly will be short circuited automatically, preventing the airbag from being deployed unexpectedly. If the airbag is deployed unexpectedly, the deployed surface should face up. It should be kept on a flat surface without any other items on it.

- b. Prepare two 6m plus wire harnesses for deployment, connect the other two ends to avoid unexpected deployment in case of static electricity (see the figure below).

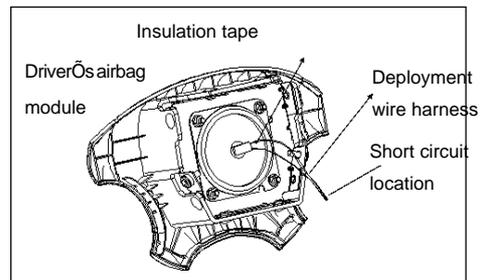


- c. Touch the body of the vehicle with hands for static electricity elimination.

**Notice**

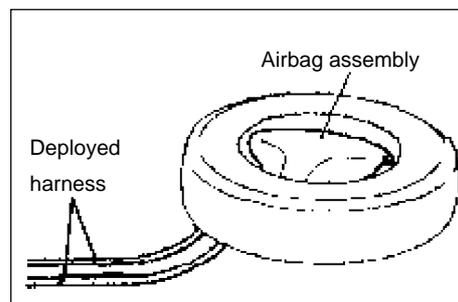
The above-mentioned procedures can prevent the unexpected deployment due to static electricity and shall therefore be performed strictly.

- d. Cut off the wire harnesses of the driver airbag assembly and connect them with the two wire harnesses for deployment, and make sure to wrap up the connecting location with insulating tape for insulation (see the figure on the right).

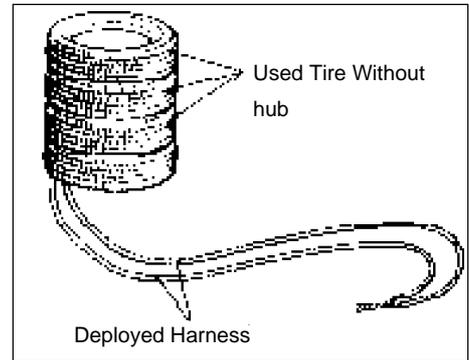


- e. Install the unused bolts to the inside bolt of the driver airbag assembly, and tie a thick metal wire securing the wheel rim.

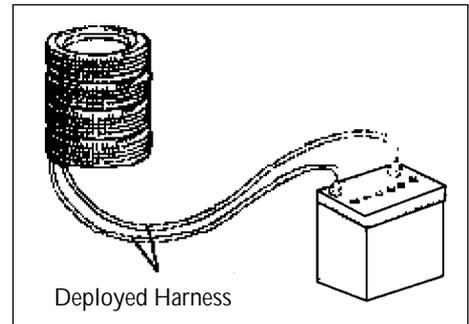
- f. Pass the deployment wire harness of the driver airbag assembly through an old tire with rim, and fix upwards the driver airbag assembly by means of the wire connected to the bolts, etc (see the figure on the right).



- g. Put three used tires without hubs onto the tire used to fix the driver airbag assembly (see the figure on the right).



- h. Try to disconnect at a location far away from the vehicle the connector of the wire harness for deployment of the driver airbag assembly, connect with the two terminals of the battery removed from the vehicle and deploy the airbag (see the figure on the right).



- i. The deployed driver airbag assembly shall be scrapped according to the scrapping procedures.

**Notice**

- Make sure to deploy the driver airbag assembly when there is no person close by.
- After the driver airbag is deployed, the gas generator is of high temperature. Keep it for over 30 minutes until it gets cool for use.
- If the driver airbag can't be deployed, please contact the Geely service station for help.

# Chapter 7 Air Conditioning System

## Section 1 General Information

### Overview:

Air-conditioning system consists of refrigeration and heating parts. Refrigerating system mainly consists of compressor, condenser and evaporator etc, it adsorbs heat in the air through circulation of refrigerant, so as to reduce air temperature in car body and eliminate water vapour in air, to achieve the purpose of temperature drop and dehumidification. Heating system mainly consists of heat exchanger and heater unit. It utilizes heat of engine cooling water to heat air via heat exchanger, so as to achieve the purpose of heating. Regulation and control of temperature, humidity and flow rate of air in car body is realized via heating and refrigeration systems separately or jointly.

For parameters of refrigerating system, see the table:

Item		Parameter	
Temperature regulation method		Control mixing of cool and warm air	
Compressor	Nominal refrigerating capacity / w	4200	
	Displacement / (ml /r)	143	131
	Model	SEBX13	FM10S13
	Power consumed by magnetic clutch /W	43	
Lubricating oil / ml		300001202/150ml 0 <sup>+20</sup> cm <sup>3</sup>	
Blower	Maximum air quantity / (m <sup>3</sup> /h)	≥ 420	
	Air regulation	Manual 4 speed	
	Motor power / W	200	
Condenser	Dimension /mm	16 x 350 x 630	
	Heat exchange quantity / W	≥ 10000	
	Fan motor current / A	≤ 8	
	Fan motor revolution / (r/min)	≥ 2200	
Evaporator	Dimension /mm	225 x 250 x 58	
	Refrigerating capacity /W	≥ 4000	
	Thermostatic expansion valve	Internal balance type 1.5 tons of refrigeration	
Driving belt	4PK820		
Refrigerant filling amount/g		440± 20g	420± 10g

**Precautions:**

1. Don't operate refrigerant in confined space or near open fire.
2. Always wear eyeglass.
3. Be careful don't let liquid refrigerant contact your eyes and skin, if liquid refrigerant contacts your eye or skin.
  - (a) Please wash with fresh water.
 

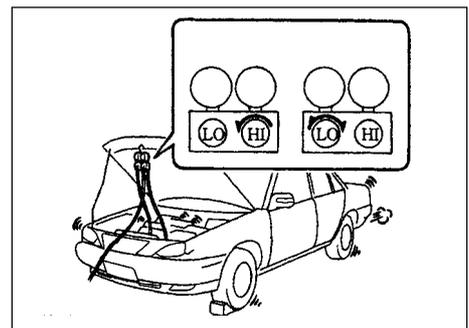
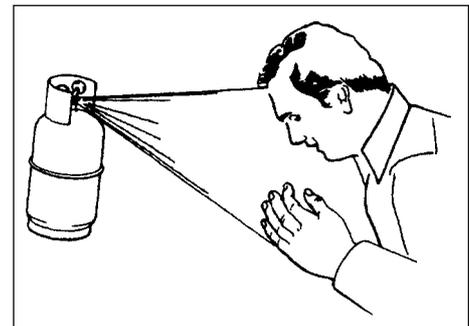
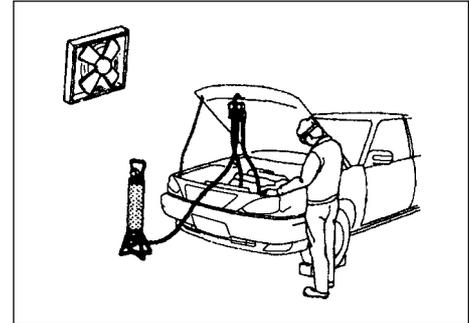
Warning:

Don't knead your eyes or scrub your skin
  - (b) Apply soft petroleum ointment on your skin.
  - (c) See doctor or go to hospital immediately for specialized treatment.
4. Don't heat container or put it near open fire.
5. Be careful not to fall off, object should not touch container.
6. If there is no sufficient refrigerant in refrigerating system, don't operate the compressor.
 

If there is no sufficient refrigerant in the system, insufficient oil lubrication might cause burning out of compressor. Be careful to avoid occurrence of such things.
7. When compressor runs, don't turn on pressure gauge high-pressure valve.
 

If high-pressure valve is turned on, refrigerant will flow in reverse direction, and cause bursting of refrigerant tank, so only low pressure valve may be turned on or off.
8. Be careful to avoid excess refrigerant
 

Excess refrigerant will result in poor refrigerating capacity, worse fuel economical efficiency, engine overheat etc problems.



**Symptom table**

Use the following table to find out the cause of fault, number indicates probable priority of problem, check each part according to priority, replace components if required.

Symptom	Suspected Area
Blower does not work	1. Blower fuse 2. Centralized controller fuse 3. Blower relay 4. Integrated control panel assembly (blower switch) 5. Blower adjustment resistor 6. Blower 7. Wiring harness.

Symptom	Suspected Area
No air temperature control	<ol style="list-style-type: none"> <li>1. Engine coolant quantity</li> <li>2. Air conditioning control mechanism assembly.</li> </ol>
Compressor does not work	<ol style="list-style-type: none"> <li>1. Refrigerant quantity</li> <li>2. Compressor fuse</li> <li>3. Centralized controller fuse</li> <li>4. Magnetic clutch relay</li> <li>5. Pressure switch</li> <li>6. Magnetic clutch assembly</li> <li>7. Air conditioning compressor assembly</li> <li>8. Integrated control panel assembly (air conditioner switch)</li> <li>9. Air conditioner thermistor</li> <li>10. Engine ECU</li> <li>11. Wiring harness</li> </ol>
Insufficient refrigeration	<ol style="list-style-type: none"> <li>1. Refrigerant quantity</li> <li>2. Refrigerant pressure</li> <li>3. Driving belt</li> <li>4. Air conditioner thermistor</li> <li>5. Integrated control panel assembly (air conditioner switch)</li> <li>6. Magnetic clutch assembly</li> <li>7. Air conditioning compressor assembly</li> <li>8. Condenser</li> <li>9. Accumulator-drier</li> <li>10. Expansion valve</li> <li>11. Evaporator</li> <li>12. Refrigerant line</li> <li>13. Pressure switch</li> <li>14. Air conditioner control mechanism assembly</li> <li>15. Wiring harness</li> </ol>
No engine idle speed when air conditioning switch is ON (switch on)	<ol style="list-style-type: none"> <li>1. Idle speed control system</li> <li>2. Wiring harness</li> <li>3. ECM</li> </ol>
No air input control	<ol style="list-style-type: none"> <li>1. Air conditioner control mechanism assembly</li> </ol>
No mode control	<ol style="list-style-type: none"> <li>1. Air conditioner control mechanism assembly</li> </ol>
Condenser fan does not work	<ol style="list-style-type: none"> <li>1. MAIN fuse</li> <li>2. Condenser fan fuse</li> <li>3. Condenser fan relay</li> <li>4. Condenser fan motor</li> <li>5. Wiring harness</li> </ol>

### Inspection

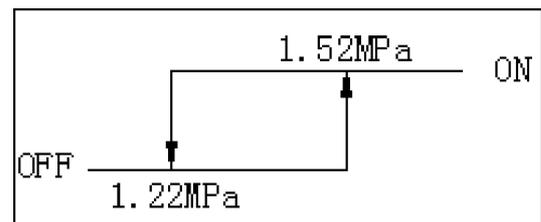
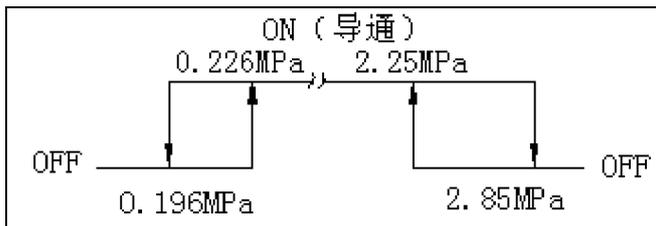
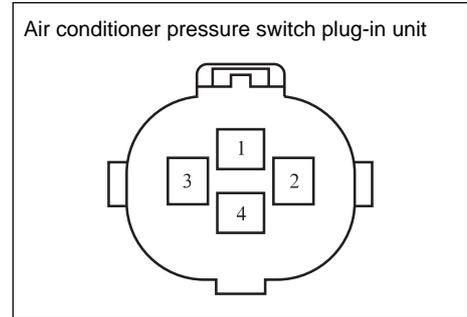
#### 1. Check pressure switch

##### (a) Magnetic clutch control:

Check operation of pressure switch

- (1) Install manifold instrument
- (2) Connect positive meter pen of ohmmeter to terminal 4, negative meter pen to terminal 1 respectively.
- (3) As shown in the figure, check connection of each terminal when refrigerant pressure changes

If operation does not conform to specification, replace pressure switch.



##### (b) Check operation of condenser fan

- (1) Connect positive meter pen to terminal 2, negative meter pen to terminal 3 respectively.
  - (2) As shown in the figure, check connection of each terminal when refrigerant pressure changes
- If operation does not conform to specification, replace pressure switch.

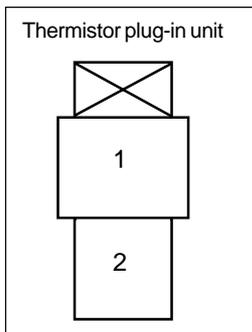
#### 2. Compressor magnetic clutch

(a) Connect positive pole of storage battery to binding post, negative pole to compressor shell.

(b) Check magnetic clutch in energized condition.

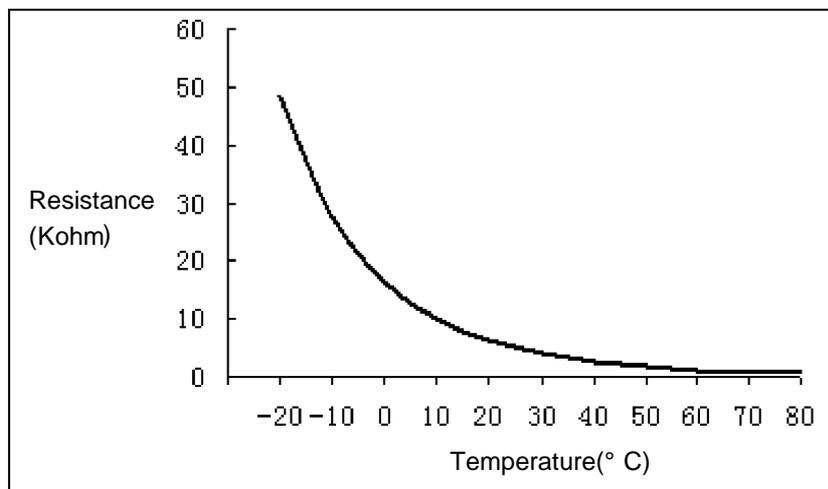
If abnormal, replace magnetic clutch.

#### 3. Air conditioner thermistor



(a) As shown in the figure, check resistance value of air conditioner thermistor between terminal 1, 2 at each temperature,

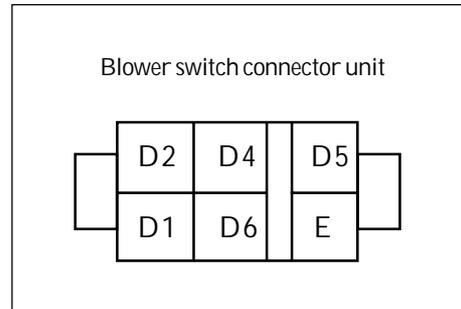
Resistance:



4. Integrated control panel assembly

(a) Check connection of blower switch.

Condition/ circuit	Tester connection	Specification
OFF	—	OFF
LO	E — D1	ON
ML	E — D1 — D2	ON
MH	E — D1 — D4	ON
HI	E — D1 — D5	ON



If connection does not conform to specification, replace integrated control panel assembly.

(b) Check lighting operation

Connect positive wire of storage battery to terminal D6, negative wire to terminal E, then check whether illuminating lamp illuminates. If bulb does not illuminate, replace the bulb.

(c) Check connection of air conditioning switch

As shown in the table, check connection of terminal when switch is pressed

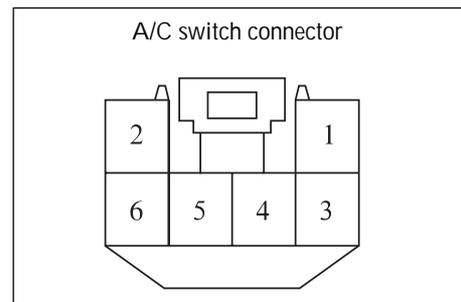
Tester connection	Specification
2 — 5	ON

If connection does not conform to specification, replace air conditioning switch.

(d) Check indicator work

Connect positive wire of storage battery to terminal 1, negative wire to terminal 3, then check whether illuminating lamp illuminates.

If connection does not conform to specification, replace integrated control panel assembly.



4. Blower adjustment resistor

(a) Measure resistance between terminals, as shown in the table

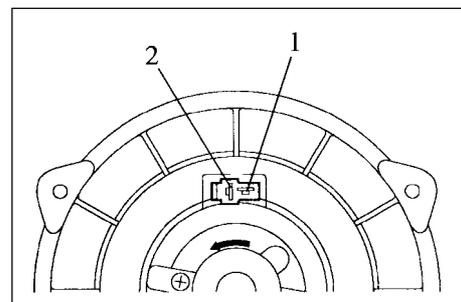
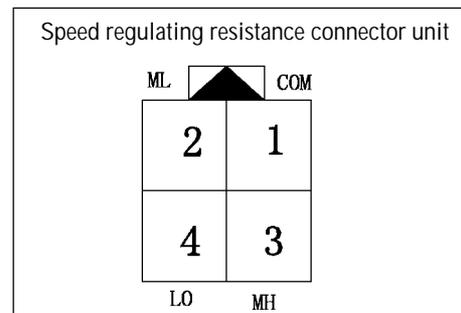
Tester connection	Specification
1-2	About 0.38 Ohm
2-3	About 1.47 Ohm
1-4	About 2.71 Ohm

If resistance does not conform to specification, replace blower resistance.

5. Blower assembly

(a) Connect positive wire of storage battery to terminal 2, negative wire to terminal 1, check work smoothness of motor.

If work does not conform to specification, replace blower assembly

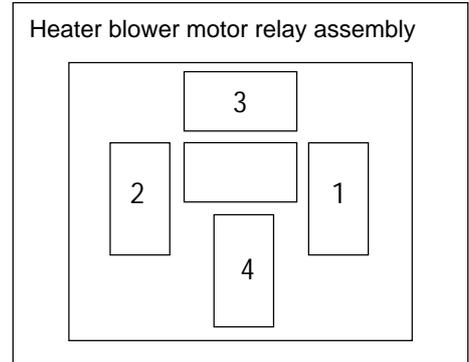


6. Heater blower motor relay assembly

Check connection of relay

Condition	Tester connection	Specification
Constant	1 — 2	ON
Apply storage battery positive voltage between terminal 1, 2	3 — 4	ON

If connection does not conform to specification, replace heater blower motor relay.

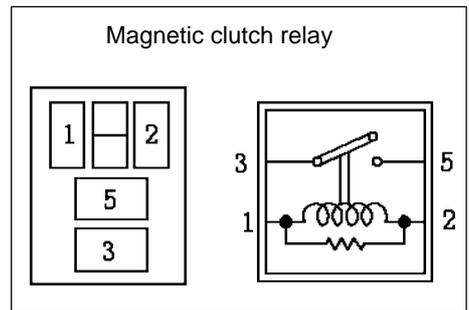


7. Magnetic clutch relay

(a) Check connection of relay

If connection does not conform to specification, replace magnetic clutch relay

Condition	Tester connection	Specification
Constant	1 — 2	ON
Apply storage battery positive voltage between terminal 1, 2	3 — 5	ON



## Section 2 Refrigerant

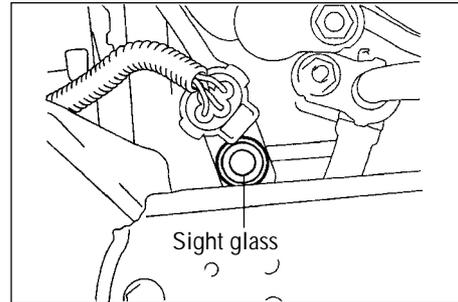
### Refrigerant inspection

1. Check refrigerant quantity

(a) Observe sight glass on refrigerating liquid pipe.

Test condition:

- Engine speed: 1500 rpm
- Blower speed control switch: HI "high "
- Air conditioning switch: switch on
- Temperature setting: maximum refrigeration
- Refrigeration runs for 5 minutes
- Open door



	Symptom	Refrigerant quantity	Correct treatment
1	With foam	Insufficient *	1. Check gas leakage, repair if necessary 2. Add refrigerant until foam disappears
2	Without foam	Empty, insufficient or beyond	Refer to 3 and 4
3	No temperature difference between input and output of compressor	Empty or nearly full	1. Use detector to check gas leakage, repair if necessary 2. Add refrigerant until foam disappears.
4	There is considerable temperature difference between compressor input and output	Proper or beyond	Refer to 5 and 6
5	After air conditioner is turned off, refrigerant should be cleared immediately	Excess	1. Discharge refrigerant 2. Eliminate air, add appropriate quantity of pure refrigerant
6	After air conditioner is turned off, refrigerant foams immediately, then clears	Appropriate quantity	

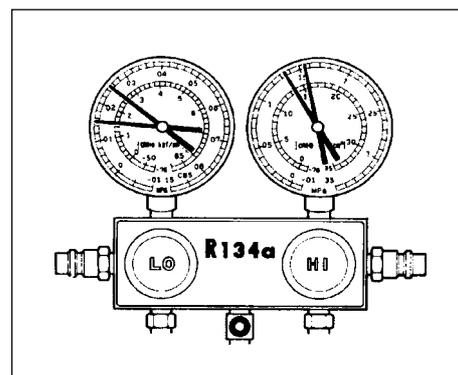
\*: If refrigerating capacity is sufficient, environmental temperature is higher than normal condition, bubble in sight glass may be deemed as normal.

2. Use manifold meter to check refrigerant pressure

( a ) This method is to utilize installed instrument to determine where the fault is. Use manifold pressure meter reading to evaluate fault condition.

Test condition:

- Switch sets temperature of cyclical air inlet: 30-35° C
- Engine speed: 1500 rpm
- Blower speed control switch: high
- Temperature control panel: refrigeration



Air conditioning switch:switch on

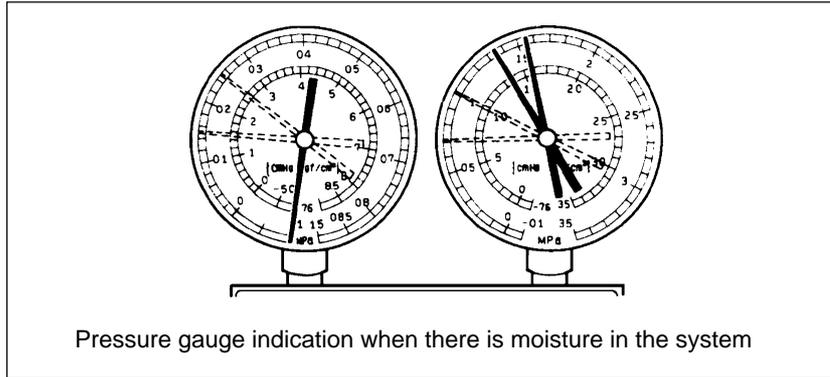
So door is completely open

(1) Refrigerating system meter reading during normal work:

Low pressure side:0.15-0.25MPa

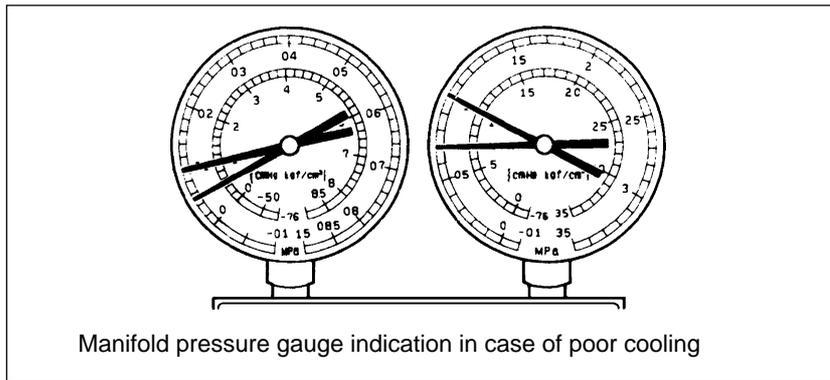
High pressure side:1.37-1.57MPa

(2) System contains moisture



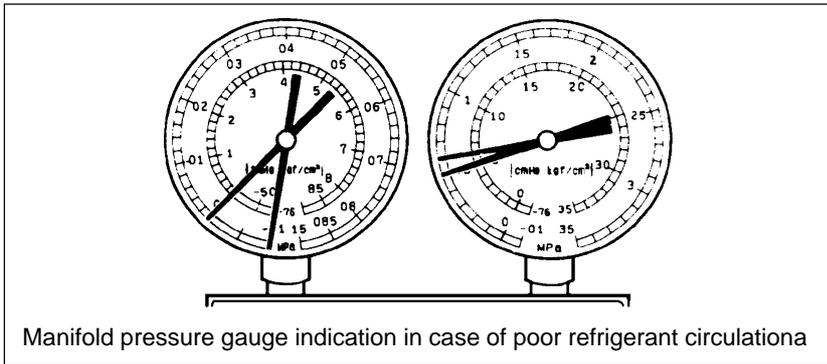
Symptom	Possible cause	Diagnosis	Correct treatment
1. During work, pressure on low pressure side sometimes becomes vacuum 2. Intermittent refrigeration, finally no refrigeration	Moisture in the system freezes at orifice of expansion valve, circulation suspends, but system restores to normal after ice thaws	1. Drying agent is in saturated state 2. System moisture freezes at orifice of expansion valve, obstructs refrigerant circulation	1. Replace stock solution drying agent 2. By drawing off air repetitively to remove water vapor in the system, fill in appropriate quantity of new refrigerant

(3) Poor cooling



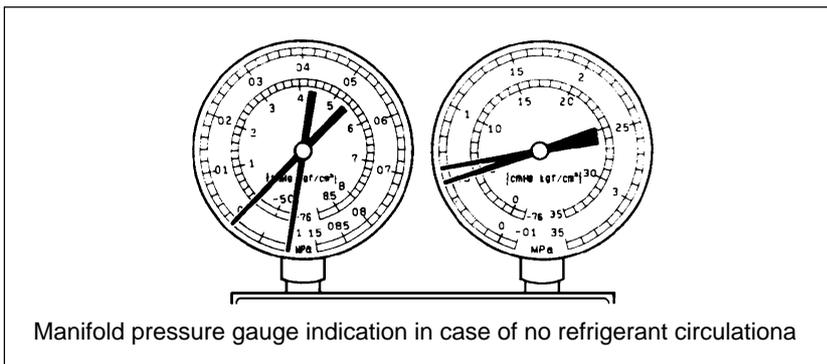
Symptom	Possible cause	Diagnosis	Correct treatment
1. Pressure on high, low pressure side is a bit low 2. Successive bubble appears in glass window 3. Refrigeration efficiency deteriorates	Refrigerant leakage occurs in refrigerating system	1. System refrigerant is insufficient 2. Refrigerant leaks	1. Use leak detector to check whether there is gas leakage, repair if there is any. 2. Fill in appropriate quantity of refrigerant 3. Connect a pressure gauge, if pressure is zero, repair leaking part, and vacuumize the system

(4) Poor refrigerant circulation



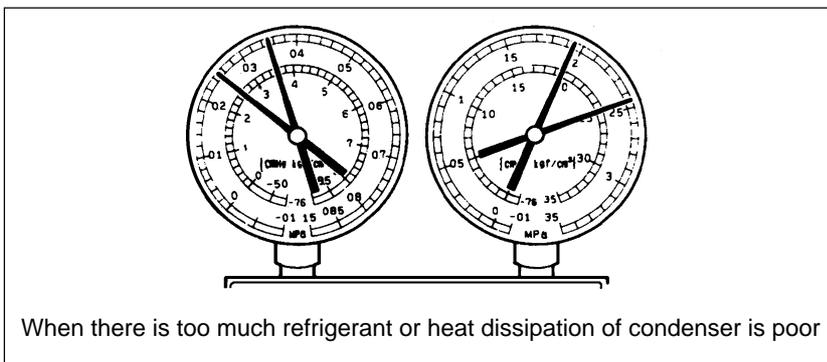
Symptom	Possible cause	Diagnosis	Correct treatment
1. Pressure on high, low pressure side is a bit low 2. Pipeline from stock solution drier to main set frosts 3. Refrigeration is insufficient	Dirt in refrigeration drier obstructs flow of refrigerant	Stock solution drier does not circulate	Replace stock solution drier

(5) Refrigerant does not circulate



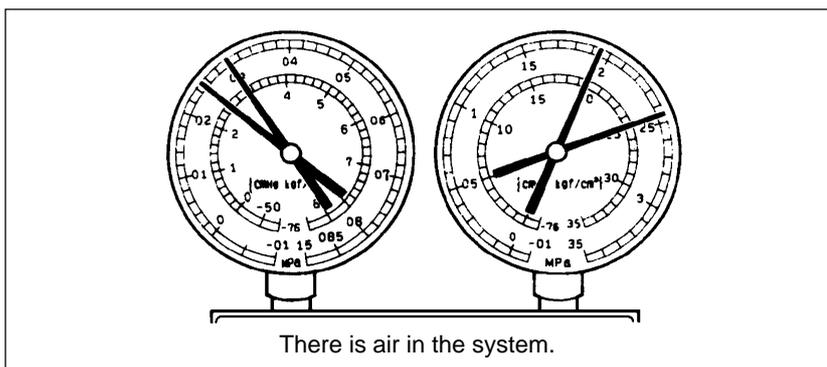
Symptom	Possible cause	Diagnosis	Correct treatment
1. Indicates vacuum on low pressure side, indicates too low pressure on high pressure side 2. There is dew or frost on pipe before and after expansion valve or stock solution drier	System contains moisture or dirt which obstructs flow of refrigerant Expansion valve failure	Refrigerant does not circulate	1. Check expansion valve 2. Use compressed air to eliminate dirt of expansion valve, but it cannot be eliminated, replace expansion valve. 3. Vacuumize and fill in appropriate quantity of new refrigerant 4. Expansion valve leaks, replace expansion valve

(6) Too much refrigerant or heat dissipation of radiator is poor



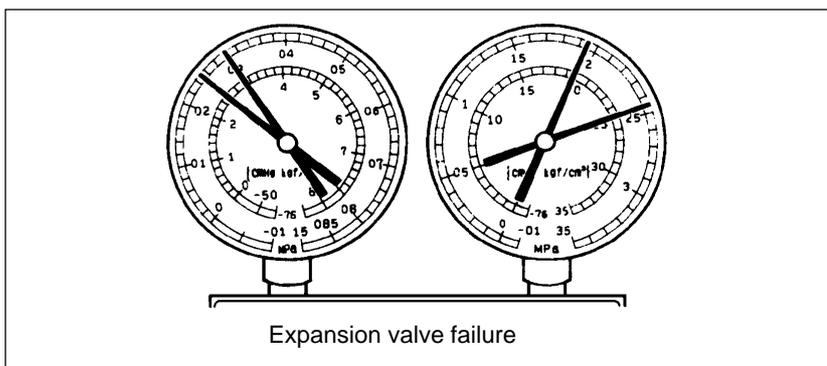
Symptom	Possible cause	Diagnosis	Correct treatment
1. Too high pressure on the high and low pressure side 2. Even with decreasing engine speed, no bubble can be seen through view glass 3. Refrigeration is insufficient	1. Excessive refrigerant, not utilizing the efficacy of refrigerant 2. Poor heat dissipation of condenser	1. Excessive refrigerant is circulating 2. Insufficient refrigeration in condenser, block of condenser radiator or fan fault	1. Clean condenser 2. Check operation of fan motor 3. Check the amount of refrigerant, and fill in proper amount of refrigerant

(7) There is air in the system



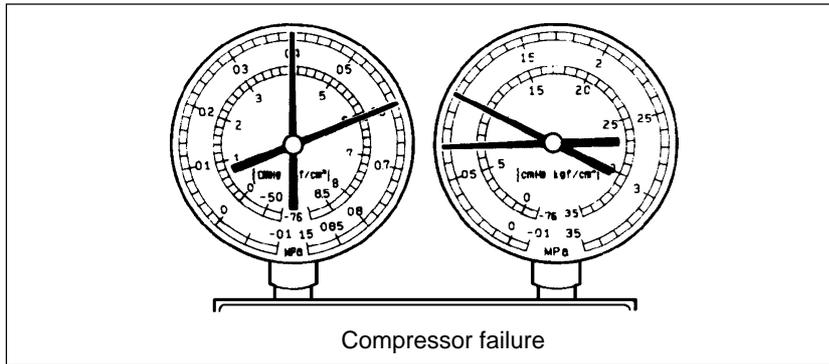
Symptom	Possible cause	Diagnosis	Correct treatment
1. Pressure on high, low pressure side is too high 2. Touch the suction hose, it is hot 3. Bubble appears in glass window, cooling is not good	There is air in refrigerating system	1. There is air in refrigerating system 2. Vacuumizing is not complete	1. Check whether compressor lubricating oil is dirty or insufficient 2. Pump off air and fill in appropriate quantity of refrigerant

(8) Expansion valve fault



Symptom	Possible cause	Diagnosis	Correct treatment
1. Pressure on high, low pressure side is too high 2. There is frost or a great deal of water drops on pipeline of low pressure side	Expansion valve fails	1. Refrigerant in low-pressure line is too much 2. Expansion valve is opened too large	Check expansion valve

(9) Compressor poor compression fault



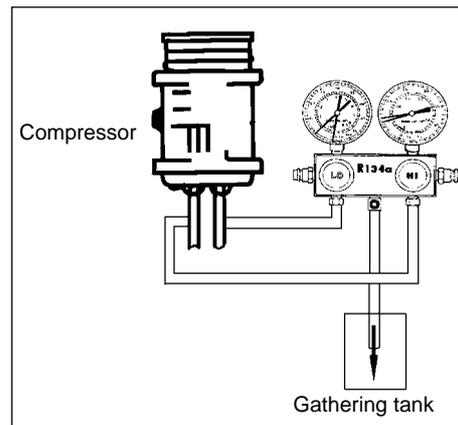
Symptom	Possible cause	Diagnosis	Correct treatment
1. pressure is too high on low pressure side, pressure on high-pressure side is too low 2. Without cold air	Inside sealing of compressor is poor	Compressor fails, valve leaks or is damaged.	Repair or replace compressor

Discharge and fill-up of refrigerant

Discharge of refrigerant

In case of depletion, surrounding environment should always be well-ventilated, do not approach open fire, otherwise toxic gas might be generated.

(1) Firstly turn off meter valve high low manual valve, connect pipeline according to the figure below, then adjust air conditioner to maximum refrigeration operating condition, adjust engine speed to 1000 - 2000 r/min, run for 5 min. Circulate refrigerant and collect residual oil in parts as far as possible into compressor.



(2) Loosen throttle, let engine restore to normal idle speed, turn off engine.

(3) Slowly open high voltage manual valve, cover a white towel on hose outlet, observe whether there is oil stain on the towel, adjust flow of refrigerant.

(4) When high pressure gauge reading decreases to below 0.35MPa, slowly open low pressure manual valve. Close manual valve until reading of high low pressure gauge is zero.

Fill-up of refrigerant

(1) Use vacuum pump to vacuumize the system

During repair of refrigerating system, once refrigerating system is exposed to air or certain refrigerating system part is to be replaced, automobile air conditioner must be vacuumized. So as to eliminate air and water vapour in the system.

(2) Fill in R134 a

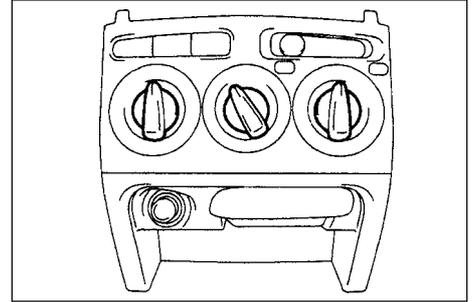
Standard: 420 ± 10 g (Dongfeng Painen System)

440 ± 20 g (Tianjing Sando System)

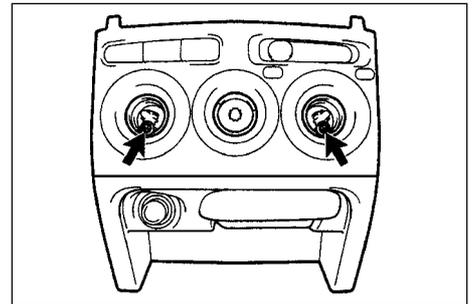
## Section 3 A/C Operating Mechanism

### 1. Remove heater control and attachment assembly

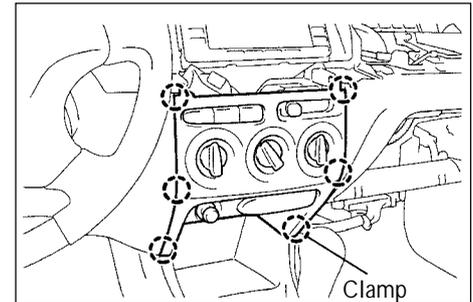
(1) Remove three control knobs.



(2) Remove two screws and middle instrument board subassembly.

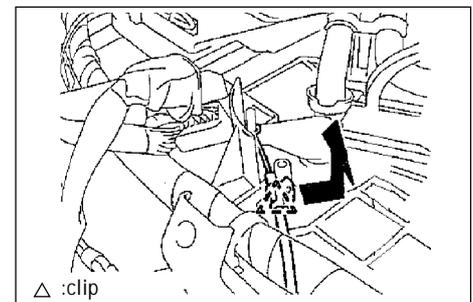


(3) Loosen six lock catches, pull out heater control and attachment assembly

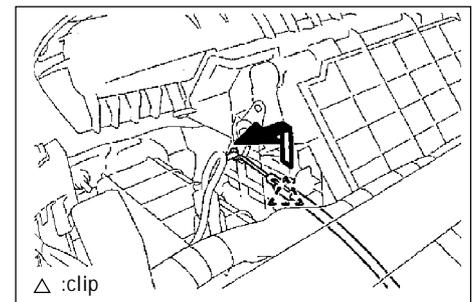


### 2. Remove the operation mechanism

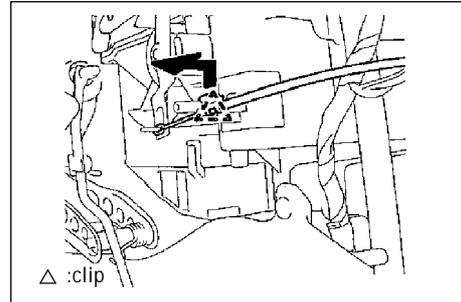
(1) Loosen the fixed clip (air distributor) and remove the air mit damper control cable.



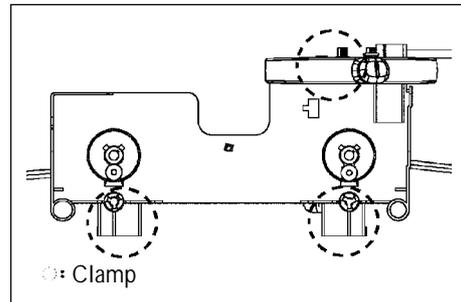
(2) Loosen the fixed clip (air distributor) and remove air inlet mode selector cable.



(3) Loosen the fixed clip (air distributor) and remove the adjustment vent cable.

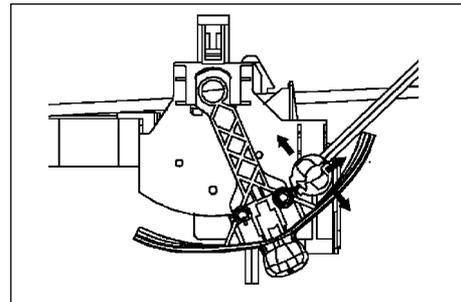


(4) Loosen 3 fasteners on the operation mechanism and remove the operation mechanism assembly.

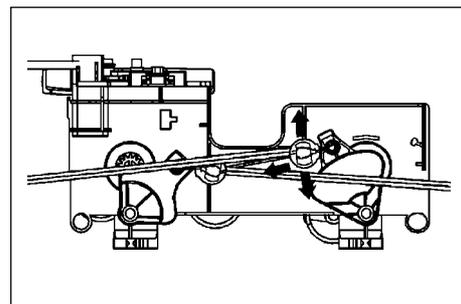


### 3.Remove the cable of the operation mechanism

(1) Loosen the fixed clip and remove air inlet mode selector cable.

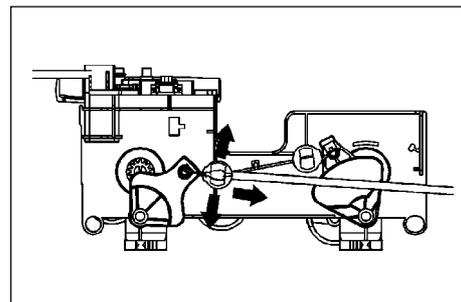


(2) Loosen the fixed clip and remove the air mit damper control cable.



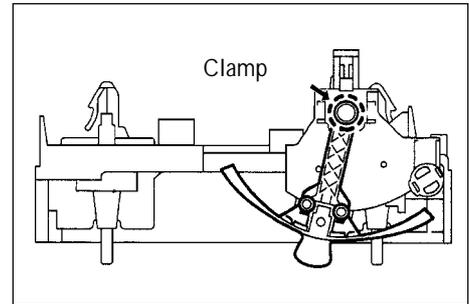
(3) Loosen the fixed clip and remove the adjustment vent cable.

Notice: Do not twist the cable, otherwise the air conditioning operation mechanism does not work normally.



#### 4. Remove the inner and outer cycle flipper

Unscrew the retaining buckle and the inner and outer cycle flipper.



#### 5. Install the control mechanism assembly

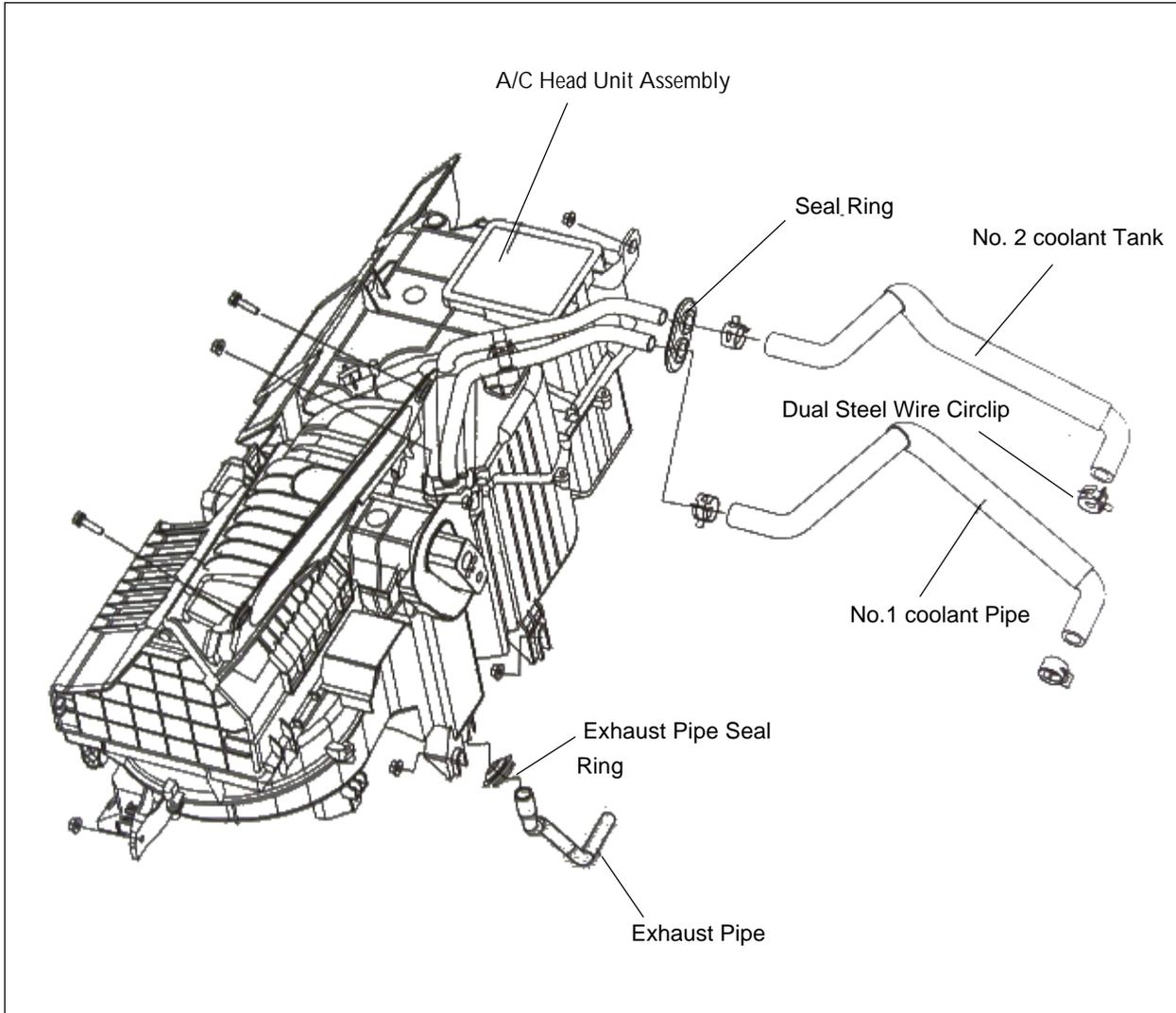
(1) Replace the damaged part, installation is in the reverse order of removal.

(2) Notice:

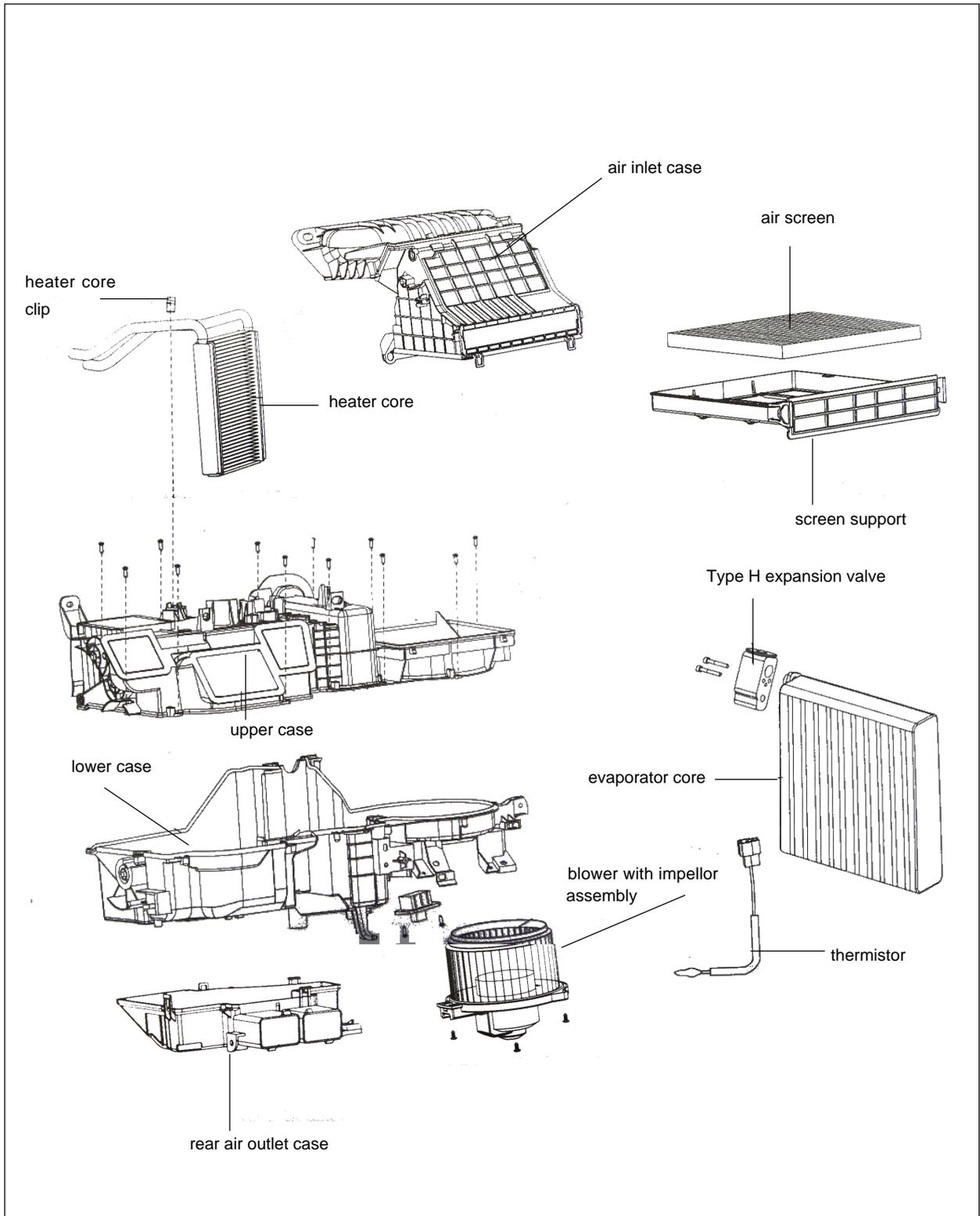
- When installing the warm and cold adjustment damper cable on the head unit of the air conditioner, set the rocker arm connecting the cable to the maximum travel position of the damper for refrigeration, then press the cable in the clamp. Do not twist the cable. Check that the temperature control knob on the rotation panel can stop at both the maximum refrigeration and maximum heating positions and won't resile.
- When installing the inner and outer cycle damper cable on the head unit of the air conditioner, set the rocker arm connecting the cable to the maximum travel position of the inner cycle, then press the cable in the clamp. Do not twist the cable. Check that the air intake adjustment rod on the rotation panel can stop at both the inner and outer cycle maximum positions and won't resile.
- When installing the outlet vent adjustment damper cable on the head unit of the air conditioner, set the rocker arm connecting the cable to the maximum travel position of face mode, then press the cable in the clamp. Do not twist the cable. Check that the airflow selector knob on the rotation panel can stop at both the face mode and defroster heating positions and won't resile.

## Section 4 Heater, Ventilation and Air Conditioning

### Component View I



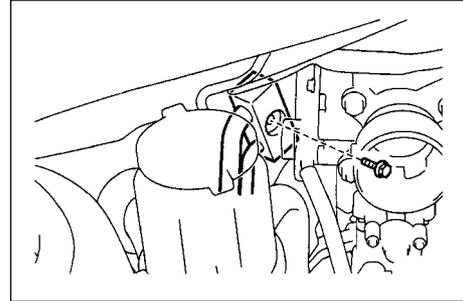
### Component View II



## Overhaul

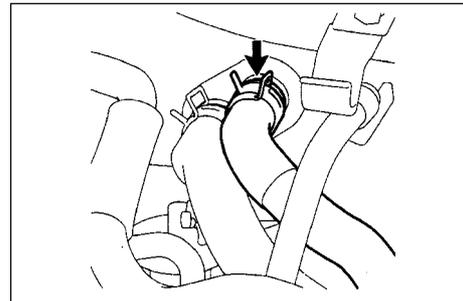
1. Drain the coolant (refer to Coolant for details).
2. Disconnect A/C pipeline assembly.
  - (1) Remove the bolt, disconnect A/C pipeline assembly
  - (2) Remove 2 O-rings form the A/C pipeline assembly.

Notice: O-ring is a non-reusable part.



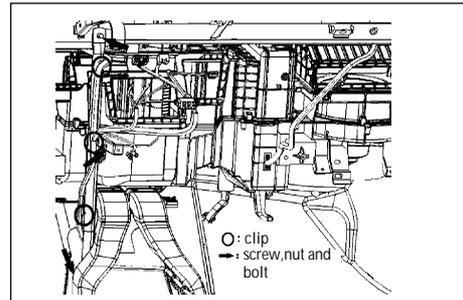
3. Disconnect the water pipe assembly connecting the heater core.
 

Loosen the dual steel wire circlip, disconnect the water pipe connecting the heater core.

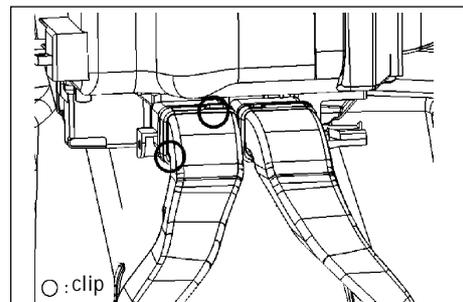


4. Remove console assembly
 

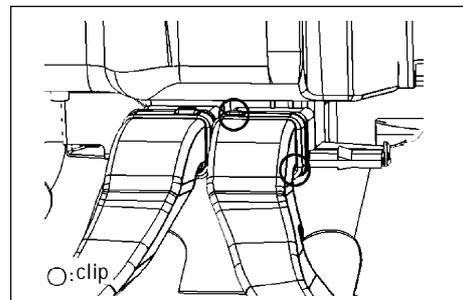
Refer to Interior Trim: Removal of the Console Assembly
5. Remove central cross member assembly
  - (1) Unscrew the wire harness clip and screw.
  - (2) Remove the nut and bolt.
  - (3) Remove cross member assembly.



6. Remove A/C lower left and right air outlet pipe
  - (1) Unscrew the two clips, disconnect the A/C lower left air outlet pipe.

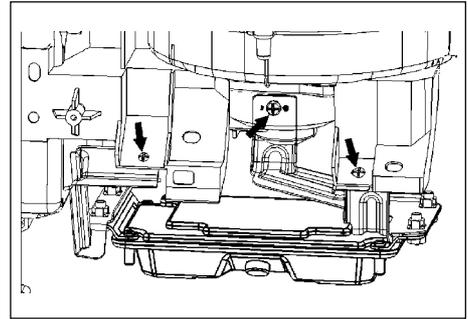


- (2) Unscrew the two clips, disconnect the A/C lower right air outlet pipe.

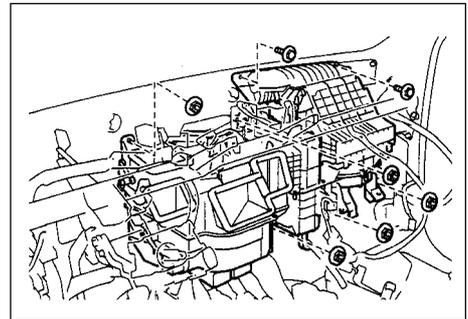


**7. Disconnect engine ECU**

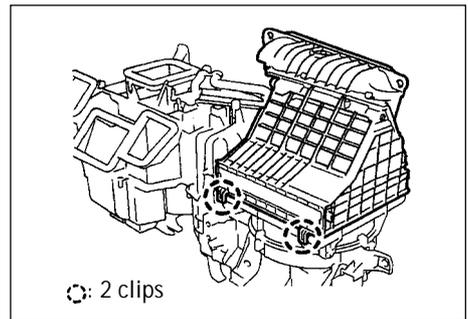
- (1) Remove 3 bolts.
- (2) Carefully disconnect the wire harness.

**8. Remove A/C head unit assembly.**

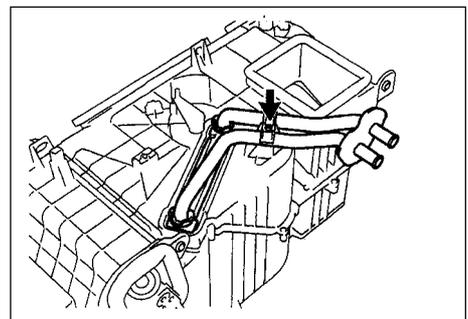
- (1) Remove the clip attaching the console wire harness on the A/C head unit body.
- (2) Disconnect 3 connectors.
- (3) Remove 2 bolts and 5 nuts, remove the A/C head unit assembly

**9. Remove heater core**

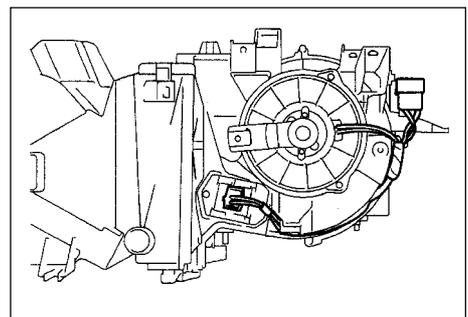
- (1) Loosen two clips, remove the air inlet case assembly.



- (2) Remove the screw, clamp and heater core.

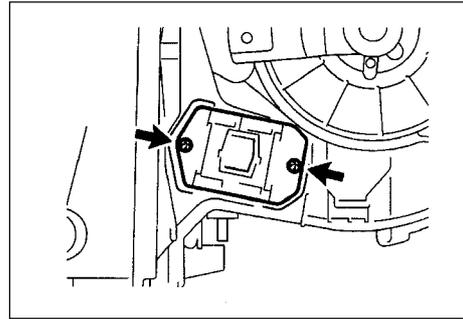
**10. Remove A/C wire harness**

- disconnect the connector, remove the A/C wire harness.



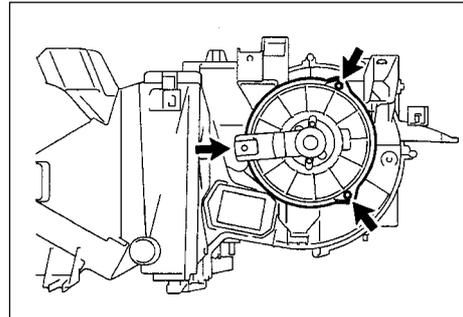
## 11. Remove adjustment resistor

remove 2 screws and blower adjustment resistor.



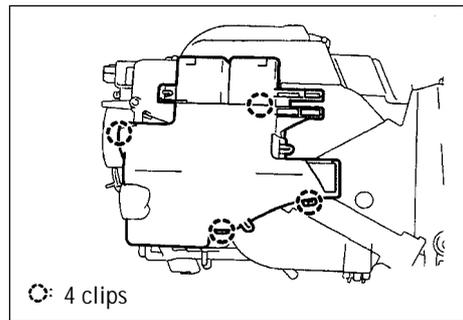
## 12. Remove blower motor with impellor assembly.

remove 3 screws and blower motor with impellor assembly.



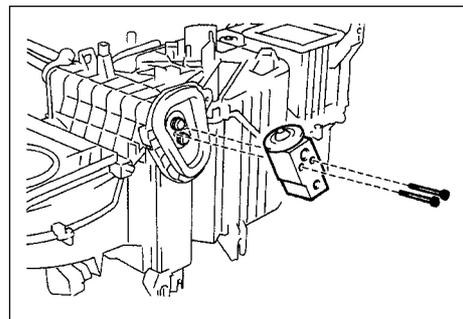
## 13. Remove rear air outlet case

remove rear air outlet case after loosening the clip.



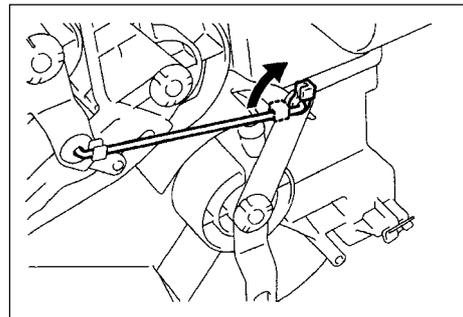
## 14. Remove Type H expansion valve

Use inner hex wrench of 5.0mm to remove 2 bolts and type H expansion.

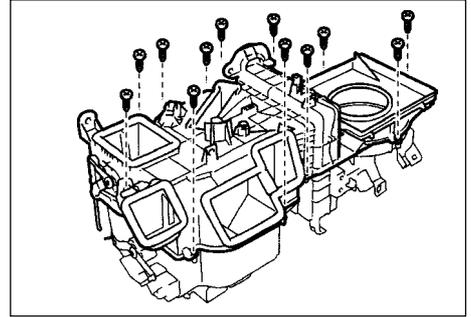


## 15. Remove the thermistor on the evaporator

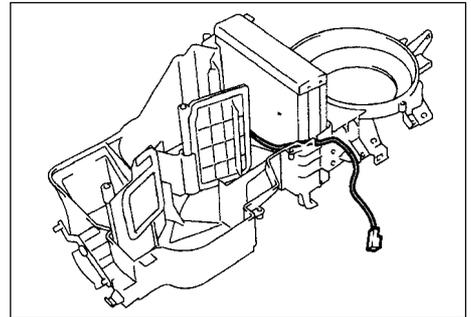
(1) Disconnect the mode damper drive arm.



(2) Remove 12 screws and upper case assembly.

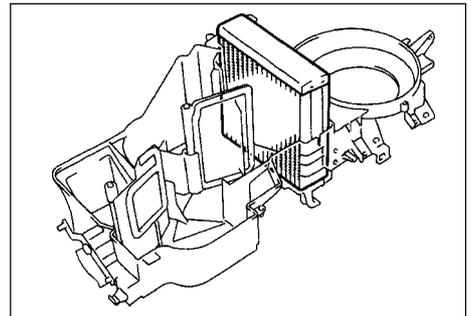


(3) Remove the thermistor from the evaporator.



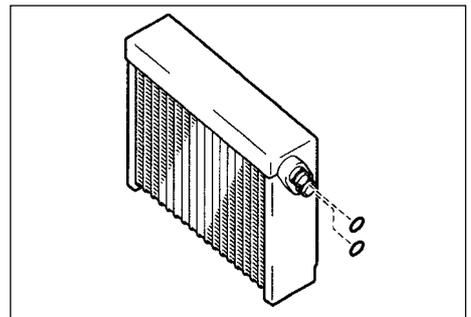
16. Remove evaporator core assembly

(1) Remove evaporator core assembly from the lower case assembly.



(2) Remove 2 O-rings from the evaporator core assembly.

Notice: O-ring is a non-reusable part.



17. Remove exhaust pipe

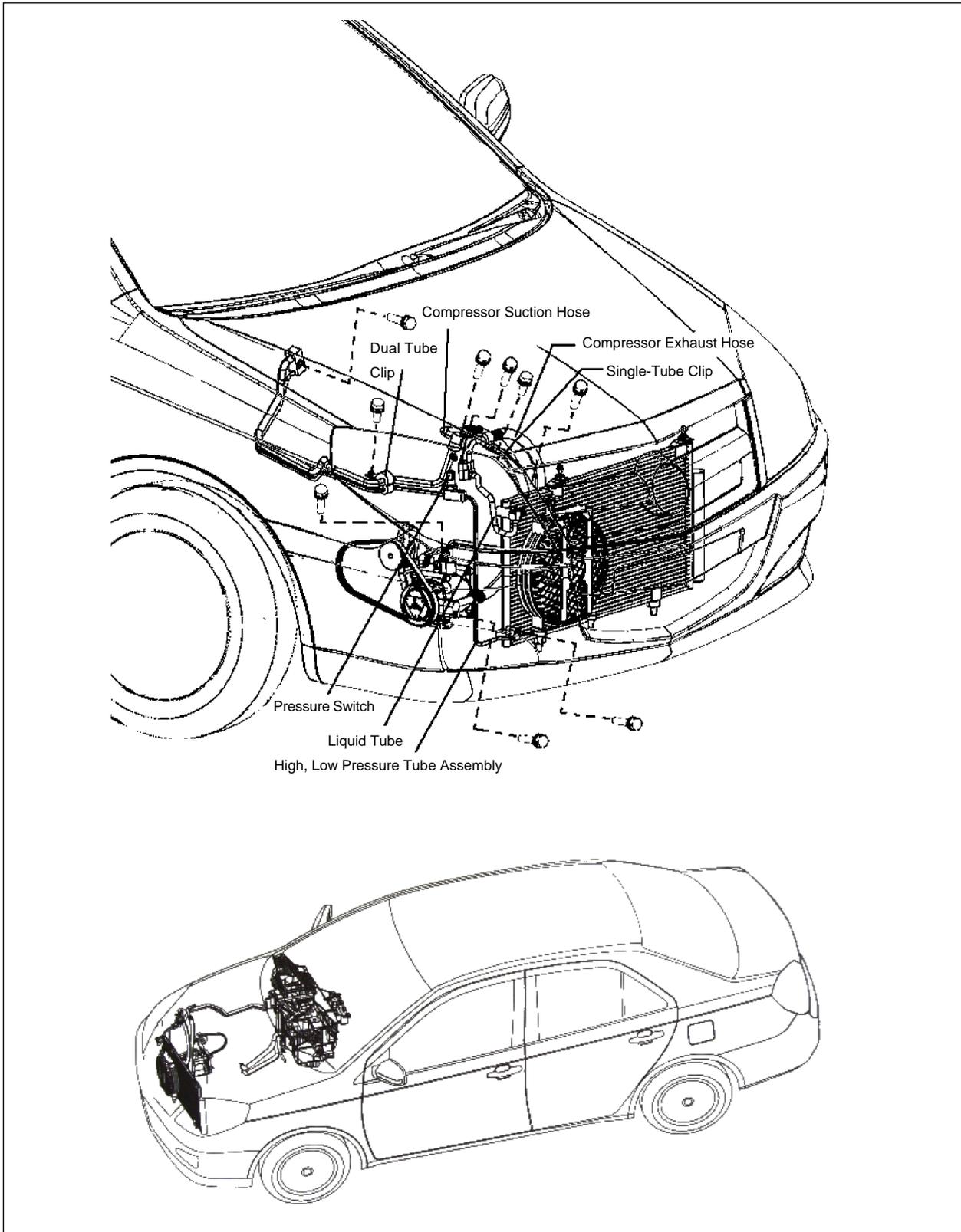
18. Installation

(1) Installation is in the reverse order of removal.

(2) O-ring is a non-reusable part and needs to be replaced.

## Section 5 Layout of Air Conditioning Hose

### Component View

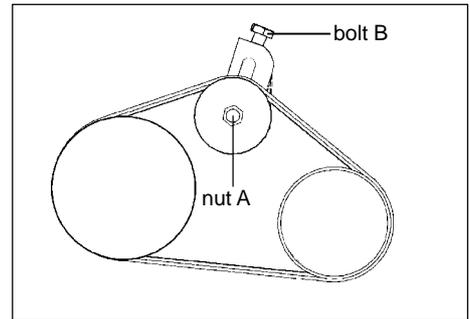


## Section 6 Multi-wedge belt (Connecting Compressor and Crankshaft Pulley)

### Replacement

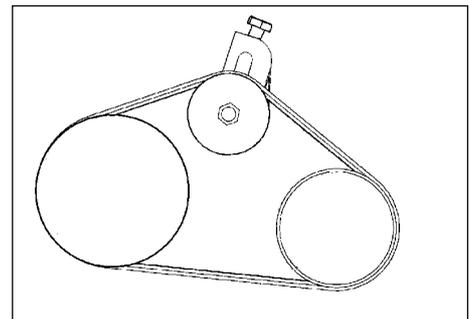
#### 1. Remove multi-wedge belt

- (1) Loosen nut A.
- (2) Loosen bolt B, remove multi-wedge belt (A/C compressor to crankshaft pulley)



#### 2. Install multi-wedge belt

as shown in the illustration, temporarily install the multi-wedge belt.



#### 3. Adjust multi-wedge belt

- (1) Tighten nut A  
Torque: 25 N.m
- (2) Adjust the belt tension by turning bolt B.

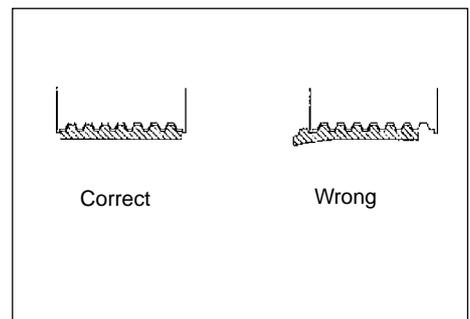
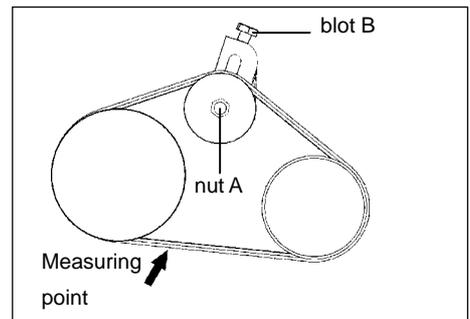
Belt Distortion:

New belt: 6.5 - 7.0mm

Old belt: 8.0- 9.0mm

Tip:

- New belt means the belt used on the engine for less than 5 minutes.
- Old belt means the belt used on the engine for more than 5 minutes.
- Install the drive belt, check whether the belt fit the belt slot.
- Use hand to confirm that the belt does not slide in the belt slot.



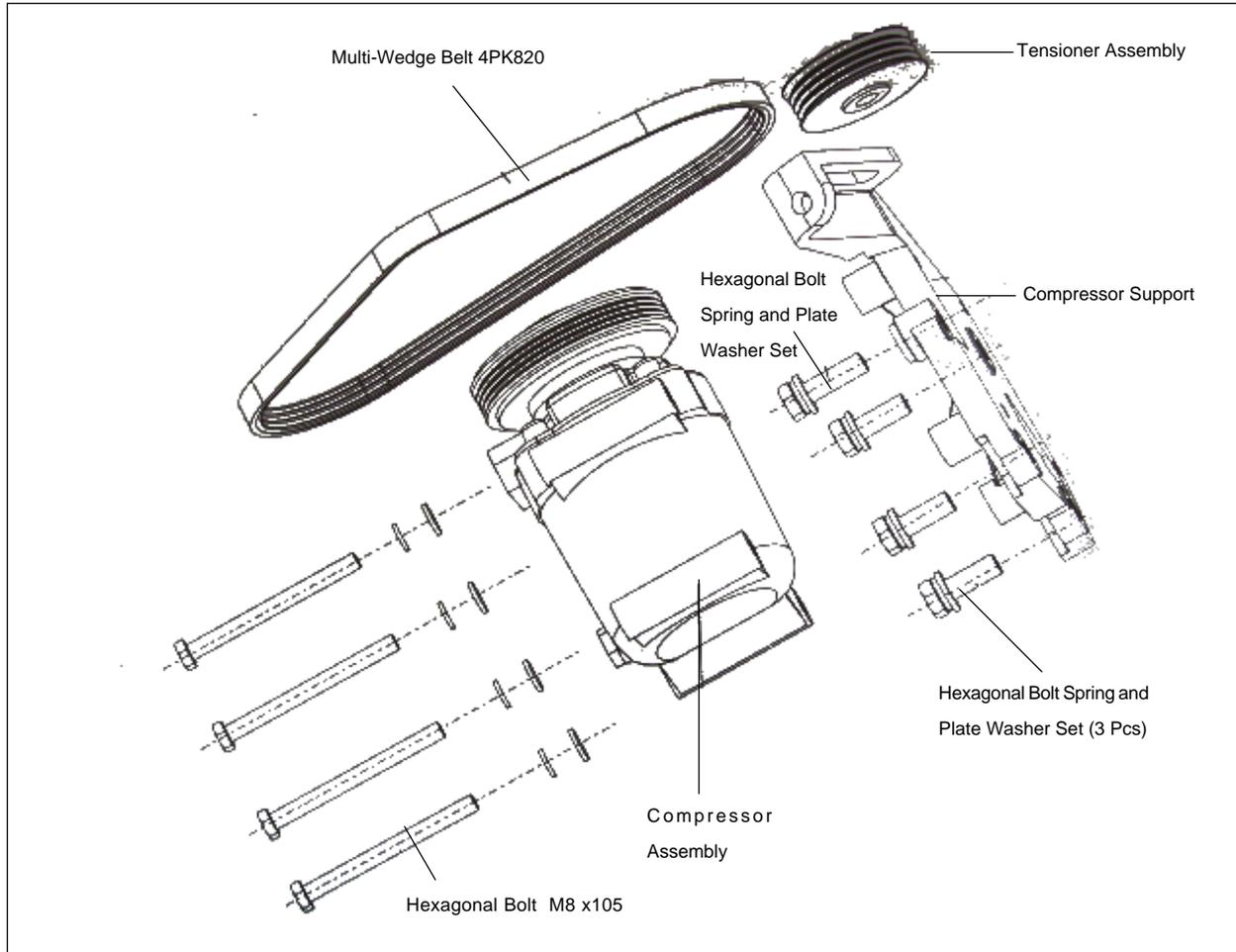
#### 4. Tighten multi-wedge belt

Tighten bolt A

Torque: 39 N. m

## Section 7 Compressor Assembly

### Component View

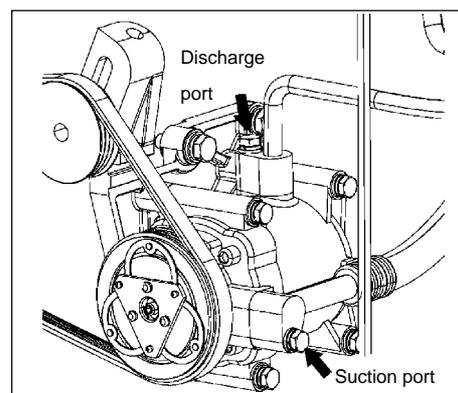


### Replacement

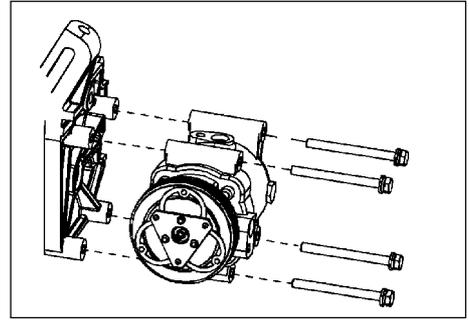
1. System drains coolant (refer to Coolant for details)
2. Remove multi-wedge belt (refer to Multi-wedge Belt (A/C Compressor to Crankshaft Pulley for details)).
3. Disconnect the suction vent
  - (1) Remove the bolt, disconnect the suction vent.
  - (2) Remove the O-ring from the suction vent.
4. Disconnect the exhaust vent
  - (1) Remove the bolt, disconnect the exhaust vent.
  - (2) Remove the O-ring from the exhaust vent.

**Notice:**

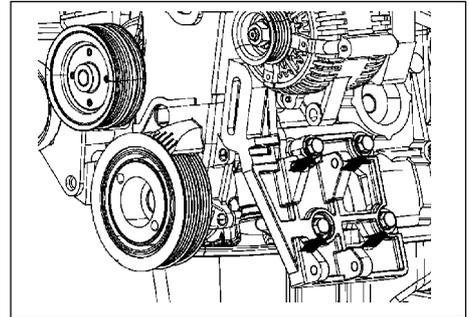
- Use vinyl tape seal all the interfaces of the disconnected parts to avoid entry of water and foreign objects.
- O ring is a non-reusable part.



5. Remove the compressor and magnetic clutch
  - (1) Disconnect the connector.
  - (2) Loosen 4 bolts and remove the compressor.



6. Remove the bracket for compressor
  - (1) Remove 4 bolts and detach the bracket for compressor.



7. Installation is the reverse order of removal.

## Section 8 Condenser Fan Motor and Condenser Assembly

### On-board Inspection

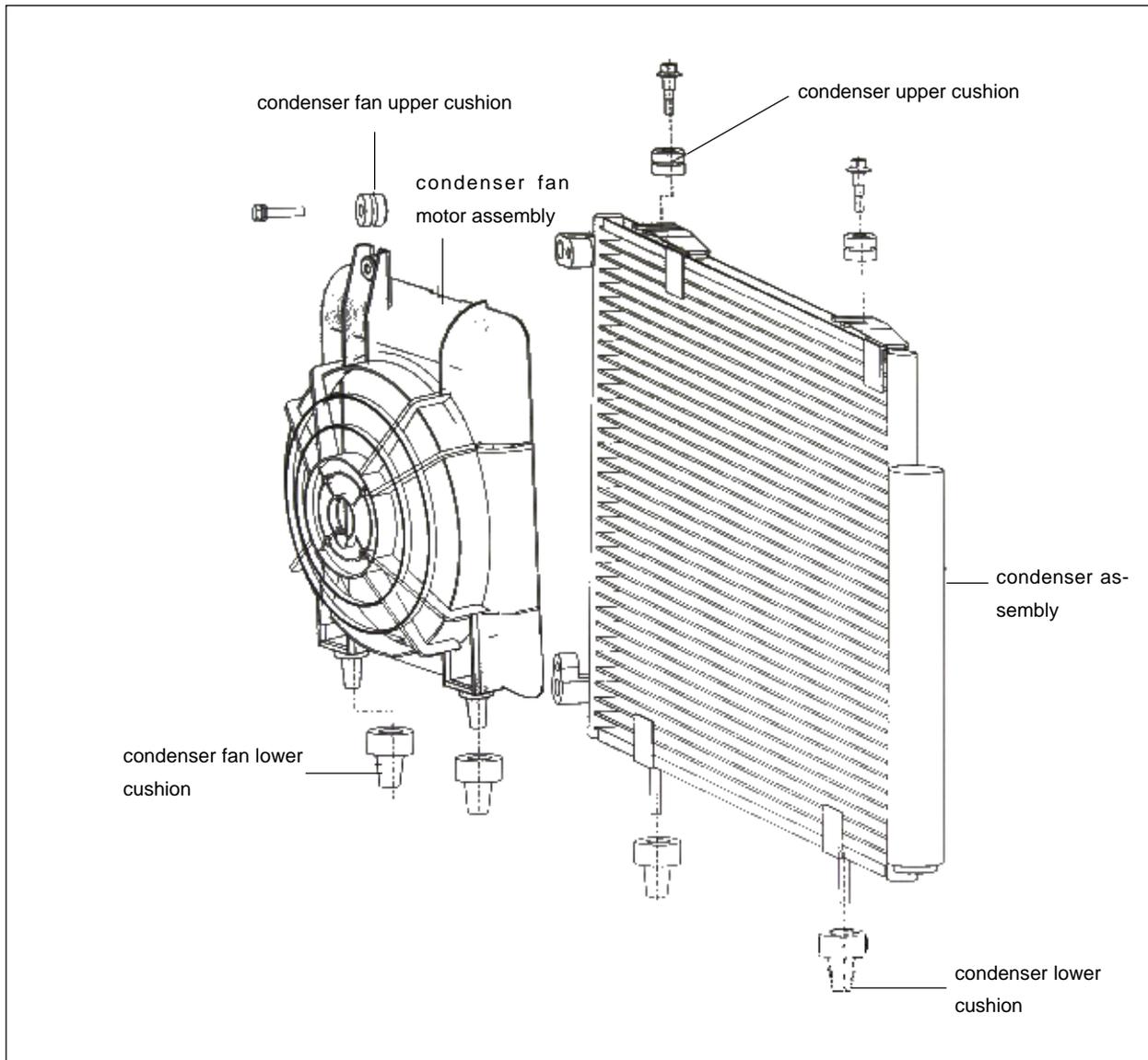
#### 1. check condenser assembly

- (1) if the radiator in the condenser is dirty, wash it with clean water and dry it with compressed air.
- (2) if the radiator in the condenser is distorted, use the proper tool to correct it.

#### 2. check the condenser for coolant leakage.

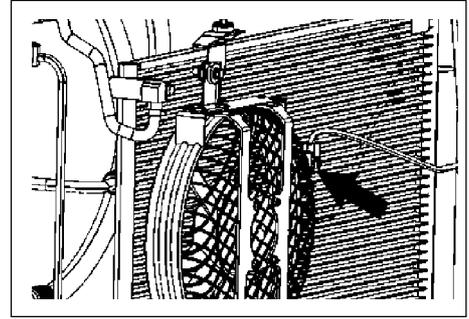
- (1) use the leakage tester to check the connection area of the pipeline for leakage.
- (2) If there is leakage, check the connector set bolt for tightening condition.

### Component View

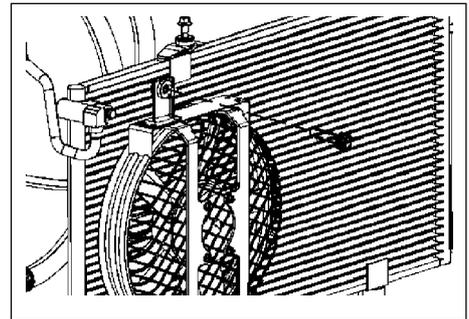


## Overhaul

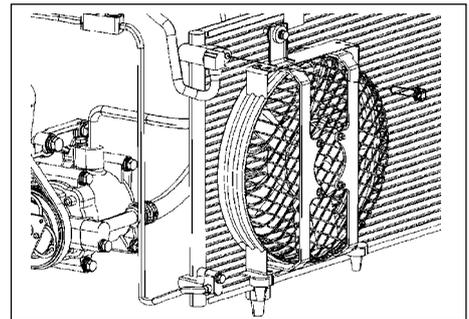
1. Drain coolant (refer to Coolant for details).
2. Remove condenser fan motor assembly
  - (1) Disconnect condenser fan motor wire harness connector.



- (2) Unscrew 1 bolt, remove condenser fan motor assembly.

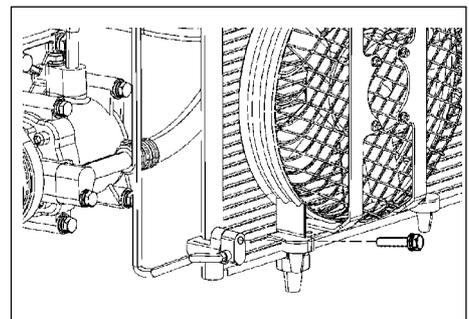


3. Disconnect the liquid tube
  - (1) Remove the bolt, disconnect the liquid tube from the condenser.
  - (2) Remove the O-ring from the liquid tube.

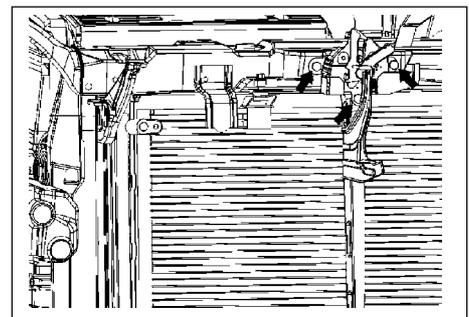


4. Disconnect the high and low pressure pipe assembly
  - (1) Remove the bolt, disconnect the high and low pressure tube assembly from the condenser.
  - (2) Remove the O-ring from the high and low pressure tube assembly.

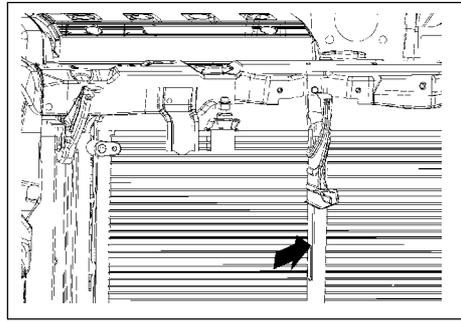
Notice: Use vinyl tape seal all the interfaces of the disconnected parts to avoid entry of water and foreign objects.



5. Remove engine hood lock assembly
  - (1) remove the bolt, remove engine hood lock assembly



6. Remove the center bracket for the radiator.



7. Remove the condenser body.



8. Change new O sealing ring and Installation is the reverse order of removal.

# Chapter 8 MK-60 ABS system

## Section 1 ABS Diagnosis

### I. Check ABS warning lamp

1. Check whether ABS warning lamp illuminates in the following way
  - a. Ignition switch turns to ON, ABS warning lamp illuminates for approximately 1.7s then goes out.
  - b. If it is not the above-mentioned case, it shows that there is fault, please check fault code.
  - c. If warning lamp does not illuminate at all, refer to trouble check list without fault code.

### II. Reading of information state

After power on fault diagnosis instrument, turn ignition switch to "ON " position, select function menu item 01, press OK for confirmation, the screen will display the following status information

1. E. g. ECU drawing number and version number:

ABS MK60 IE

2. Code 040907

### III. Read and eliminate fault code

1. After select "02 read fault code" in function selection menu, firstly display total number of fault, if there is no fault code, display no fault code. Now, press OK key to turn page, look down for fault code and its description. There is generally P or O before fault code, which represents that this is a persistent fault or a occasional fault. Persistent fault always exists, while occasional fault may be eliminated, only when run on real vehicle, might it appear again.

Note:

Read fault code function can not be exited in midway, only after all fault codes are turned over, could it return to function menu.

Eliminate fault code

2. In function selection function menu 05, press OK key to eliminate fault code, if fault code cannot be eliminated, it shows that this is a occasional fault, could be detected again only when the vehicle is actually running.

### IV. Display mode of malfunction code

System problem		Display code
No problem for the time being (ABS warning lamp does not illuminate)	Never occurred before	No fault code
	Once occurred before	Occasional fault code
Problem still exists (ABS warning lamp illuminates)	Never occurred before	Non-occasional fault code
	Once occurred before	Occasional fault code and non-occasional fault code

### V. Hydraulic control unit diagnosis

Use fault diagnosis instrument to diagnose hydraulic control unit, after select "3 hydraulic control unit diagnosis" , proceed according to the following steps.

Step	Action of operator	Screen display	Result in normal condition
01	Step down brake pedal and hold	Hydraulic control unit diagnosis -- hydraulic pump test	Pump motor works
02		Left front wheel -- step down brake pedal	
03		Left front wheel -- normally open valve opens, normally closed valve is closed, wheel lockup?	Wheel lockup
04		Left front wheel -- normally open valve is closed, normally closed valve is closed, wheel lockup?	Wheel lockup
05		Left front wheel __ normally open valve is closed, normally closed valve opens, wheels may rotate freely	Wheels may rotate freely, pedal rebounds, work noise of pump motor may be heard
06		Left front wheel __ normally open valve is closed, normally closed valve is closed, wheels may rotate freely	Wheels may rotate freely
07		Left front wheel -- normally open valve opens, normally closed valve is closed, wheel lockup?	Wheel lockup, pedal automatically goes down slightly
08	Release brake pedal		

\* Perform testing of the above steps 2-8 for each wheel. Sequence is as follows: left front → right front → left rear → right back.

\* If result of one of the above steps is different from the result in normal condition, it shows that corresponding actuator fails to work normally, please check corresponding actuator.

\* Here as long as "return " position appears on the screen, it may finish the testing via "ESC " key and returns to function menu.

## VI. Troubleshooting quick index table

Diagnostic code	Fault description	Diagnosis content	Check list No.	Reference page
65535	Electronic control unit	Damaged		
01276	ABS hydraulic pump	Motor cannot work	1	5-103
00283	Left front wheel sensor	Electric and mechanical failure	2, 3, 4	5-104
00285	Right front wheel sensor			5-106
00290	Left rear wheel sensor			5-106
00287	Right rear wheel sensor			
01044	ABS coding error		5	5-107
00668	Supply terminal 30		6	5-107
01130	ABS works abnormally	Signal lacks of conformity	7	5-108

## VII. Check list index of fault without fault code

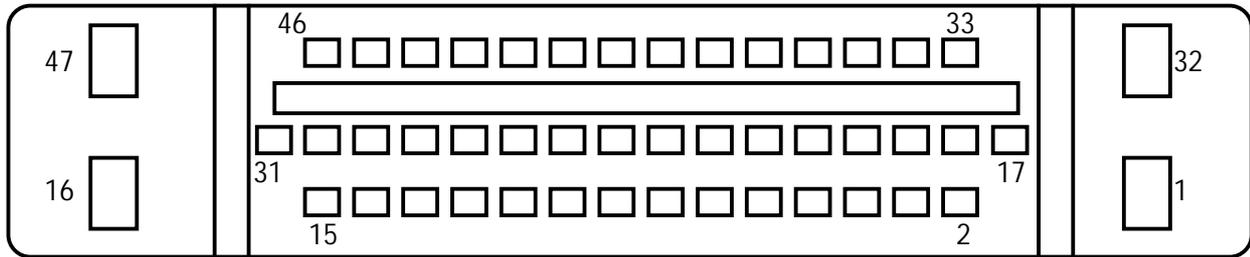
Fault condition		Check list No.	Reference page
When Ignition switch is turned to "ON " (engine stall condition), ABS warning lamp does not illuminate		1	5-109
After Engine is started, warning lamp does not go out		2	5-110
ABS works abnormally	Braking force on both sides is not even	3	5-111
	Braking force is insufficient		
	When brake pedal is stepped on slightly, ABS works (automobile in idle state)		
	When brake pedal is stepped on slightly, ABS works (automobile in running state)		
	When ABS works, brake pedal vibrates excessively		
Travel of brake pedal is too long		4	5-112
A very large force is needed to step on brake pedal		5	5-112
No fault code output (cannot communicate with fault diagnosis instrument)		6	5-113

## VIII. Circuit diagram

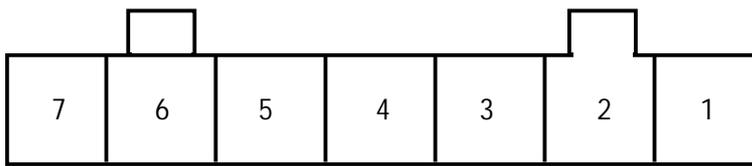
Please Refer to "MK WIRING DIAGRAM"

ABS ECU socket pin distribution (wiring harness end)

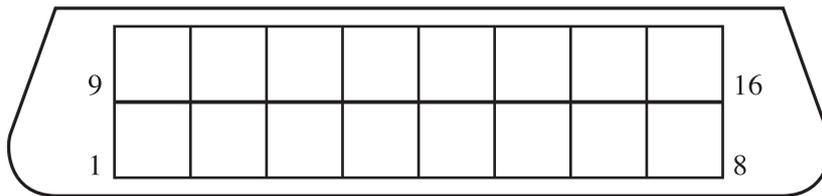
(1) ABS ECU socket (view of leading-out terminal)



(2) Trouble light driver module



(3) Diagnosis connector

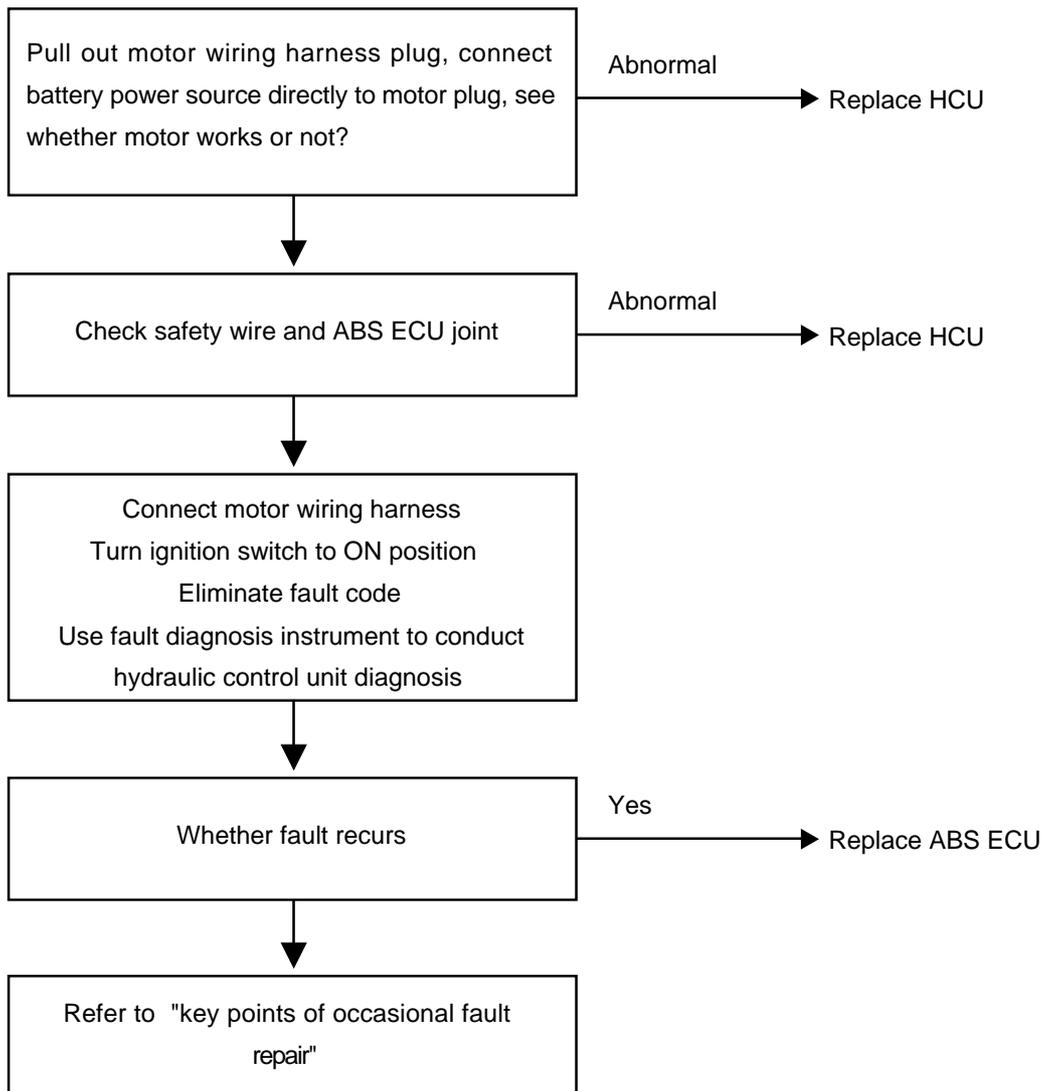


## Section 2 ABS System Check

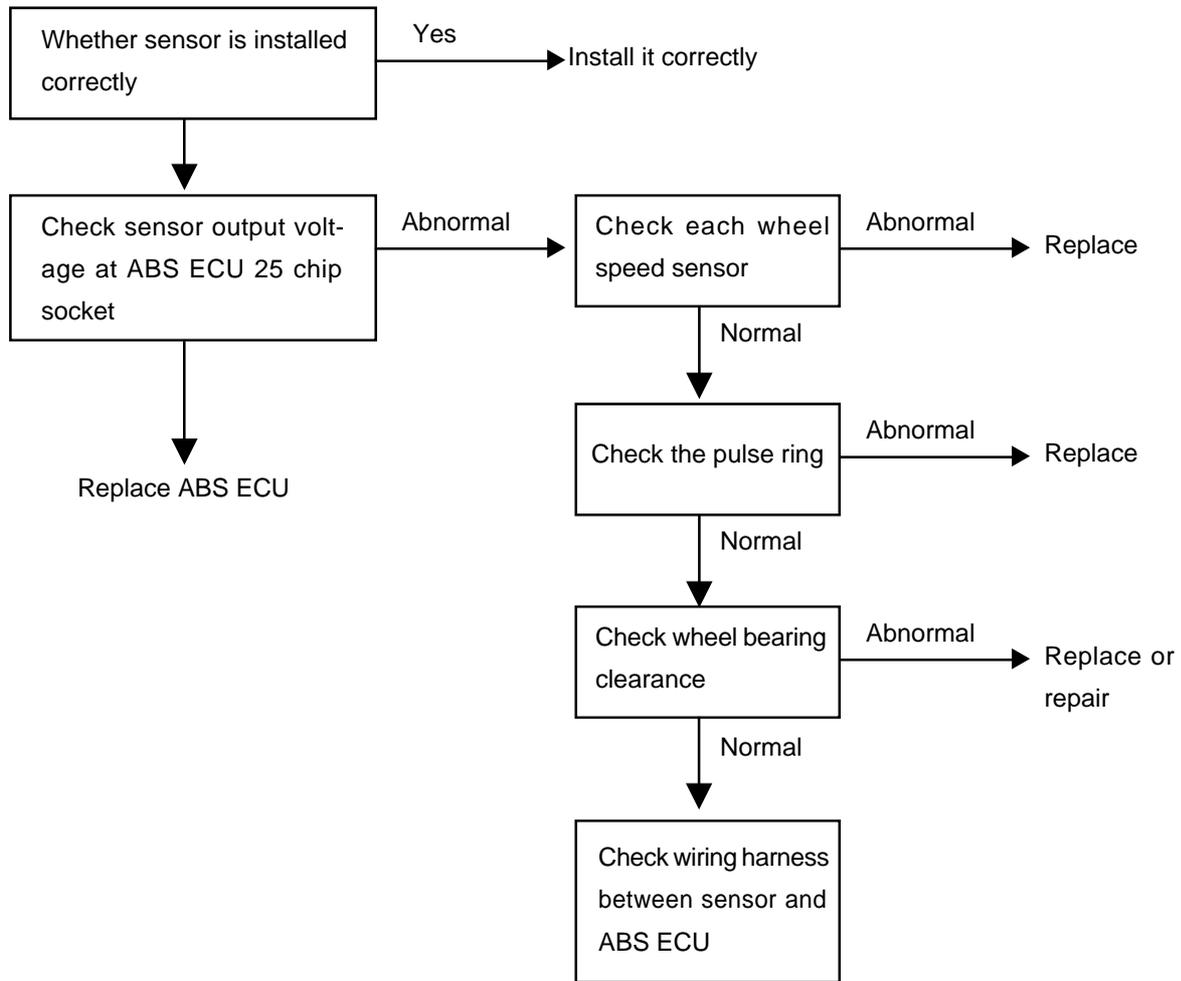
### I. Check list of fault with fault code

<p><b>1</b> Fault code is 01276</p> <p>[Description ] When vehicle speed exceeds 20 km/h, ABS ECU monitors that motor can not work normally, it will record this fault code</p> <p>[Prompt ] When this fault appears, wiring harness connection between motor and ECU may get loose. Use hydraulic pressure unit functional testing of fault diagnosis instrument to drive motor for this test.</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● Power supply is disconnected or earthed</li> <li>● Motor wiring harness gets loose</li> <li>● Motor is damaged</li> </ul>
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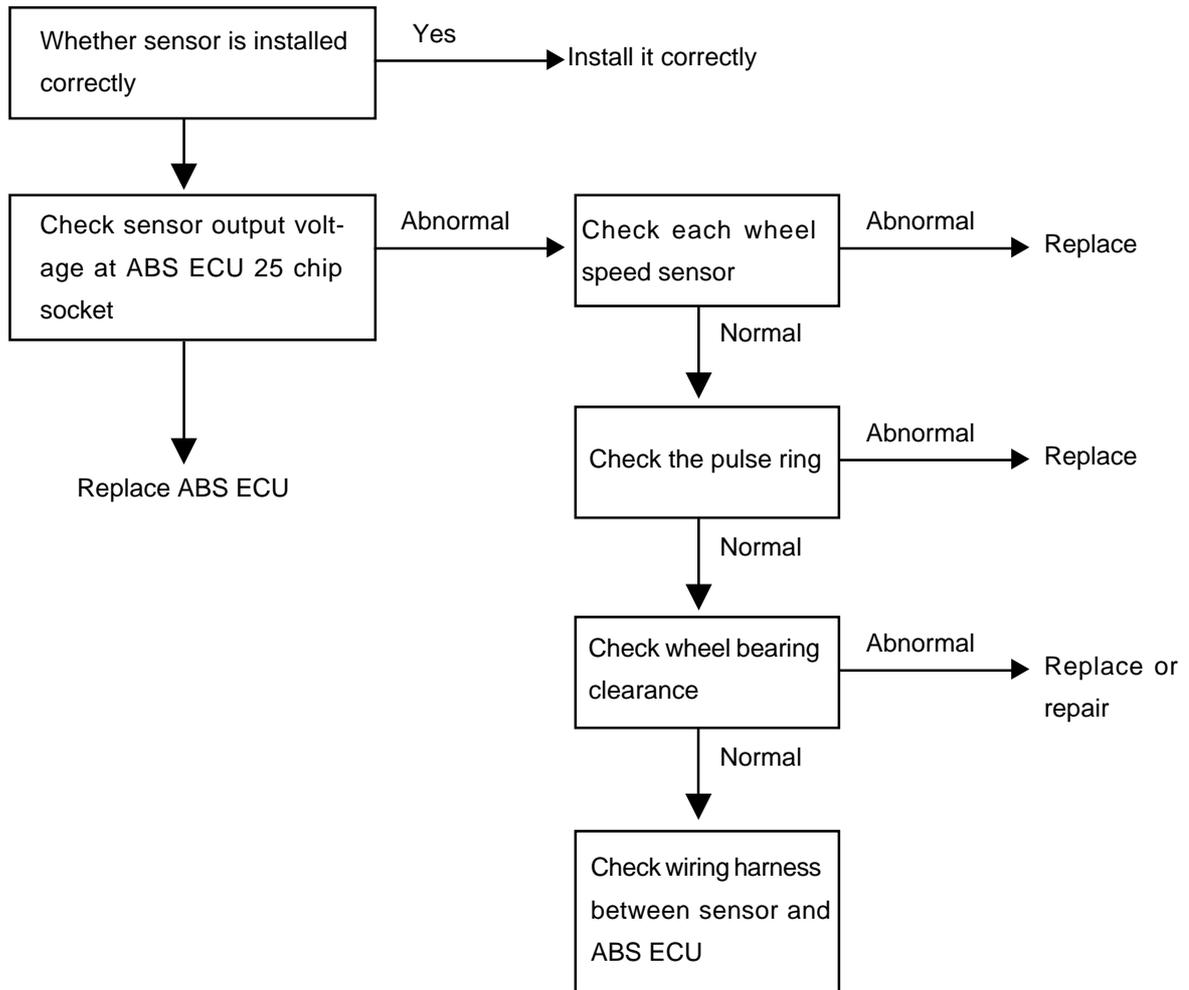
Note: If storage battery is discharged excessively, it might fail to drive motor, so when conduct motor drive test, firstly confirm whether voltage of storage battery is normal, when conduct motor drive test, vehicle must be in idle state.



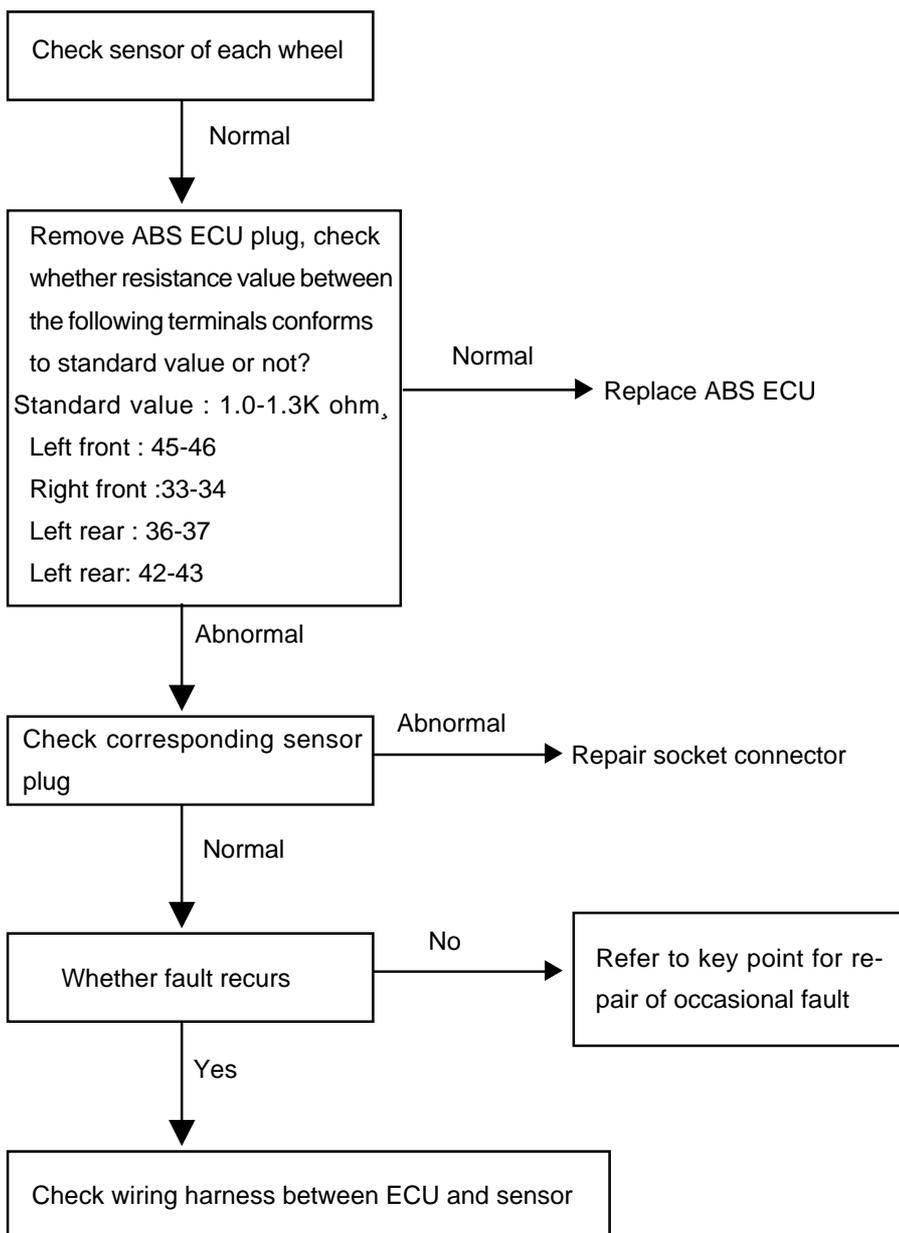
<p><b>2</b> Fault code is 00283, 00285, 00290, 00287</p> <p>[Description ] when open circuit cannot be detected, there is no signal output even if vehicle speed reaches above 20 km/h, this fault code will appear.</p> <p>[Prompt ] It is probably because that sensor is not mounted, sensor coil or wiring harness is shorted, air gap between sensor and gear ring is too large or gear ring is damaged.</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● Sensor is not mounted</li> <li>● Sensor coil or wiring harness is shorted</li> <li>● Air gap between sensor and gear ring is too large</li> <li>● Gear ring is not mounted</li> <li>● ABS ECU fails</li> </ul>
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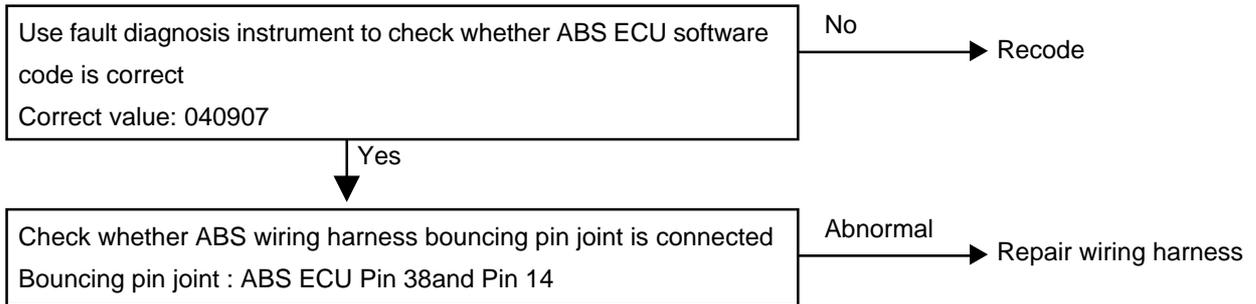
<p><b>3</b> Fault code is 00283, 00285, 00290, 00287</p> <p>[Description] When speed &gt;20km/h, if sensor signal exceeds tolerance range, this fault code will appear.</p> <p>[Prompt ] It is probably because intermittent poor contact or short circuit of sensor coil or wiring harness, gear ring is damaged or air gap between sensor and gear ring is too large, so sensor signal is too weak.</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● Intermittent poor contact or short circuit of sensor coil or wiring harness</li> <li>● Air gap between Sensor and gear ring is too large or too small</li> <li>● Gear ring teeth is damaged</li> <li>● Bearing clearance is too large</li> <li>● ABS ECU fails</li> </ul>
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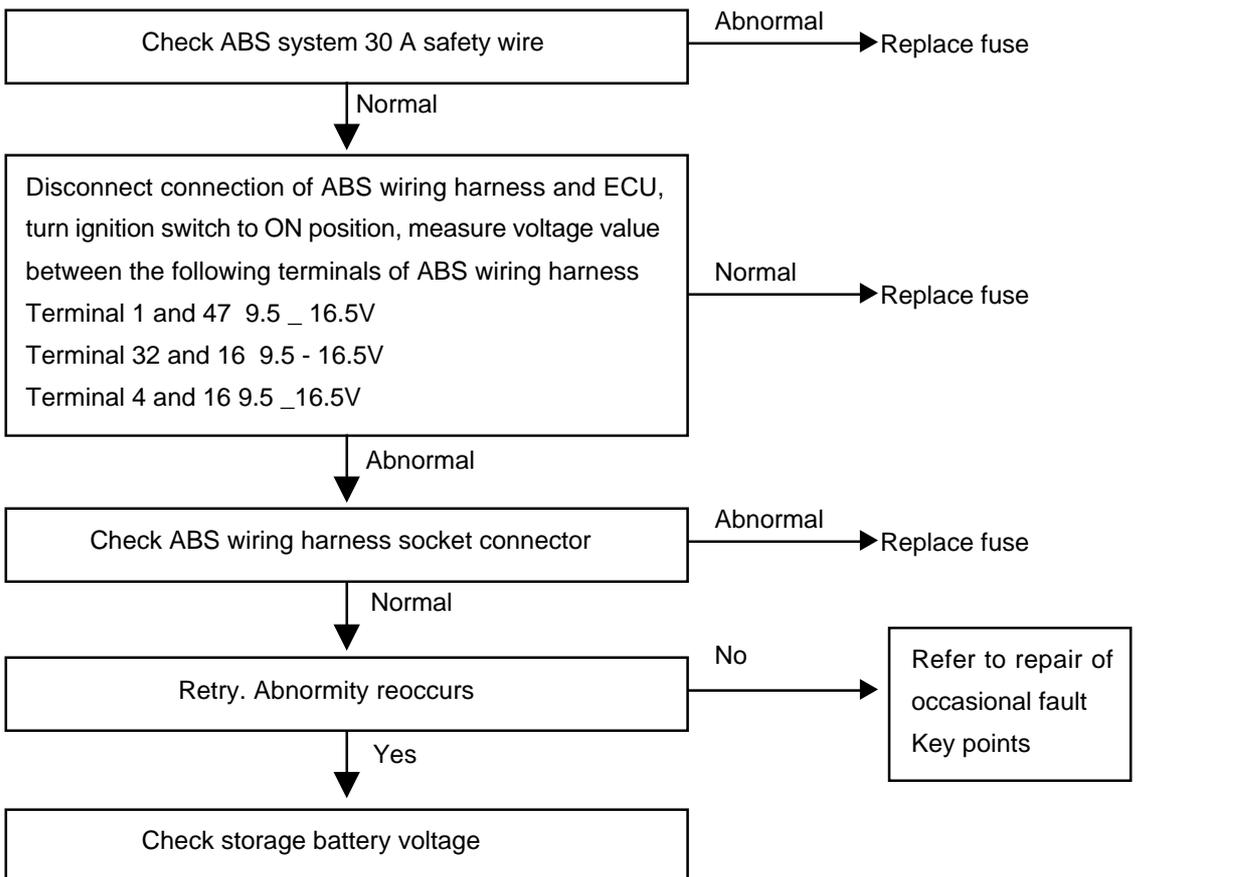
<p><b>4</b> Fault code is 00283, 00285, 00290, 00287</p> <p>[Description]When identifiable open circuit, short circuit etc faults exist on sensor, this fault code will appear.</p> <p>[Prompt ] It might because poor contact of sensor, short circuit of coil or wiring harness or faulty sensor signal processing circuit in ABS ECU</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● Sensor socket connector or coil is disconnected</li> <li>● Sensor coil appear is shorted</li> <li>● Sensor plug or wiring harness is shorted with earth or power supply</li> <li>●ABS ECU sensor signal processing circuit fails</li> </ul>
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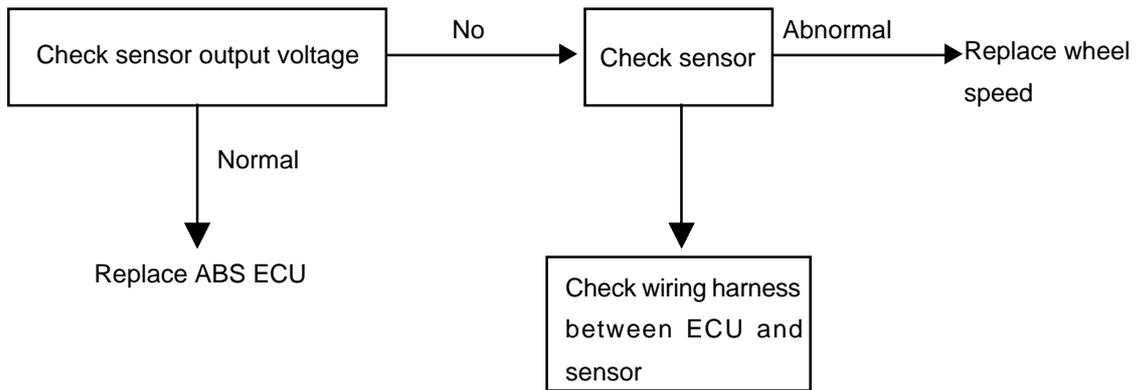
<p><b>5</b> Fault code is 01044</p> <p>[Description]When ECU software code is inconsistent with hardware bouncing pin connection, this fault code will appear</p>	Possible cause
	<ul style="list-style-type: none"> <li>● Bouncing pin connection error in ABS wiring harness</li> <li>● Abs ecu coding error</li> </ul>



<p><b>6</b> Fault code is 00668</p> <p>[Description]When supply terminal 30 does not supply voltage or voltage is too high, this fault code will appear.</p>	Possible cause
	<ul style="list-style-type: none"> <li>● Abs system fuse is blown out</li> <li>● Storage battery voltage is too low or too high</li> <li>● ABS wiring harness socket connector is damaged</li> <li>● ABS ECU is damaged</li> </ul>

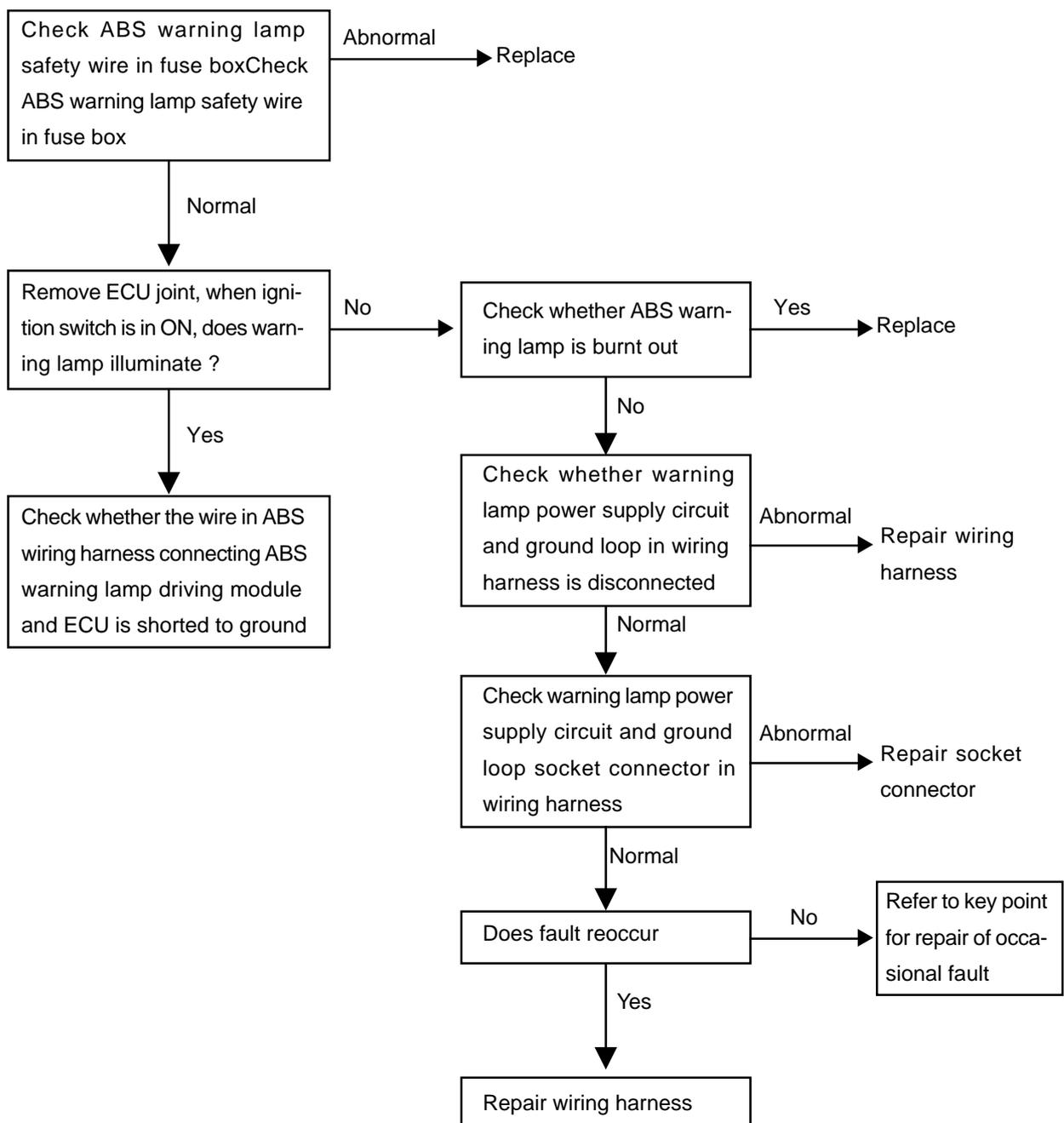


<p><b>7</b> Fault code is 01130</p> <p>[Description]When ABS suffers from high frequency interference of electromagnetic wave or microprocessor thinks that input speed signal is unauthentic, this fault code will appear</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● High frequency interference of electromagnetic wave</li> <li>● Sensor is damaged or sensor wiring harness is damaged</li> <li>● ABS ECU is damaged</li> </ul>
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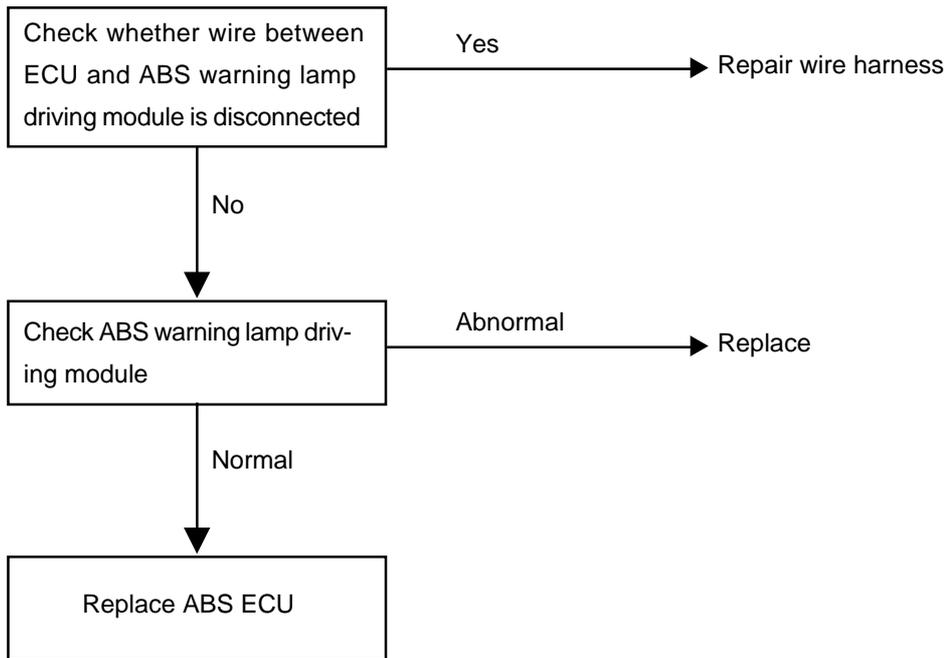
## II. Check list of fault without malfunction code

<p>1 When ignition switch is in ON position (engine stall), ABS warning lamp does not illuminate</p> <p>[Description] ABS warning lamp does not illuminate, warning lamp power supply circuit might be disconnected, bulb is burnt out or warning lamp driving module is damaged.</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● Safety wire is burnt out</li> <li>● ABS warning lamp bulb is burnt out</li> <li>● Power circuit is disconnected</li> <li>● ABS warning lamp driving module is damaged</li> </ul>
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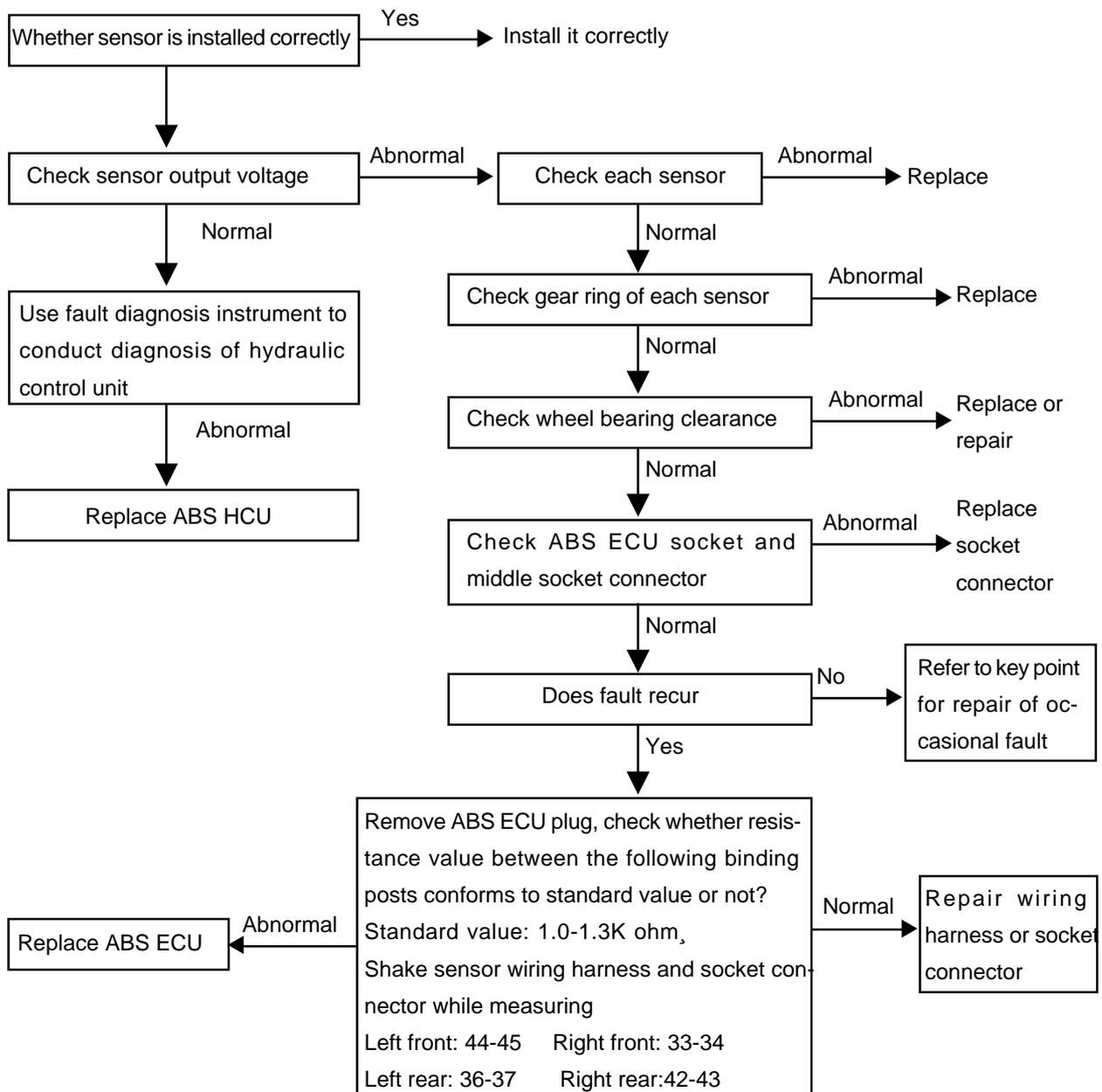


<p>2 After engine starts up, ABS warning lamp illuminates normally                  [Description] Probably because ABS warning lamp driving module is damaged or ABS warning lamp circuit is disconnected.</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● ABS warning lamp driving module is damaged</li> <li>● ABS warning lamp driving module circuit is disconnected</li> <li>● ABS ECU is damaged</li> </ul>
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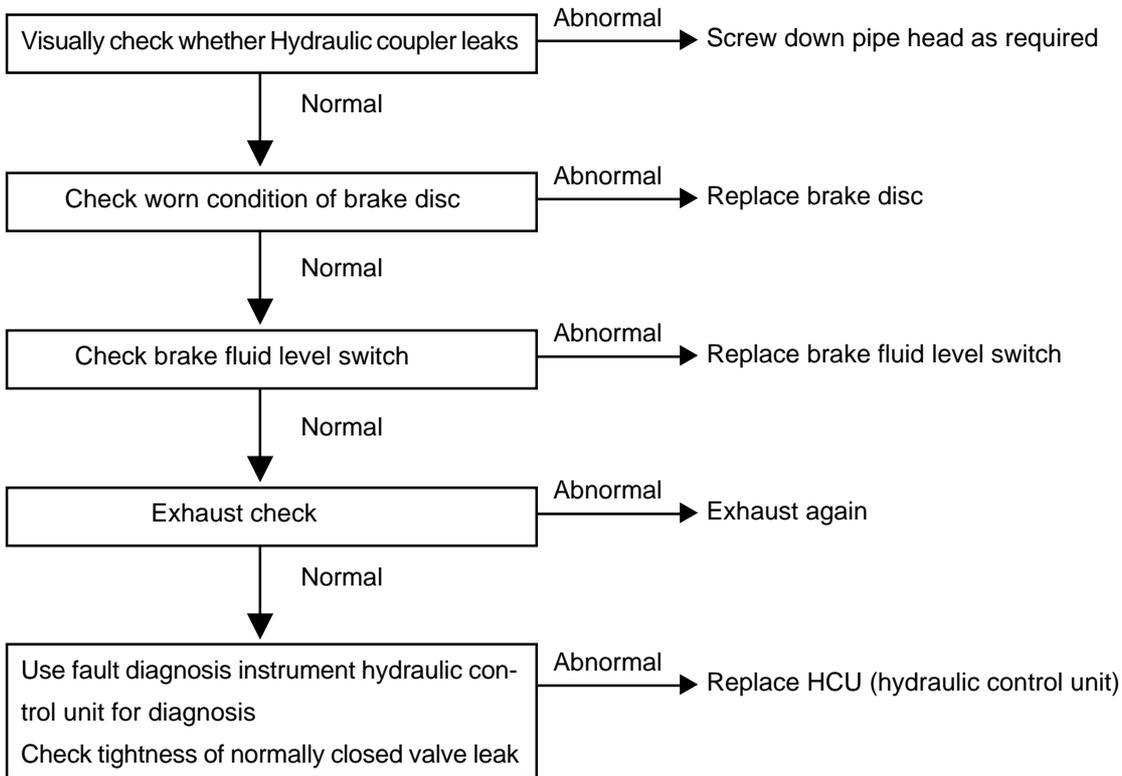
Note: this fault mode is only limited to the condition in which system may communicate with fault diagnosis instrument (ABS ECU ABS ECU power supply is normal), and there is no fault code.



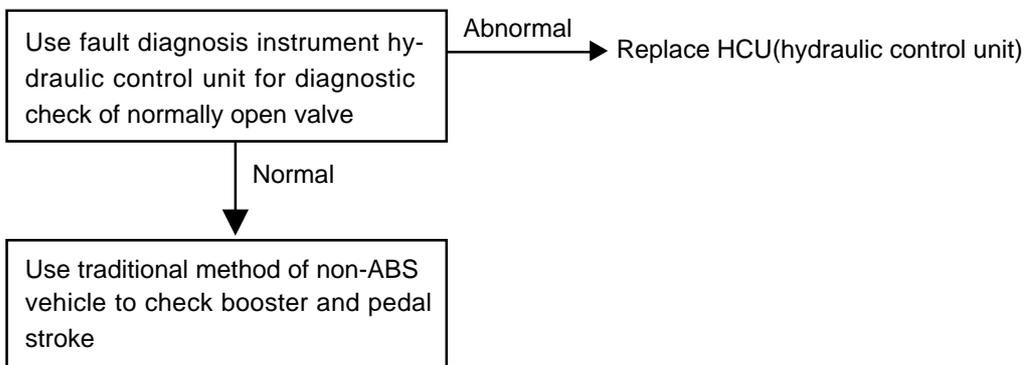
<p><b>3</b> ABS works abnormally</p> <p>[Description] This issue is closely related to driver condition and road surface condition, so it is not easy to conduct fault diagnosis. However, if there is no fault code memory, the following inspection may be conducted.</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● Sensor is not installed properly</li> <li>● Sensor wiring harness has problem</li> <li>● Sensor is damaged</li> <li>● Gear ring is damaged</li> <li>● Sensor is attached with foreign matter</li> <li>● Wheel bearing is damaged</li> <li>● ABS HCU (hydraulic pressure unit) is damaged</li> <li>● ABS ECU (electric control unit) is damaged</li> </ul>
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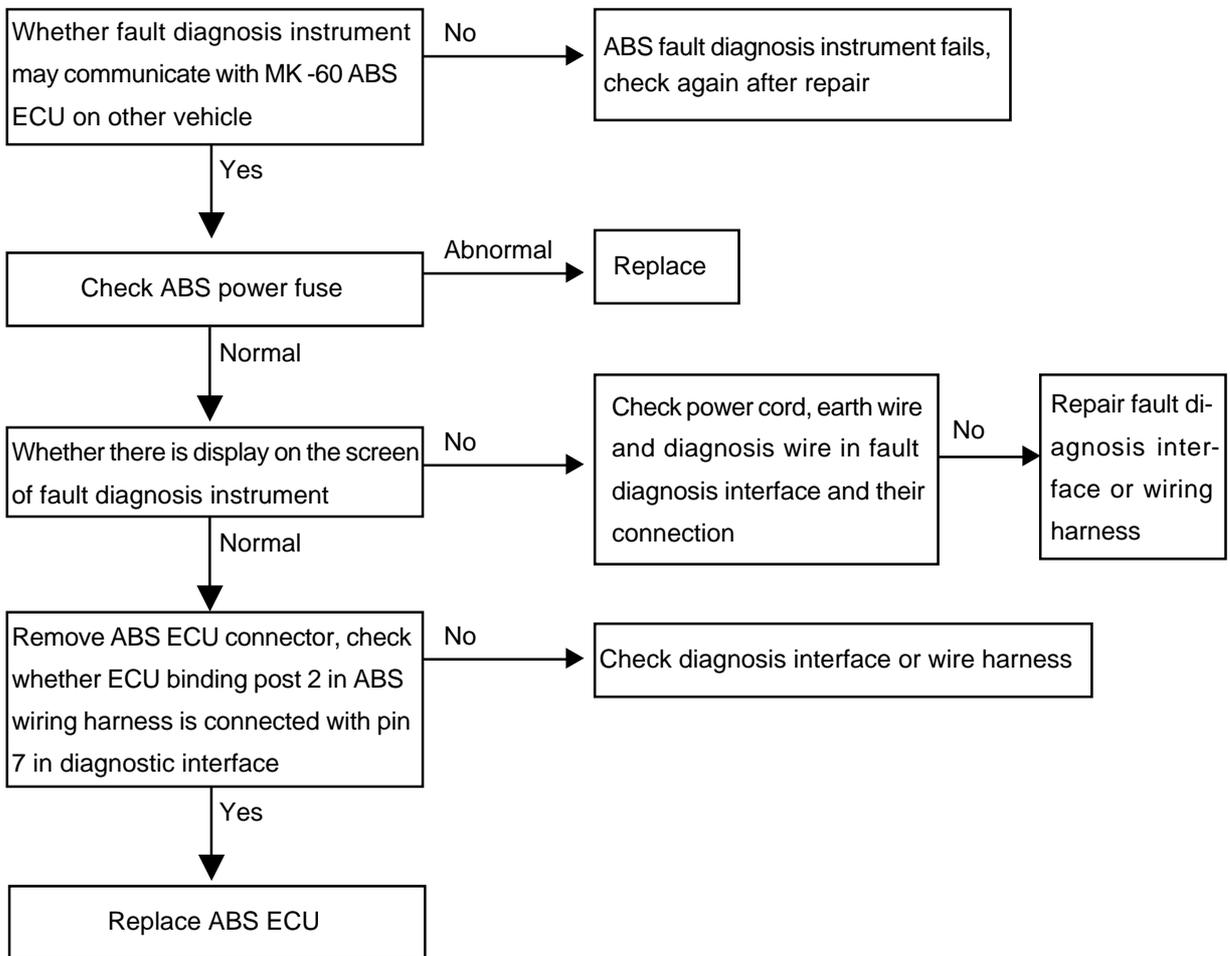
<p>4 Travel of brake pedal is too long</p>	<p>Possible cause</p>
<p>[Description] Firstly visually check whether there is external leakage or mechanical failure. Use exhaust method to check whether there is air in the system. Use fault diagnosis instrument hydraulic pressure unit functional testing to check whether normally closed valve leaks.</p>	<ul style="list-style-type: none"> <li>● Brake fluid leaks</li> <li>● There is air in the system</li> <li>● Brake disc is worn severely</li> <li>● Brake fluid level switch fails</li> </ul>



<p>5 A very large force is needed to step on pedal</p>	<p>Possible cause</p>
<p>[Description] Use traditional method to check travel of booster and brake pedal. Fault of normally open valve may be checked using fault diagnosis instrument hydraulic pressure unit functional testing</p>	<ul style="list-style-type: none"> <li>● Booster has problem</li> <li>● Normally closed valve has problem</li> </ul>



6	<p>No diagnostic code output (cannot communicate with fault diagnosis instrument)</p> <p>[Description] When it cannot communicate with fault diagnosis instrument, ABS ECU power supply circuit or diagnosis wire circuit might be disconnected</p>	<p>Possible cause</p> <ul style="list-style-type: none"> <li>● Safety wire is burnt out</li> <li>● Diagnosis wire is broken or joint gets loose</li> <li>● ABS ECU is damaged</li> <li>● Fault diagnosis instrument has problem</li> </ul>
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## III. ABS system inspection

Inspection item	Ignition switch position	Binding post	Standard value	Unit
Storage battery voltage (motor)	OFF	1-47	10.1 ~ 14.5	V
Storage battery voltage (Solenoid valve)	OFF	32-16	10.1 ~ 14.5	V
Power supply insulating property	OFF	4-16	0.00 ~ 0.5	V
Earth insulating property	OFF	16-47	0.00 ~ 0.5	V
Supply voltage	ON	4-16	10.1 ~ 14.5	V
ABS warning lamp	OFF	ECU is not connected	Warning lamp goes out	Visual inspection
	ON		Warning lamp illuminates	Visual inspection
	OFF	Connect ECU	Warning lamp goes out	Visual inspection
	ON		Warning lamp illuminates for about 1.7s, then goes out	Visual inspection
Brake light switch function pedal is not stepped down	ON	16-41	0.0 ~ 0.5	V
Brake light switch function pedal is stepped down	ON	16-41	10.0 ~ 14.5	V
Diagnostic interface	OFF	Diagnosis joint K and 7	0.0 ~ 0.5	ohm
Left front wheel speed sensor resistance value	OFF	45-46	1.2 ~ 1.3	k ohm
Right front wheel speed sensor resistance value	OFF	33-34	1.2 ~ 1.3	k ohm
Left rear wheel speed sensor resistance value	OFF	37-36	1.0 ~ 1.3	k ohm
Right rear wheel speed sensor resistance value	OFF	42-43	1.0 ~ 1.3	k ohm
Left front wheel sensor output voltage value	OFF	45-46	3.4 ~ 14.8	MV/Hz
Right front wheel sensor output voltage value	OFF	33-34	3.4 ~ 14.8	MV/Hz
Left rear wheel sensor output voltage value	OFF	37-36	>12.2	MV/Hz
Right rear wheel sensor output voltage value	OFF	42-43	>12.2	MV/Hz
Speed sensor output voltage ratio	$\frac{\text{Maximum peak to peak value voltage}}{\text{Minimum peak to peak value voltage}} \leq 2$			

Inspection item	Key switch position	Operation	Standard value	Remarks
Note: when perform the following inspection, vacuum must be applied on vacuum booster.				
Tightness of left front wheel normally open valve and normally closed valve	ON	Step on pedal	When left front wheel cannot rotate, pedal does not sink	Check normally closed valve
	ON (two valves are energized simultaneously with pump)	Step on pedal	Left front wheel may rotate freely, pedal does not sink	Check normally open valve
Tightness of right front wheel normally open valve and normally closed valve	ON	Step on pedal	When right front wheel cannot rotate, pedal does not sink	Check normally closed valve
	ON (two valves are energized simultaneously with pump)	Step on pedal	Right front wheel may rotate freely, pedal does not sink	Check normally open valve
Tightness of left rear wheel normally open valve and normally closed valve	ON	Step on pedal	When left rear wheel cannot rotate, pedal does not sink	Check normally closed valve
	ON (two valves are energized simultaneously with pump)	Step on pedal	Left rear wheel may rotate freely, pedal does not sink	Check normally open valve
Tightness of right rear wheel normally open valve and normally closed valve	ON	Step on pedal	When right rear wheel cannot rotate, pedal does not sink	Check normally closed valve
	ON (two valves are energized simultaneously with pump)	Step on pedal	Right rear wheel may rotate freely, pedal does not sink	Check normally open valve

Note: fault diagnosis instrument function "03 hydraulic control unit diagnosis" is used for this inspection.

#### IV ABS work inspection

1. Check wheel speed sensor output voltage
  - a. Check whether gap between wheel speed sensor and gear ring meets standard value or not
    - For standard value of front wheel, see installation drawing of front wheel sensor
    - For standard value of rear wheel, see installation drawing of rear wheel sensor
  - b. Jack up wheel, loosen manual brake
  - c. Remove ABS wiring harness, measure at wiring harness socket connector

d. Rotate the wheel at speed of about 1 / 2 turns per second, use multimeter or oscillograph to measure output voltage

Terminal 45-46

Terminal 33-34

Terminal 37-36

Terminal 42-43

Output voltage

- When use multimeter for measurement
  - See front wheel sensor drawing for front wheel.
  - See rear wheel sensor drawing for rear wheel
- When use oscillograph for measurement
  - See relevant standard for front wheel.
  - See relevant standard for rear wheel.

e. If output voltage is not in above-mentioned range, the cause might be the following:

- Air gap between sensor and pulse ring is too large.
- Sensor fails.
- Check sensor resistance value (1. 0 - 1. 3 k ohm).
- Take four points on pulse ring to check air gap between pulse ring and wheel speed sensor (pulse ring distortion).

2. Check hydraulic pressure unit HCU

- a. Jack up vehicle to confirm that wheel may rotate freely.
- b. Release manual brake.
- c. After connecting fault diagnosis instrument, turn ignition switch to ON, here it is not necessary to start up engine.
- e. Check with reference to hydraulic control unit diagnosis.

Note: when connect or remove fault diagnosis instrument, ignition switch must be in OFF position

## Section3 Removal and Installation

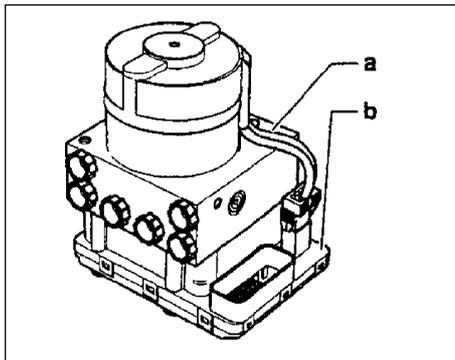
I. Precautions for removal and installation

1. Firstly use diagnostic instrument to find out source of trouble, then repair.
2. Repair front prior use excluding mineral oil of detergent will surface clean Neatness ;repair when should note before repair, use detergent without mineral oil to wipe off surface;pay attention to cleaning during repair, only use rag without wool to wipe removed components.
3. Only use original factory spare parts, and new spare parts could only be unpacked just before installation.
4. Return liquid pump motor and hydraulic controller (HCU) is integrated structure, can not be separated.

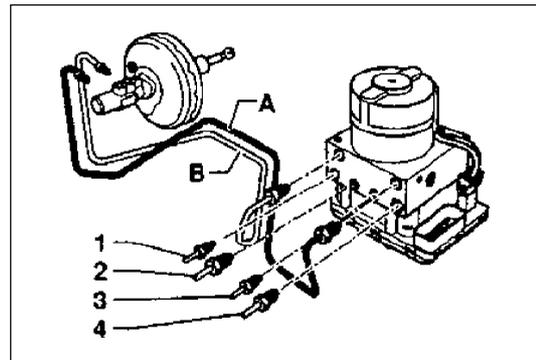
5. When system is opened, don't use compressed air or move the vehicle.
6. After removing ABS assembly, use appropriate plugs to plug up hydraulic delivery outlets as soon as possible.  
Remove other parts that might hinder work.
7. Please use HZY4 brake fluid, do not use mineral oil.
8. Use brake fluid to soak sealing member and Oring, do not use engine oil or brake ointment.
9. After repair, check whether function of routine brake system and ABS brake is reliable and normal or not.
10. Check whether there is any leakage at all Hydraulic couplers.

## II. Removal of HECU

1. Turn off ignition switch and disconnect storage battery minus earth wire.
2. Remove wiring harness plug from ABS HECU assembly.
3. Step down the pedal >60mm, use pedal bracket to fix it, so master cylinder center valve will be turned off, when system is opened, brake fluid will not flow out from outlet.
4. Put a clean pad under hydraulic controller.
5. Firstly remove brake hard tube (A, B) on HCU connecting with master cylinder, make sign. Plug up the outlet with a plug immediately.
6. Remove brake pipe (1 - 4) to wheels and make sign. Plug up the outlet with a plug immediately.
7. Remove the screw cap fixing HECU onto the bracket.
8. Remove the entire HECU from bracket.



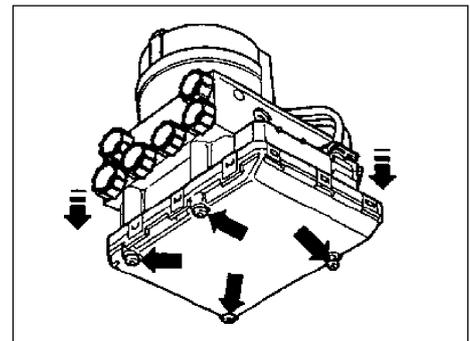
ABS HECU assy.



Schematic diagram for removal of ABS HECU brake oil pipe

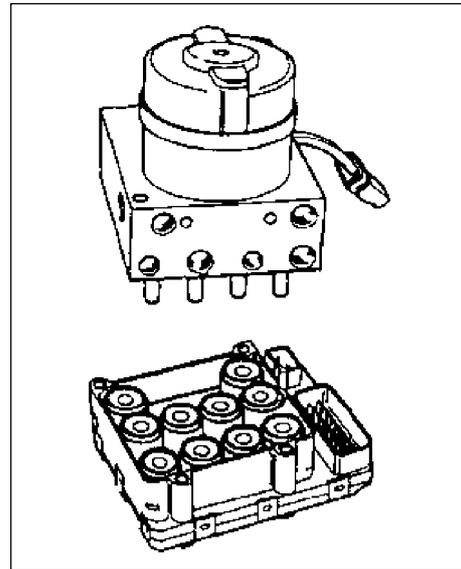
## III. Replace hydraulic control unit

1. Press lock catch on joint side, remove wire harness of pump motor.
2. Remove 4 screws as shown in the figure, the removed old screws can not be reused.
3. Separate hydraulic control unit HCU from electronic control unit ECU.
4. Mount new hydraulic control unit HCU onto electronic control unit ECU.
5. Use new screw to fix ECU onto HCU, tightening moment: 3-4N.m.
6. Insert motor wiring harness, note that lock catch must be in right position.



#### IV. Replace electronic control unit

1. Press lock catch on joint side to remove wiring harness.
2. Remove 4 screws as shown in the figure and discard them.
3. Remove hydraulic control unit HCU from electronic control unit ECU.
4. Mount new electronic control unit ECU onto hydraulic control unit HCU.
5. Use new screws to lock ECU on HCU, torsional moment:3-4N. m.
6. Insert motor wiring harness, note that lock catch must be in right position.



#### V. Reinstallation of ABS assembly

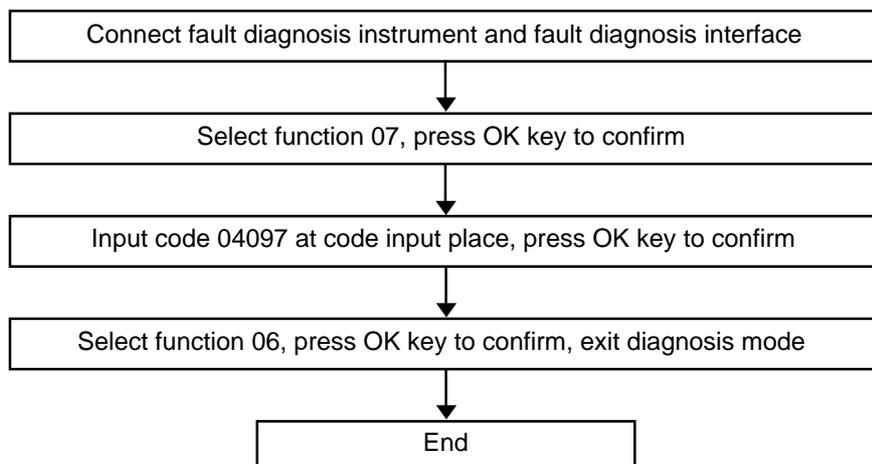
Note: plug of hydraulic opening on ABS assembly may be removed only when brake hard tube is to be installed, so as to avoid foreign body entering brake system

1. Mount ABS assembly to bracket and tighten it, moment is 20~24 N. m.
2. Remove the plug on hydraulic opening, mount brake hard tube, confirm that hard tube connection is correct.
3. Mount brake hard tube to master cylinder.
4. Tightening moment for assembly of brake hard tube is 12~16N. m (M10 x 1) and 15~18 N. m (M12 x 1).
5. Fill new brake fluid into tank until liquid level reaches MAX place, use specified method to exhaust.
6. Turn ignition switch to ON, ABS warning lamp must illuminate for 1. 7s, then go out.
7. Eliminate fault code memory, reread to see whether there is any fault code.
8. Finally, run the vehicle in actual situation to confirm function of ABS (you should feel rebound of pedal).

#### VI. ECU code

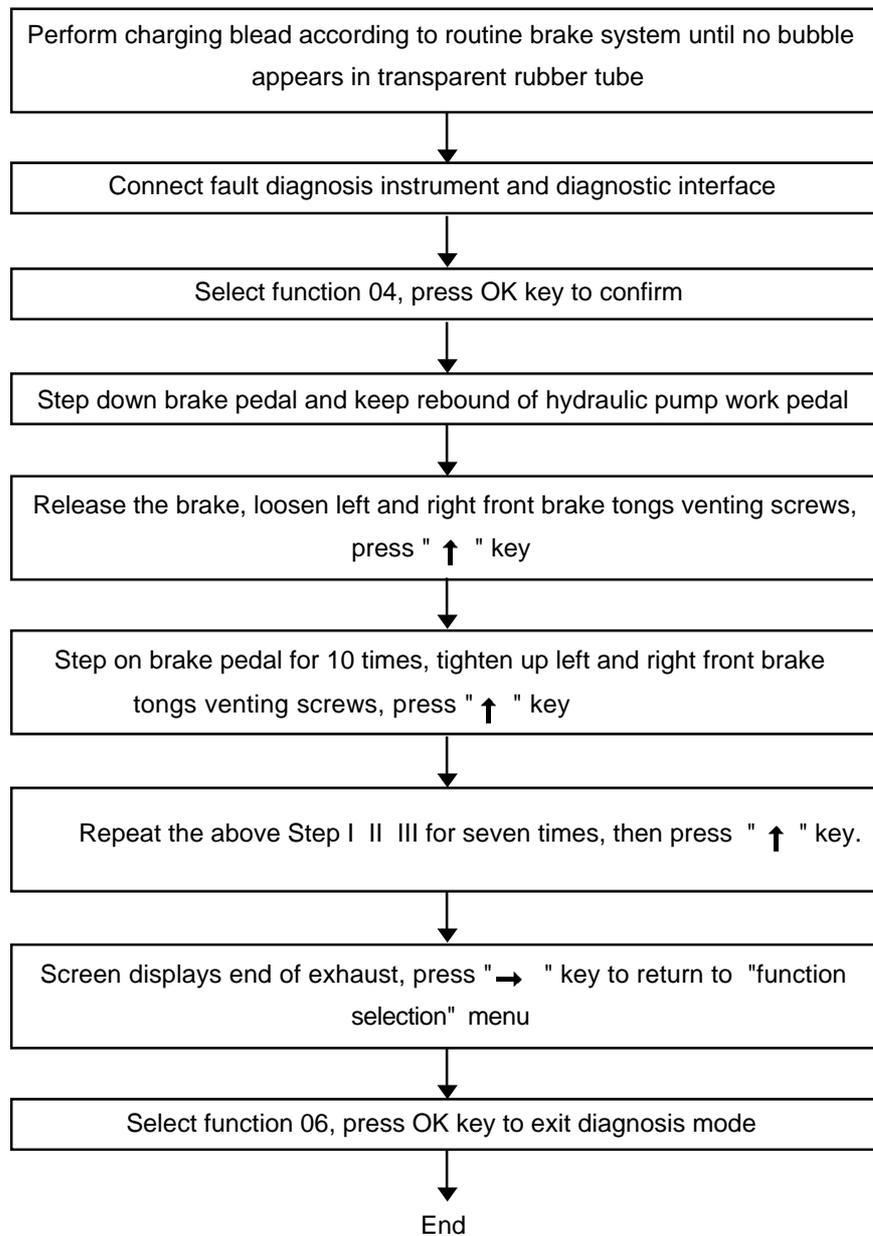
Note: when replacing HECU or ECU, encode new ECU, otherwise ABS warning lamp blinks, system can not work normally.

Use fault diagnosis instrument to encode ECU, the steps are as follows:



## VI. Filling brake fluid and bleed

After replace HECU, besides filling and bleed as per routine brake system, also bleed the secondary circuit of HECU. Steps are as follows if fault diagnosis instrument is used for operation:



# Chapter 9 Engine EFI System

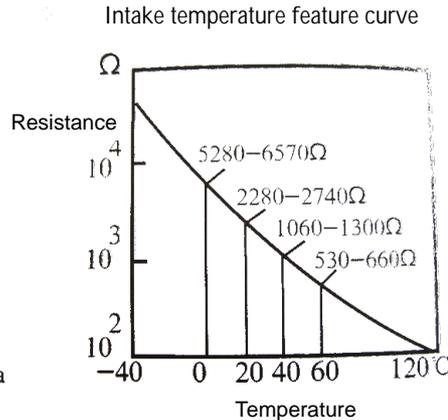
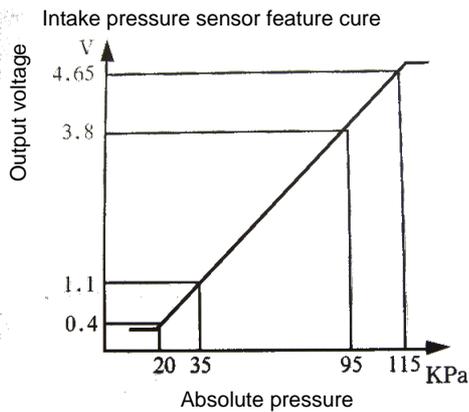
## I. Outline

This system includes sensor that detects engine functioning. Engine ECU utilizes sensors installed at different parts of engine to measure various working parameters of engine, accurately control oil injection quantity according to control procedure set in engine electronic control unit, so engine could work in optimum mode under various operating conditions, i. e. optimal power output, the most economical oil consumption, optimal exhaust emissions. Engine ECU is capable of start up control, idle speed closed-loop control, air fuel ratio closed-loop control, canister control, transient operation control, angle of ignition control, knocking control, air conditioning control, coasting fuel cutoff and overspeed fuel cutoff control, ternary catalyst heating and protection control, system self-diagnosis etc.

## II. Inspection of control element

### 1. Manifold intake pressure temperature sensor

(1) The part to measure intake pressure is piezo type sensor, could provide controller with "load signal " according to the difference between atmospheric pressure and manifold pressure; controller will supply 5V voltage, and feed back 0-5V voltage to controller according to different intake pressures. The part to measure intake temperature is NTC type (negative temperature coefficient) sensor, resistance changes with intake temperature, this sensor conveys a voltage representing intake temperature change to the controller.

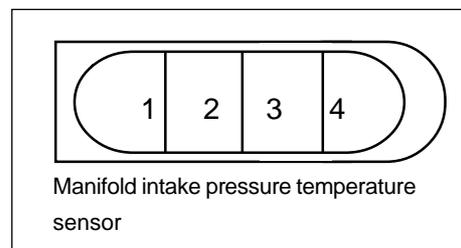


Fault symptom	Possible cause
Flameout, poor idle speed	There is abnormal high voltage or reverse heavy current during use Vacuum unit is damaged during repair

Repair precautions: it is prohibit to use high pressure gas to impact vacuum unit during repair; when replace sensor case of trouble, check whether generator output voltage and current is normal or not.

### (2) Simple measuring method:

Temperature sensor part: (remove joint) turn digital multimeter to Ohm position, two meter pens connect sensor 1 #, 2 # pin respectively, rated resistance is 2.5k ohm±5% at 20° C, corresponding resistance value may be measured from the above characteristic curve. Simulation method may also be used for measurement, specific procedure is to use electric drier to blast sensor (pay attention not to be too close), observe change of sensor resistance, here resistance



should drop.

Pressure sensor part: (connect joint), turn digital multimeter to DC voltage position, black meter pen is earthed, red meter pen is connected with 3#, 4# pin respectively. In condition of idle speed, 3# pin should have reference voltage of 5 V, 4 # pin voltage should be about 1. 3 V (specific value is related with vehicle type); in no-load condition, open the throttle slowly, change of voltage of 4 # pin is not large; open the throttle quickly, voltage of 4 # pin may reach about 4V in no time (specific value is related with vehicle type), then it drops down to about 1. 5 V.

2. Throttle position sensor

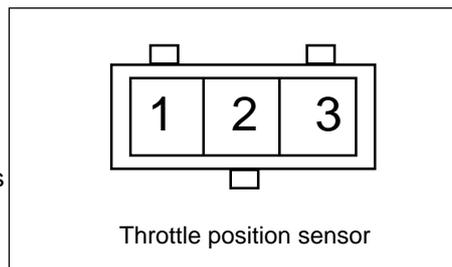
(1) This sensor is actually corner potentiometer with linear output characteristic. Potentiometer tumbler is mounted coaxially with throttle, when throttle rotates, it drives potentiometer tumbler to slide to certain position, potentiometer outputs voltage signal proportional to throttle position.

Fault symptom	Possible cause
Poor speedup etc	Man made fault

Repair precautions: pay attention to mounting position.

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with sensor 1 #, 2 # pin respectively, its resistance value at room temperature is 2k ohm± 20 %. Connect two meter pens with 1 #, 3# pin respectively, rotate throttle, its resistance value shows linear change with opening of throttle, while situation is reverse for 2 #, 3# pin.



Note: when observe change of resistance value, pay attention to observe whether has large leap.

3. Coolant temperature sensor

(1) This sensor is a negative temperature coefficient (NTC) thermistor, its resistance value decreases with increase of temperature, but not a linear relationship. This thermistor is installed in a copper heat conducting sleeve.

Fault symptom	Possible cause
Difficult to start	Man made fault

Mounting torque: 20 N.m(Max)

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with sensor pins respectively, rated resistance at 20° C is 2.5 k ohm± 5%. Simulation method may also be used for measurement, specific procedure is to put sensor work area into boiled water (pay attention to soak for sufficient time), observe change of sensor resistance, now resistance should drop down to 300 ohm-400 ohm (specific value subjects to temperature of boiled water).

No.	Resistance value (K ohm)				Temperature (° C)
	Temperature tolerance ± 1° C		Temperature tolerance ± 0° C		
	Min.	Max.	Min.	Max.	
1	8.16	10.74	8.62	10.28	-10
2	2.27	2.73	2.37	2063	+20
3	0.290	0.354	0.299	0.345	+80

4. Knocking sensor

(1) Knocking sensor is a vibration acceleration sensor. Mounted on engine cylinder body. Sensing element of the sensor is a piezocrystal. Vibration of engine cylinder body is transferred to piezocrystal via mass block in the sensor. Since pressure generated by vibration of mass block is applied to piezocrystal, it generates voltage on two polar planes and turns vibration signal into voltage signal for output.

Symptom	Possible cause
Poor acceleration	Various liquids, such as engine oil, cooling fluid, brake fluid, water etc contact the sensor for a long time, which cause corrosion to the sensor.

Mounting torque: 20 ± 5 N.M

Repair precautions: sensor must be fitted closely to cylinder body with its metal surface, any type of washer is not permitted for installation. For wiring of sensor signal cables, note that do not let resonance occur to signal cables, otherwise they might be broken. Energizing of high voltage between sensor 1 # and 2 # pins must be avoided, otherwise piezoelectric element might be damaged.

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with sensor 1 #, 2 # pin respectively, its resistance value at room temperature should exceed 1M ohm. Turn digital multimeter to millivolt position, use a hand hammer to tap near knocking sensor, now voltage signal output should be available.

5. Oxygen sensor

(1) Its sensing element is a ceramic tube, outside is open to exhaust, inside is open to atmosphere. When temperature of sensing ceramic tube reaches 350° C, it will have the characteristic of solid state electrolyte. Just utilizing this characteristic, it converts concentration difference of oxygen into electric potential difference, thus forms electrical signal output. If mixed gas is a bit concentrated, inside and outside oxyanion concentration difference of ceramic tube is high, electric potential difference is a bit high.

A large number of oxyanions move from inside to outside, output voltage is high (approximate 900mV); if mixed gas is a bit thin, inside and outside oxyanion concentration difference of ceramic tube is low, electric potential difference is low, only a small quantity of oxyanions move from inside to outside, output voltage is low (approximate 100mV).

Symptom	Possible cause
Poor idle speed, poor speedup, tail gas overproof, too high oil consumption	1. humid water vapor ingresses inside of sensor, temperature changes rapidly, probe is broken. 2. oxygen sensor "is poisoned". (Pb, S, Br, Si)

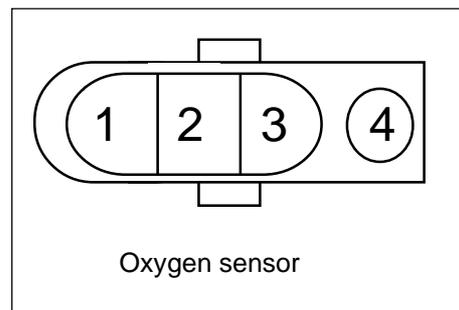
Mounting torque: 40-60 N.m

Repair precautions: it is prohibited to use cleaning fluid, oily liquid or volatile solid on oxygen sensor during repair.

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with sensor 1#(white), 2 #(white) pin respectively, its resistance value at room temperature is 1- 6 ohm.

(Connect joint) in idle speed condition, when oxygen sensor reaches its working temperature of 350° C, turn digital multimeter to DC voltage position, connect two meter pens with sensor 3#(grey),



4#(black) pin respectively, now voltage should fluctuate quickly between 0. 1-0. 9V.

6. Speed sensor

(1) Use with oscillator. Oscillator is a fluted disc, originally has 60 teeth, but two teeth are absent. Oscillator is mounted on crankshaft, and rotates with the crankshaft. When tooth tip passes by sensor end closely, the oscillator which is made of ferromagnetic material cuts magnetic line of permanent magnet in the sensor, and generates induced voltage in coil, which is output as rotating speed signal.

Symptom	Possible cause
Fail to start	Man made fault

Mounting torque:  $8 \pm 2$  N.m

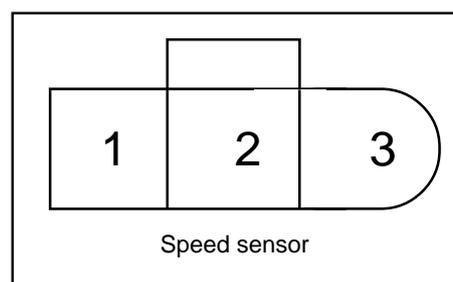
Repair precautions: use pressing in instead of hammering method for installation during repair.

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with sensor 2#, 3# pins respectively, rated resistance at 20° C is 770-950 ohm.

(Connect joint) turn digital multimeter to AC voltage position, connect two meter pens with sensor 2 #, 3# pins respectively, start up engine, now voltage output should be available.

Suggestion: use oscillograph for vehicle use to check.



7. Phase sensor

(1) This sensor consists of a hall sensor and a rotor made of steel plate. Fix hall sensor, mount rotor on camshaft. Rotor is a 180( range cylindrical face steel blade. When the blade covers hall sensor, high Level signal is output; otherwise low level signal is output. This differentiates two different upper dead points.

Fault symptom	Common cause
Dischrge overproof, increased oil consumption	Man made fault

Repair precautions: avoid removing end cover as far as possible during repair, so as to avoid ingress of foreign matter, which might result in abnormal damage of magnetic gate.

(2) Simple measuring method:

(Connect joint) turn on ignition switch but not start up engine, turn digital multimeter to DC voltage position, connect two meter pens with sensor red, black conductors respectively, ensure reference voltage of 5V is available. Start up engine, voltage output between green and black conductors should be available.

Suggestion: use oscillograph for vehicle use to check.

8. Idle speed regulator

(1) Idle speed regulator consists of a step motor and a sealing plug on its shaft, sealing plug may generate radial displacement driven by step motor shaft, position of sealing plug determines extent of opening of by-pass airway, so as to adjust the size of by-pass air quantity. Position of sealing plug is controlled by ECU output.

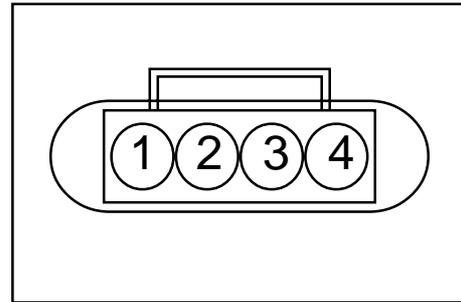
Fault symptom	Possible cause
Too high idle speed, flameout at idle speed	Since interior contamination is severe, regulating element is blocked and leads to malfunction.

Repair precautions: dust and sand grain will result in damage of idle speed regulator. Intake air should be filtered by dry air cleaner before entering idle speed regulator, filtration efficiency should exceed 99 %. To

replacing air cleaner, always ensure that no dirt enters air duct, never use ungraded air cleaner.

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with regulator pin 1, 4 and 2, 3 respectively. Rated resistance between 1, 4 and between 2, 3 at 20° C should be about 43.2 ohm.



9. Fuel injector

(1) ECU energizes coil of fuel injector to form magnetic field force. When magnetic field force increases to sufficient to overcome pressure of return spring, gravity of needle valve and resultant force of frictional force, needle valve begins to rise, oil injection process begins. When oil injection impulse cuts off, pressure of return spring closes needle valve again.

Symptom	Possible cause
Poor idle speed, poor speedup, failure to start (difficult to start)	Since lack of maintenance, gum builds up in fuel injector and leads to malfunction

Repair precautions:

1. there are many kinds of fuel injector, their appearance is the same, mountable fuel injector may not be the exactly suitable one, part number of fuel injector used in repair must be consistent with original fuel injector, wrong replacement is not permitted;

2. To facilitate installation, it is recommended to apply silicon free clean engine oil on O ring surface at upper part connecting distributing pipe of fuel oil. Pay attention not to let engine oil contaminate fuel injector inside and jet orifice;

3. To remove and reinstall fuel injector, O ring must be replaced, here do not damage sealing surface of fuel injector;

4. if fuel injector has two slots, when mount buckle clamp, pay attention not to clamp in the wrong position, refer to mounting position of original parts;

5. It is strictly prohibited to remove strainer, clean or replace strainer at discretion; 6. after removal, ensure cleanness of fuel injector holder, avoid foreign matter ingressing the cylinder.

Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with fuel injector pins respectively, rated resistance at 20° C is 11-17 ohm.

Suggestion: use special cleaning analyzer to conduct thorough cleaning for the fuel injector per 20000km.

10. Electric fuel pump

(1) Fuel pump is a vane pump driven by DC motor, is placed in oil tank, immersed in fuel oil, utilizes fuel oil for heat dissipation and lubrication. Storage battery supplies power to electric fuel pump via oil pump relay, the relay switches on electric fuel pump circuit only at the time of startup and during operation of engine. When engine shuts down due to accident, fuel pump stops running automatically.

Symptom	Common cause
Large running noise, poor speedup, failure to start (difficult to start)	1. Gum builds up to form insulating layer; 2. Oil pump bushing is blocked with armature; 3. Fuel level sensor assembly is corroded etc.

Repair precautions:

1. according to engine requirement, electric fuel pumps with different flows are available, they have the same appearance, mountable fuel pump may not be exactly suitable, during repair, part number of fuel pump used must be consistent with original one, wrong replacement is not permitted;
2. in order to prevent fuel pump from damaging, please do not run it in dry state for a long time;
3. in case fuel pump needs to be replaced, please pay attention to clean fuel tank and pipeline and replace fuel filter.

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with fuel pump pins respectively, measure internal resistance, it should not be zero or infinite (namely not in short circuit, open circuit condition).

(Connect joint) connect fuel pressure gauge on sucker, start up engine, run the engine at idle speed, now fuel pressure of engine should be about 260kPa;unplug fuel pressure regulator vacuum tube, now fuel pressure should be about 300KPa.

#### 11. Canister control valve

(1) Canister in fuel evaporation control system adsorbs oil vapor from oil tank until saturated. Electronic control unit controls opening of canister control valve, fresh air and saturated fuel vapor in canister form regeneration stream, which is led into engine intake pipe again. Electronic control unit changes duty ratio of pulsing signal to canister control valve solenoid according to different operating conditions of engine, thus controls flow of regeneration stream. In addition, this flow is also influenced by pressure difference at both ends.

Symptom	Possible cause
Poor idle speed, malfunction etc	Entering of foreign matter into valve inside results in corrosion or poor leak tightness etc

Repair precautions:

1. To install, airflow direction must meet the specification;
2. when black granules inside valve body result in malfunction of control valve, and control valve needs to be replaced, please check the condition of canister;
3. avoid water, oil etc liquids from entering valve as far as possible during repair;
4. in order to avoid transfer of solid-borne noise, it is recommended to install canister control valve suspending on the hose or use soft rubber to fix.

(2) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with canister control valve pins respectively, rated resistance at 20° C is 22 - 30 ohm.

#### 12. Ignition coil

(1) When earthing channel of primary winding is connected, this primary winding is charged. Once ECU cut off primary winding circuit, charging stops, high voltage is induced in secondary winding at the same time, so spark plug discharges. Ignition coil ZSK 22 (both ends of 2 secondary windings are connected with a spark plug respectively, so these two spark plugs ignite simultaneously).

Symptom	Possible cause
Fail to start	Too heavy current leads to burnout, damaged by external force

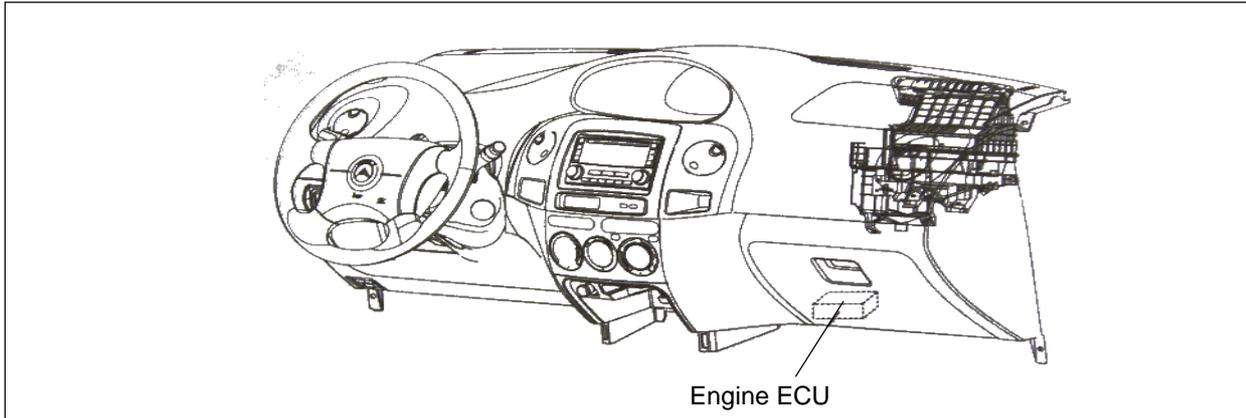
Repair precautions: it is prohibited to use "short circuit ignition testing method" to test ignition function, so

as to avoid damaging electronic control unit.

(1) Simple measuring method:

(Remove joint) turn digital multimeter to ohm position, connect two meter pens with primary winding pins respectively, rated resistance at 20° C is 0.4-0.6 ohm for 2X2 type; on secondary winding, 11-15k ohm for 2x2 type.

### 13. Electronic control unit ECU



Symptom	Possible cause
Unsteady idle speed, poor speedup, failure to start, too high idle, tail gas overproof, difficult to start, malfunction of air conditioner, malfunction of fuel injector control, flameout	Electric overload of externally connected device leads to burnout of components inside ECU and results in malfunction

Repair precautions:

1. Don't remove ECU at discretion during repair;
2. ECU may be removed more than 1 minute after removing storage battery head;
3. Store removed ECU properly;
4. It is prohibited to attach any circuit onto connecting wire of ECU.

Simple measuring method:

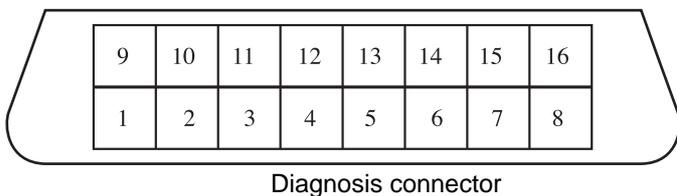
1. (Connect joint) use engine data K-line to read engine trouble record;
2. (Remove joint) check whether ECU connecting wire is in good condition or not, mainly check whether ECU power supply grounded circuit is normal or not;
3. Check whether external sensor works normally, whether output signal is credible, whether circuit is in good condition;
4. Check whether actuator works normally, whether its circuit is in good condition;
5. Finally replace ECU to conduct test.

Judgment principle: "two interchange principle" ---interchange ECU, interchange fault symptom.

### III. Diagnostic system

Description:

When engine ECU detects a trouble, engine trouble warning lamp on instrument will illuminate. In addition, relevant diagnostic code will be recorded in ECU memory. Connect handheld tester with diagnostic interface on automobile, read various data from automobile ECU. Connect handheld tester with diagnostic interface. Technical personnel may also read fault code via blinking of instrument fault warning lamp.



Terminal No.	Terminal definition
4	Power supply (-)
7	Bus (signal)
16	Power supply (+)

Notes: use tester cable to connect handheld tester with diagnostic interface, turn ignition switch to ON position, operate tester, if tester displays that communication is not possible, the vehicle or tester fails.

Inspection diagnosis

1. Check engine fault warning lamp

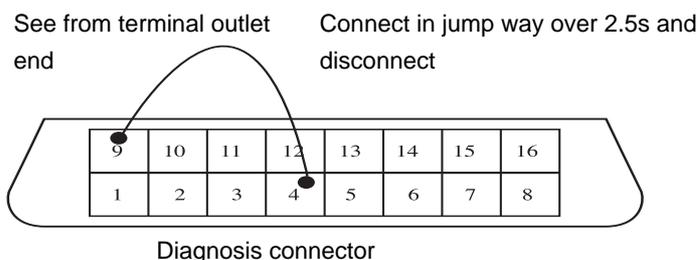
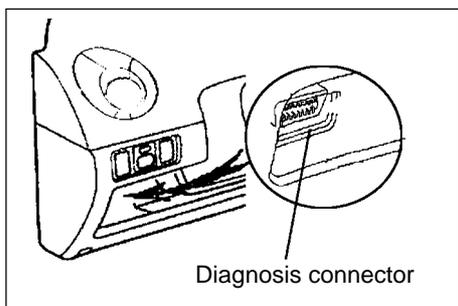
- (1) When ignition switch is turned to ON position and engine does not run, engine warning lamp on instrument should illuminate.
- (2) When engine runs, engine fault warning lamp should go out. If it still illuminates, diagnostic system detects system fault or abnormality.

2. Use handheld tester to check diagnostic code

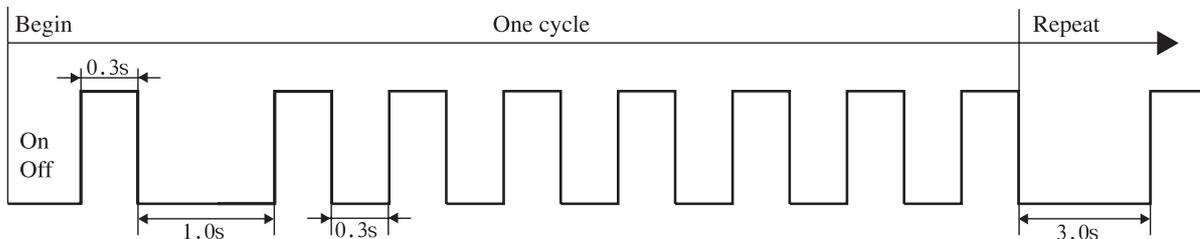
- (1) Connect handheld tester according to corresponding pin.
- (2) Turn ignition switch to ON position, turn on main switch of handheld tester.
- (3) Use handheld tester to detect and check diagnostic code, refer to fault diagnostic code table. (For operation of handheld tester, see instruction manual of handheld tester)

3. Engine fault warning lamp displays fault code through blinking code, so professional may make fault judgment in case of emergency.

- (1) Turn ignition switch to ON position.
- (2) Short signal pin (9<sup>#</sup>) and negative pole (4<sup>#</sup>) for more than 2.5s, then disconnect them, detection fault lamp on dashboard will blink the faults in fault code according to their occurrence sequence.



(3) Each fault code will blink for three times, interval time is 3s, after blinking for the third times, after an interval of 3s, next fault code will blink. After blinking of all fault codes is finished, they will blink from beginning again. The following diagram shows engine fault warning lamp blinking mode for oxygen sensor fault code 17.



Flashing way of malfunction code 17 for O<sup>2</sup> sensor

4. Eliminate fault code either by diagnosis instrument or manually. Manual operation method, specific procedure: use engine data K-line (namely 9 # terminal of diagnostic interface) earth twice, earthing time is more than 2.5 s at each time.

Fault code table

No	Faulty part	Fault code	Fault lamp	Fault type
1	No fault	11	OFF	-
2	Electronic control unit (unit) fault	34	ON	2
3	Knocking control zero test	1	OFF	-
4	Knocking sensor	15	ON	2
5	Storage battery voltage	38	OFF	2
6	Intake pressure sensor	16	ON	1
7	Throttle position sensor	14	ON	1
8	Idle speed control valve	61	ON	1
9	Coolant temperature sensor	19	ON	1
10	Intake temperature sensor	18	ON	1
11	Engine maximum speed overrun	33	OFF	2
12	Fuel injector 1	22	ON	1
13	Fuel injector 2	23	ON	1
14	Fuel injector 3	24	ON	1
15	Fuel injector 4	21	ON	1
16	Fan relay	42	ON	1
17	Oxygen sensor	17	ON	1
18	Air fuel ratio control correction coefficient	31	OFF	2
19	? self-learning value 1	35	OFF	2
20	? self-learning value 2	36	OFF	2
21	? self-learning value 3	37	OFF	2
22	Fault caution light	45	OFF	1
23	Canister control valve	25	ON	1
24	Air conditioner condenser temperature sensor	13	OFF	1
25	Phase sensor	43	ON	1

Fault type: 1-open circuit 2-signal overrun

No. 18 to 21 in the table refers to air fuel ratio correction coefficient, ?=actual air quantity/air need for combustion, "? self-learning value" is also called learning air fuel ratio control value.

## Chapter 10 On-board Vehicle Telephone

### I. Key points for use of Geely hands-free car telephone:

1. Microphone of hands-free car telephone is installed on the back of steering wheel upright column, away from driver to ensure talking effect. During talking, do not open window, otherwise noisy wind might influence talking effect.

2. Since there are many kinds of mobile phones in Chinese market, in order to ensure talking effect, please select interface line corresponding to your mobile phone, otherwise talking effect might be influenced. At present, Nokia, Motorola, Siemens interface lines are available.

3. To use, insert one end of mobile phone interface line into 8 core RJ 45 stand on automobile panel, connect the other end to earphone output port of the mobile phone. When mobile phone is not connected, automobile sound works normally, when mobile phone receive a call, CD becomes quiet automatically, at the same time, loudspeaker in the vehicle is switched to hands-free telephone output. This hands-free car telephone is provided with response button at the top of microphone, however, new style of mobile phone does not support manual response function for the time being, while supports automatic response function, namely it receive the call automatically after ringing for three times.

4. After talking is finished, automobile sound will return to original state automatically.

5. During daily use, note that contact insertion and withdraw force of mobile phone interface line should not be too large, so as to avoid damage.

6. Hands-free car telephone has no volume switch, volume of loudspeaker voice may be adjusted by regulating the volume of handset earphone.

### II. Circuit diagram

Please Refer to "MK WIRING DIAGRAM"

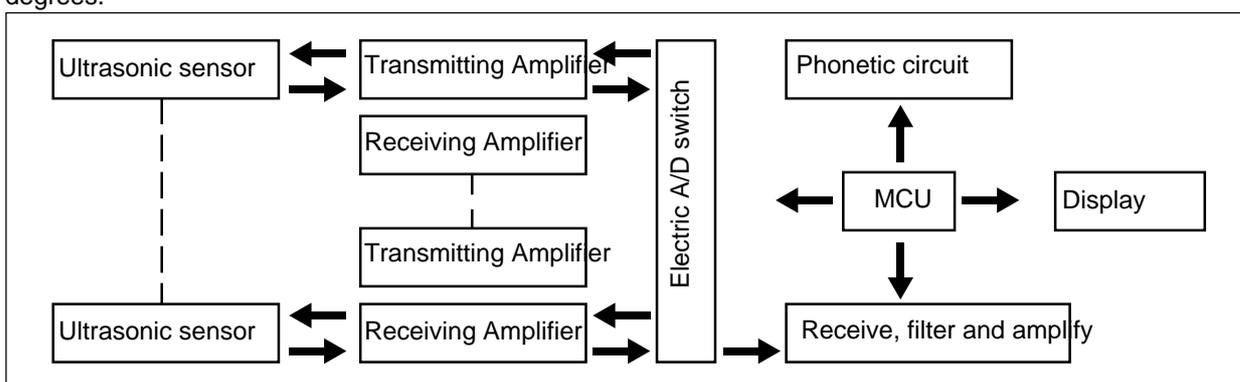
### III. Troubleshooting:

No.	Symptom	Possible cause
1	No voice can be heard from hands-free telephone	1. Whether power supply is normal or not.
		2. Increase mobile phone output volume.
		3. Confirm whether mobile phone interface line is correct, (replace with new mobile phone interface line).
		4. When mobile phone works, confirm whether there is relay closing sound in hands-free telephone box.
		5. If there is relay closing sound, check whether anything is wrong with socket drop-out line.
2	Loudspeaker sound is light	Adjust mobile phone output volume.
3	Connection is interrupted	Check receiving signal of mobile phone.

# Chapter 11 Rear Parking Radar System

## I. System principle

Reversing radar system mainly adopts ultrasonic ranging technology, utilizes piezoelectric property of transducer (ultrasonic sensor), excites piezo sheet with voltage with frequency of 40KHZ intermittently, this piezo sheet is then converted from electric energy to mechanical energy and sent out. When emitted sound wave contacts object, it will reflect weak sound wave energy to transducer according to sound wave reflection principle, i. e. convert received weak acoustic vibration signal to electrical signal, after signal amplification processing, it is transmitted to microprocessor to calculate the distance between vehicle and this object and display the distance. Then microprocessor determines whether to give caution remind for dangerous object according to varying degrees.



## II. Circuit diagram

Please Refer to "MK WIRING DIAGRAM"

### III. Fault diagnosis

1. During detection, if there is no sound or display screen does not illuminate, please detect whether polarity of power supply is connected in a wrong way, whether power cord is connected, whether supply voltage  $\geq 9V$ , whether display joint is inserted properly.

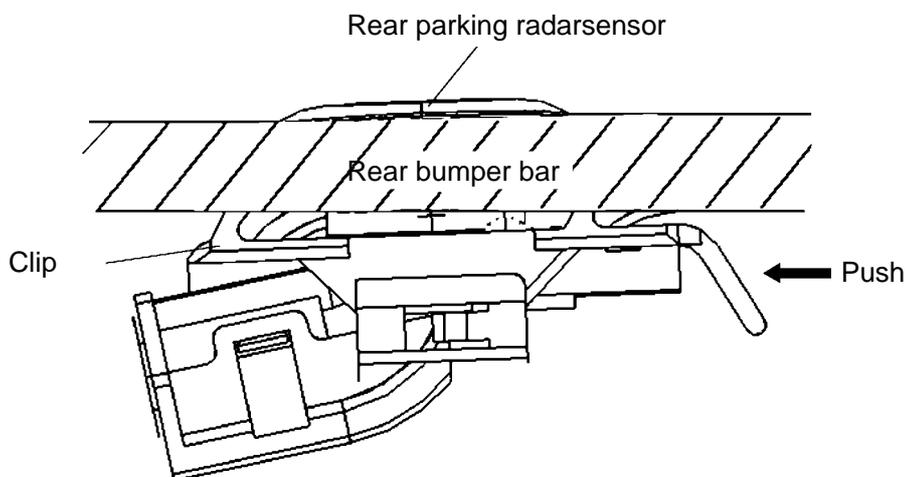
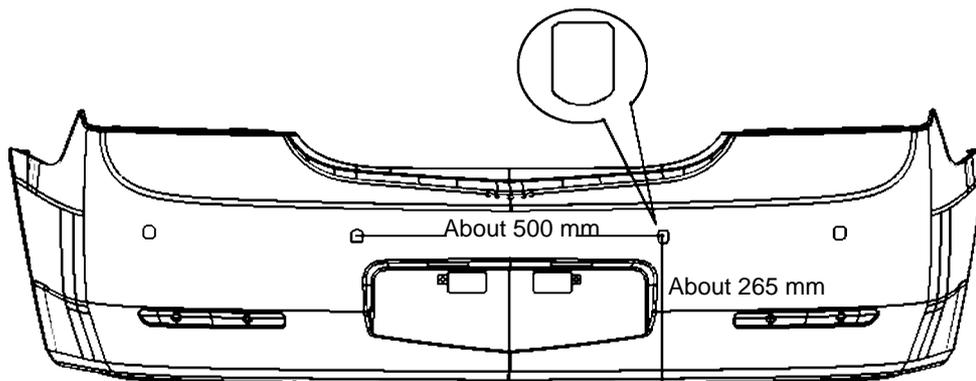
2. If clobber "0.0" or constant ringing occurs, please exit reverse gear, engage reverse gear again. If the above symptom still exists, it may be deemed that principal machine is damaged, and should be replaced completely.

3. If certain value is displayed, while there is no evident barrier at right ahead of probe. Prominence on or rear might be detected (such as license plate, bumper bar etc). please check whether direction axis of the probe is correct, horizontal axis of the probe should slightly upwarp.

4. When accelerating, the installed display shows irregular disordered frame, circuit interference might occur, check earth wire of reversing radar.

### IV. Installation of reversing radar

1. Reversing radar system consists of reversing radar principal machine, reversing radar display screen, wiring harness, buckle and reversing radar probe etc.



# Chapter 12 Centralized Controller System

## Section 1 Function Inspector

### I. Glass frame riser:

1. Glass frame riser may be operated to move within 60s after ignition switch is turned on or off; 60s after ignition switch is turned off, glass frame riser cannot be operated to move;
2. Manual rise: press corresponding glass frame riser switch rise key, corresponding glass frame riser motor works, glass frame rises, release rise key, it stops.
3. Manual fall: press corresponding glass frame riser switch fall key (hold time  $\geq 100\text{ms}$ ), corresponding glass frame riser motor works, glass frame falls, release fall key, it stops.
4. Automatic fall: press corresponding glass frame riser switch fall key (hold time  $< 300\text{ms}$ ), corresponding glass frame riser motor works, glass frame falls down to end; or fall down until rise key or fall key is pressed again.

#### Note:

During automatic fall of glass frame, if corresponding glass frame riser switch fall key is pressed down for more than 300 ms, glass frame riser is changed to manual fall mode; if corresponding glass frame riser switch rise key is pressed down for more than 300ms, glass frame riser stops work.

#### 5. Remote window closing:

In case of remote protection, if a key is pressed down for more than 1s, perform glass frame riser automatic rise action, left front, right front, left rear, right rear in turn.

### II. Central lock:

1. In case protection is deactivated, use a key to open left front door switch or press internal unlock switch to open four door fasteners; close left front door switch, close four door fasteners.
2. Remote unlock /lock:
  - (1) Ignition switch opening
    - a. Press remote control unlock key to open four door fasteners;
    - b. Press remote lock key to close four door fasteners;
  - (2) Turn off ignition switch
    - a. Press remote unlock key to open four front door fasteners, at the same time turn light flashes once.
    - b. Press remote lock key to close four door fasteners, at the same time turn light flashes twice.
  - (3) When door is opened, press remote fastener, turn light will flash for three times, at the same time electric horn beeps for three times.
  - (4) If the system is triggered in anti-theft condition, when remote unlock system exits protection state, directional turn signal will flash for four times, at the same time, electric horn beeps for four times.
3. Automatic lock  
When vehicle speed exceeds 30km/h, three doors will be closed.
4. Door lock priority

Central door lock should not act simultaneously with glass frame riser; when they conflict with each other, central door lock acts with priority, while glass frame riser stops; after central door lock action is finished, glass frame riser continue its work in previous condition.

### III. Front wipers:

After spray water signal is finished, the wiper acts twice.

#### IV. Post-defrost:

1. When engine speed exceeds 700rpm (ignition switch is turned on), defrost work is permitted.
2. Turn on defrost switch, perform defrost work for 12 minutes, if defrost switch is pressed down again during defrost work, defrost work will stop.
3. During defrost, turn off ignition switch, cancel this defrost.

#### V. Light control:

##### 1. Headlight:

- (1) After press remote lock key to close four doors, if remote lock key is pressed down again twice in succession within in 2s, dipped headlight will extend lighting for 1 minute; if remote unlock key is pressed down within 60s, dipped headlight control output will be turned off.
- (2) During output of 60s low level, if ignition switch is turned on, low level output will stop.

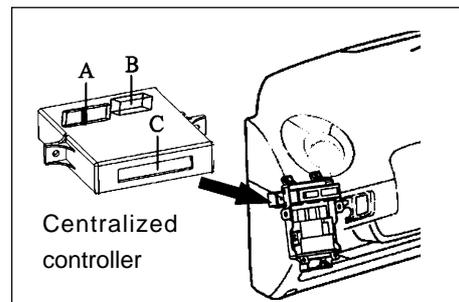
##### 2. Ceiling lamp:

- (1) When any of the doors is opened, ceiling lamp illuminates; if door is not closed, ceiling lamp will be turned off after 10 minutes of delay.
- (2) For closing of all doors, ceiling lamp will go out after time delay of 30s;
- (3) In case all doors are closed, and ceiling lamp illuminates, ignition switch is turned on, ceiling lamp goes out.
- (4) For remote unlock, ceiling lamp illuminates; in case all doors are closed and ceiling lamp illuminates, remote lock ceiling lamp goes out.

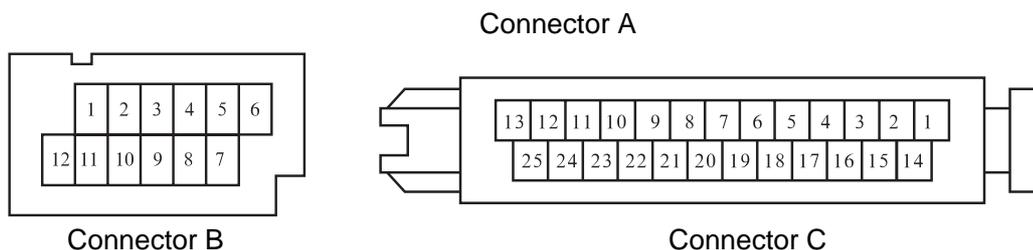
#### VI. Remote anti-theft

1. Protected state: press lock key on remote controller, while closing four doors, anti-theft indicator lamp will flashes slowly, indicating that the system enters protected state, when the system is triggered, turn light of the vehicle will flash, warning horn gives out alarm.
2. Cancel protection: press unlock key on remote controller, while opening left front door, anti-theft indicator lamp flashes rapidly, if at least one of ignition switch, door is opened within 30 s, anti-theft indicator lamp will go out; otherwise it will enter secondary anti-theft state.
3. Two stage type protection cancellation: while the system is in triggered state, press any key on the remote controller, alarm sound will stop, however, the system is still in protected state, and car door is still locked; if the system continues to receive invasion signal, alarm will ring again after brief stop. To cancel protection completely, cancel alarm for the first time, then press unlock key once immediately;
4. Secondary anti-theft: after protection is cancelled, if any of ignition switch, door is not opened within 30s, the system will restore alert status automatically, and lock the car door.

Distribution of centralized controller connector terminals:



Connector on wiring harness, as shown in the figure below (view from outgoing terminal):



Definition of centralized controller terminals:

Terminal No.	Conductor color	Terminal definition
1	RY	Power supply (+)
3	YR	Speed sensor signal
4	BBL	Engine speed signal
5	BR	IG2
6	BL	Spray water signal wiper switch 7 #
7	GR	Wiper intermittent position signal (+)
8	WR	Right front door lamp switch
9	WB	Left front door lamp switch
10	BR	Hazard lamp switch
11		GND
14	WG	Right rear door lamp switch
15	BW	Left rear door lamp switch
19	Gr	Rear right glass regulator switch (down)
20	VY	Rear right glass regulator switch (up)
21	BG	Turn light switch (right turn)
22	WG	Turn light switch (left turn)
24	BLW	Defrost switch
26	BR	Left front door fastener unlocked signal
27	BY	Left front door fastener locked signal
28	BG	Anti-theft indicator lamp
29	R	Rear left glass regulator switch (down)
30	O	Rear left glass regulator switch (up)
31	GR	Front right glass regulator switch (down)
32	WG	Front right glass regulator switch (up)
33	BLB	Front left glass regulator switch (down)
34	BLR	Front left glass regulator switch (up)
35		GND
36	BL	Antenna

Terminal No.	Conductor color	Terminal definition	
B	1	G	Hazard lamp power supply
	2	G	Hazard lamp power supply
	3	RY	Dome lamp
	4	Br	Wiper motor (INT)
	5		GND
	6		GND
	7	GB	Right turn light and its indicator lamp
	8	GW	Left turn light and its indicator lamp
	9	BLW	IG2
	10	Br	Wiper switch 3 #
	11	RB	Head light relay 85 #
	12	RB	Head light relay 85 #
C	1	YB	Rear air window defrost and indicator lamp
	2	YB	Rear air window defrost and indicator lamp
	3	RBL	Rear air window defrost power supply
	4	RBL	Rear air window defrost power supply
	5		GND
	6	GBL	Horn relay 85 #
	7	R	Electric glass frame power supply
	8		GND
	9		GND
	10	RW	Fastener power supply
	11	RW	Right front, right rear, left rear fastener
	12	BR	Right front, right rear, left rear fastener
	13	WR	Left actuator
	14	BL	Front left glass regulator
	15	W	Front left glass regulator
	16		GND
	17	WB	Front right glass regulator
	18	BLB	Front right glass regulator
	19	R	Glass power supply
	20	BLB	Rear left glass regulator
	21	WB	Rear left glass regulator
	22		GND
	23	BLY	Rear Right glass regulator
	24	WY	Rear Right glass regulator
	25	RB	Left actuator

## Replacement

- ( 1 ) Remove dashboard subassembly (refer to trim)
- ( 2 ) Remove two bolts

( 3 ) Disconnect the connector

Repair precautions:

If a new centralized controller is replaced, it must be encoded again, only in this way could remote controller use it normally.

We may adopt the method of replacing centralized controller to determine whether there is any fault.

## Section 2 Remote Transmitter

### I. Replacement of remote transmitter battery

Note:

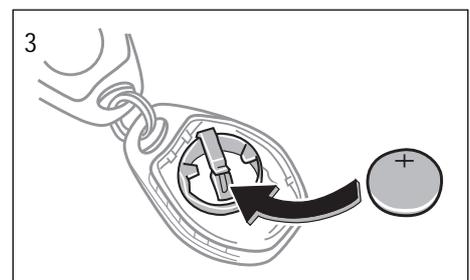
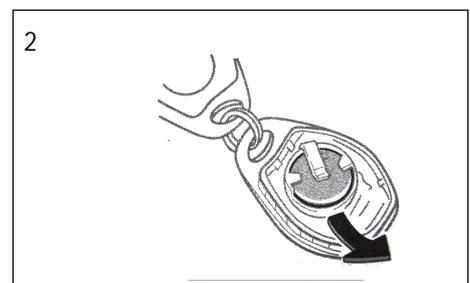
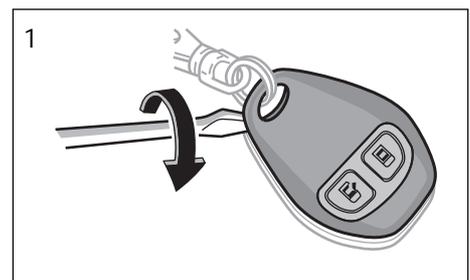
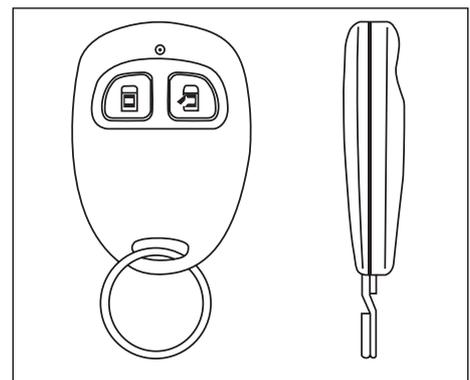
Be very careful during operation, so as to avoid damaging electronic components in the remote transmitter. When replacing the battery, don't bend or contaminate electric pole, otherwise poor contact might occur.

1. Unclench the remote transmitter housing with flat-tip screw driver or similar tool.

2. press down the battery edge and take out the battery.

3. When replacing, please use CR2032 lithium battery or the same class product. Ensure the new battery with anode upward. The remote transmitter housing must be firmly encased.

After replacing the battery, check the remote transmitter operates normally,



# Chapter 13 Door Glass Regulating and Power Door Lock Control

## Section 1 Door Glass Regulating System

### I. Inspection

#### 1. Check basic function

(1) Ignition switch is turned "ON" or within 60 s after ignition switch is turned off.

- a. Check when rise key of glass regulator switch is pressed, corresponding glass rises, when release, it stops rising; when press fall key and hold it, corresponding glass falls, when release, it stops falling.
- b. Check when glass regulator main control switch lock switch on driver side is pressed, except which on driver side, other glass regulator switches do not act.
- c. Automatic fall: press corresponding glass regulator switch fall key briefly, corresponding glass regulator motor works, glass falls down to the end; or falls down until rise key or fall key is pressed again.

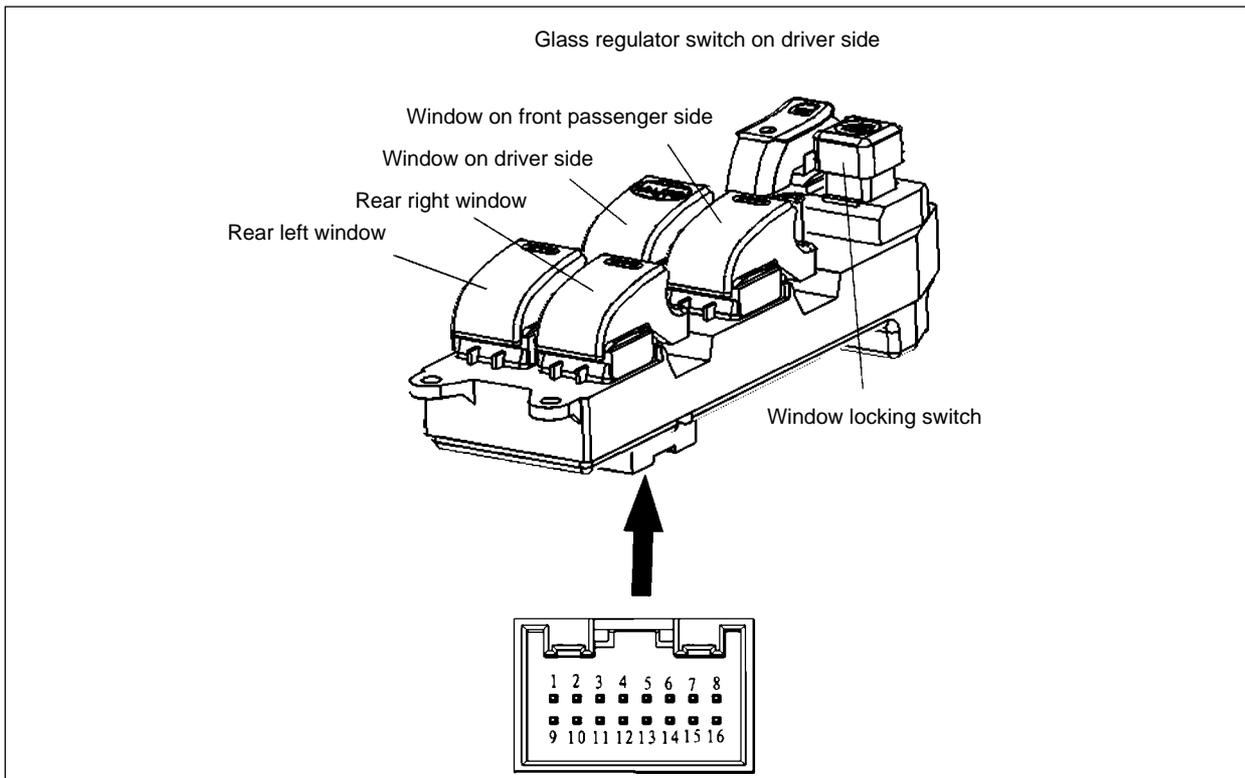
Notes:

During automatic glass down, if corresponding glass regulator switch fall key is pressed down and held, glass regulator is changed into manual fall mode; if corresponding glass regulator switch rise key is pressed down and held, glass regulator is changed into manual rise mode; if corresponding glass regulator switch rise or fall key is pressed briefly, glass regulator stops work. Press briefly: less than 300ms; press and hold: more than 300 ms.

(2) Close window remotely.

In case setting protection remotely, if a key is pressed for more than 1s, glass regulator automatic window rising action will be performed, implementation mode: left front, right front, left rear, right back, in the process of window rise, only one glass regulator is permitted to act, only after glass regulator up to the top, could the other glass riser act.

#### 2. Glass regulator switch on driver side



(1) Check conductivity of the switch.

Standard

Switch position		Terminal	Result
On driver side	UP	12--- 13	ON
	DOWN	12---14	ON
On front passenger side	UP	12---5	ON
	DOWN	12---6	ON
Left rear	UP	12---9	ON
	DOWN	12---10	ON
Right rear	UP	12---1	ON
	DOWN	12---2	ON
Window locking switch	Lock	12---3	ON
	Unlock	12---3	OFF

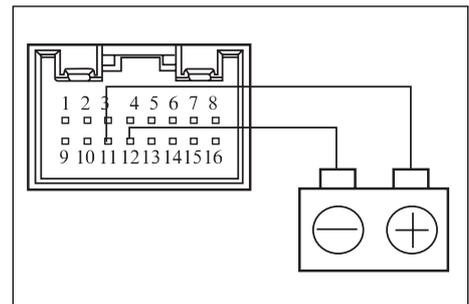
If it does not meet stipulation, replace this switch.

(2) Check indicator lamp on glass riser switch on driver side

Storage battery may be connected with terminal of indicator lamp directly (as shown in the figure)

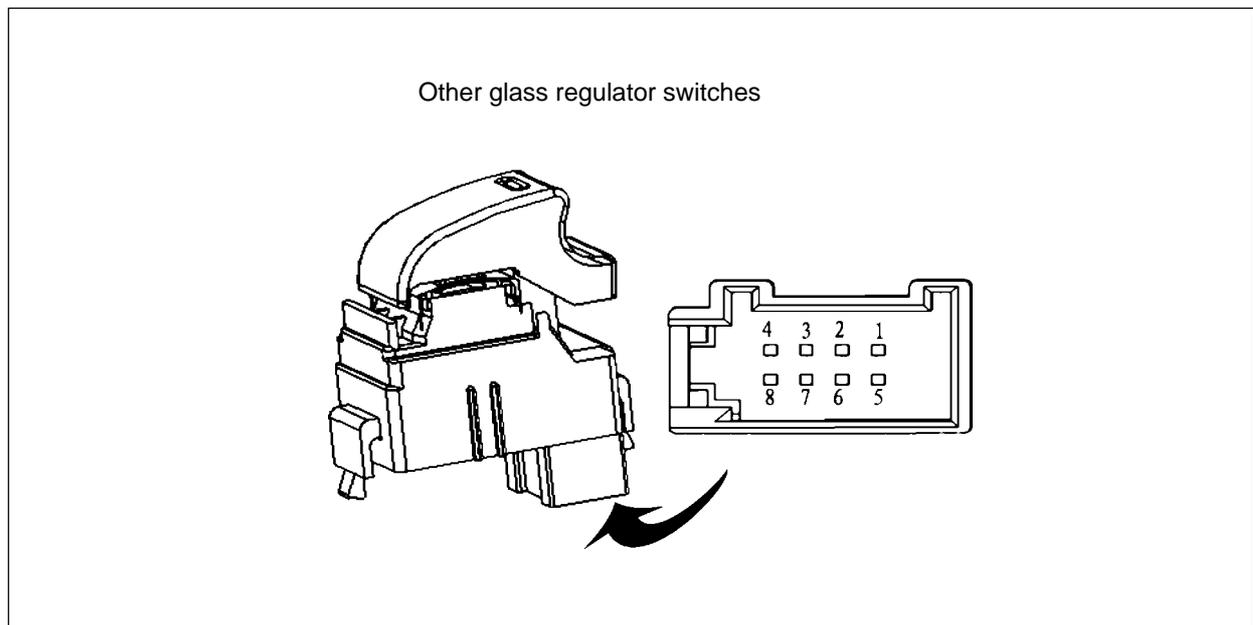
Standard

Connecting condition	Result
Battery positive - terminal 11	Indicator lamp illuminates
Battery negative - terminal 12	



If it does not meet stipulation, replace this switch.

3. Other window glass riser switches (passenger side, left rear, right rear)



(1) Check conductivity of the switch.

Standard

Switch position	Terminal	Result
UP	5-7	ON
DOWN	5-8	ON

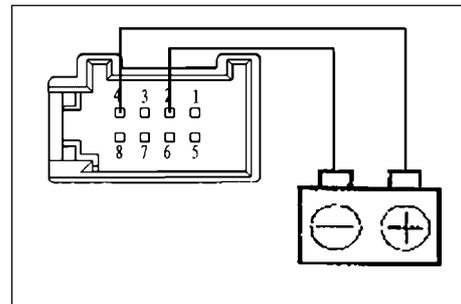
If it does not meet stipulation, replace this switch.

(2) Check indicator lamp on switch

Standard

Connecting condition	Result
Battery positive - terminal 4	Indicator lamp illuminates
Battery negative - terminal 2	

If it does not meet stipulation, replace this switch.



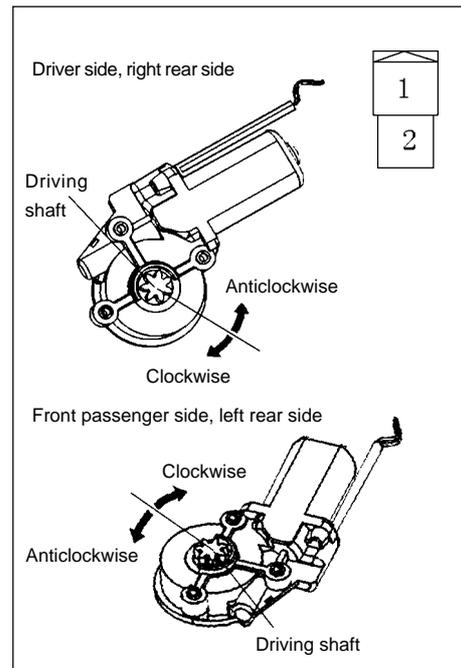
#### 4. Check door glass riser motor

Notes:

- (1) Detect door glass riser motor on driver side and on right rear side following the same steps.
- (2) Detect door glass riser motor on front passenger side and on left rear side following the same steps.
- (3) Connect door glass riser motor terminal with storage battery, check operation of the motor.

Standard

Measuring condition		Stipulations
On driver side, rear right side	Battery positive -1 Battery negative -2	Clockwise
	Battery positive -2 Battery negative -1	Anticlockwise
On front passenger side, rear left side	Battery positive -2 Battery negative -1	Clockwise
	Battery positive -1 Battery negative -2	Anticlockwise



5. Electric circuit diagram for door glass regulating system

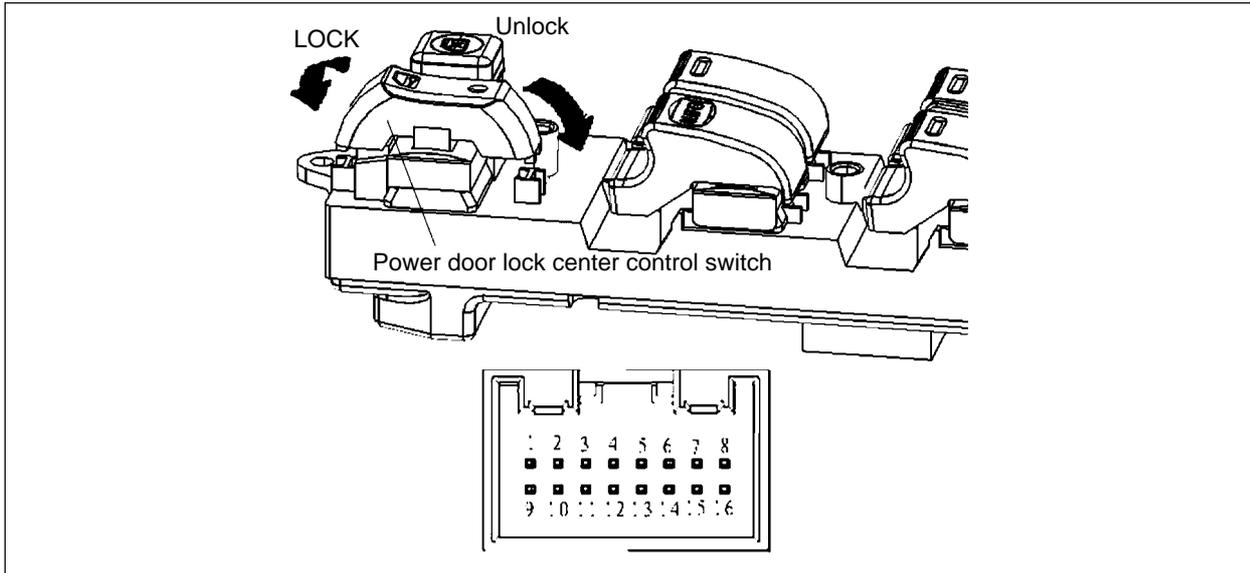
Please Refer to "MK WIRING DIAGRAM"

## Section 2 Power Door Lock Control System

### I. Inspection

#### 1. Check basic function

- a. When door lock control switch locks, four door locks are locked; when door lock control switch unlocks, four doors are unlocked.
- b. When door lock on driver side is locked using key, four door locks are locked.



#### 2. Check door lock main control switch (1) Connection of terminals

Standard:

Terminal No.	Door lock state	Standard state
12-7	Lock	ON
-	OFF	OFF
12-15	Unlock	ON

If it does not meet stipulation, replace this switch.

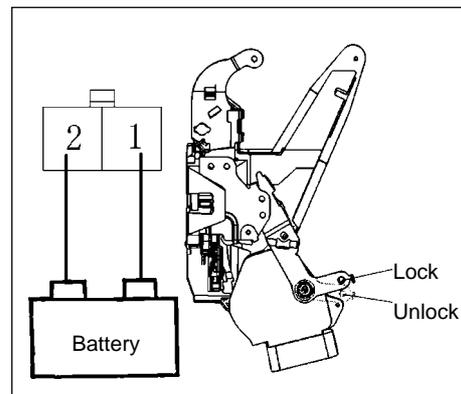
#### 3. Fastener inspection

- (1) Apply storage battery voltage, check operation of the actuator.

Standard:

Measuring condition	Standard state
Battery positive -1 Battery negative -2	Unlock
Battery positive -1 Battery negative -2	Lock

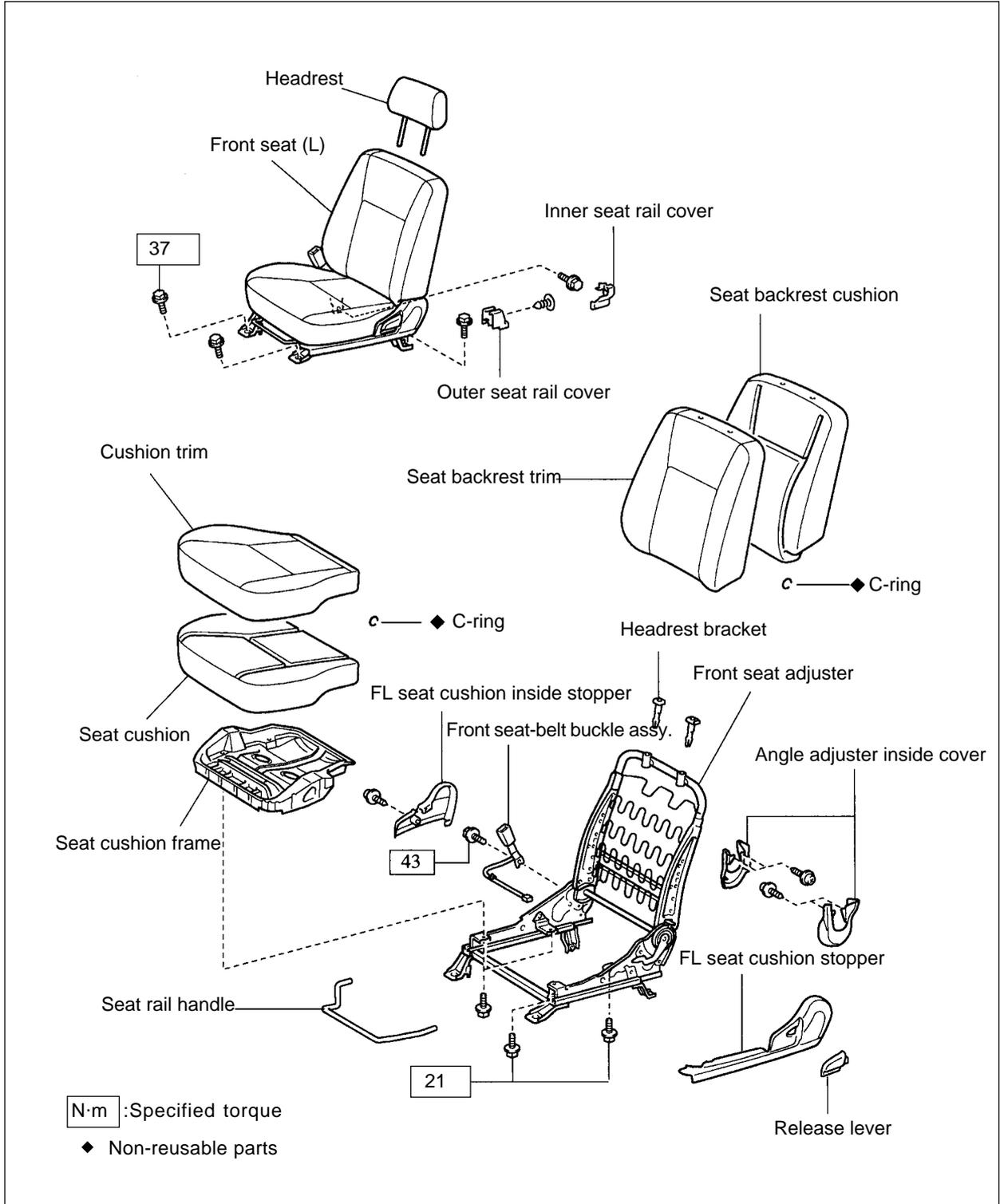
If not, replace actuator assembly.



# Part VI Interior & Exterior Trim and Accessory

## Chapter 1 Front Seat Assembly

### I. Component View



## II. Removal and installation of front seat assembly

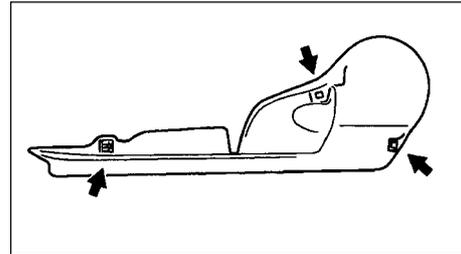
The operation procedure on the right side is identical with that on the left side.

### 1. Remove the front seat

- a. Remove the headrest;
- b. Remove the inner and outer seat rail covers;
- c. Unfix 4 screws;
- d. Disconnect the connector on the back of seat cushion;
- e. Remove the front seat.

### 2. Remove the left front seat cushion outer stopper

- a. Unfix the release lever;
- b. Loosen 3 clips and then unfasten the outer stopper.

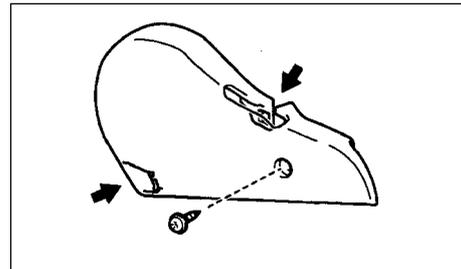


### 3. Remove the left front seat cushion inner stopper

- a. Unfix the screw;
- b. Loosen the clip and then unfasten the inner stopper.

### 4. Remove the left front seat-belt buckle assembly

- a. Disconnect the connecting wiring harness;
- b. Unfix the screw and then unfasten the seat-belt buckle assembly.

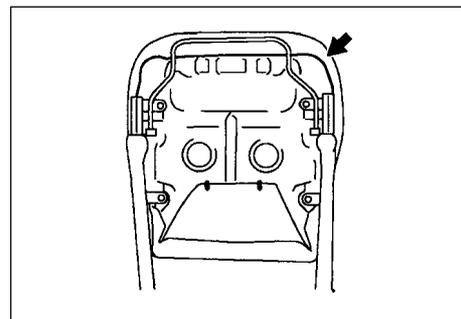


### 5. Remove the left front backrest trim

- a. Turn the backrest over and unfix the C-rings;
- b. Remove 2 headrest brackets;
- c. Remove the backrest trim.

### 6. Remove the left front seat cushion trim

- a. Remove the C-rings from the back of seat cushion;
- b. Remove the seat cushion trim.



### 7. Remove the seat adjuster

- a. Remove the seat rail handle;
- b. Unfix the screw and then unfasten the seat rail.

### 8. Install the front seat assembly

Tips:

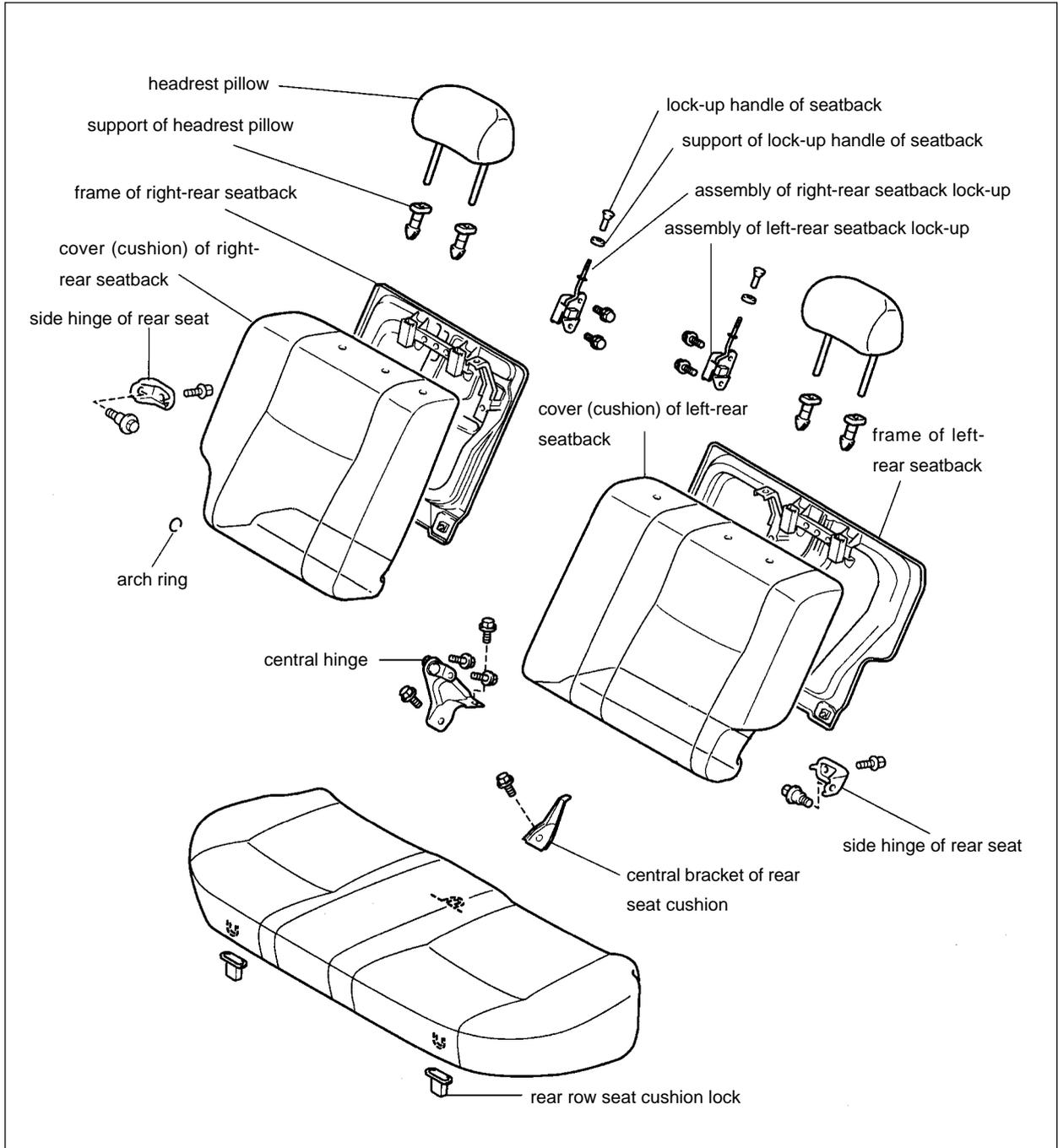
Install in reverse order of removal.

Install seat cushion frame with 4 bolts, Torque:21N.m.

Install FL seat belt buckle assembly. Torque:43N.m.

# Chapter 2 Rear Row Seat Assembly

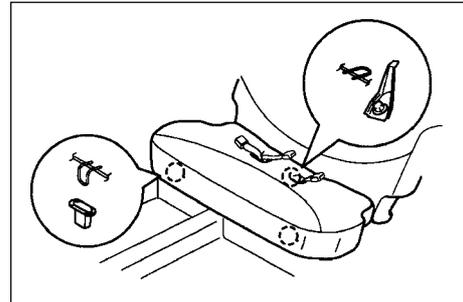
## I. Component View



## II. Removal & Installation of Rear Seat Assembly

### 1. Remove the rear seat cushion assembly

- a. Pull out the front part of seat cushion upwards.
- b. Release the wire harness of seat cushion from the central protuberance, and remove the seat cushion assembly.



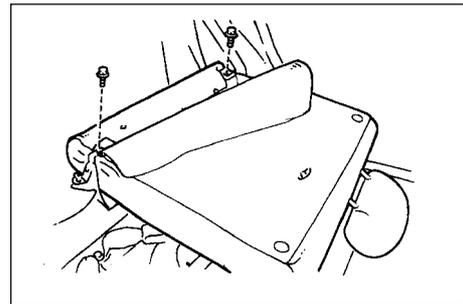
### 2. Remove the assembly of left-rear seatback

- a. Fold the seatback;
- b. Remove the clamp, and uncover the seat;
- c. Remove the 2 bolts and seatback assembly.

### 3. Remove the assembly of right-rear seatback

Tip:

Apply the procedures the same as aforesaid for the left side.



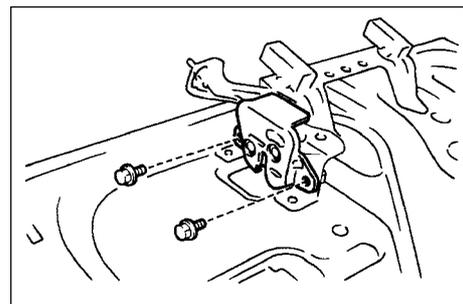
### 4. Remove the assembly of left-rear seatback lockup

Remove the 2 bolts and the seatback lockup device off the seatback frame.

### 5. Remove the assembly of right-rear seatback lockup

Tip:

Apply the procedures the same as aforesaid for the left side.



### 6. Install the assembly of rear seatback

Tip:

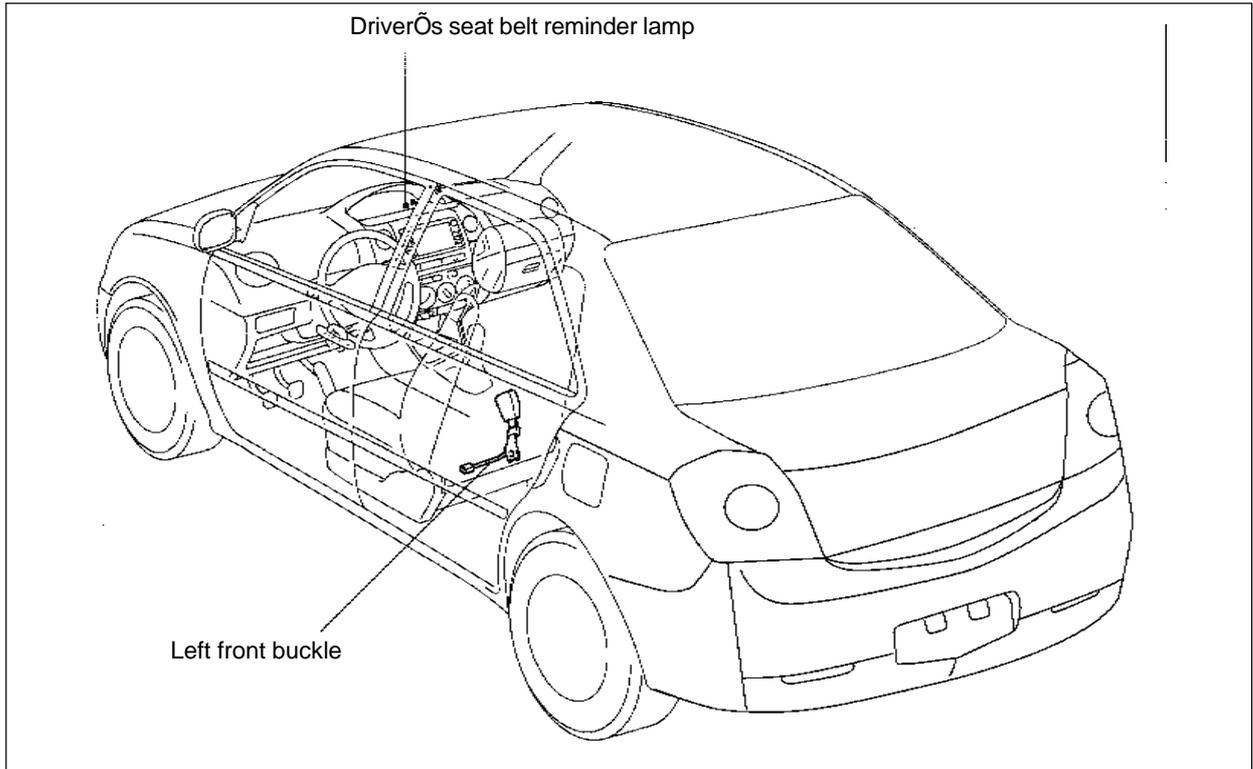
Follow the sequence reverse to removal.

All the bolts shall be installed with the torque: 18N.m.

# Chapter 3 Front Seat Belt

## Seat Belt Reminder System

### I. Component View



### II. Fault diagnosis

Symptom	Possible causes
Driver's seat belt lamp is not on	1. GAUGE fuse; 2. Instrument cluster; 3. Left front buckle assembly 4. Wiring harness

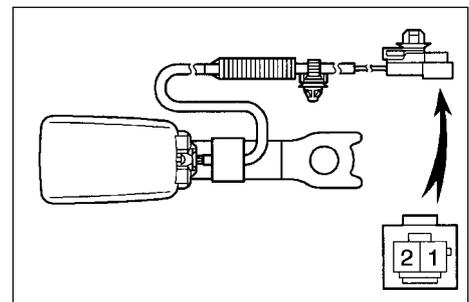
### III. Alarm system inspection

#### 1. To inspect the left front buckle assembly

Check the conductivity of left front buckle assembly

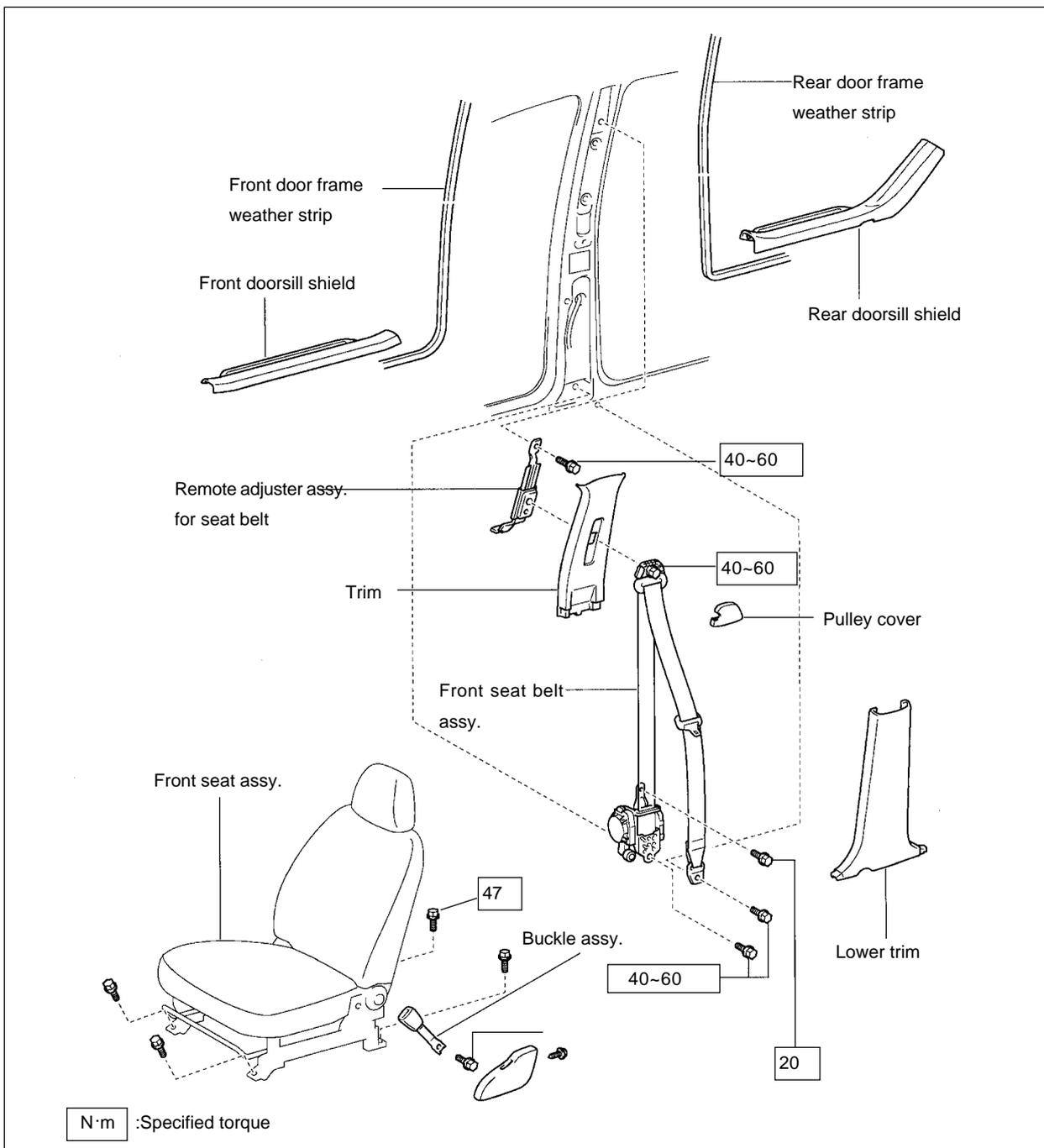
Terminal Number	Seat Belt	Required
1<=>2	Insert	OFF
1<=>2	Release	ON

If you find that the result of the inspection is not the same as required, you can replace the left front buckle assembly.



## Detach and Mount Front Seat Belt

### I. Component View



### II. Belt replacement

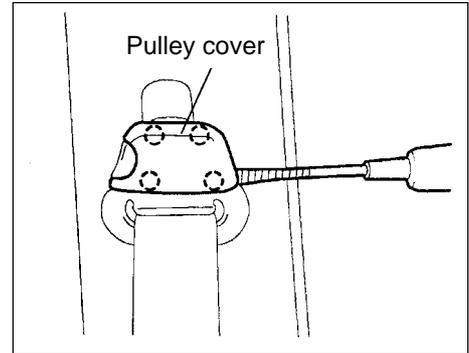
Notes: Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

1. Remove the negative terminal of battery;
2. Detach the front seat assembly;  
Loosen the front lock bolt and remove the buckle assembly from inside the front seat;
3. Use the screwdriver to detach the center pillar lower trim; Cut two clips and 4 buckles and remove the trim;

**Notes:**

Wrap the sharp end of screwdriver up with adhesive tape before operation.

4. Use screwdriver to pry open the seat belt pulley cover;
5. Unscrew the bolt and detach the seat belt ring from the car;
6. Disconnect the pre-load insertion of seat belt on the bottom edge of the middle pillar;
7. Detach the front seat belt from the car;
8. Unfix the clip using the screwdriver and detach the trim from the right middle pillar;
9. Unscrew two bolts using the spanner and detach the remote adjuster assembly.



Notice: Only the ignition switch turns to "OFF" position and the battery negative should be disconnected more than 90s, the seat belt with pretensioner can be removed.

**III. Seat belt with ELR and pre-tensioner**

Seat belt with ELR and pre-tensioner is provided with pre-tensioner which works together with the airbag. The pre-tensioner is part of airbag assembly. The pre-tensioner is mounted in the retractor and controlled by SDM. When the front bumping force of the car exceeds a specific value, the pre-tensioner and airbag can be triggered at the same time. To maintain the pre-tension type of seat belt (retractor), observe all the "Alarm" and "Operation Instruction".

**Warning:**

Do not try to remove or repair seat belt pre-tensioner. If any abnormal situations take place, replace the whole assembly with a new one.

Before working, be sure to read through "Attention for Maintenance", and observe them during working. Any ignorance can cause injury or the failure of seat belt pre-tensioner.

**IV. Inspect Operations of Seat Belt Alarm Lamp (on Driver's side)**

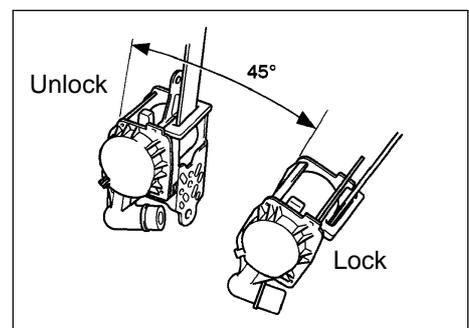
1. Turn on the ignition switch and check if the seat belt alarm lamp flashes;
2. Fasten the belt buckle and check if the belt alarm lamp goes out;
3. Turn off the ignition switch;
4. Disconnect the seat belt buckle;
5. Turn on the ignition switch;
6. Connect wiring terminal and make earth connection, and inspect the lamp status of the seat belt. Seat belt lamp: flashing.

**V. Inspect Seat Belt**

1. Confirm whether the seat belt is properly mounted.
2. Inspect whether the metal part of seat belt is damaged.
3. If the car vibrates in accidents, pull out the seat belt from the retractor and determine whether the seat belt is scratched (load limit retractor does not work) by visual inspection and touching.
4. Inspection contents before outer seat belt installation: When ELR lock, check the gradient of ELR. Check and make sure the seat belt can not be locked from any aspect within 15°. When you move the belt ring device beyond 45° slowly, the seat belt should be locked.
5. After installation check the seat belt lock in this way that draw the seat belt from belt ring quickly and the seat belt can be locked normally.

**Attention:**

Should the seat belt not comply with the technical specification, you should replace it.



## VI. Attentions:

1. Before mounting, you must check if the product is damaged, cracked or rusted.
2. Place the retractor on the vertical position before pulling out the strap. Check if the strap can be easily pulled out and rotated and the retractor can be locked.
3. When installing a pretensioning seat belt, check if the emitter head pin deflects and is rusted, etc. The emitter in the pre-tensioning seat belt can work for 15 years.
4. Check if the buckle lock and connection piece comply with the connection of the car. And check if the buckle can be opened easily.
5. When fitting the bolts, check if the threads on the nut of coating are clear. Those with welding slag must be cleaned before fitting the bolts.
6. After pulling out the strap of retractor, no barrier (such as wiring harness, etc.) around the strap is allowed. If there is, it is necessary to get rid of the barrier to ensure the force of retractor and that the strap is not scratched.

## VII. How to handle with scraped seat belt

## Tips:

Scrap seat belt provided with pre-tensioner, you have to trigger the pre-tensioner taking the following steps.

1. Check if the storage battery is above 12 V on its positive and negative poles;
2. Check the energizing tool;

## Warning:

When energizing the pre-tensioner of seat belt, be sure to use dedicated energizing tool for the pre-tensioner of seat belt.

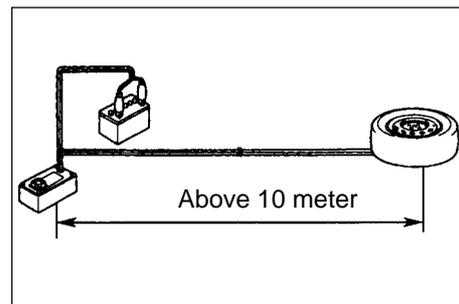
3. Connect the special tool with the storage battery and also connect the red clip on the special tool with the positive terminal of the battery and connect the black clip with the negative terminal of the battery;
4. If the front seat belt is on the car body and is not taken off, disconnect the joint of the pre-tensioner of seat belt;
5. Connect the yellow joint of the special tool with the joint of the pre-tensioner of seat belt;
6. At 10 meter away from seat belt, use a special tool to trigger the pre-tensioner of seat belt.

## Warning:

- a. Ensure that there be no people within 10 meters from the seat belt;
  - b. If the seat belt has already been taken down from the car, it is necessary to cover it using the car wheel with tire to avoid injury.
  - c. When triggering, explosion will emit loud sound. So it shall be done outdoors without disturbing local community.
  - d. When you hold the triggered seat belt, be sure to wear gloves and goggles.
  - e. After you have finished the operation, you must wash your hands.
  - f. Do not pour water, etc. to the energized seat belt pre-tensioner.
7. Place the already triggered seat belt into the ethylene bag and tighten it as you do with other articles.

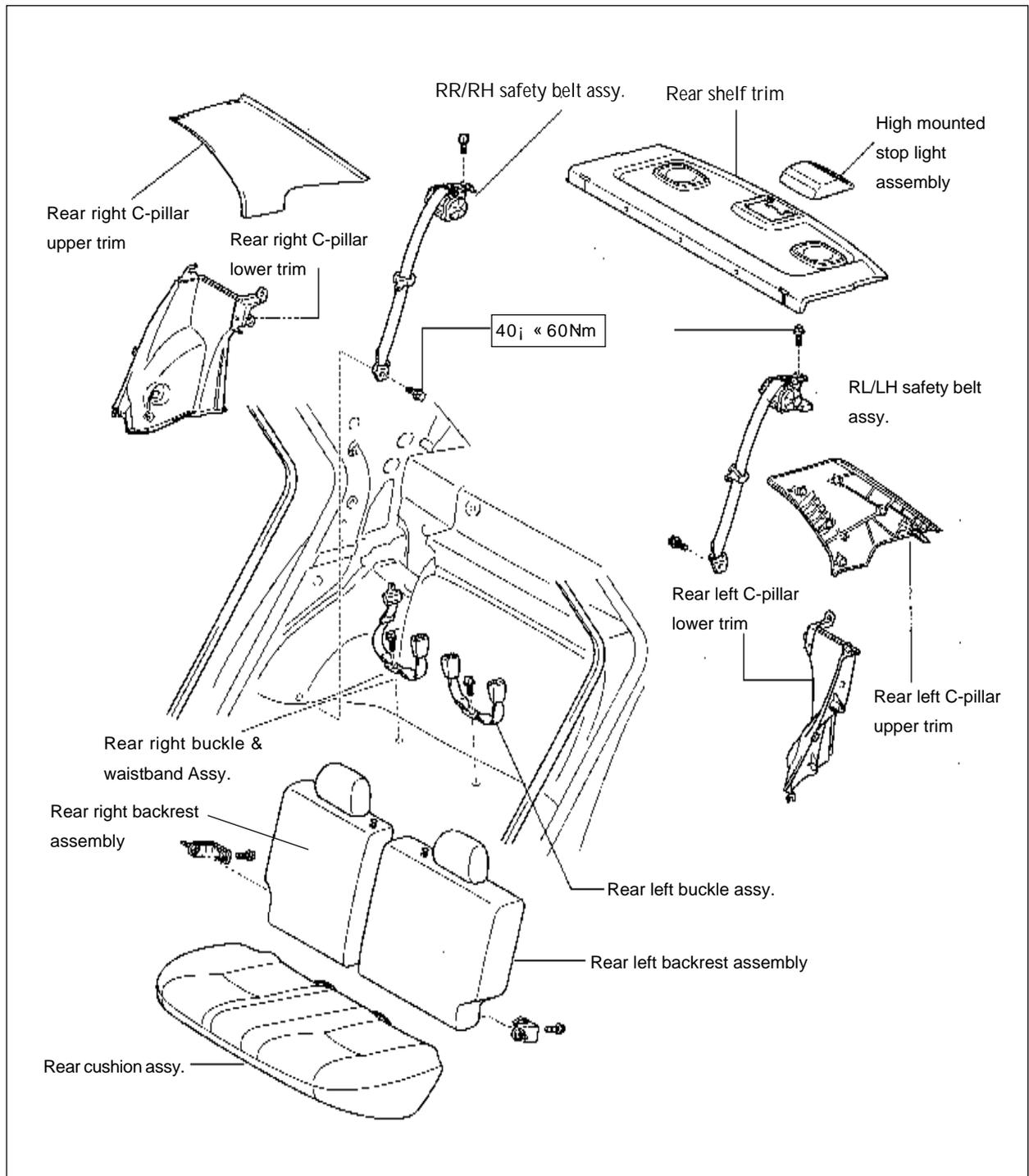
## Warning:

- a. Do not dispose untriggered seat belt at will.
- b. When the pre-tensioner of seat belt is triggered, the seat belt assembly would be very hot. Therefore, you cannot touch it until at least 30 minutes after it is triggered.



# Chapter 4 Rear Seat Belt

## I.Component View



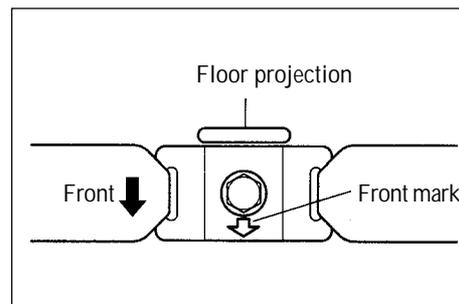
## II. Rear seat belt removal

1. Remove the rear cushion assembly;
2. Remove the rear backrest assembly;
3. Remove left (right) side quarter upper trim;
4. Remove the high mounted stop light;
5. Remove the rear shelf trim;
6. Remove the rear seat belt assembly;
  - a. Remove bolts under the quarter lower trim connecting the left and right rear side;
  - b. Remove bolts for the retractor and take down the rear seat belt assembly;
7. Remove bolts on the floor and disassemble the right rear seat belt buckle assembly and the waistband assembly;
8. Remove bolts on the floor and take down the left and rear buckle assembly.

## III. Installing rear seat belt

1. Install the left and rear buckle assembly;
 

As per the drawing, bolt the left and rear buckle assembly. on the floor. Torque: 40~60N.m



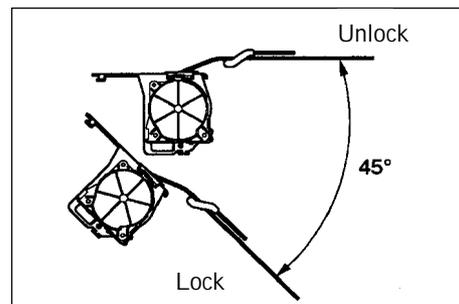
2. Install the right rear seat belt buckle and the waistband assembly;
 

Tips: same as way of the left.

3. Install the rear seat belt assembly;
 

Attention: Do not break down the retractor.

a. Inspection contents before outer seat belt installation: When ELR lock, check the gradient of ELR. Check and make sure the seat belt can not be locked from any aspect within 15°. When you move the belt ring device beyond 45° slowly, the seat belt should be locked.

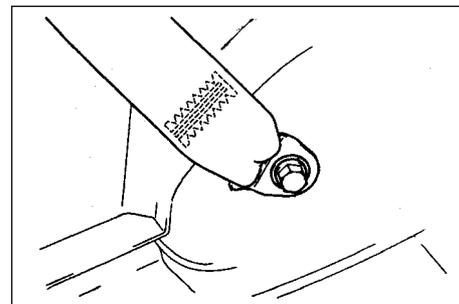


- b. Install the rear seat belt assembly using bolts (part of retractor) ;
 

Torque: 40~60N.m
- c. Install the rear seat belt assembly using bolts(part of anchor).
 

Torque: 40~60N.m

4. Inspect the properties of seat belt assembly;
5. Install the rear seat and trim.

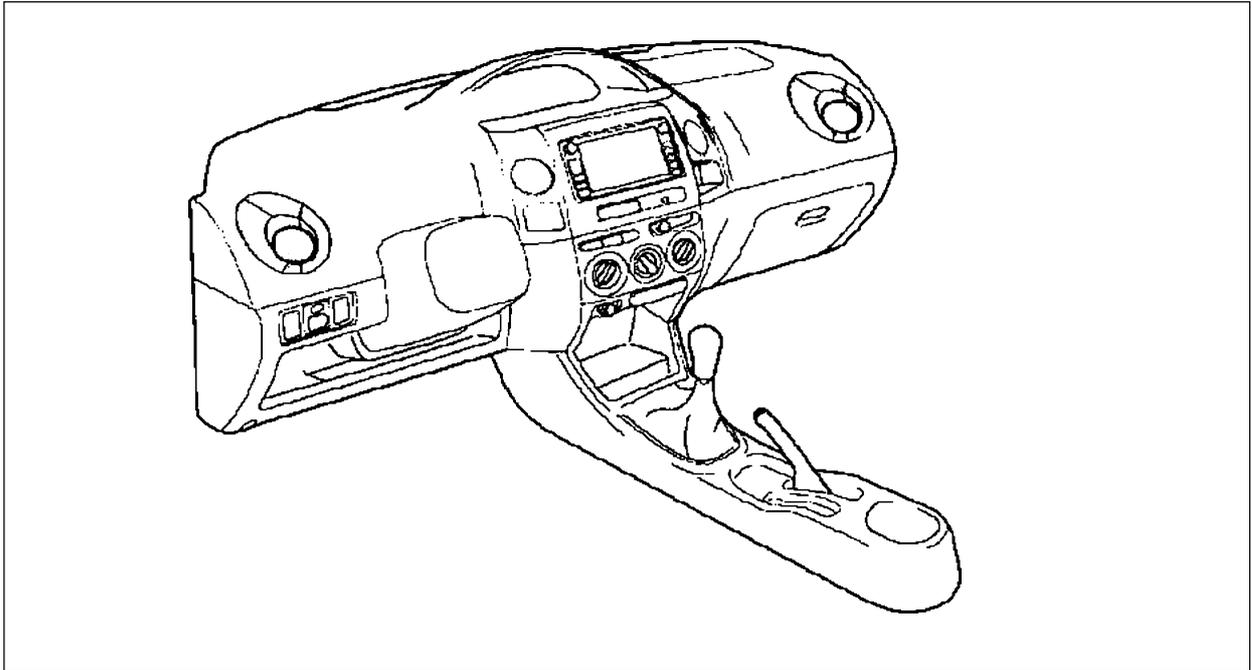


## IV. Precaution for Usage and Disposal of Used Safty Belt

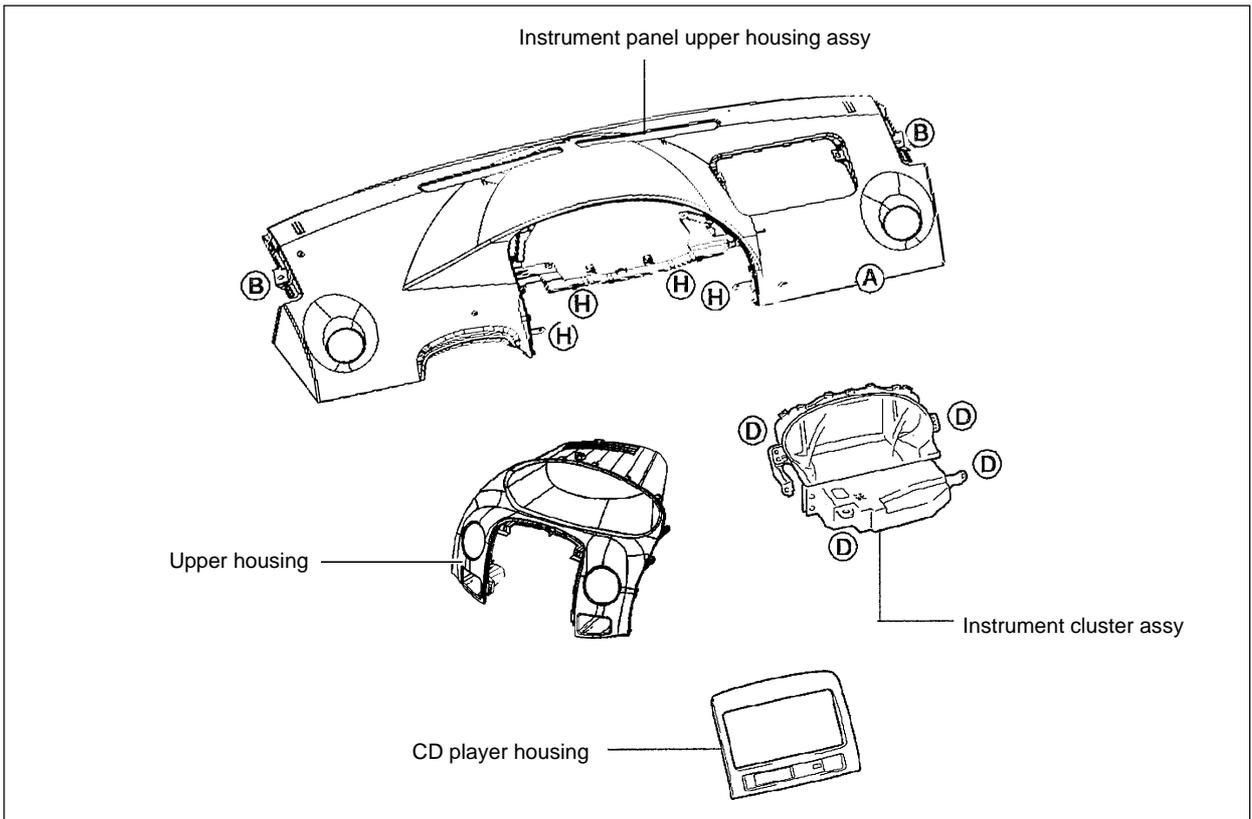
The details are the same as front safty belt.

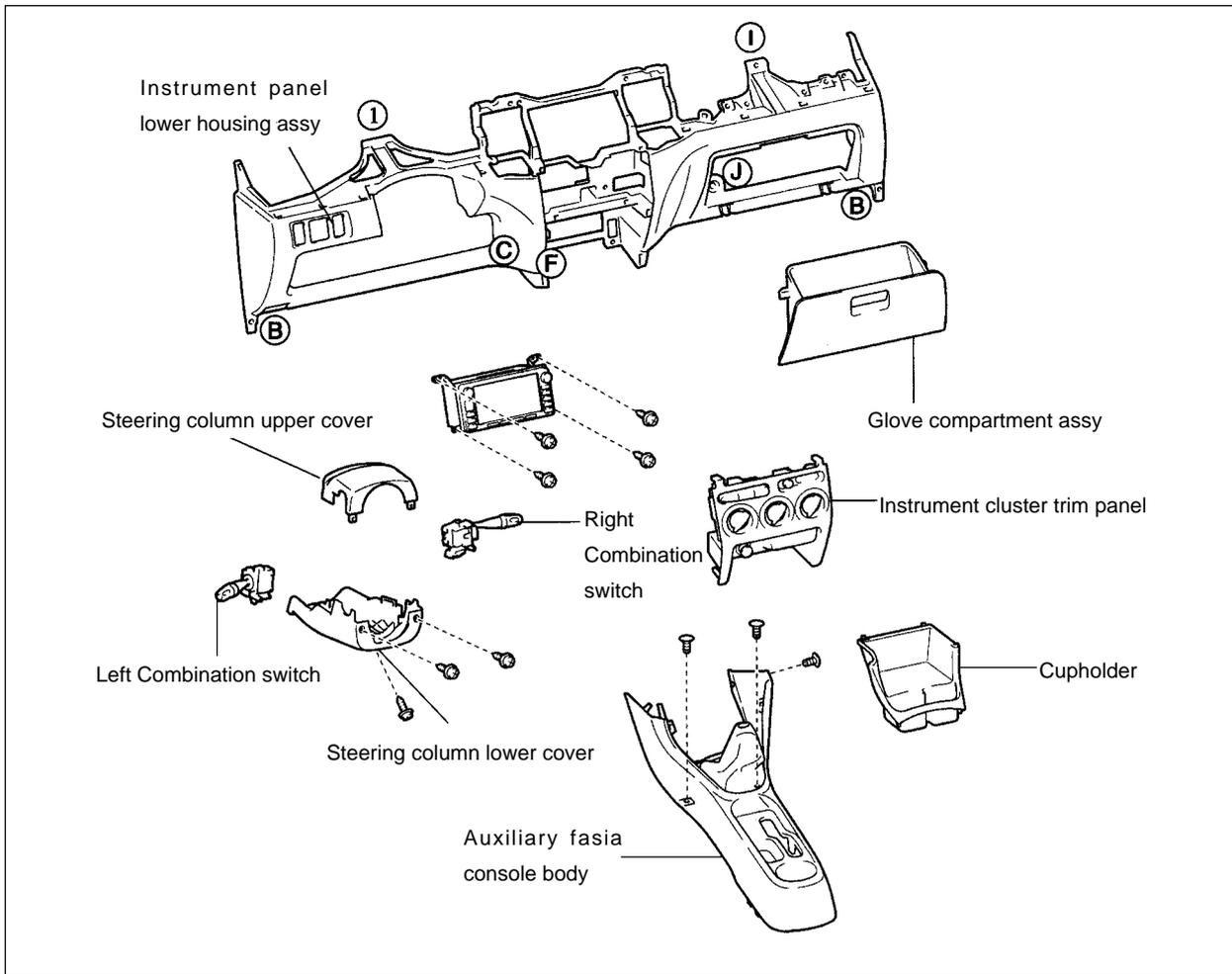
# Chapter 5 Dashboard, Middle Console and Instrument Panel

## I.Component View



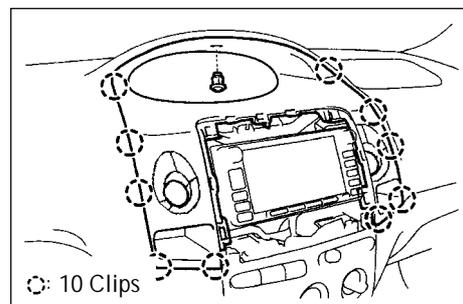
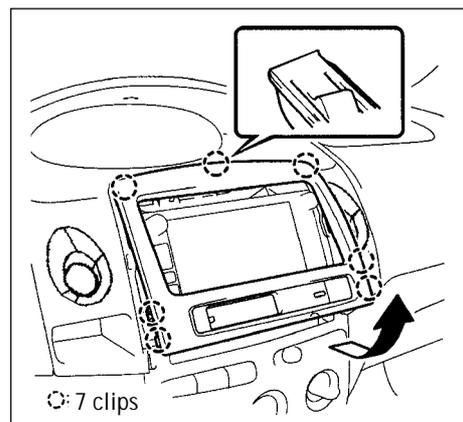
## II.Component View





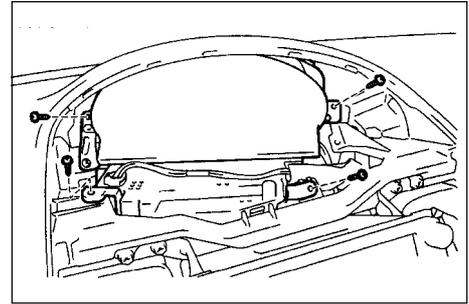
### III. Removal and installation of instrument panel

1. Disconnect the negative terminal of storage battery
2. Remove the instrument panel trim panel sub-assembly
  - a. Loosen 7 clips;
  - b. Disconnect the connector and unfasten the trim panel.
3. Remove the instrument cluster trim panel sub-assembly
  - a. Unfix the clamp;
  - b. Loosen 10 clips and unfasten the trim panel.



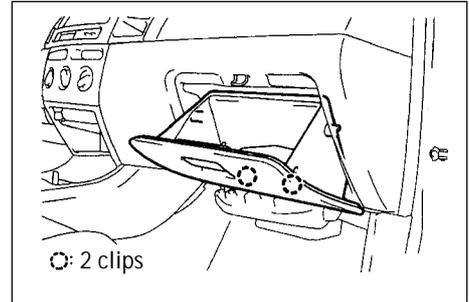
## 4. Remove the instrument cluster assembly

- a. Unfasten 4 screws;
- b. Disconnect the connector and unfasten the instrument cluster assembly.



## 5. Remove the glove compartment assembly

- a. Detach the glove compartment assembly by pressing the top releaser;
- b. Pull the glove compartment upward and then take it out.

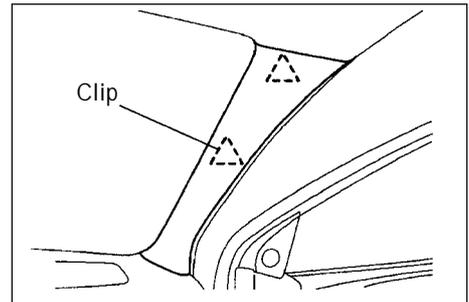


## 6. Remove the right front pillar trim panel

Unfix 2 clamps by use of a screwdriver and then unfasten the right front pillar trim panel.

## Tips:

Protect the trim panel from damage by wrapping the sharp end of screwdriver up with adhesive tape before operation.

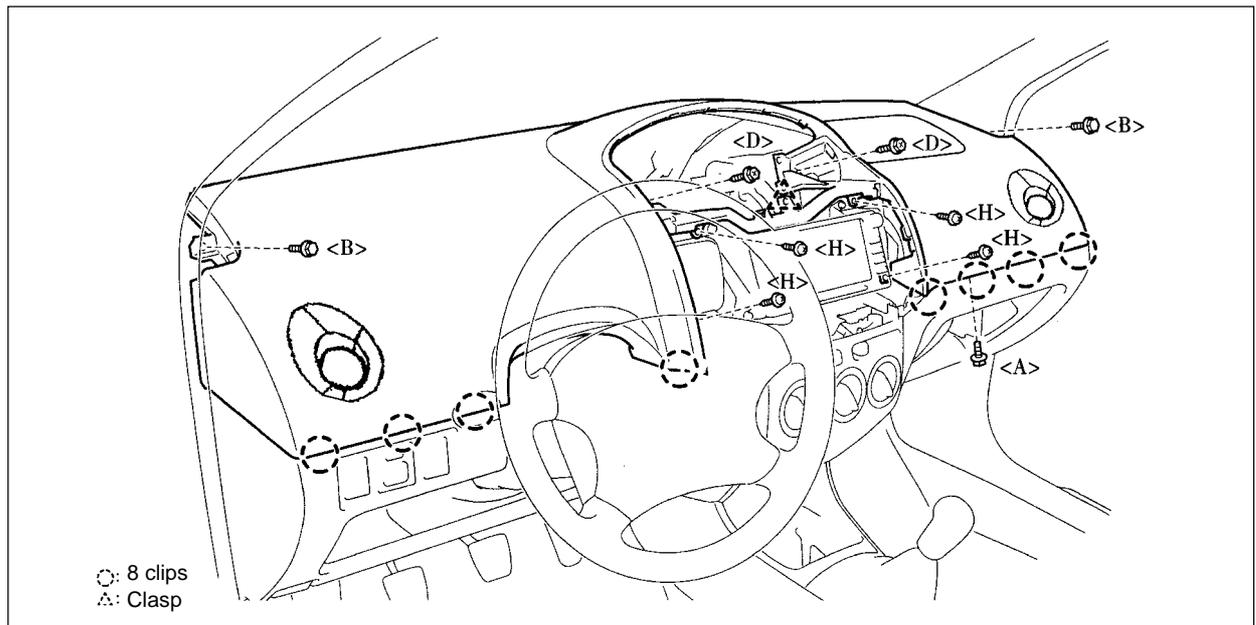


## 7. Remove the left front pillar trim panel

## 8. Disconnect the right airbag connector

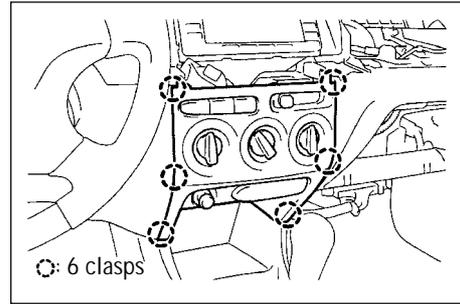
## 9. Remove the instrument panel sub-assembly

- a. Unfix 6 screws <D>, <H> and 2 bolts <B>;
- b. Unfix the screw <A>
- c. Loosen 8 clips;
- d. Disconnect the connector;

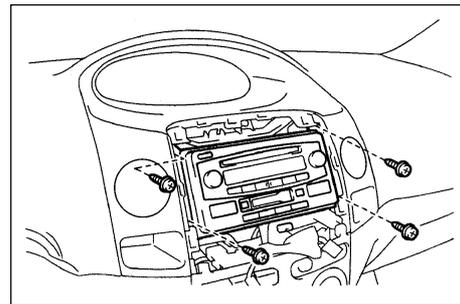


e. Pull the instrument panel sub-assembly backward and then take it out.

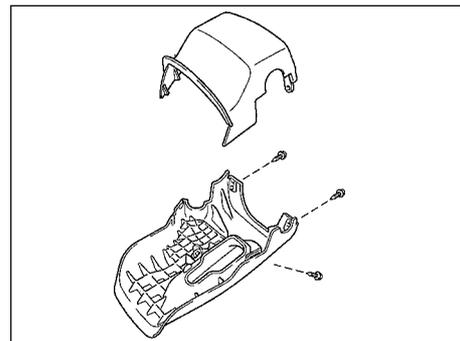
10. Remove the instrument panel lower housing assembly  
Loosen 6 clasps and then pull the lower housing assembly out.



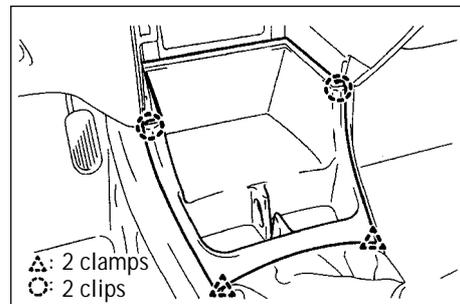
11. Remove the radio set assembly with bracket  
a. Unfix 4 screws;  
b. Disconnect the connector and then unfasten the radio set assembly with bracket.



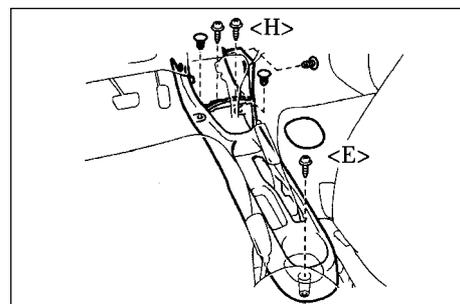
12. Remove the horn button assembly  
13. Remove the steering wheel assembly  
14. Remove the steering column upper cover assembly  
15. Remove the steering column lower cover assembly



16. Remove the cupholder

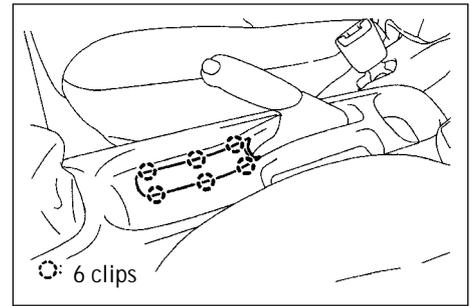


17. Remove the auxiliary fascia console assembly  
a. Unfix 3 screws;  
b. Unfix 3 clips by use of a clip remover and then unfasten the auxiliary fascia console assembly.



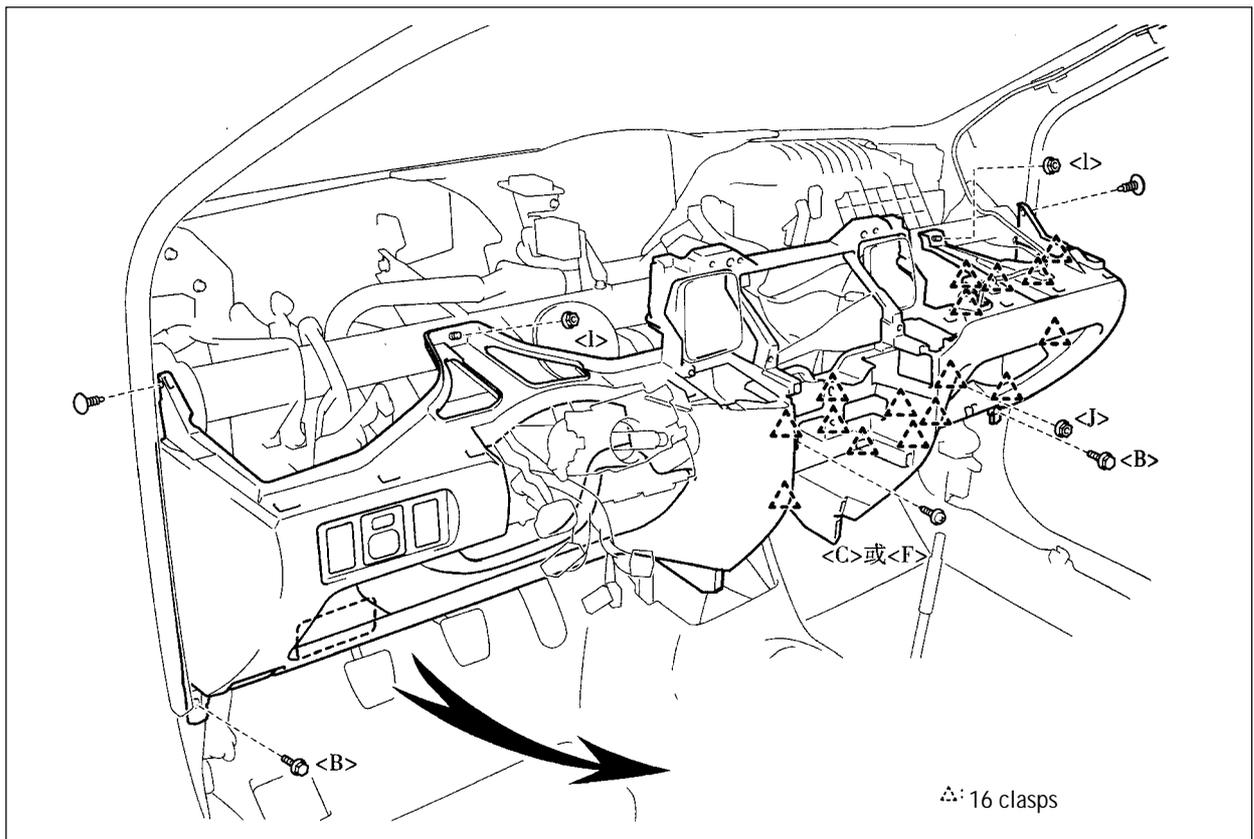
18. Remove the auxiliary fascia console trim panel

Unfix 6 clips and then unfasten the auxiliary fascia console trim board



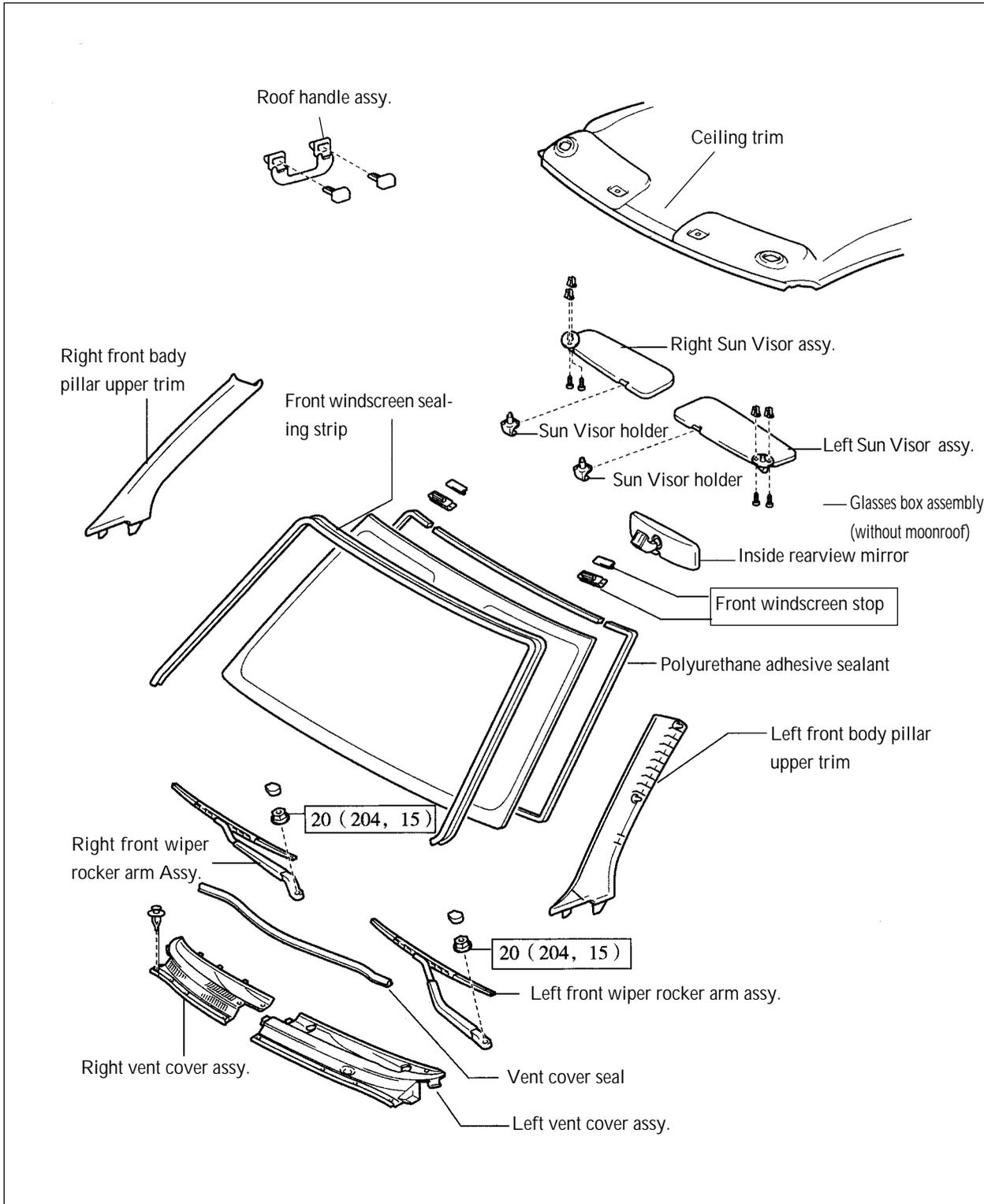
19. Remove the instrument panel lower housing assembly

- a. Unfix 2 nuts <I> and <J>, 2 bolts <B> and 3 screws <C> <F> <H>;
- b. Unfix 16 clasps;
- c. Unfasten the lower housing assembly.



# Chapter 6 Windshield

## I. Component View



## II. Install and replace windscreen glass

1. Remove the rearview mirror assy.
2. Remove the cover assy.
  - a. Unfasten two bolts on the wiper and remove the wiper assy.
  - b. Remove bolts and clips from vent cover, and take down the left portion of the cover.
  - c. Remove the right part of the board.

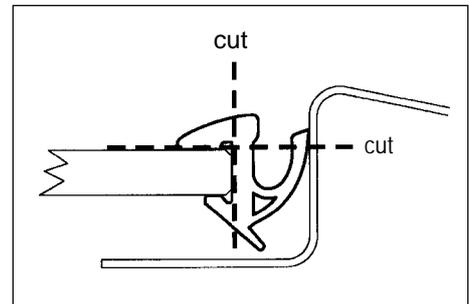
### 3. Remove the exterior sealing strip of the windscreen glass.

- a. As per the drawing, cut the sealing strip with a knife;

Attention:

Avoid damaging the car body.

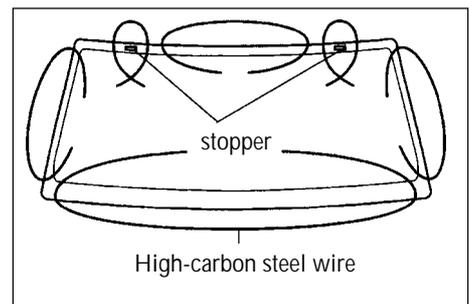
- b. Tear away the sealing strip.



### 4. Remove windscreen glass

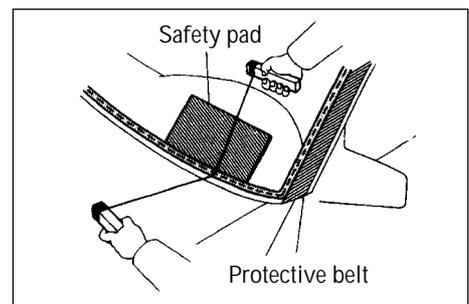
- a. Guide iron wire through inner side right car body and glass;
- b. Fasten a wood block or article of similar function to both ends of the wire;
 

(Tips: Stick a protective film on the exterior surface to avoid it being scratched)
- c. Draw the steel wire and cut the polyurethane adhesive sealant;
- d. Remove the stop block;
- e. Use a rubber cupule to detach the glass.



Attention:

1. When detaching the glass, be careful not to scratch the paint or the inner and outer trims;
2. When removing the glass, leave as much as possible polyurethane adhesive sealants.

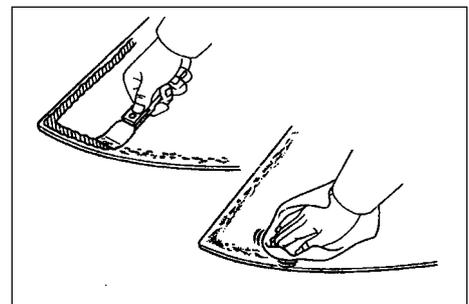


### 5. Clean the windscreen glass;

- a. Use drawknife to remove the remaining stop block and polyurethane adhesive sealant;
- b. Use clean gasoline to clean outer race of glass.

Attention:

Do not touch the glass surface after cleaning.



### 6. Install the stop block of windscreen glass (II)

- (1) Clean the mounting position of stop block for glass;
- (2) Install two new stops (with pressure sensitive adhesive) onto the glass.

## 7. Install stop block of windscreen (I)

As per the drawing, install two new stops onto the car body.

## 8. Install the polyurethane adhesive sealant onto the windscreen

Apply primer onto the mounting portion of polyurethane adhesive sealant for windscreen glass.

Attention:

- 3 minutes for adhesive drying
- Once opened, the adhesive can not be used anymore.
- Do not apply too much adhesive.

## 9. Install the seal for windscreen

(1)Apply primer G on glass edge and touching surface using brush or sponge;

(2)Install the sealing strip for windscreen.

## 10. Install windscreen

(1)Clean and tidy the car body contact surface;

- a. Cut the polyurethane adhesive sealant on the contact surface with a knife and clean it.

(Tips: Leave as much as possible polyurethane adhesive sealant.)

- b. Clean the contact surface using cloth wetted with detergent.

(Tips: Even though all the polyurethane adhesive sealants are removed, the car body yet has to be cleaned.)

(2)Place glass

- a. Use rubber cupule to place the glass at a proper position;
- b. Check whether the contact surface around the glass is smooth;
- c. Put reference marks between glass and car body.

Attention:

Check whether the stop block is well glued on car body and whether it is correctly positioned.

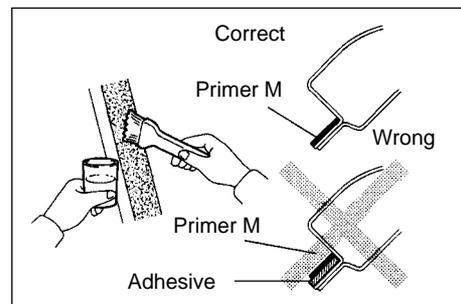
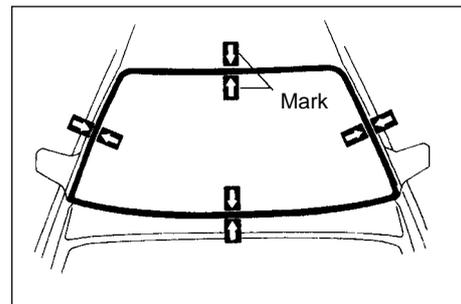
(Tips: When using the original glass again, check and correct the position of reference marks.)

- d. Detach glass

(3)Use a brush to apply primer M on the exposed parts of car body.

Attention:

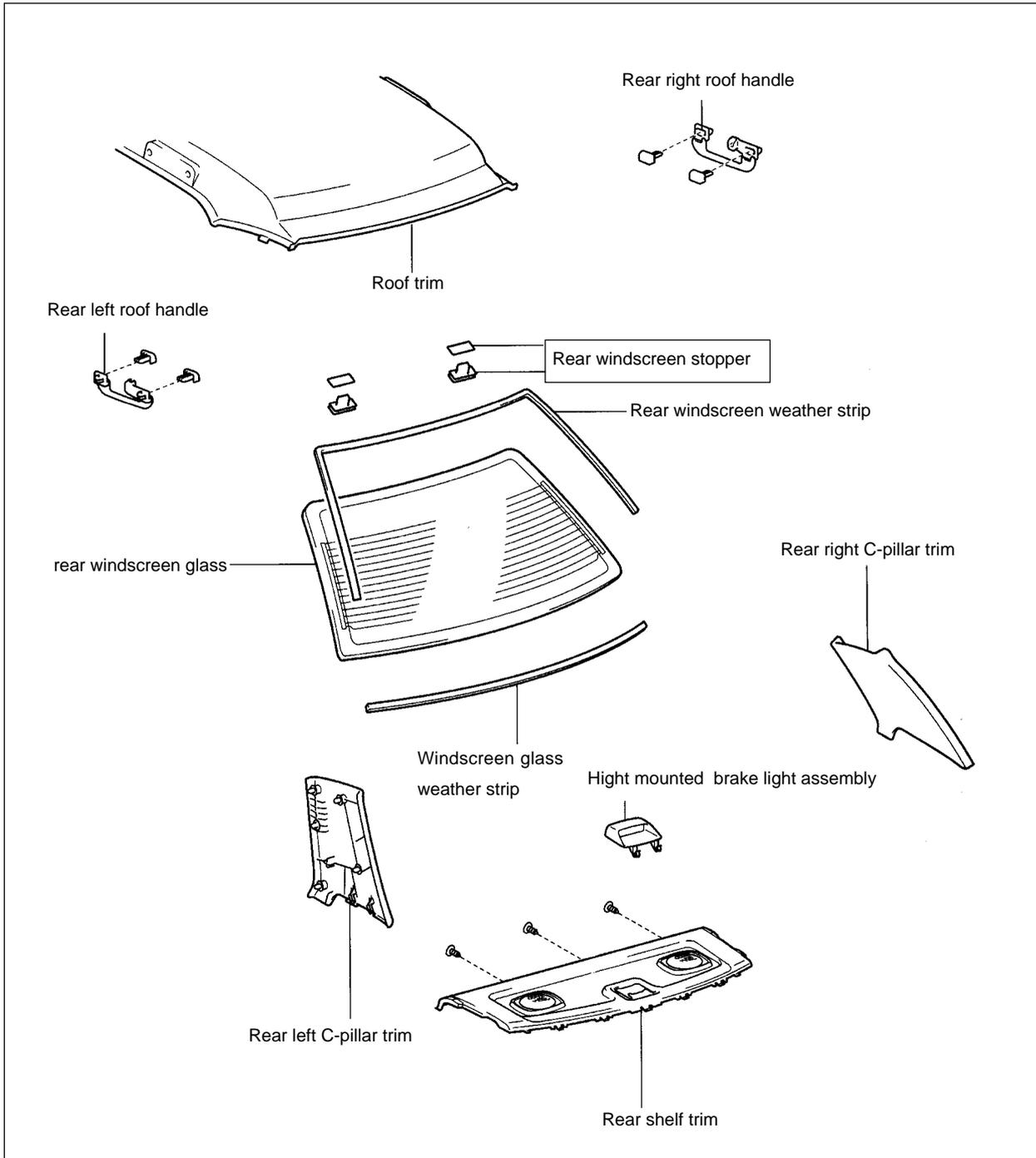
- It takes three minutes for primer drying;
- Once opened, primer M can not be used anymore;
- Avoid daubing primer onto the adhesive.



- (4) Use a brush to apply primer M onto the glass edge and contacting parts.
- (5) Add the polyurethane adhesive sealants
  - a. Prepare a sealing gun with sleeve;
  - b. As per the drawing, use the gun to apply the polyurethane adhesive sealants around the glass.
- (6) Install glass
  - a. Use cupule to place glass and align with the reference marks and press it gently along the edge.
  - b. Press the front surface of glass gently so that it comes to tight contact with the frame.
  - c. Use a scraper to clean the remaining polyurethane adhesive sealants.
- (7) Inspect leakage and service
  - a. Leakage test will be carried out after the polyurethane adhesive sealants are fully solidified.
  - b. Use the polyurethane adhesive sealants to seal up all the leaking areas.

## Chapter 7 Rear Window Glass (with Defrosting Heater Wire)

### I. Component View

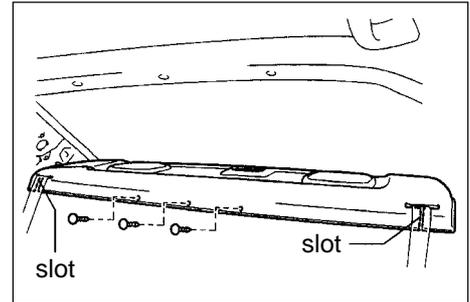


### II. Removal and Replacement of Rear Windscreen Glasses

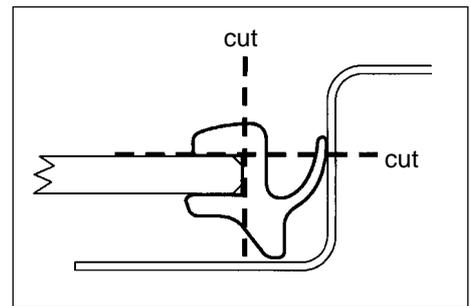
Tip:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

1. Remove the assembly of rear seatback; (Refer to "Removal and Installation of Seat")
2. Remove the interior decorative components of vehicle top; (Refer to "Removal and Installation of Interior Decorative Components of Vehicle Top" )
3. Remove the upper decorative plate at the right-rear enclosure; (Refer to "Removal and Installation of Interior Decorative Components at side enclosure" )
4. Remove the assembly of high-level brake light; (Refer to "Removal and Installation of Interior Decorative Components at side enclosure" )
5. Remove the assembly of trunk shelf; (Refer to "Removal and Installation of Interior Decorative Components at side enclosure" )
6. Remove the exterior seal belt of rear window glass;

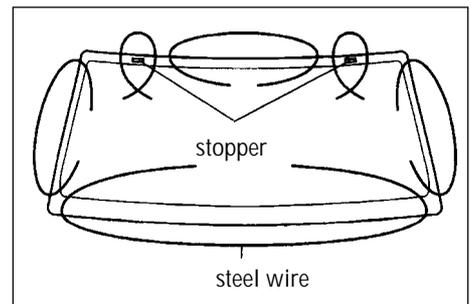


- (1) Cut apart the seal belt with knife;
- Tips:
- Do never damage the vehicle body with knife.
- (2) Pull off the cut seal belt by hand, and remove it.



7. Remove the rear window glass.

- (1) Let the steel wire go through the vehicle body and the glass;
- (2) Secure the wire at two ends with wood-block-kind-of objects; (Tip: attach the protective film to the exterior surface to prevent scratch)
- (3) Pull the steel wire, and cut off the polyester urethane sticking/sealing materials around the glass;
- (4) Remove the stopper;
- (5) Remove the glass with the rubber extraction.

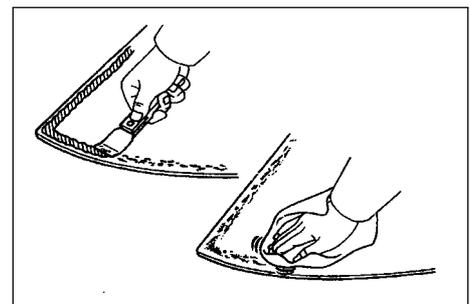


- Tips:
- Separate the glass carefully to prevent scratch on paint or interior/exterior upholsteries;
  - Leave as much polyester urethane sticking/sealing materials as possible on the vehicle body during the removal of glass.

8. Clean the rear windscreen;

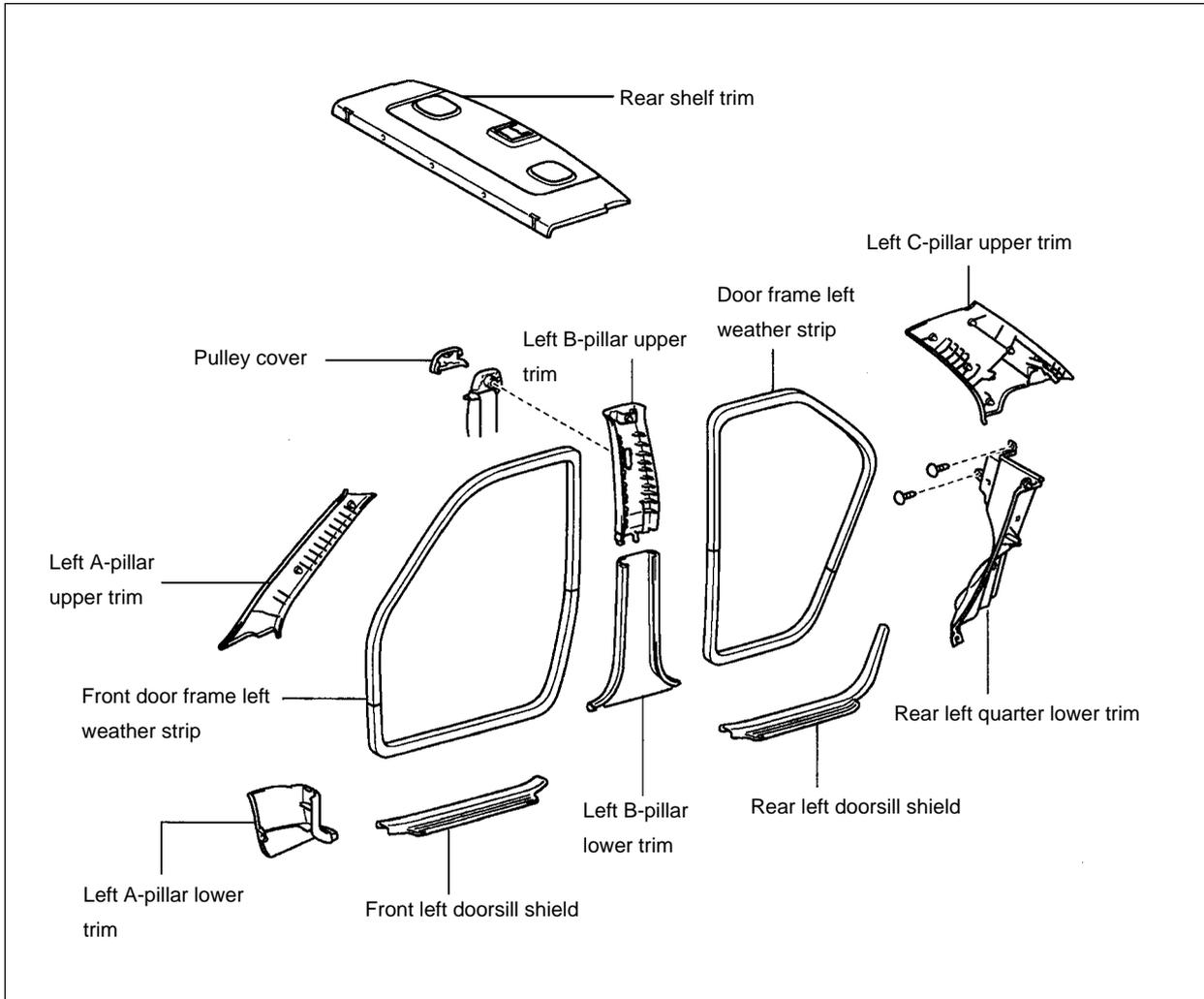
- (1) Remove the remained stopper, waterproof layer and polyester urethane sticking/sealing materials with the scraper;
- (2) Clean the exterior glass ring with uncontaminated petroleum.

- Tips:
- Keep off the glass surface after cleaning it.



## Chapter 8 Side Inner Panel Trim

### I. Component View



### II. Removal & installation Side Quarter Trim Assy.

#### Tips:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically. Mounting and taking down at right side is the same as the left side.

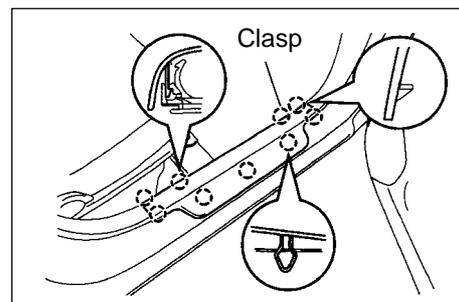
#### 1. Detach right doorsill shield

Use the screwdriver to loosen 7 clasps and detach the right front doorsill shield.

#### Notes:

Wrap the sharp end of screwdriver up with adhesive tape before operation.

#### 2. Detach the left front doorsill shield.



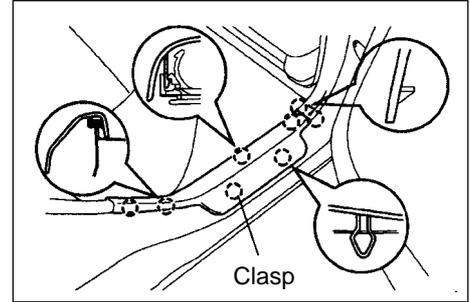
## 3. To remove the right rear doorsill shield.

Use screwdriver to loosen 6 buckles and detach the right rear doorsill shield.

## Notes:

Wrap the sharp end of screwdriver up with adhesive tape before operation.

## 4. Detach the left rear doorsill shield.



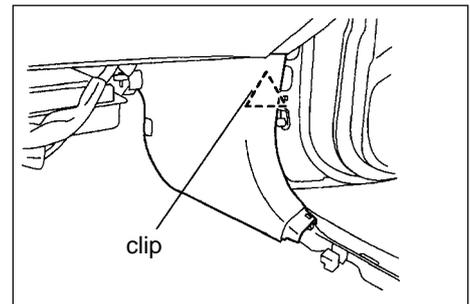
## 5. Detach the right front pillar trim

Use the screwdriver to loosen the clip and detach the right front pillar lower trim.

## Note:

Wrap the sharp end of screwdriver up with adhesive tape before operation.

## 6. Detach the left front pillar trim.



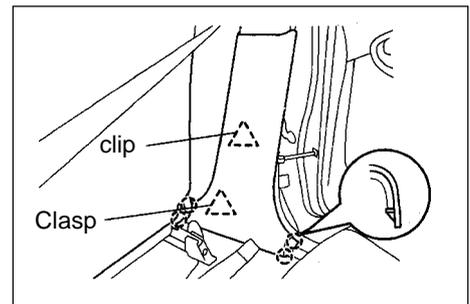
## 7. Detach the right center pillar trim

Use the screwdriver to disconnect 2 clips, 4 buckles and detach the right mid pillar lower trim.

## Notes:

Wrap the sharp end of screwdriver up with adhesive tape before operation.

## 8. Detach the left center pillar lower trim.



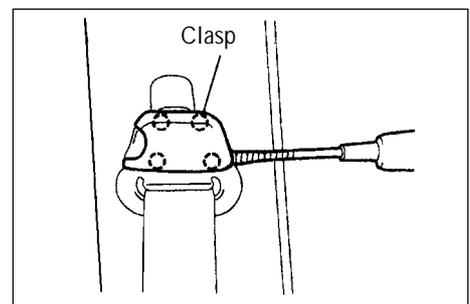
## 9. Detach the right center pillar upper trim.

- Use the screwdriver to open the pulley cover of the seat belt;
- Unscrew the bolts and detach the belt rings from the car.
- Use the screwdriver to loosen the clip and detach the right center pillar upper trim.

## Notes:

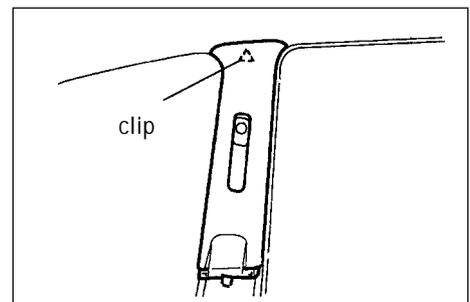
Wrap the sharp end of screwdriver up with adhesive tape before operation.

## 10. Detach the left center pillar upper trim.

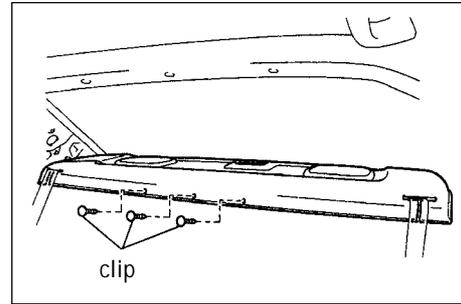


## 11. Detach the backseat cushion assy.

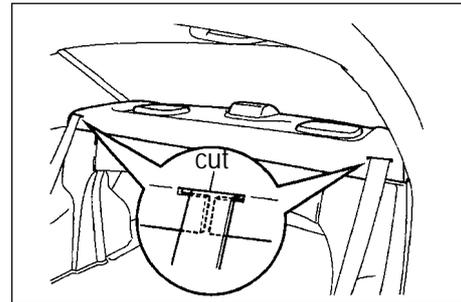
## 12. Detach the backrest assy.



13. Detach the luggage shelf assy.;
- Detach the high-mounted stop lamp assy.;
  - Unfix three clips;



- To pull the belt from the rife and detach the luggage shelf assy;

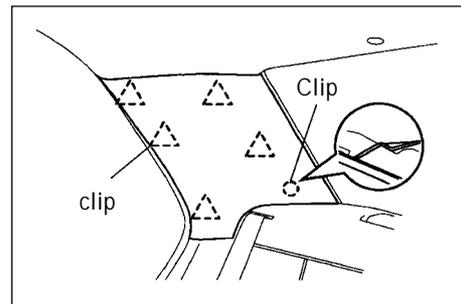


14. To remove the right quarter upper trim;
- Use the screwdriver to unfasten 5 clips and 1 buckle and detach the right quarter upper trim.

Notes:

Before using the screwdriver, apply the tape to cover its head.

15. Detach the left quarter upper trim.

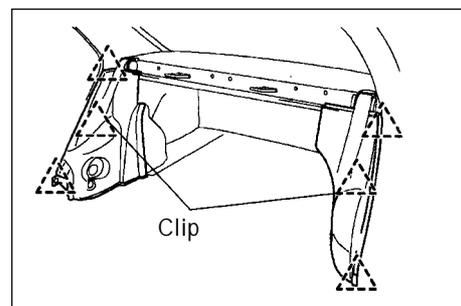


16. Detach the right quarter lower trim.
- Unfasten bolts and brackets.
  - Use the screwdriver to unfix 3 clips and detach the right quarter lower trim.

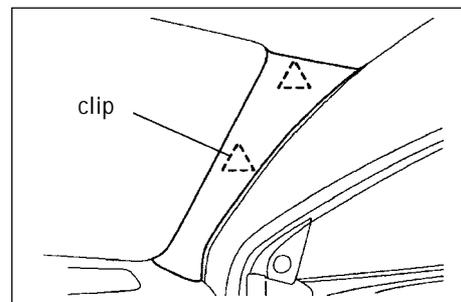
Notes:

Wrap the sharp end of screwdriver up with adhesive tape before operation.

17. Detach the left quarter lower trim.



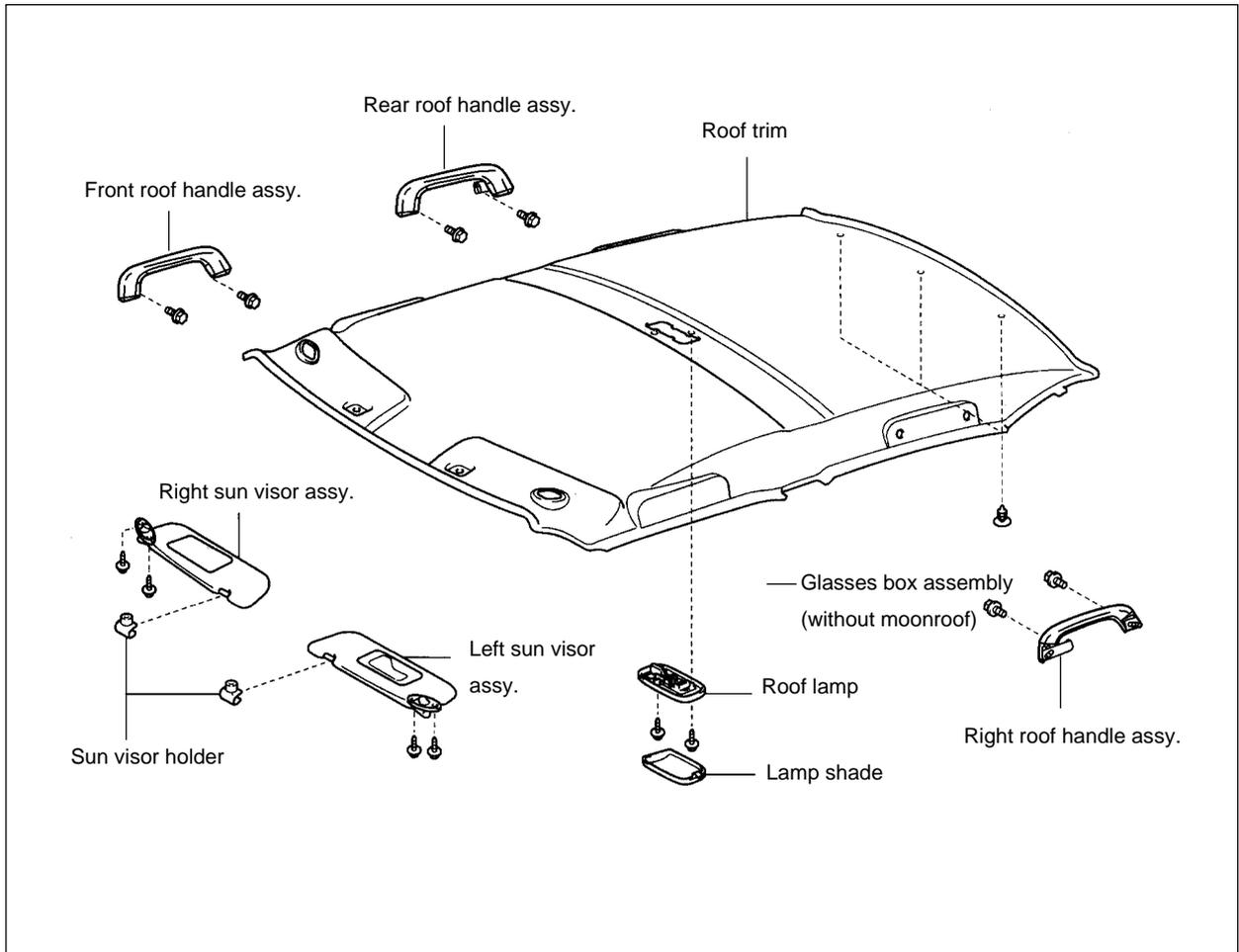
18. Detach the ring front pillar upper trim.
- Use the screwdriver to unfix 2 clips and detach the ring front pillar trim.
- Notes:
- Wrap the sharp end of screwdriver up with adhesive tape before operation.



19. Detach the left front pillar upper trim.

## Chapter 9 Roof Trim

### I. Component View



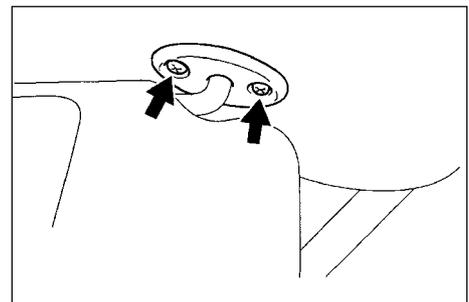
### II. Removal and Installation Roof Trim Assy.

#### Tips:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

Follow the same steps as you do with left side parts when installing the right side parts.

1. Remove side quarter trim assy.
2. Remove the right sun visor assy.;  
Unfasten 2 screws;
3. Remove the sun visor assy..  
Remove the left sun visor assy.;



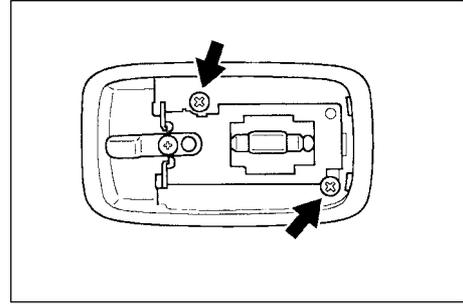
## 4. Remove the indoor roof lamp assy.

- a. Use screwdriver to unfix the 4 buckles and remove the lampshade;

Tips:

Wrap the sharp end of screwdriver up with adhesive tape before operation.

- b. Unfix 2 screws and the roof lamp assy.

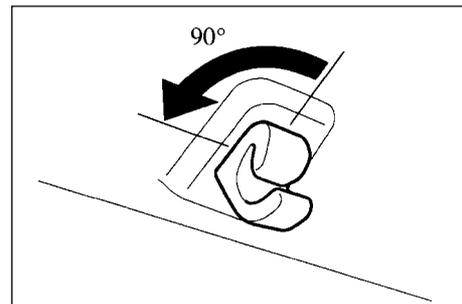


## 5. Remove the handle assy.

- a. Pull down the handle and take out 2 rubber plugs from the holes where two bolts are positioned;
- b. Unfasten 2 screws and remove the handle assy.

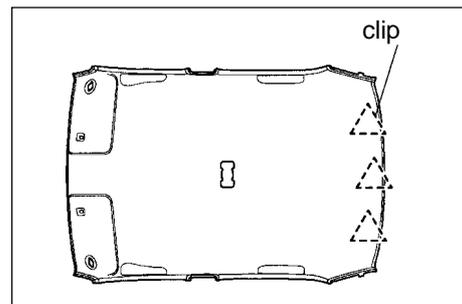
## 6. Detach the sun visor tightener.

(Take down anti-clockwise the sun visor fastener.)



## 7. Remove the top trim

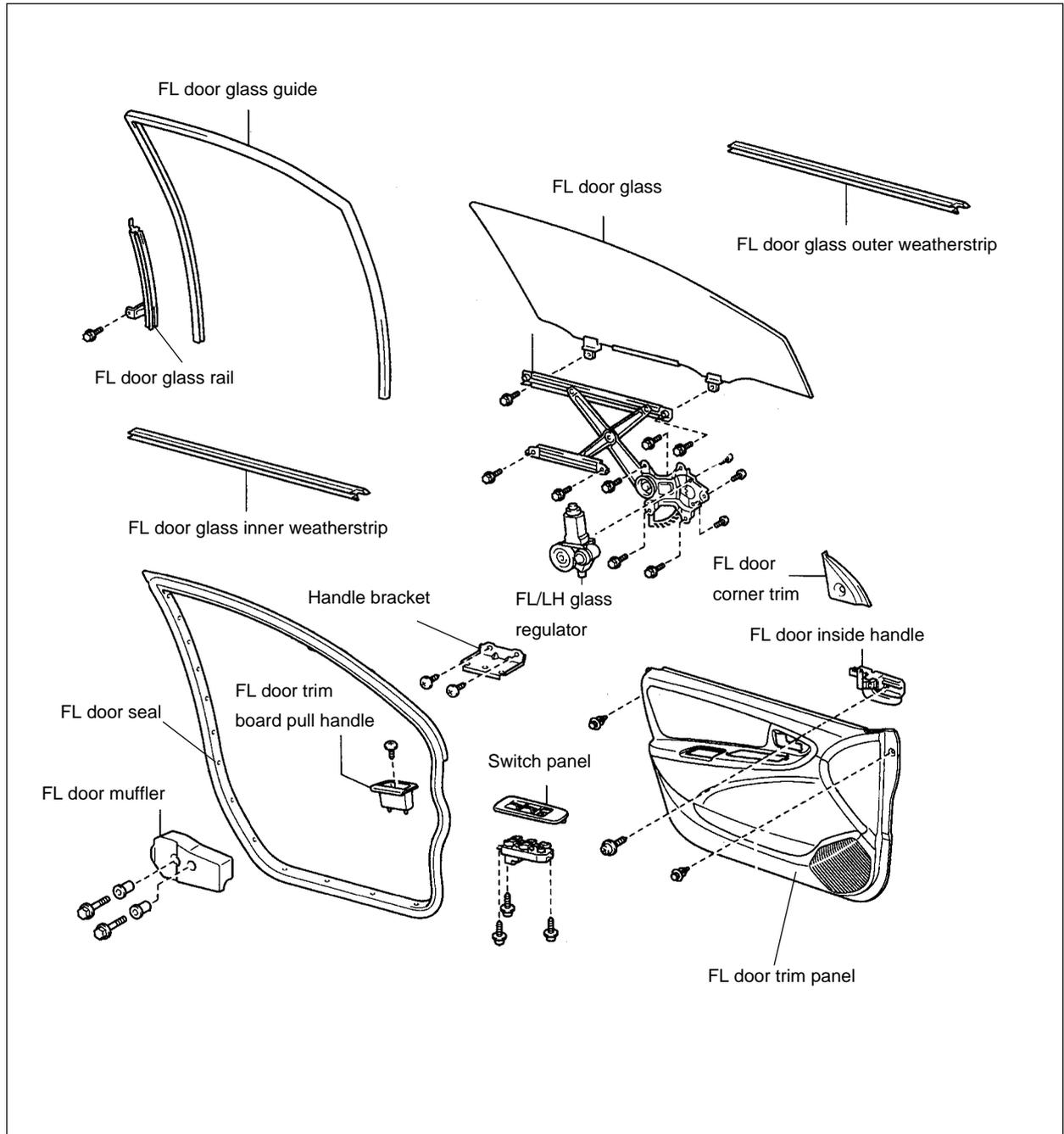
Use a special tool to remove 3 clips and remove the roof trim assy.



## 8. Installation is basically the reverse of removal.

# Chapter 10 Front Door Interior Trim

## I.Component View



## II. Removal and installation of front door trim assembly

### Notes:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

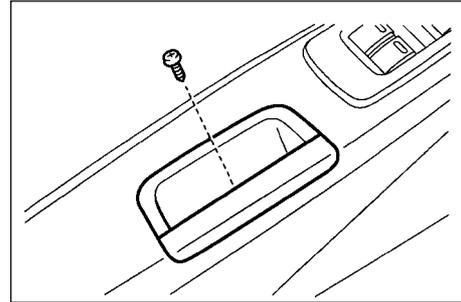
Installation and removal on the right side is identical with that on the left side.

### 1. Remove the left front door trim board pull handle

Unfix 1 screw by use of a crosshead screwdriver and then unfasten the pull handle.

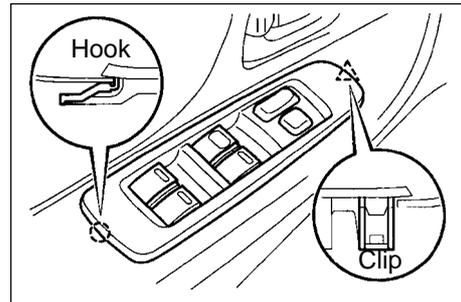
#### Tips:

Protect the pull handle from damage by wrapping the sharp end of screwdriver up with adhesive tape before operation.



### 2. Remove the glass regulator switch assembly

- Loosen the hook and the clamp by use of a slot-head screwdriver and then unfasten the glass regulator switch;
- Disconnect the switch;
- Unfix 3 screws and the trim board.

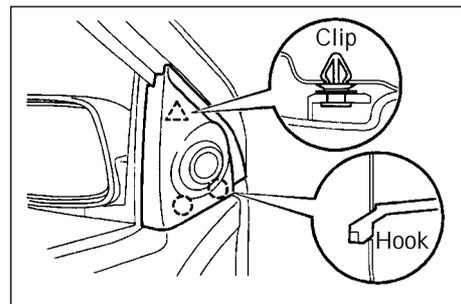


### 3. Remove the left front door corner trim

- Loosen 2 hooks and clamps by use of a slot-head screwdriver and then unfasten the corner trim.

#### Tips:

Protect the corner trim from damage by wrapping the sharp end of screwdriver up with adhesive tape before operation.

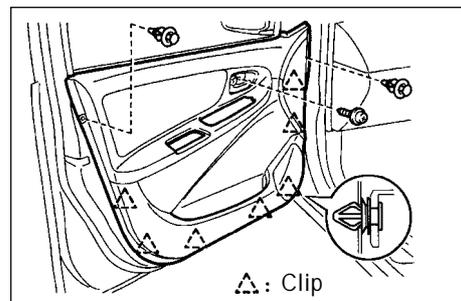


### 4. Remove left front door trim board

- Unfix the screw and 2 clips;
- Loosen 7 clips by use of a slot-head screwdriver and then pull the door trim board backward to unfasten it.

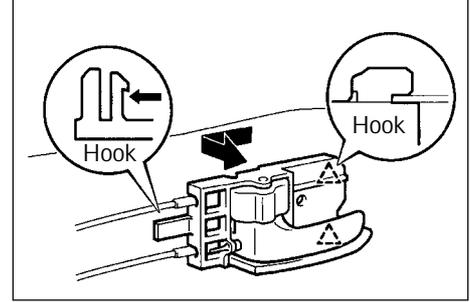
#### Notes:

Protect the door trim board from damage by wrapping the sharp end of screwdriver up with adhesive tape before operation.



## 5. Remove the left front door inside handle

Loosen 2 hooks, unfasten the left front door inside handle and then disconnect 2 wires from the handle.



## 6. Peel off the rainproof film

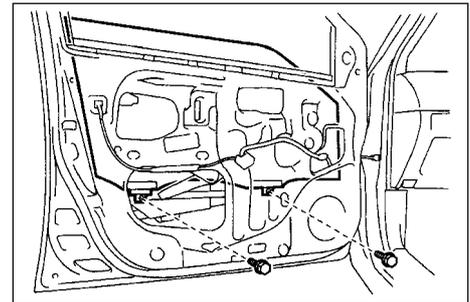
## 7. Remove the speaker assembly

## 8. Remove the left front door glass and the left front door glass guide

## Tips:

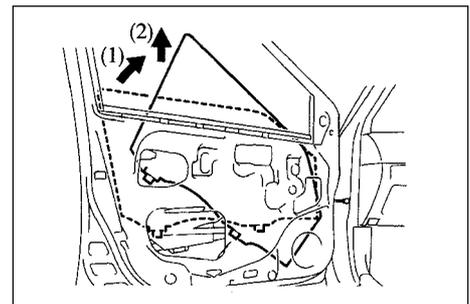
Protect the glass from scratch by inserting a cloth in the LF door inner panel.

a. Unfix 2 bolts retaining the glass in place;



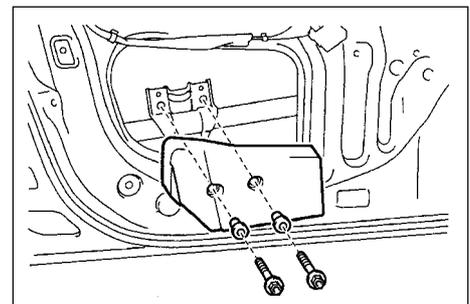
b. Remove the left front door glass;

c. Take out the glass guide.



## 9. Remove the left front door muffler

Unfix 2 bolts, 2 liners and the left front door muffler.



## 10. Remove the left front door glass regulator assembly

a. Disconnect the connector;

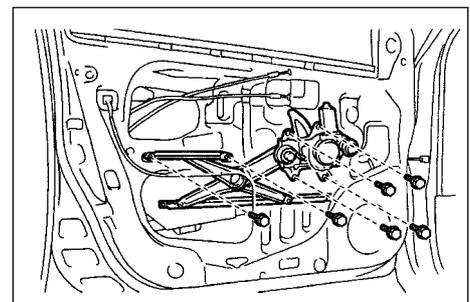
b. Unfix 6 bolts and left front door glass regulator assembly.

## Caution

Be careful to prevent the glass regulator assembly from damage when it is not supported by the bolts.

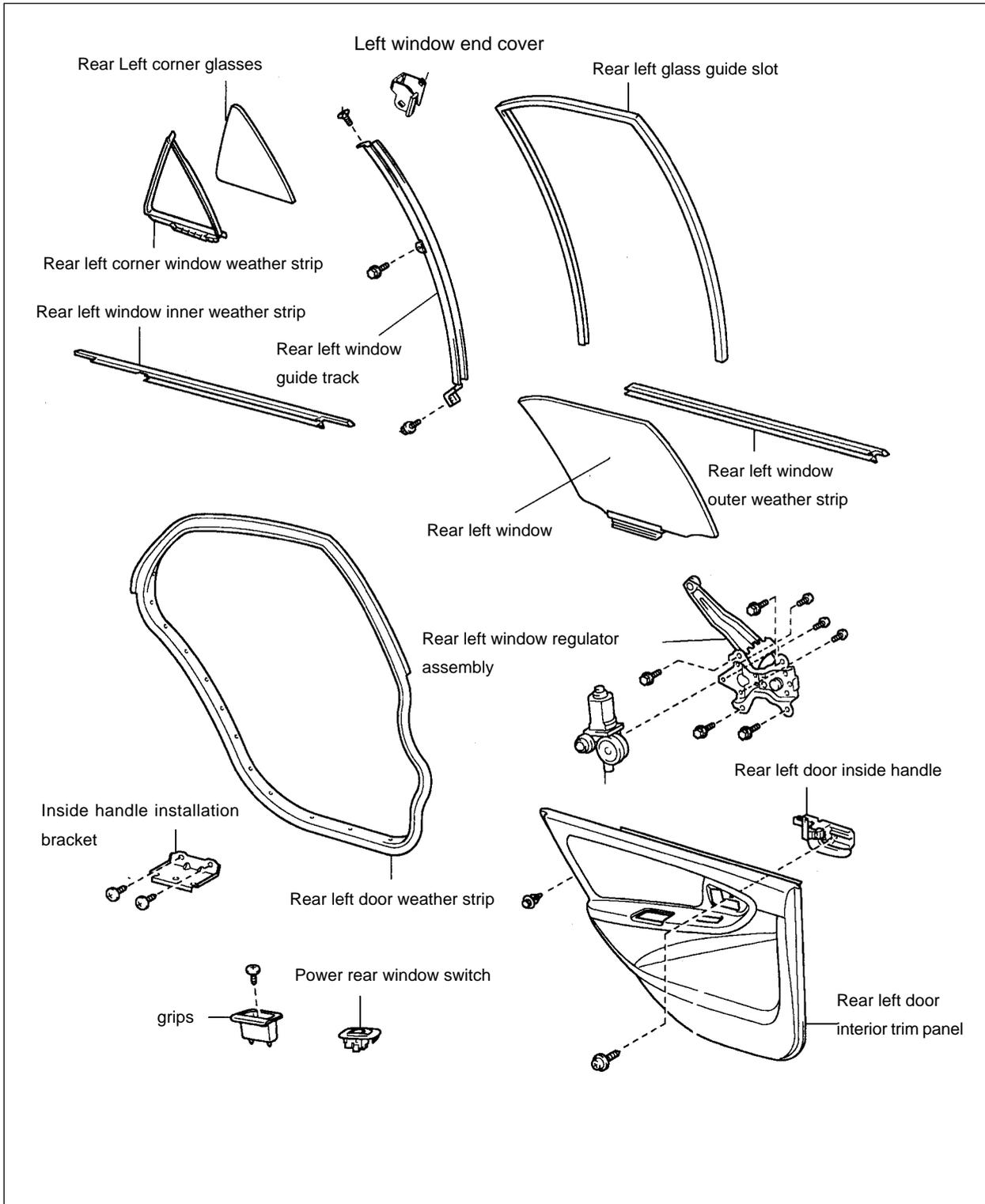
## Notes:

Remove the left front door glass regulator assembly through the service hatch.



# Chapter 11 Rear Door Interior Trim

## I. Component View



## II. Removal and Installation of the Rear Door Interior trim

Tip:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

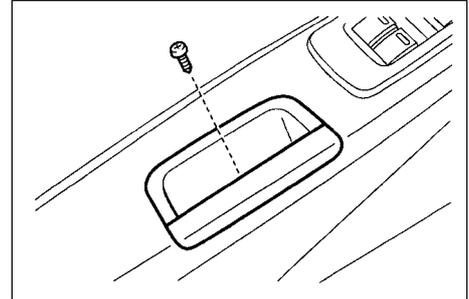
The removal and installation at the right side are the same as those at the left side.

1. Remove the interior decorative plate handle of left rear door;

Remove a screw with the cross-head screwdriver, and then take off the interior decorative plate handle of left-rear door.

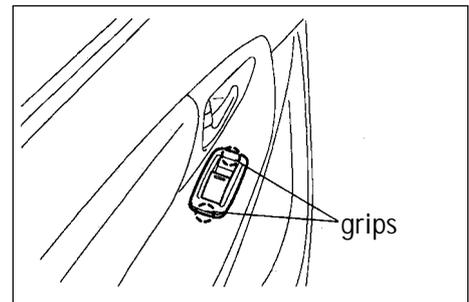
Tip:

Wrap the head of screwdriver with belt before using it.



2. Remove the assembly of electric-driven window regulator switch;

- a. Release the grips with the straight screwdriver, and then remove the regulator switch off the decorative plate.
- b. Disconnect the switch connector.

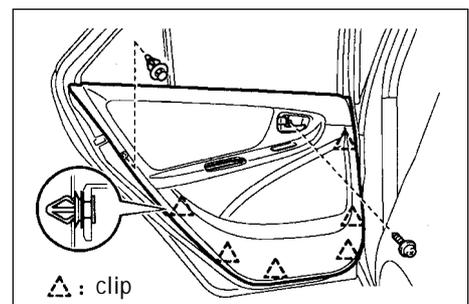


3. Remove the interior decorative plate of left rear door;

- a. Remove the screws and buckles;
- b. Release the 6 buckles with the straight screwdriver, and hold upwards the interior decorative plate of rear-left door to remove it.

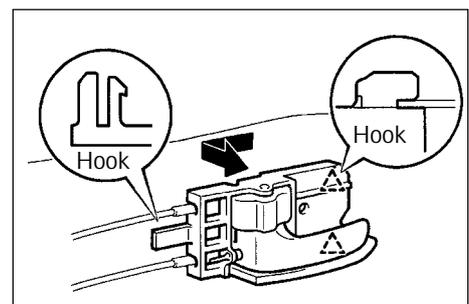
Tip:

Wrap the head of screwdriver with belt before using it.



4. Remove the interior handle of left-rear door;

Release the 2 hooks, remove the interior handle of left-rear door, and disconnect the 2 wires off the interior handle of left-rear door.



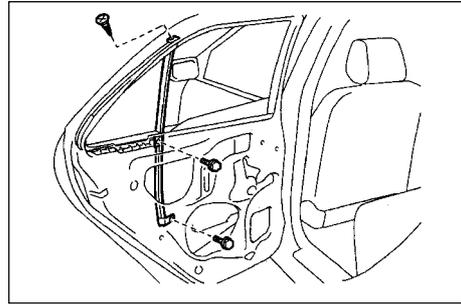
5. Remove off the rain-proof film on the door;

6. Remove the rear left window and the guide slot of rear left window;

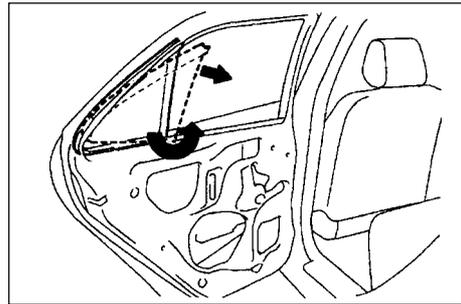
Tip:

Insert the duster cloth into the interior plate of door to prevent scratch on glass.

- a. Remove the left rear window;
- b. Remove the screws and the 2 bolts;
- c. Remove the guide slot of rear left window.



7. Remove the rear left corner window;



8. Remove the assembly of left-rear window regulator.

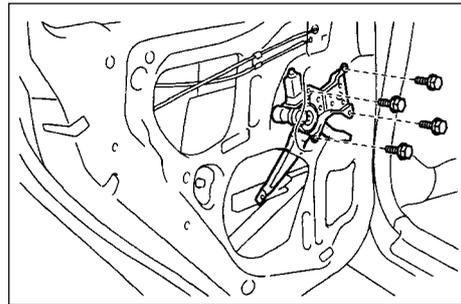
- a. Disconnect the connector;
- b. Remove the 4 bolts and the assembly of left-rear window elevator.

Tips:

After removal of bolts, rear left window regulator may fall to cause damage.

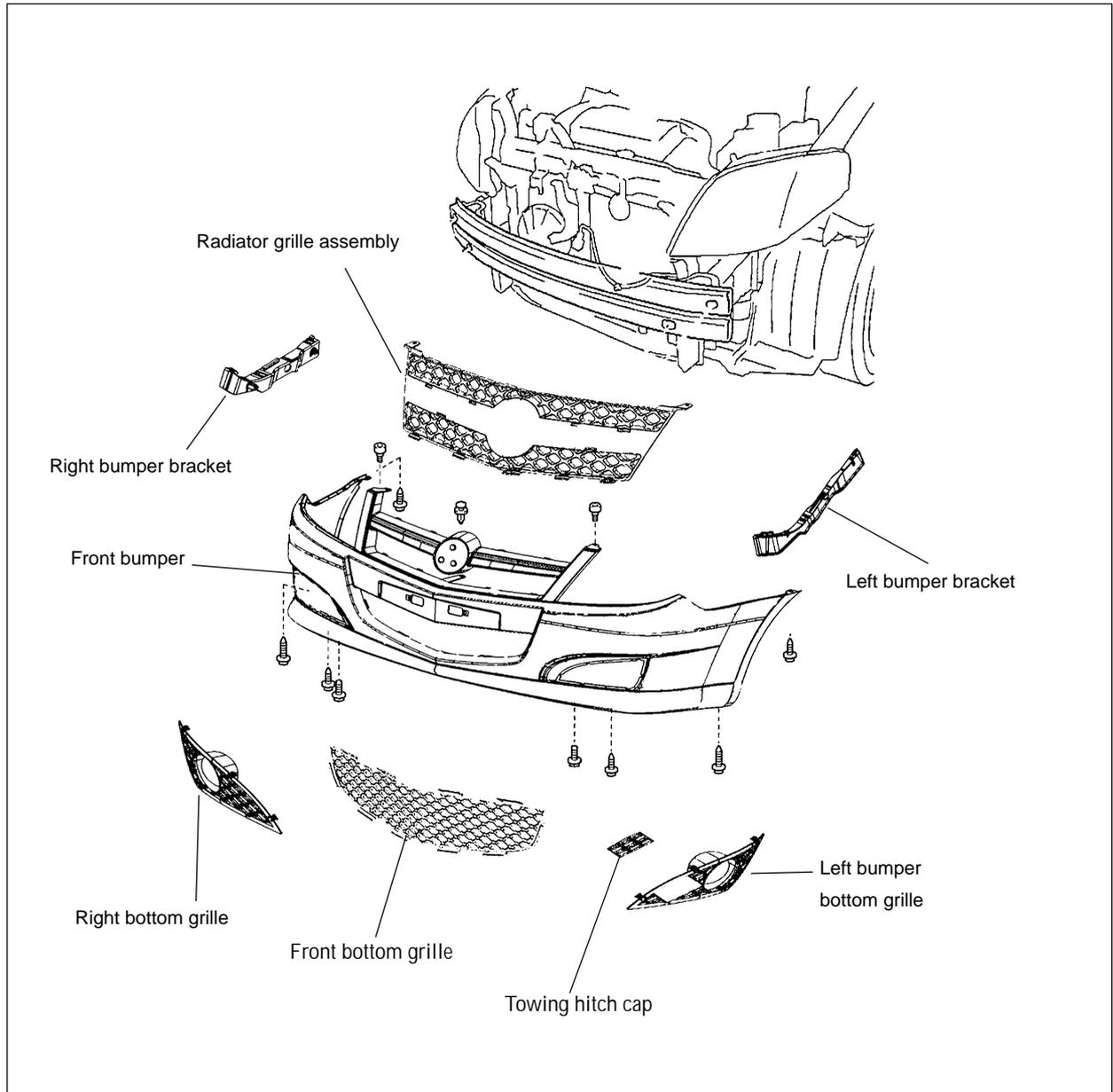
Tip:

Remove the rear left window regulator through the manhole.



## Chapter 12 Front Bumper

### I. Component View



### II. Removal and installation of front bumper

#### Notes:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

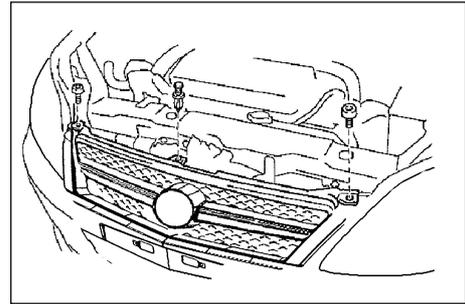
1. Remove the radiator grille assembly
  - a. Unfix 2 bolts and clips;

- b. Loosen the clips by use of a screwdriver and then unfasten the radiator grille assembly.

Caution

Protect the radiator grille from damage carefully by wrapping the sharp end of screwdriver up with adhesive tape before operation.

2. Remove the front bumper
  - a. Unfix 2 bolts, 6 screws and clips;
  - b. Loosen 2 clips and then unfasten the front bumper.



3. Remove the left bumper bracket  
Unfix 2 nuts and then unfasten the bracket.

4. Remove the right bumper bracket  
Unfix 2 nuts and then unfasten the bracket.

5. Remove the left bottom grille  
Loosen clips and then unfasten the grille.

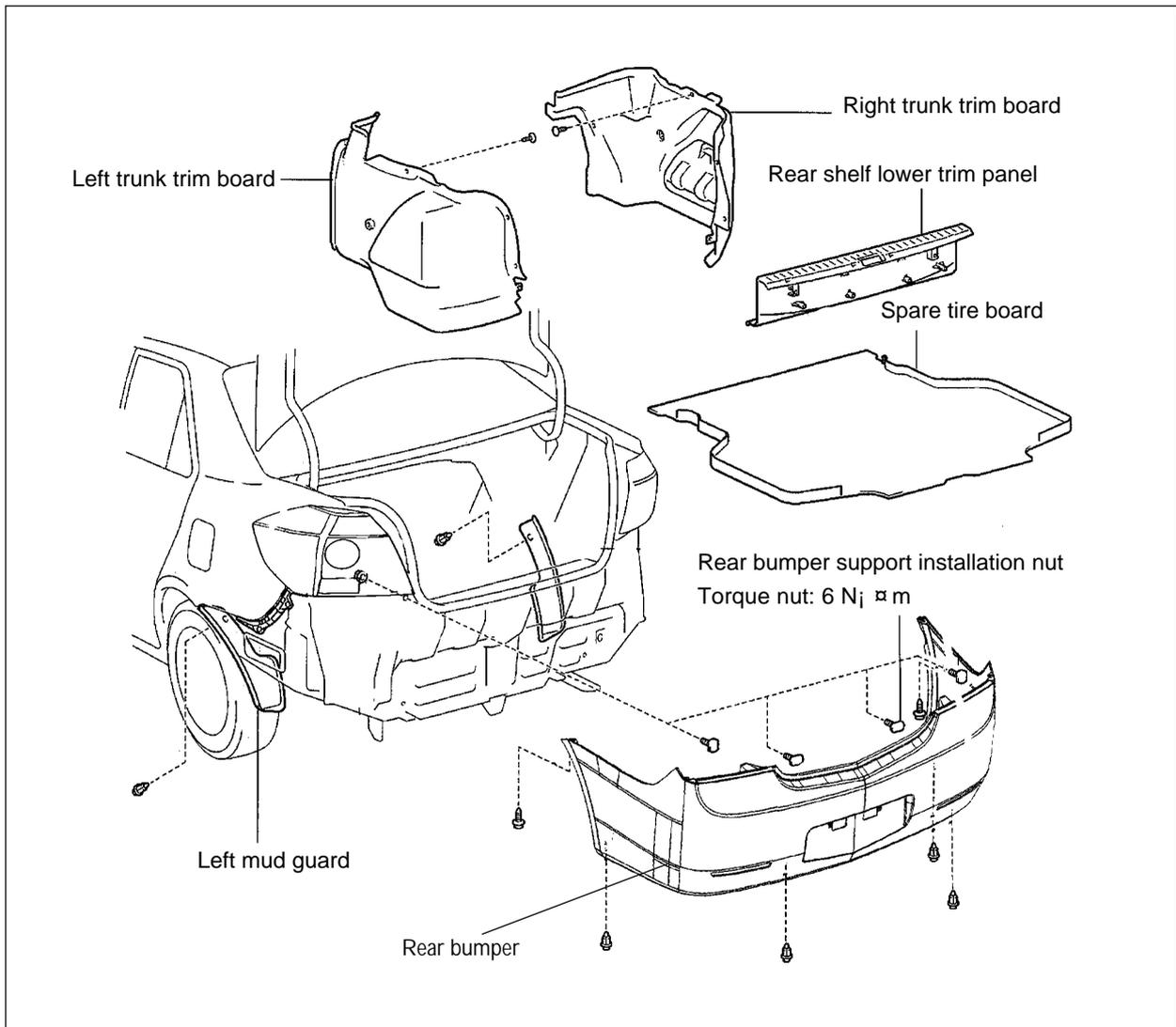
6. Remove the right bottom grille  
Loosen clips and then unfasten the grille.

7. Remove the front bottom grille  
Loosen clips and then unfasten the grille.

8. Install in reverse order of removal.

## Chapter 13 Rear Bumper

### I. Component View



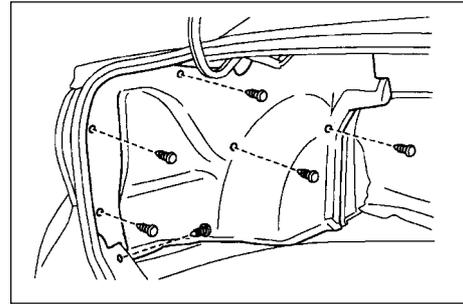
### II. Disassembly and assembly of the rear bumper

#### Notes:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

1. Remove the spare tire cover assembly.
2. Remove the lower trim board of the rear separator.
3. Remove the ornamental blanket at the left side of the luggage compartment.
  - a. Remove six snaps.

- b. Remove the ornamental blanket at the left side of the luggage compartment.
- 4. Remove the ornamental blanket at the right side of the luggage compartment.
  - a. Remove six snaps.
  - b. Remove the ornamental blanket at the right side of the luggage compartment.

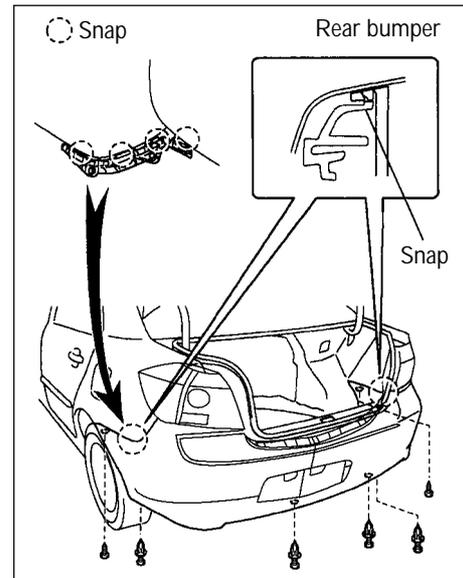


- 5. Remove the rear bumper.
  - a. Remove four nuts;
  - b. Remove two screws and four clips;
  - c. Remove 8 snaps and the bumper.

- 6. Mount the rear bumper.

Installation is basically the reverse of removal.

(Notes: Mount the rear bumper with two screws, 4 clips and 4 nuts; Torque: 5.5N.m, for the nut)



## Chapter 14 Outside Rearview Mirror

The outside rearview mirrors are mounted on the left and right doors. With specially designed rubber sheath, the rearview mirrors are seamlessly and smoothly joined to the body of vehicle. Meanwhile, they block neither upward nor backward turn of rearview mirrors upon knocking. Such installation also plays an important role in decreasing the air resistance coefficient of the whole vehicle.

The mirror glasses are fixed to the supporting plates with double-side adhesive tape. The supporting plates are connected to the shell of rearview mirrors with ball hinge in order to make sure no glass will scatter that causes secondary injury, as well as replacing the damaged glasses easily. When the glasses are damaged, the supporting plates can be taken out of the ball-head mount with tools, and then pressed into the mount again after replacing the glasses. The turning force of rearview mirror is designed as 30N, which enables easy turn and less hurt/damage in case human or object knocks the mirror. In addition, the rearview mirrors are equipped with electric adjustment and heat defrosting.

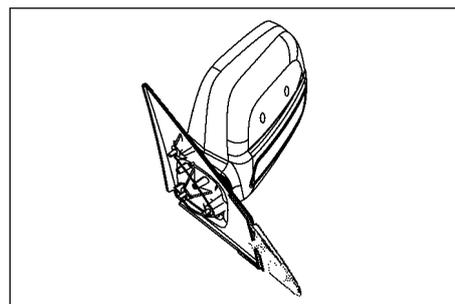
### Notes

When turning over the rearview mirror, please don't put your finger between the exterior rearview mirror and the hinge in order to avoid extrusion injury!

### Replacement of Rearview Mirror

#### Removal procedures

1. Remove the cathode lead wire off the storage battery;
2. Remove the corner decoration of door;
3. Disconnect the plug of electric-driven exterior rearview mirror;
4. Remove the 3 screws;
5. Remove the electric-driven exterior rearview mirror



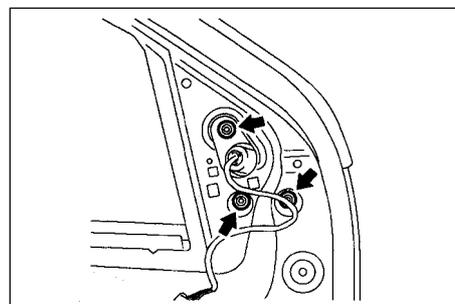
#### Installation procedures

1. Mount the rearview mirrors onto the doors
2. Fasten the screws from the lower-left side clockwise

#### Fastening

Fasten the screws of exterior rearview mirrors with the torque of 8.0N.m

3. Connect the plug of electric-driven exterior rearview mirrors;
4. Install the corner decoration of door



# Chapter 15 Door Protecting Stripe

## I. Removal and installation of door protector

Notes:

Installation is basically the reverse of removal and different operation(s) in the process of installation, if any, will be pointed out specifically.

Installation and removal on the right side is identical with that on the left side.

### 1. Remove the door protector from the left front door

- a. Use a heating lamp or a dedicated electric blower to heat up the door protector to 40~60° C.

Caution: Do not overheat the door protector.

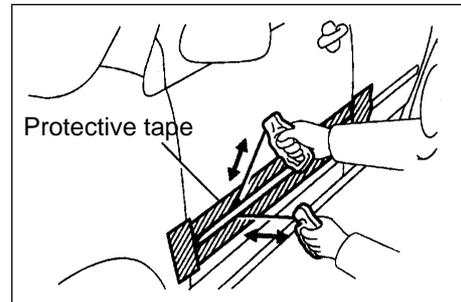
- b. Fasten both ends of the steel wire to the wooden handle.

- c. Cut the adhesive tape by pulling the steel wire.

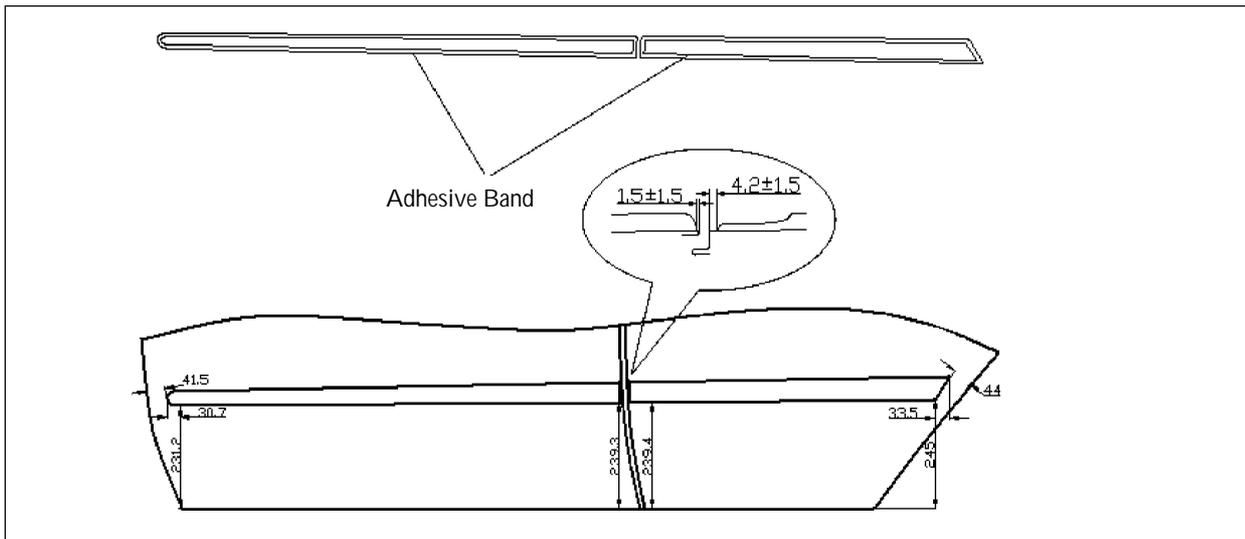
Caution: Make sure not to break the door protector to be installed later.

Do not cause damage to the car.

- d. Remove the door protector.



### 2. Install the door protector



- a. Rip off the protective tape from the car;
- b. Use a heating lamp or a dedicated electric blower to heat up the car exterior and the door protector.

Desired temperature

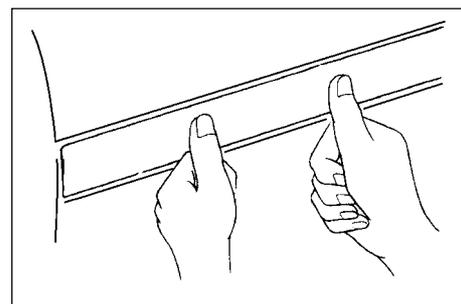
Car body	40~60° C
Door protector	20~30° C

Caution: Do not overheat the car exterior and the door protector.

- c. Rip off the release liner from the door protector;

Caution

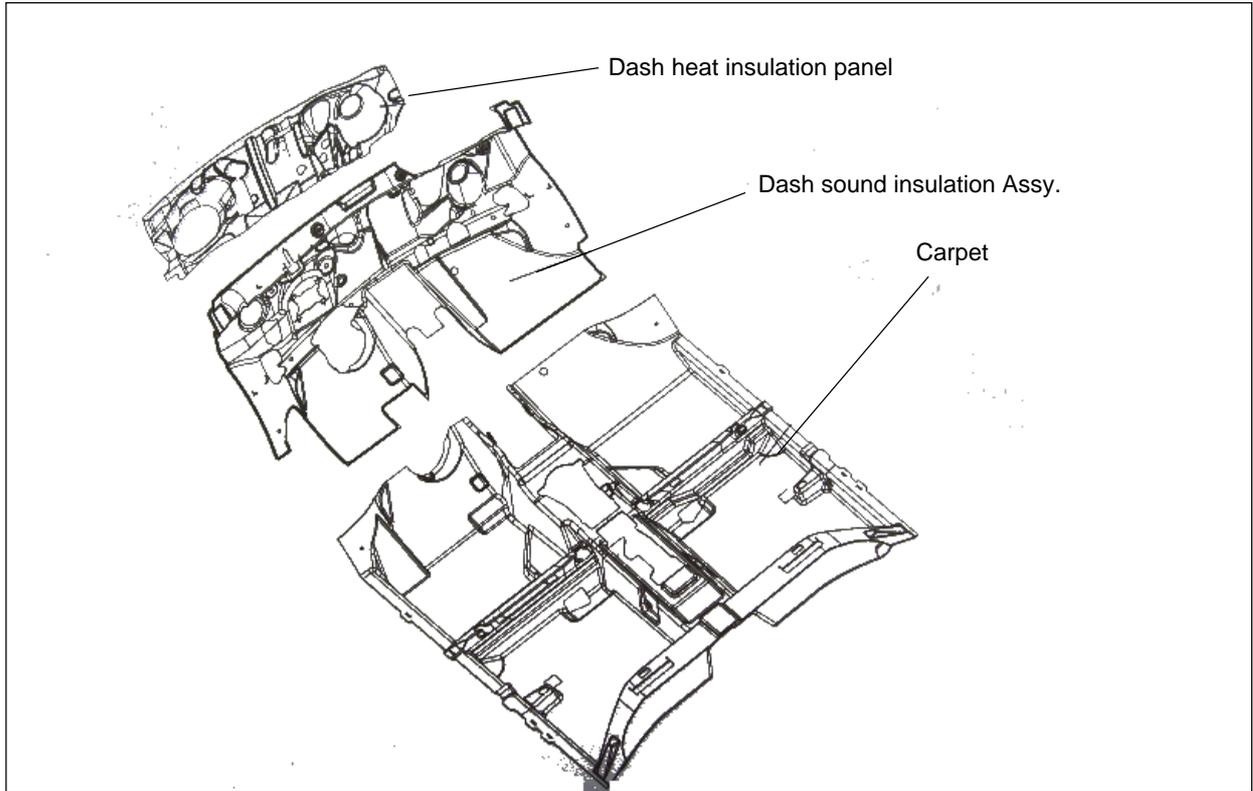
Make sure the adhesive tape does not get dusted or stained when the release liner is ripped off.



Do not push the door protector too hard; make sure it is attached to the door firmly by pressing it with your fingers.

## Chapter 16 Carpet and Insulator

### Component View



#### 1. Removal

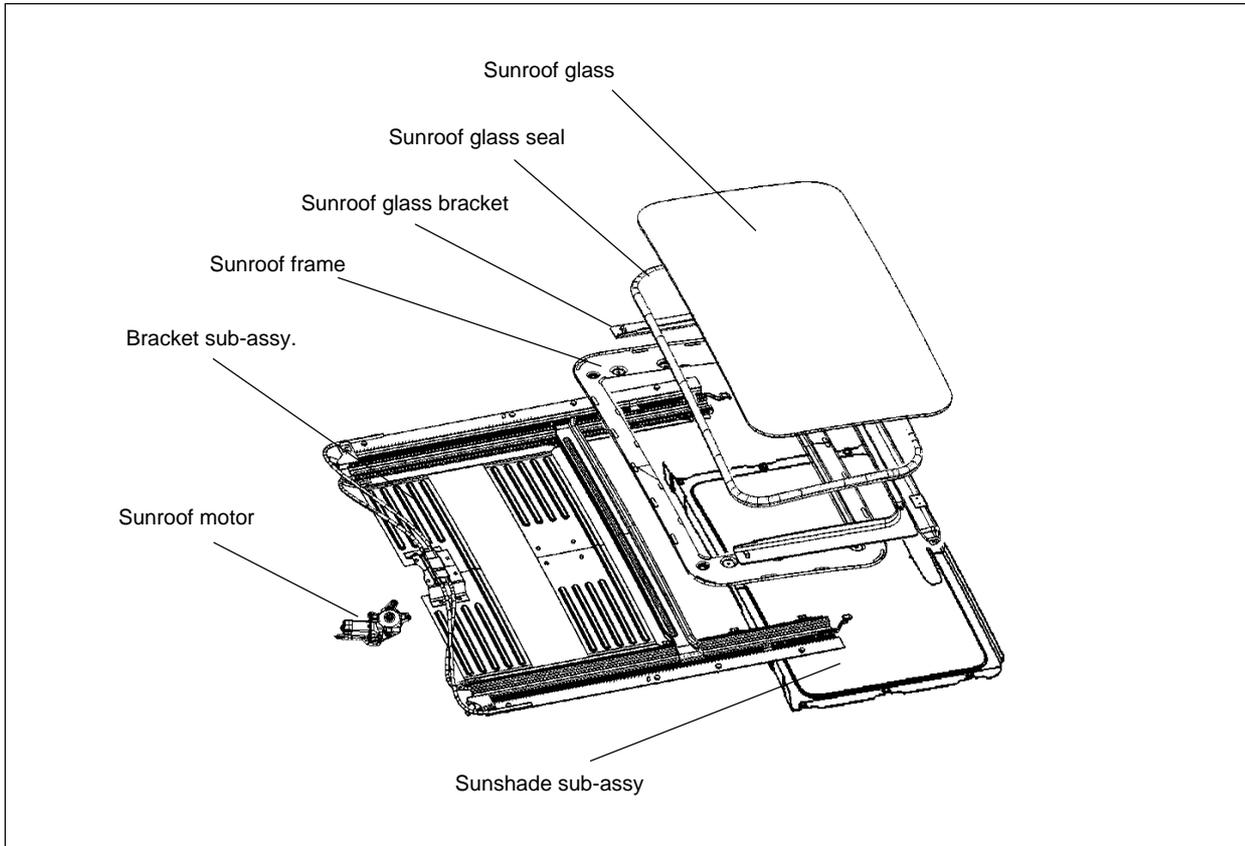
- a. Remove front rear seat, left front doorsill, right front doorsill, right center lower pillar lower trim, left center pillar lower trim, right rear doorsill shield, left rear doorsill shield, frontal and rear parts of auxiliary fascia console;
- b. Remove the sound insulator assembly under carpet and dash, the dash heat insulation (in compartment).

#### 2. Mounting

- a. Mount accelerator pedal assembly, brake and clutch pedal assembly, brake assembly onto the car;
- b. Install the carpet according to the corresponding holes with its left and right edges mounted separately under the left front doorsill shield, the right front doorsill shield, the right center pillar lower trim, the left center pillar lower trim, right rear doorsill shield and the left rear doorsill shield.

# Chapter 17 Moonroof Assembly (Optional)

## Component View



## II. Inspection of sunroof

Troubleshooting form

Symptom	Possible causes
Sliding sunroof system doesn't work.	<ol style="list-style-type: none"> <li>1. Power relay</li> <li>2. Instrument fuse</li> <li>3. Sunroof switch</li> <li>4. Sunroof lock switch</li> <li>5. Sunroof motor</li> <li>6. Sunroof guide rail</li> <li>7. Wire harness</li> </ol>
Sliding sunroof system gets stuck (e.g. foreign matter like gravel caught in motor)	<ol style="list-style-type: none"> <li>1. Sunroof lock switch</li> <li>2. Sunroof motor</li> <li>3. Sunroof guide rail</li> <li>4. Wire harness</li> </ol>

### III. Removal and installation of sliding sunroof

1. Remove the roof panel trim

(For more information, see "removal and installation of roof panel trim".)

2. Remove the ceiling lamp

(For more information, see "removal and installation of roof panel trim".)

3. Remove the sunroof glass sub-assembly

- a. Unfix the screw by use of a box spanner;
- b. Pull the glass upward and then take it out.

4. Remove the sunroof motor

Caution

Make sure the sunroof is completely closed before removing the sunroof motor.

- a. Disconnect the connector;
- b. Unfix the bolt and then remove the sunroof motor.

5. Remove the sunroof bracket sub-assembly

- a. Detach water pipe;
- b. Unfasten the retaining bolts around the sunroof bracket sub-assembly;
- c. Take out the sunroof bracket sub-assembly.

6. Remove the sunshade sub-assembly

Slide the sunshade backward and then take it out.

7. Remove the sunroof drive cable and the sunroof guide rail;

8. Install in reverse order of removal.

Caution

Check if the sunroof is waterproof after installation.

If a water leak is detected, readjust the sunroof.

For more information on the electrical part of sunroof, see the chapter on electrical part of this manual.

## Chapter 18 Plug List

No.	Picture	Material code	Position	Diameter	Quantity
1		1018005004	Side Dash	25.5	2
2		1018005000	Front floor	13.5	4
3		1018005001	Front floor and rear floor	44.5	6
4		1018005003	Front floor	30.5	2
5		1018005002	Front floor		2
6		1018005005	Rear floor		2
7		1018005006	Side dash	11	2
8		1108005007	Positioning plate for taillight	9.5	2
9		1018005008	Front floor	9.5	4
10		1018005009	B-pillar	17	2
11		1018005010	B-pillar	25	4
12		1018005011	Front of Side dash	20	2

No.	Picture	Material code	Position	Diameter	Quantity
13		1018005012	Under the Side dash outer plate	21.5	18
14		1018005013	B-pillar <sub>ij</sub>	15	2
15		1018005014	C-pillar	40	6
16		1018005015	Doorsill	30	6
17		1018005016	Top cover	60	4

# Part VII Body

## Chapter 1 Survey

### Section 1 Body Structure

The body is made up of main structure, movable plate work, interior/exterior trim parts, and body accessories.

#### I. Main Structure

As shown in Fig.5-1, the main structure is made up of various assemblies and parts including engine compartment assembly & front wall parts, floor assembly, left/right wall assembly, rear wall assembly, roof assembly and luggage compartment main cover assembly etc.

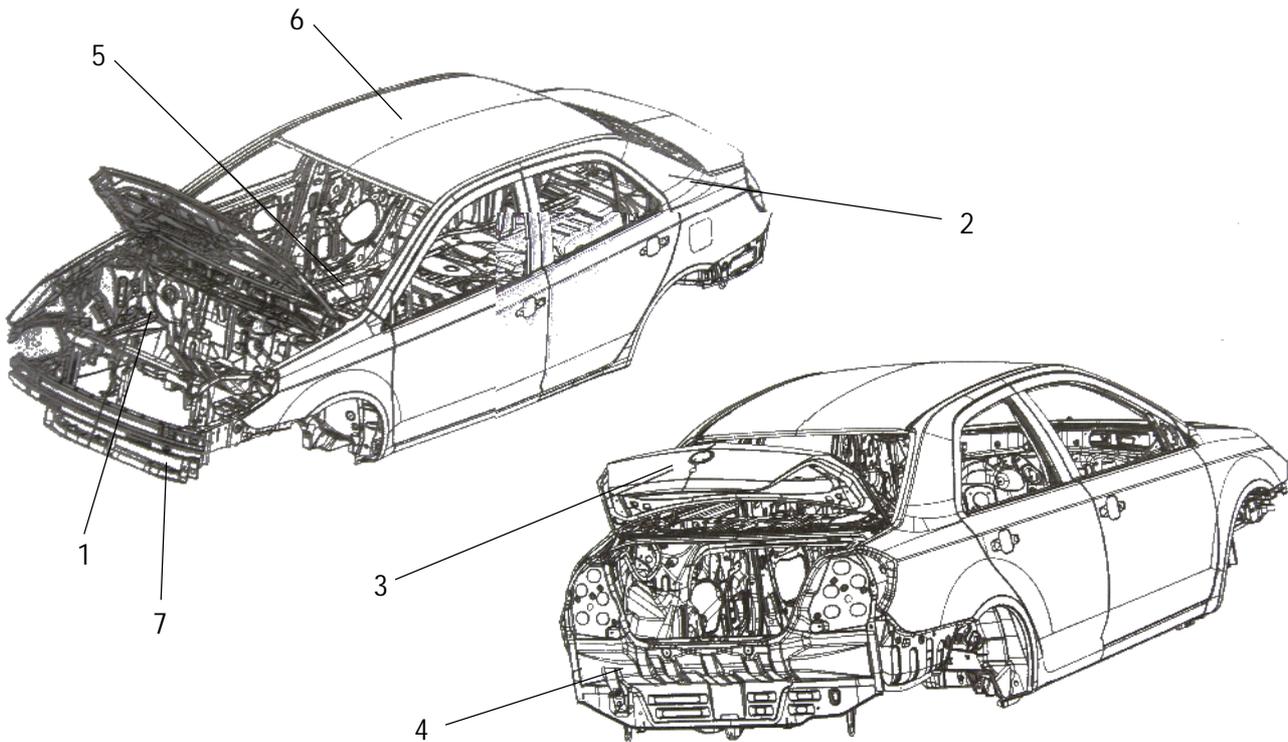


Fig. 5-1 Main Structure

- 1 Engine compartment assembly & front wall parts    2. Left/right wall assembly  
 3. Luggage compartment main cover assembly    4. Rear wall assembly    5. Floor assembly  
 6. Roof assembly    7. Front cross beam assembly

#### (1) Engine Compartment Assembly & Front Wall Parts

The main function of the engine compartment assembly and front wall parts is to form an engine compartment and absorb most energy generated when the vehicle is collided from the front. The compartment provides a hood for the engine and its accessories, which can prevent the front wheel from throwing mud. In the appearance, it represents the body's design requirements. As shown in Fig.5-2, the engine compartment assembly and front wall parts include front cross beam assembly, left/right longitudinal beam assembly, radiator cross beam assembly,

front wall lower plate assembly, front wall upper assembly, left/right front damper support lower front plate assembly, and right front damper right-angle support assembly.

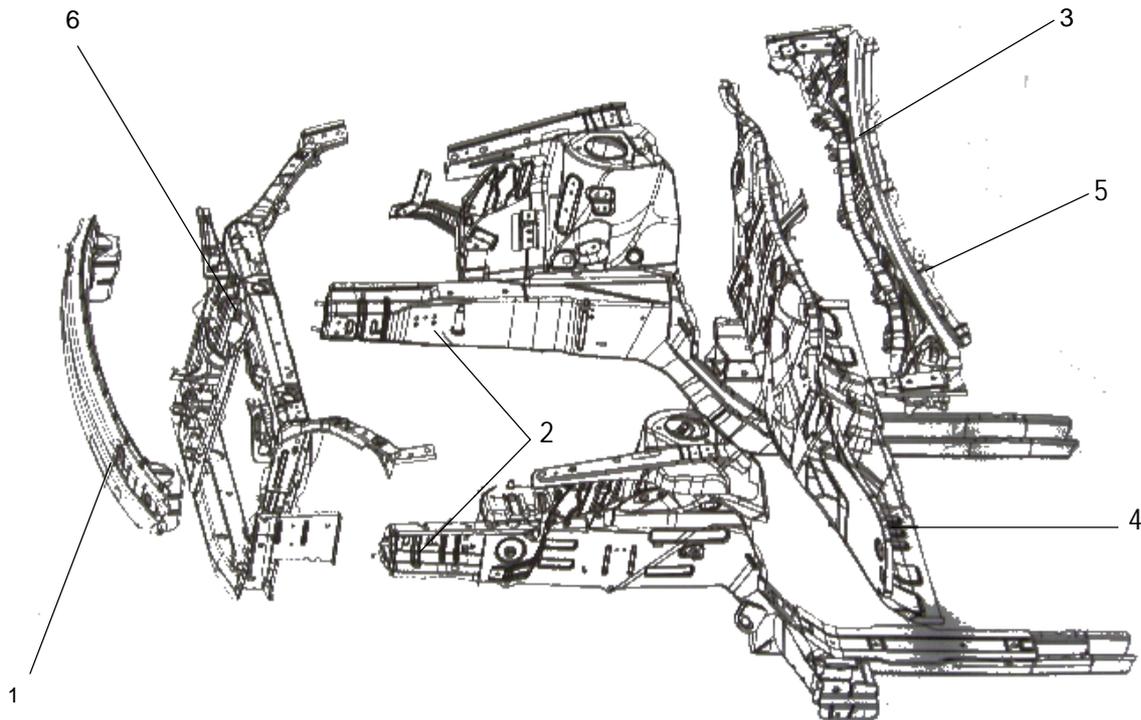


Fig. 5-2 Engine Compartment Assembly & Front Wall Parts

1. Front cross beam assembly 2. Left/right longitudinal beam assembly  
 3. Panel left/right support assembly 4. Front wall lower plate sub-assembly 5. Front wall upper assembly  
 6. Radiator cross beam assembly

#### 1. Front cross beam assembly

The front cross beam assembly includes front cross beam left/right support assembly, front cross beam sub-assembly, front cross beam side support etc. They play a role in front bumper.

#### 2. Left/right longitudinal beam assembly

The left/right longitudinal beam assembly includes left/right longitudinal beam front and mid-block assembly, energy-absorbing beam big assembly, and left/right front damper support assembly etc.

It is mainly used to install engine left/right suspension, left/right front suspension damper, storage battery and other accessories. In the outside, it can be equipped with left/right front fender.

#### 3. Radiator cross beam assembly

The radiator cross beam assembly includes radiator left/right post big assembly, radiator lower cross beam big assembly, radiator central support sub-assembly, and radiator upper cross beam big assembly etc.

It is mainly used to install radiator, condenser, engine hood lock, radiator hood, front bumper, and front headlight.

#### 4. Front wall lower plate assembly

The front wall lower plate connects to the floor, which separates the engine compartment from the cabin. It includes front wall frame assembly, front wall lower main plate assembly, brake installation reinforced plate, and front wall left/right support assembly etc.

It is mainly used to install the pipes and accessories of the brake system and clutch system.

#### 5. Front wall upper assembly

The front wall upper assembly includes left/right hinge base mounting plate big assembly, front wall upper front cover big assembly, VIN number mounting plate, and front wall upper rear cover big assembly etc.

It forms a high-stiffness frame structure together with the engine compartment assembly and the front wall lower plate assembly. It can generate strong resistant to the transverse collision and rolling deformation. It can also separate the engine compartment from the cabin, preventing the odor entering into the cabin. Consequently, it can isolate the noise, heat and vibration.

## (2) Floor Assembly

The floor assembly is the base work of the main structure. It is a key component that connects various assemblies and carries the load. The vehicle performance is subject to its strength and stiffness. For the floor assembly, see the Fig. 5-3.

The floor assembly includes front floor assembly and rear floor assembly. The front floor mid-block goes through a ridgy channel in longitudinal direction. It can increase the longitudinal rigidity together with the lower floor longitudinal beam. The space below under the channel is used to install various parts and components, such as transmission gearshift rod, parking brake cable, discharge pipe with three-way catalytic converter etc. In the cabin, there is carpet and muffle pad. The floor frame structure is made up of front floor left/right frame, front floor main plate assembly, front floor mid-bridge assembly, rear frame assembly, rear floor rear block assembly, rear floor mid-block assembly and longitudinal beam etc. These parts and components provide strong and reliable carry capacity and ensure that the vehicle meets the strict driving requirement on the body.

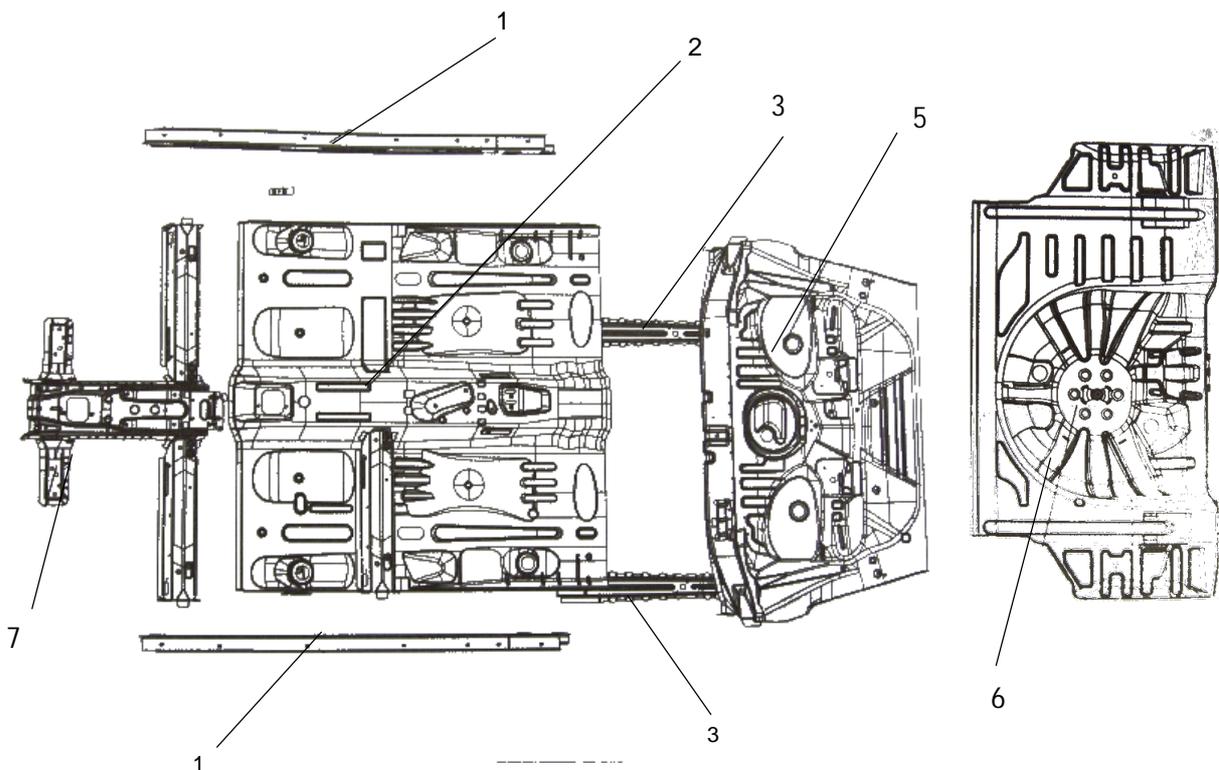


Fig. 5-3 Floor Assembly

1. Front floor left/right frame 2. Front floor main plate assembly 3. Longitudinal beam rear block 4. Rear frame assembly  
5. Rear floor rear block assembly 6. Rear floor mid-block assembly 7. Front floor mid-bridge assembly

### (3) Side Wall Assembly

The left/right side wall assembly is a frame structure, which is a side component that connects the front and rear parts of the body. As shown in Fig.5-4, it includes left/right side wall outside plate assembly, left/right wheel assembly, left/right A post inside plate assembly, and left/right intermediate post interior plate assembly etc.

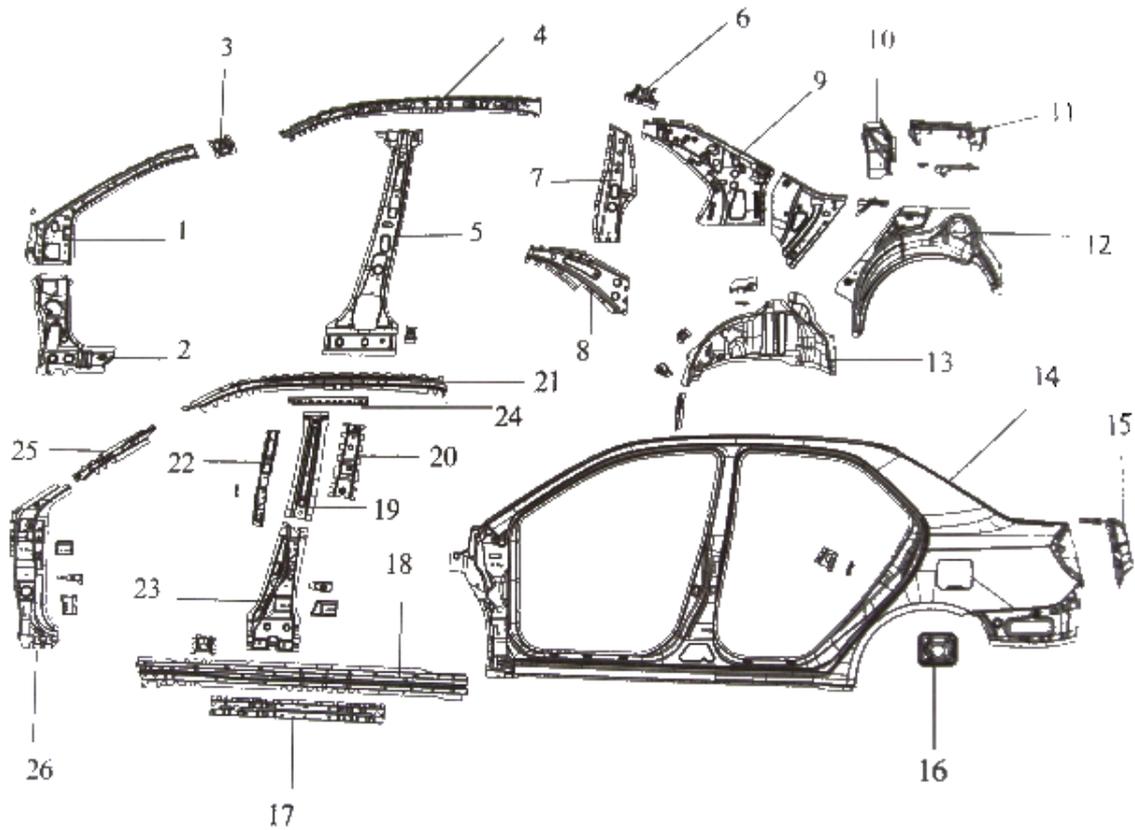


Fig. 5-4 Side Wall Assembly

- 1.LH/RH upper front body inner pillar 2.LH/RH lower front body inner pillar 3.LH/RH no.1 crossmember joint panel
- 4.LH/RH roof inner rail 5.LH/RH center body inner pillar 6.LH/RH rear crossmember tee joint panel
- 7.LH/RH lower rear pillar reinforcement panel 8.LH/RH roof rear inner panel 9.LH/RH side rear pillar inner panel
- 10.LH/RH luggage compartment support panel 11.LH/RH luggage compartment hinge fixing panel
- 12.LH/RH wheel house outer panel 13.LH/RH wheel house inner panel 14.LH/RH side panel
- 15.LH/RH rear combination lamp fixing panel 16.Fuel refilling cap assembly 17.LH/RH side doorsill outer reinforcement panel
- 18.LH/RH side doorsill inner reinforcement panel 19.LH/RH center pillar upper reinforcement panel
- 20.LH/RH front seat belt upper reinforcement panel 21.LH/RH roof rail upper master reinforcement panel
- 22.LH/RH center pillar middle reinforcement panel 23.LH/RH center pillar lower reinforcement panel
- 24.LH/RH roof rail assistant reinforcement panel 25.LH/RH front body pillar upper reinforcement panel
- 26.LH/RH front body pillar outer reinforcement panel

#### (4) Rear Wall Parts

As shown in Fig.5-5, the rear wall assembly includes rear wall plate, rear wall reinforced plate, luggage compartment door lock mounting plate and luggage compartment door cross beam etc.

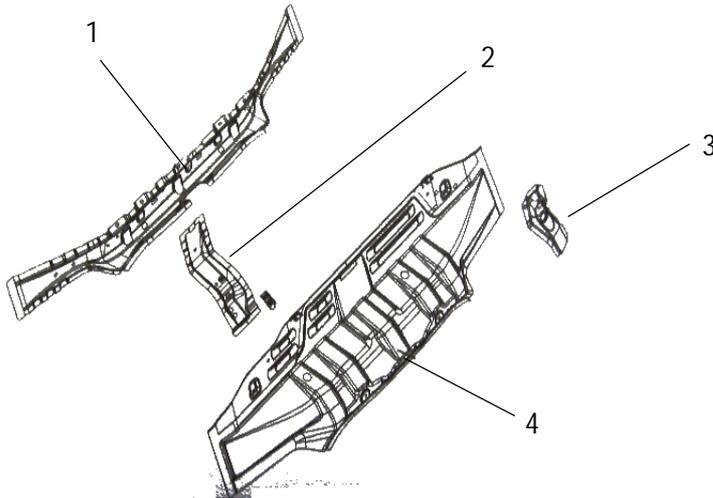


Fig. 5-5 Rear Wall Assembly

1. Rear wall upper cross beam
2. Luggage compartment lock mounting plate big assembly
3. Rear wall left double-hole plate
4. Rear wall outer plate

It is mainly used as a cross beam to improve the strength of the rear part of the vehicle and form a luggage compartment door.

#### 5) Roof Assembly

The roof assembly includes roof outer panel, roof No.1 and No.2 cross beam, and roof rear cross beam etc. Inside the roof, there is top interior decoration. There is a heat pad in the center and there is bond between the cross beam and the roof. The rain from the roof is discharged out of the rear part through the channels at both sides. These cross beams are used to reinforce the roof's transverse stiffness. For disassembled parts, see Fig. 5-6.

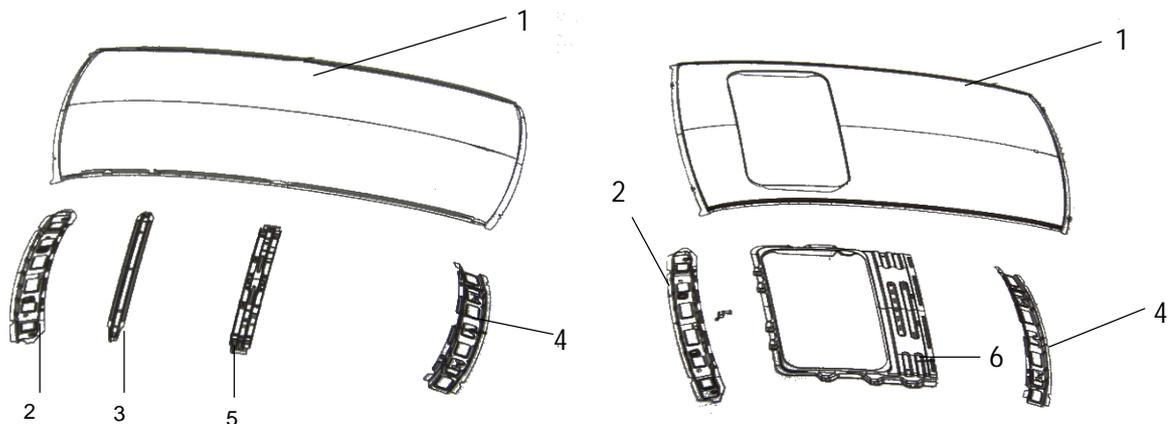


Fig. 5-6 Roof Assembly

1. Roof outer panel
2. Roof No.1 cross beam
3. Roof No.2 cross beam
4. Roof rear cross beam
5. Roof No.3 cross beam
6. Moon roof reinforcement panel

#### (6) Luggage Compartment Main Cover Assembly

The luggage compartment main cover assembly includes luggage compartment main cover sub-assembly, rear seat hook mounting plate assembly, left/right side angle plate, drip channel and reinforced upper cross beam etc.

When the luggage compartment main cover assembly is welded to the left/right side wall, it forms a luggage

compartment together with the rear floor and side walls. As shown in Fig. 5-7, a torsion resistant frame is also formed at the rear part at the same time.

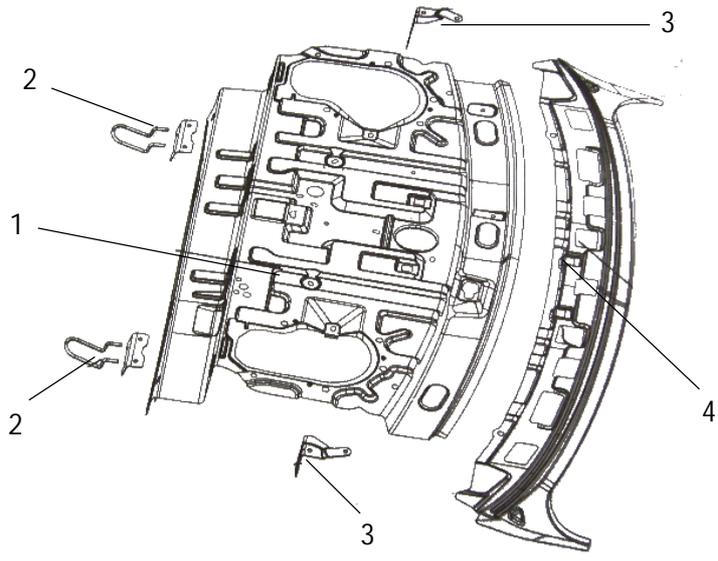
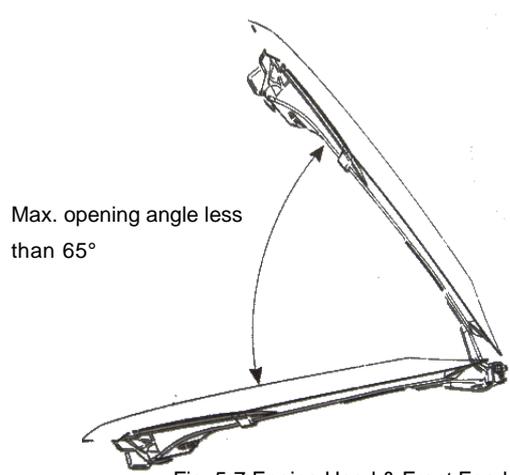
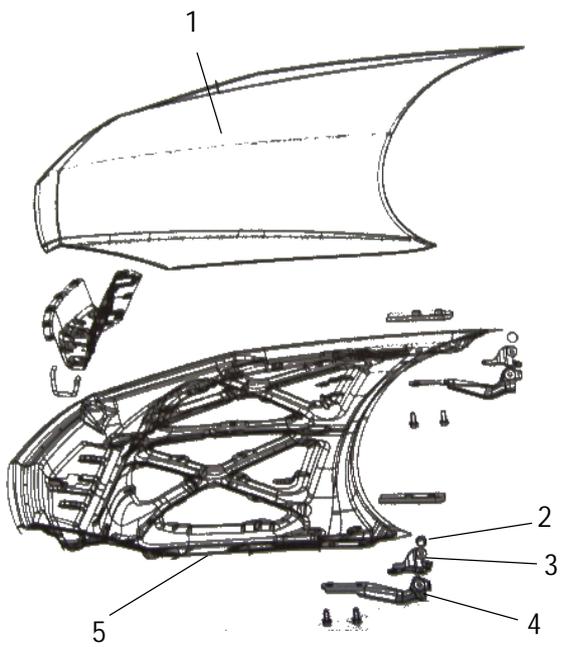


Fig. 5-7 Luggage Compartment Main Cover Assembly  
 1. Luggage compartment main cover  
 2. Rear seat hook mounting plate assembly  
 3. Left/right side angle plate  
 4. Drip channel

## II. Movable Plate Work

### (1) Engine Hood & Front Fender

The engine hood is used to protect the engine and fit the vehicle design. It is also helpful to the repair and maintenance, and isolates the engine's noise. The engine hood has a double-lock device. The unlocking function of the first locking is controlled by the cable handle under the instrument board. The unlocking function of the second locking can raise the hood to a certain height. The double-lock function is designed in consideration of safety. Especially when the vehicle is running at a high speed, it can prevent the engine hood from being raised, which may cause traffic accident. The maximum angle at which the engine hood opens is 65° (See Fig.5-8).



Max. opening angle less than 65°

Fig. 5-7 Engine Hood & Front Fender  
 1. Engine hood  
 2. Hinge pin  
 3. Hinge support  
 4. Hinge  
 5. Inner hood panel

### (2) Front Fender

Front fender plays a role in front wheel apron and protect person safety. And at the same time, it also works as vehicle styling parts.

For the match relationship between the front fender & engine hood and the front door, see Fig. 5-9.

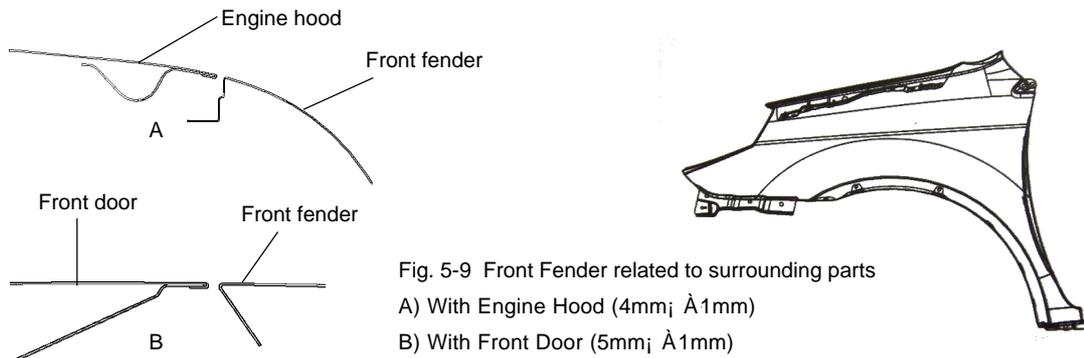


Fig. 5-9 Front Fender related to surrounding parts  
 A) With Engine Hood (4mm<sub>i</sub> ∆1mm)  
 B) With Front Door (5mm<sub>i</sub> ∆1mm)

### (3) Door Assembly

Doors have LH/RH front door and rear door.

The door uses hinge gemel with limiting device, which is an open structure.

The door includes door outside plate, door inside plate, bumper and hinge reinforced plate etc.

The door has a complex structure, which is a movable component on the body. It helps the passengers get on/off the vehicle and form an enclosed cabin with the main structure and the relevant parts. Meanwhile, the doors are used frequently, so there is high requirement on their reliability and durability.

The outside/inside plate is molded by one complete steel sheet, which can improve the stiffness and precision. In order to improve the safety when the vehicle is collided from the side, four doors are equipped with door bumpers.

As shown in Fig. 5-10 and Fig. 5-11, the door assembly is made up of outside plate assembly and inside plate assembly.

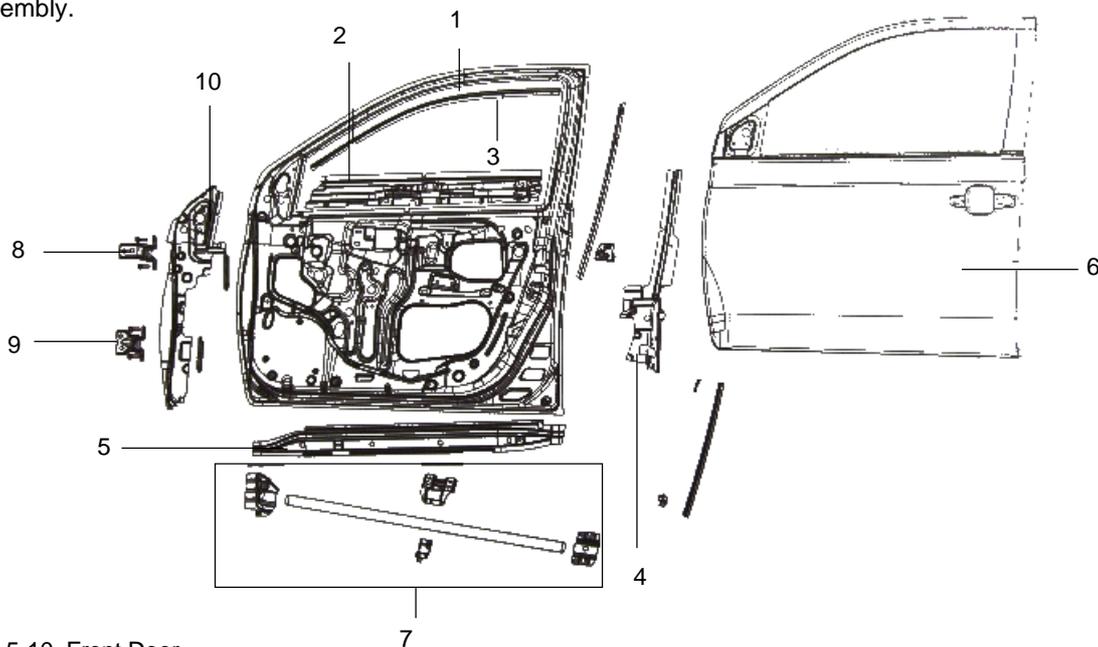


Fig. 5-10 Front Door

- 1. Front door inner panel
- 2. Left front door inner reinforced panel
- 3. Front door window upper rail
- 4. Door lock reinforced plate
- 5. Left front door inner plate cross beam
- 6. Front door outer panel
- 7. Door bumper assembly
- 8. Front door upper hinge assembly
- 9. Front door lower hinge assembly
- 10. Hinge reinforced panel assembly

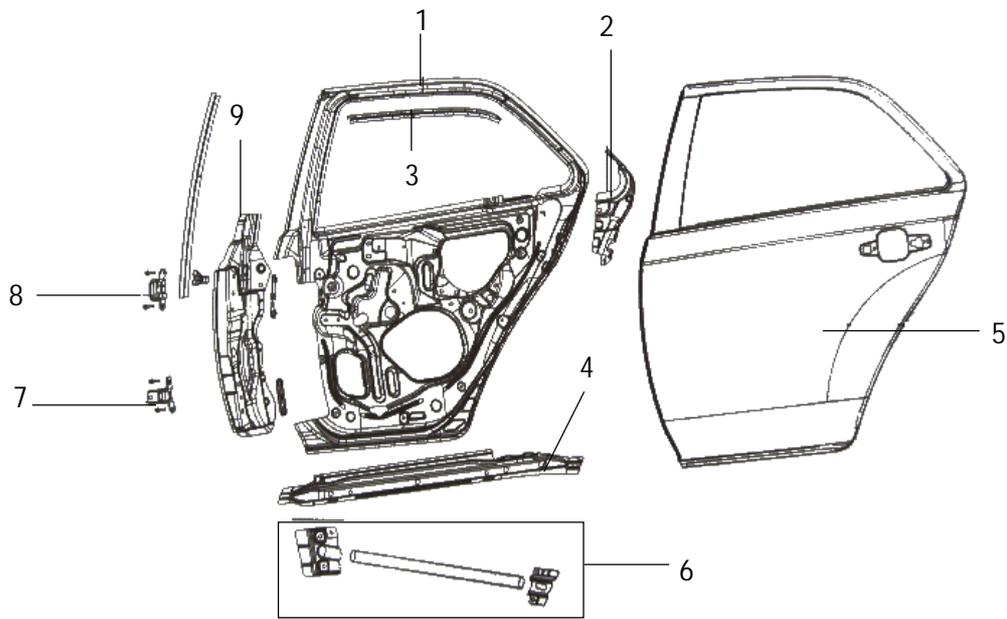


Fig. 5-11 Rear Door

1. Rear door inner panel
2. Rear door inner lock mounting panel
3. Rear door glass rail
4. Rear inner plate cross beam
5. Rear door outer panel
6. Door bumper assembly
7. Rear door lower hinge assembly
8. Rear door upper hinge assembly
9. Rear door inner plate hinge reinforced panel

### (3) Luggage Compartment Cover Assembly

As shown in Fig. 5-12, the luggage compartment cover assembly includes luggage compartment cover outside plate, luggage compartment cover inside plate, luggage compartment cover hinge mounting plate, and luggage compartment cover lock core mounting plate etc.

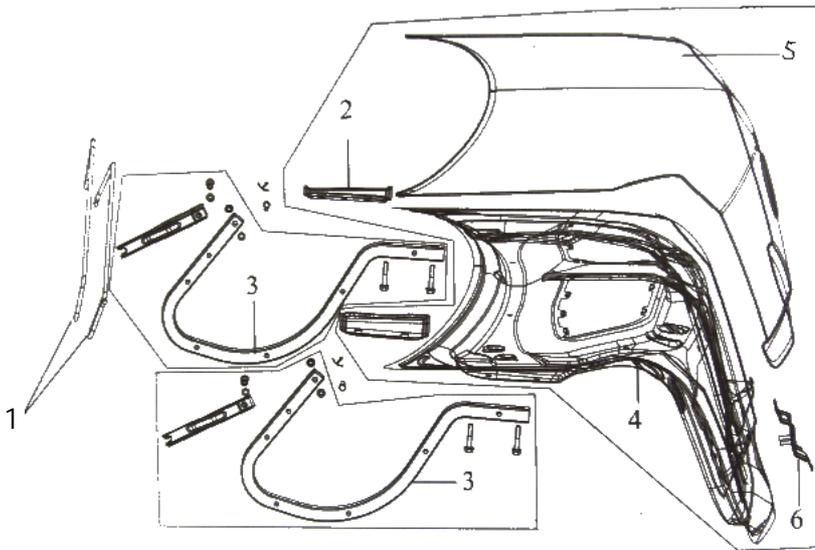


Fig. 5-12 Luggage Compartment Cover

1. Hinge torsion spring
2. Hinge mounting panel
3. Luggage compartment cover hinge
4. Luggage compartment cover inside panel
5. Luggage compartment cover outside panel
6. Luggage compartment cover lock core mounting panel

## Chapter 2 Body Repair

### Section 1 Body Damage Forms and requirements For Repair

#### I. Damage Type

The damage type includes deformation, crack, rust-through, water leakage, dust leakage and the like caused by collision, overload, fatigue, and corrosion.

The body damage is not merely caused by the huge force. As some parts (such as door etc.) are damaged, the vehicle stays in an abnormal status, which also can cause damage. In most cases, the bend and torsion is caused by huge local load in the impact or turnover accident.

Typical Body Damage:

##### 1. Front Center Collision (Fig. 5-13)

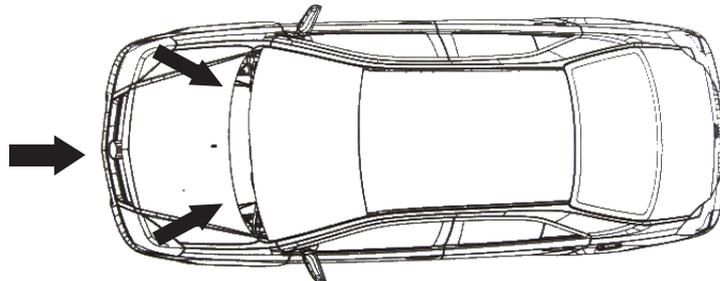


Fig. 5-13 Front Center Collision

For the damage caused by the collision on the front center, it usually makes the engine compartment front part and the engine hood left/right side extend inwards so the following positions shall be checked:

- a. Ambience of the left/right assembling position of the hood plate
- b. Ambience of the joints of the front cross beam and the left/right longitudinal beam

##### 2. Front External Force or Left External Force (Fig. 5-14)

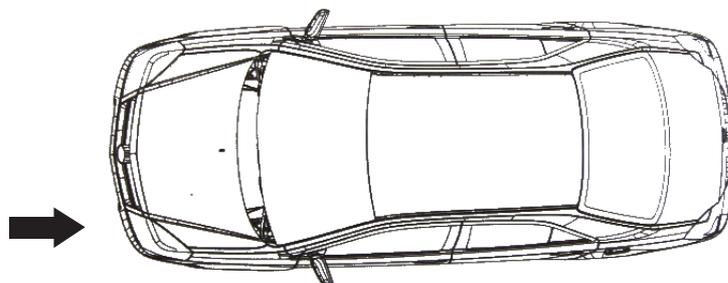


Fig. 5-14 Front External Force or Left External Force

As shown in Fig. 5-14, when the front is pressed or the left side end is acted by the external force, the external force will spread to around the front suspension mounting position from the left/right side of the hood, so deformation occurs easily in this position.

### 3. External Force Having an Angle with Vehicle Centerline (Fig. 5-15)

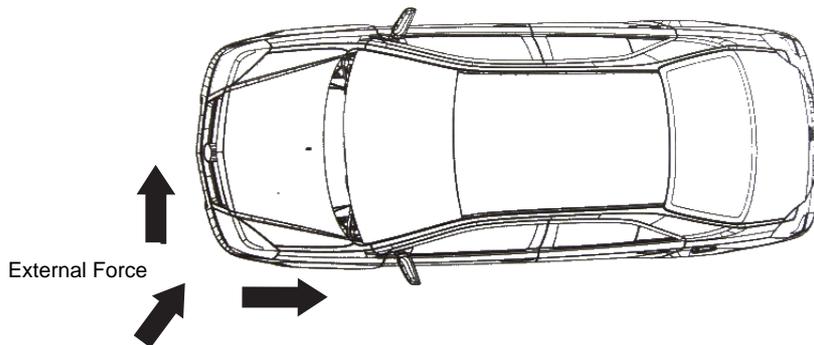


Fig. 5-15 External Force Having an Angle with Vehicle Centerline

As shown in Fig. 5-15, when the vehicle is acted by an external force having an angle with its centerline, the force will affect the hood root and the front window side post if it is strong enough.

### 4. Body Side Center Acted by External Force in Upright Direction (Fig. 5-16)

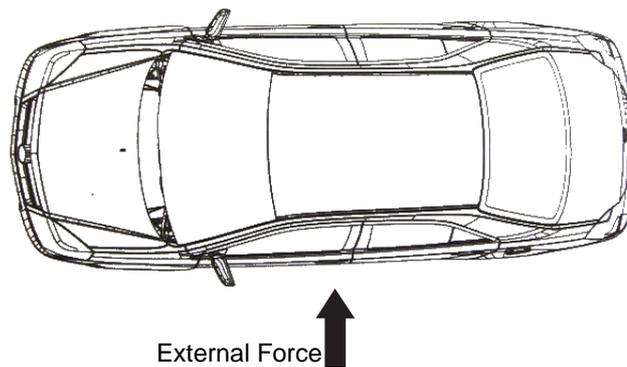


Fig. 5-16 Body Side Center Acted by External Force in Upright Direction

As shown in Fig. 5-16, when the body side center is acted by an external force in the upright direction, check the following positions:

- a. Front window side post upper/lower installation position;
- b. Side window intermediate post upper/lower installation position;
- c. Side window rear post deformation;
- d. Roof and frame deformation.

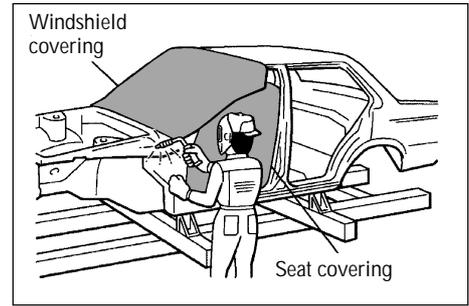
When the body is acted by an external force on the rear part, its damage is the same as that caused by an external force on the front part. Check the parts in full consideration of the rear structure and feature.

## II. General Repair Principle

### 1. Precaution

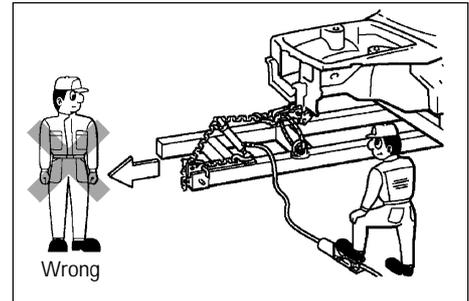
#### (a) Vehicle Protection

In the welding process, make sure to protect the paint, windshield, seat and carpet with heat-resistant and fireproof covering.



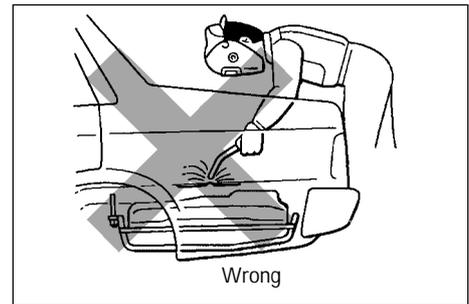
#### (b) Safety Measures

(1)When pulling the body or crossbeam with drawing device, do not stand at the position in the same line of the drawing cable, and make sure to use safe drawing cable.



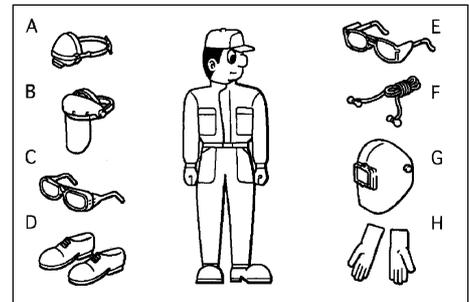
(2)Before repairing, make sure to check whether there is any leakage. In case of any hole, remove it immediately.

(3)When welding near to the oil tank, make sure to remove the oil tank first, and block the oil pipe.



#### (c) Protective Article

In the repairing process, make sure to wear uniforms, helmet and safety shoes. In addition, according to the different work types, wear proper gloves, welding mask, goggle, earplug, face cover, and dust respirator etc. Wear the protective devices properly as the table below.



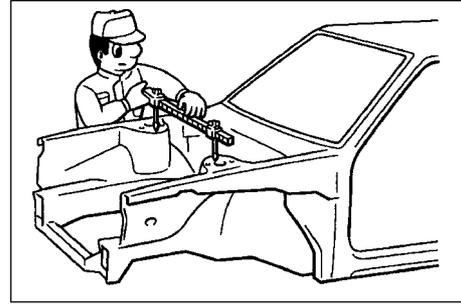
Code	Item
A	Dust Respirator
B	Mask
C	Goggles
D	Safety Shoes
E	Welded Goggle
F	Earplug
G	Welded Mask
H	Welded Gloves

### III. Correct & Efficient Repair

#### 1. Removal

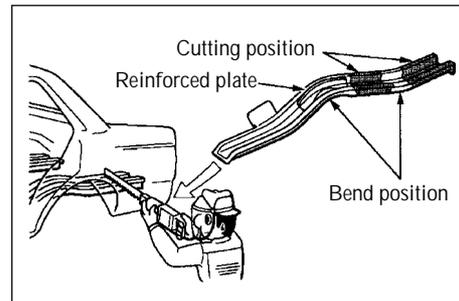
##### (a) Measure dimension before removal

Before removal and cutting operation, make measurement as the body dimension drawings. Make sure to pull the damaged body or crossbeam with drawing device.



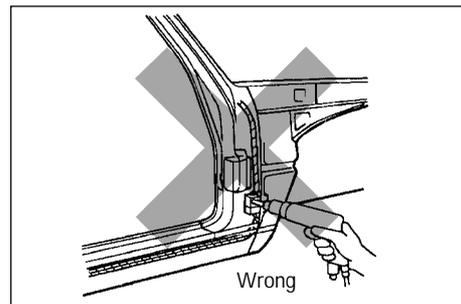
##### (b) Cutting part

When working on the cutting part, make the cutting in a straight position without reinforced plate.



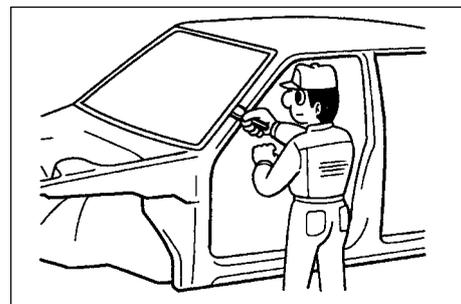
##### (c) Boring/cutting precaution

In the boring or cutting operation, make sure whether there is any oil pipe or cables etc on its back side, otherwise they may be damaged.



##### (d) Removal of ambient components

When removing the ambient components, make sure to adhere protective tape on the body and disassembly tool to prevent the body or ambient components being damaged.

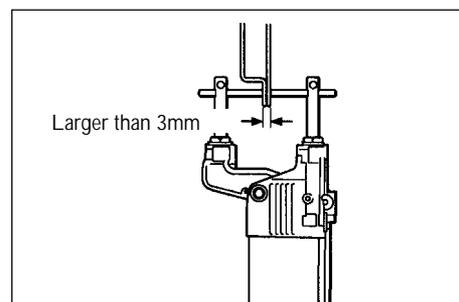


#### 2. Installation Preparation

##### (a) Precaution

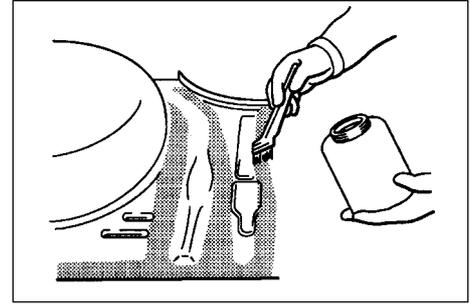
When the steel plate to be welded exceeds 3mm thick, make hole-filling welding with MIG welder.

Tips: If the total thickness exceeds 3mm, the spot can not provide adequate welding strength.



(b) Apply special paint for spot welding

Remove the paint film from the new parts to be welded and the body, and apply the special paint for spot welding.

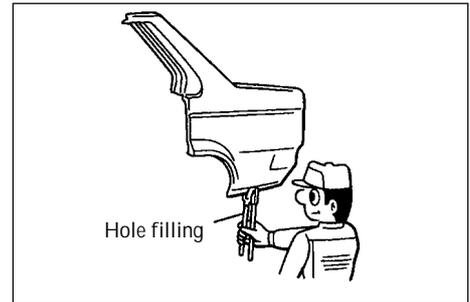


(c) Bore for hole-filling welding

In the position that can not carry out the spot welding, bore it with borer or bit to make hole-filling welding.

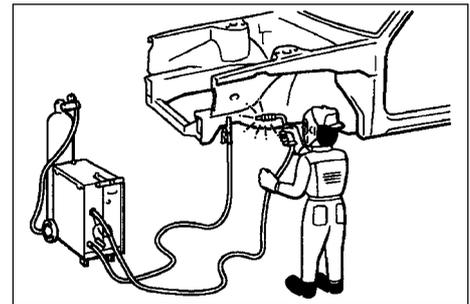
Unit: mm

Plate Thickness	Hole Diameter
<1.0	>5
1.0~1.5	>6.4
>1.5	>8



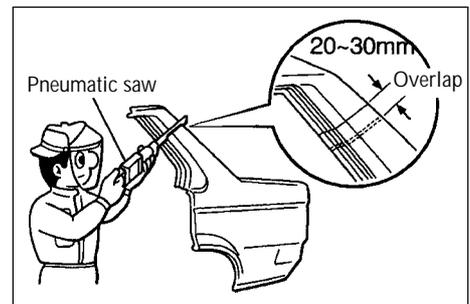
(d) Precaution for electronic parts

- (1) In the welding process, the electronic parts may be damaged due to the current in the body.
- (2) Before the welding, cut the cathode connection of the storage battery, and put the ground end of the welder on the ambience of the welding area.



(e) Rough cutting of joint parts

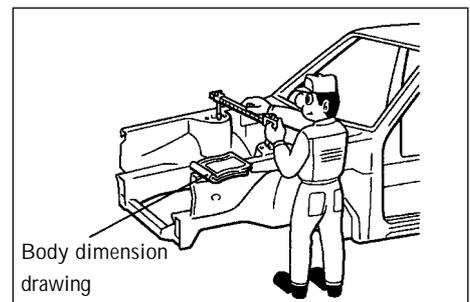
In the rough cutting process in the connecting area, an overlap of 20~30mm must be reserved on the new parts.



3. Installation

(a) Measure before Welding

Before installing the lower body or the parts of the engine compartment, make sure to make measurement as the body dimension drawing, to ensure the correctness. After the installation, reconfirm whether the assembling is proper.



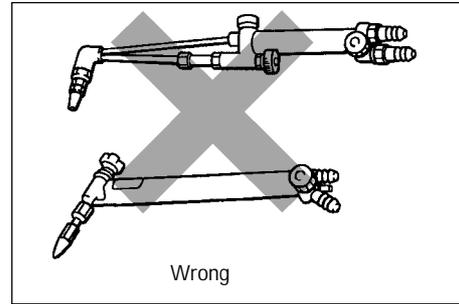
## (b) Precaution

- (1) For the number of spot welding, it depends on the following principles.

Spot welding: 1.3 times of the number specified by the manufacturer

Hole-filling welding: more than the number specified by the manufacturer

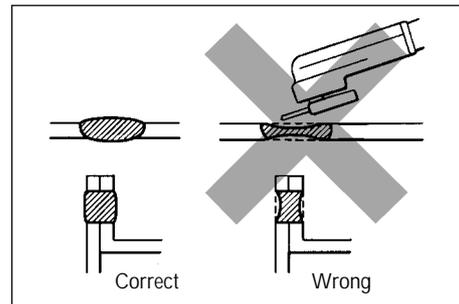
- (2) When carrying out the hole-filling welding, MIG welder shall be used. It is not allowed to use the oxyacetylene welding or braze welding outside the specified area.



Wrong

## (c) Abrasion after welding

- (1) After the welding, make sure to check the welding position whether it is welded firmly.
- (2) When abrading the welding position with disc abrader, never abrade it too much, which may weaken the strength of the welding position.

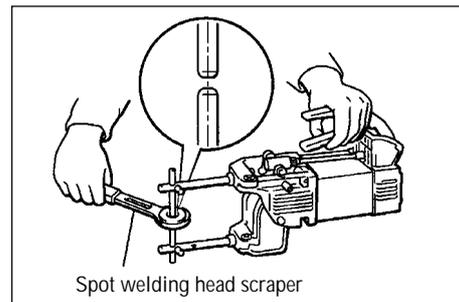


Correct

Wrong

## (d) Precaution of spot welding

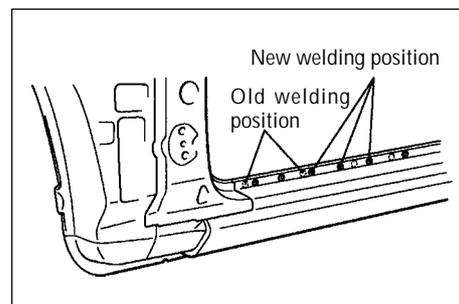
- (1) The shape of the spot welder head may affect the strength of the welding.
- (2) Make sure to remove the paint film on the surface of the spot welding and the contact surface of the welder head.



Spot welding head scraper

## (e) Position of spot welding

In the spot welding process, overlap with the old welding position shall be avoided.



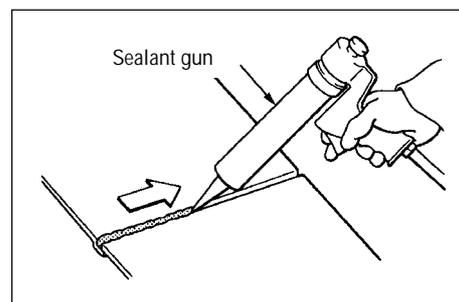
New welding position

Old welding position

## 4. Anti-rust Processing

## (a) Apply sealant

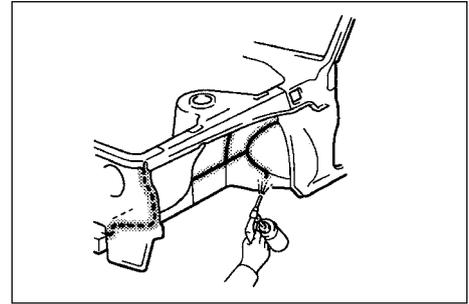
In the waterproof and antirust part operation, make sure to apply the sealant on the joint of the steel plates, door, and engine hood corner.



Sealant gun

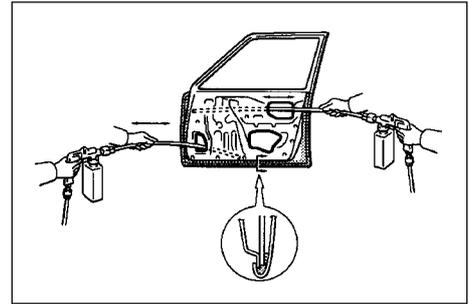
## (b) Apply primer

In order to prevent rust and protect the body steel plate from being damaged by the bouncing stone, sufficient primer is applied onto the body base and inner wheel cup.



## (c) Apply antirust (wax)

In order to prevent the painting part from rusting, sufficient antirust is applied on the engine cover, door inner corner, hinge ambience, or in the inside welding part of the box section structures such as side beam, body post.

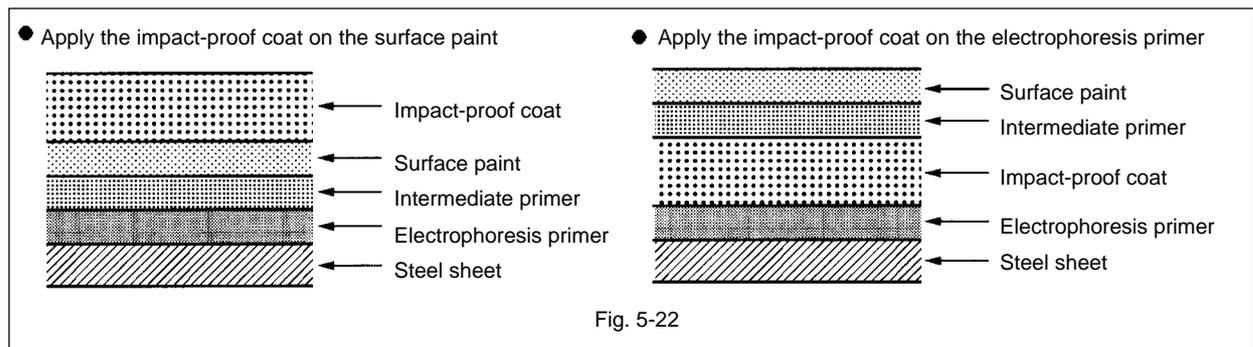


## 5. Base Anti-rust Processing

## Impact-proof Coat

In order to avoid corrosion and protect the body from being damaged by bouncing stone on the road, a layer of impact-proof coat is applied on the door threshold plate, arc area and balancing plate etc.

Tips: There are two types of painting: impact-resistant coat on the electrophoresis primer or on the surface paint according to different types and painting positions. (See Fig.5-22)



## IV. Repair Requirement

1. As the body is an integral structure and the steel plates used are not thick, special attention shall be paid to reinforce the parts acted in the reshaping process in the plate work processing. For the parts that burden the stress intensively, measures shall be taken to lower the local stress.

2. After the plate work processing, note to apply the antirust primer on the inside and outside surfaces to avoid corrosion.

3. In the body repair process, repair the old parts; or remove the parts with serious defects and order new parts from the manufacturer.

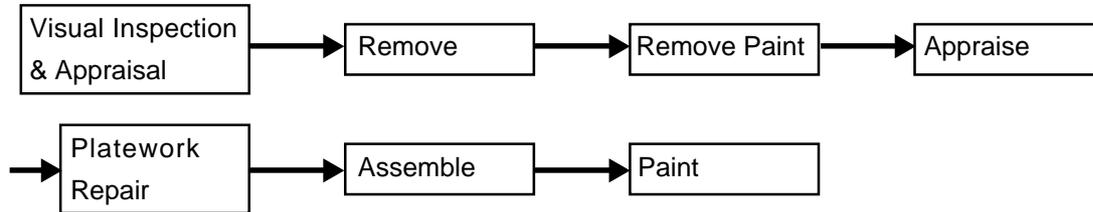
4. When making body reshaping or parts welding, make sure that all main control points of the body are within the specified scope in the design.

5. The strength and serviceability of the repaired body shall not be lower than those of the new vehicle.

6. The outside decoration of the repaired body shall meet the requirements by the new vehicle body and the drivers in various aspects, such as modern aesthetics and ergonomics etc.

## Section 2 Typical Technique of Body Panel Repair

Repair Process Flow:



## Section 3 Repair After Body Damage

The body damage repair includes rectification, reshaping, reinforcing, local change, and complete replacement. Generally, CO2 welding method is used.

### I Reshaping Repair

#### 1. Rectification

In general, the deformation of body is caused by accident. It can be rectified in a supporting method. In the rectification process, apply the force in the direction against the force of accident or deformation. In most cases, cold rectification can be used. Local heating can reduce internal stress, and the corresponding processing shall be carried out.

For the limousine, it is preferred to rectify it with the dressing machine. All dimensions and tolerances of all parts shall be returned to the original standard, so the mobility, serviceability and comfortableness can be guaranteed. (Fig.5-23)

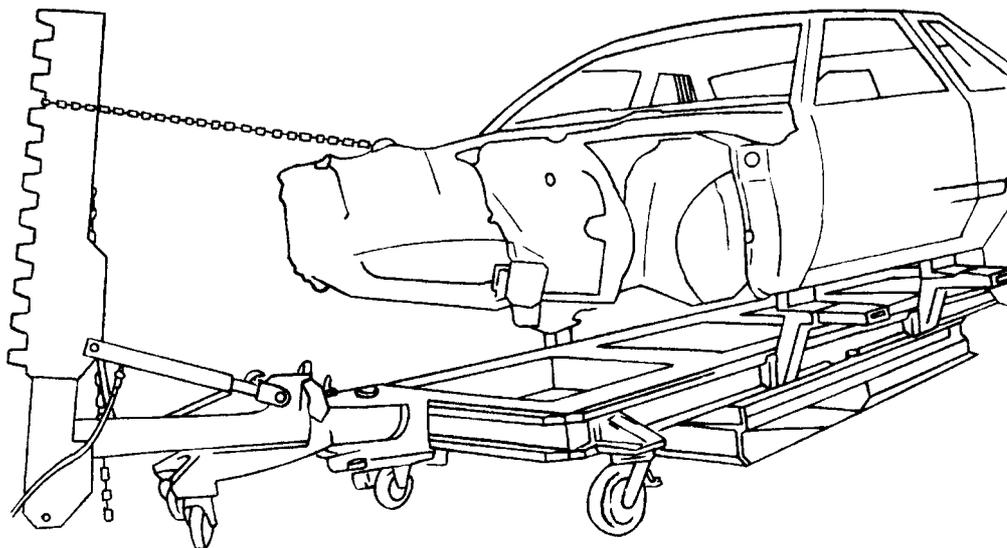


Fig. 5-23 Mounting Bench of Universal Dressing Machine

The body repair starts from the primary rectification or rough rectification. The deformation can be removed with the supporting method. The angle of the supporting force shall be close to the angle of the external force that caused the damage. Apply a counterforce at the back of the pulling force point to adjust the supporting force. Make measurement on the deformation generated in the supporting process. To remove the internal stress, heat the corresponding parts. For different rectification methods, see Fig. 5-24.

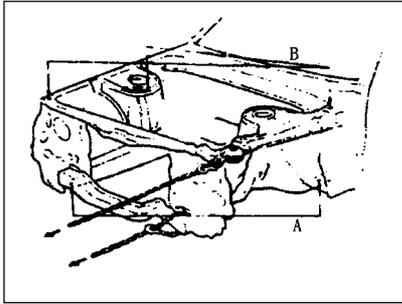


Fig. 5-24(a) Drawing Rectification

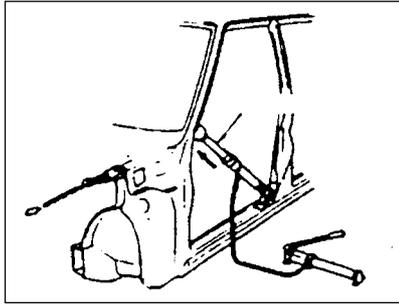


Fig. 5-24(b) Drawing & Supporting Rectification

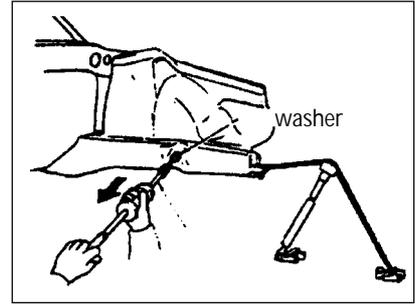


Fig. 5-24(c) Auxiliary Force-receiving Point Rectification

## 2. Reinforcement

When the local damage, rupture or crack occurs on various components, repair can be made by reinforcement. Especially for those parts on which damage occurs frequently, special reinforcement measures shall be taken. However, random reinforcement or component welding shall be avoided, which may affect the body's status. The reinforcement includes bushing reinforcement, patching reinforcement, arc inlay, and angle plate reinforcement.

## 3. Local Removal & New Parts Replacement

For the parts with serious corrosion, they must be removed. For the ruptured parts, they shall be replaced entirely. For the posts manufactured with thin plate by punch, they shall be ordered from the manufacturer. When the molding is made independently, all specifications (including material, section dimensions and thickness etc.) shall meet the original design requirement. For the ruptured post (including cross beam), if it is replaced entirely, it must be connected in the same manner as that of the original post.

# II. Repair for Body Outside Plate

## 1. Damage Type

### a. Crack & Rupture

In the running process, the body vibrates continuously and burdens the loads. When the vehicle makes accident acceleration, sharp swerve or emergency brake, the body will keep in an inertial status. When the vehicle runs on the uneven road, bend and distortion will happen on the body.

Affected by these external forces for a long time, crack and rupture may occur on the stress concentrated parts and weak structure on the body outside plate.

The stress mostly concentrates on the corner, hem and narrow part of the outside plate, so crack and rupture often occur on these parts.

### b. Corrosion

The corrosion on the outside plate is mostly caused by the mud and water on the metal surface. Only in special cases, it results from the chemical corrosion by chemicals. When the corrosion occurs, rust may appear on the outside plate and fall gradually, resulting in a hole. On the skirt outside plate and fender, corrosion usually occurs on the seams between door and frame and the interlayer between the outside plate and the frame.

### c. Cave-in

The cave-in is mainly caused by collision and extrusion. For the light cave-in damage, the metal doesn't extend, which is plastic deformation. If the collision or extrusion is serious, the metal plate will rupture. For the vehicles running in the city, it is common that collision damage occurs on the side wall.

d. Bend & Distortion

Bend and distortion belong to mechanical damage. Bend and distortion may have a variety of causes, such as collision or extrusion, alternating loads generated by the vibration, accident acceleration, emergency brake, sharp swerve and body torsion caused by poor road.

For the light distortion, it shall be confirmed by test. For the serious bend and distortion, it is obvious in the appearance. Generally, the distortion can be fixed according to the clearance of the frames and the change of their relative positions.

e. Unsoldering

The unsoldering is caused by the poor fusion between different metal plates.

## 2. Outside Plate Repair

a. Repair for Crack

(a) CO2 Welding

The crack on the metal outside plate can be repaired by CO2 welding. In the welding process, align the two metal plates, and weld the outside crack of the plate first. If the crack doesn't exceed 50mm, the welding shall start from the rear part of the crack and continue along the crack and edge. If the crack is a little longer, several points shall be welded first at a certain space. After welding several points, finish them and then weld the crack block by block. By so doing, it can prevent the metal overroasting and plate deformation caused by too high temperature. If the crack is located in the position that burden heavy force and it is convenient to carry out the welding operation, a double-welding method can be used. After the spot welding is made outside, carry out the welding inside. After the inside welding is completed, make the welding outside in the same manner.

After the welding, put a sizing block inside, and beat from the outside welding line with hammer to remove the retaining stress. Finally, finish the welding seam properly to make it even and smooth for painting.

(b) Solder Filling

For the fine concavo-convex plate with damage and crack on its surface, it can be repaired with a solder filling method. (Fig. 5-25)

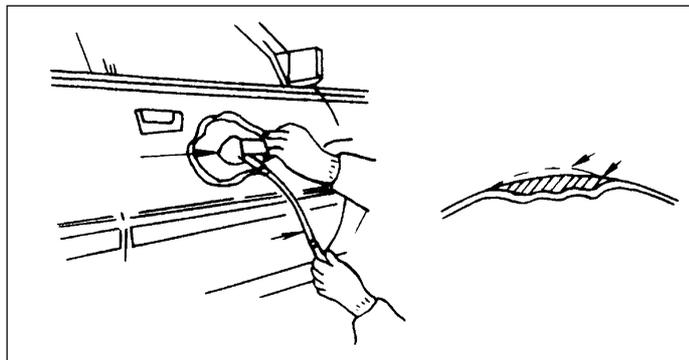


Fig. 5-25 Concave Body Filling Repair

b. Repair for Local Damage

For the local corrosion or serious mechanical damage on the outside plate, if it can't be repaired in common method, the patching or pasting repair method can be used.

Repair Method:

- (a). Fix the patching scope;
- (b). Cut the paper sample;
- (c). Cut the plate as per the sample;
- (d). Adhere the molded plate on the surface of the patching part;
- (e). Line out the profile along the plate edge with needlepoint, and cut off the damaged or corroded part;

(f). Flatten the edge with hammer or sizing block, and remove the burr with file to make sure that it is aligned with the both side alternative plates with a clearance not more than 1mm;

(g). Replace the plate, and clamp it with pincers. Carry out the spot welding along the seam at a space of approximately 50mm;

(h). Make the welding from the center to both sides alternately block by block. Which can reduce the deformation;

(i). Strike the welding line with the hammer or sizing block to remove the retaining stress. Polish the welding line with the file or manual grinding wheel to make it even and smooth for the painting.

### c. Repair for Accidented Damage

#### (a). Plate work flattening

When the accidented damage occurs on the plate work of the body, it can be repaired by means of beating. In the repair process, start from Point C as shown in Fig. 5-26. Put the sizing block on the convex point, and beat it with the hammer and change the block's position correspondingly. When the convex point is flattened, the concaved part in Point B will rise. Similar with the original profile of the plate, for the remaining dent, a sizing block with the same radian can be employed. Press the bottom of the plate with hand, and beat the high point of the dent with the hammer. (Fig. 5-27)

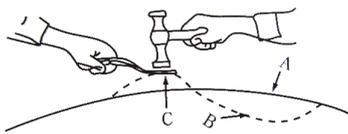


Fig. 5-26 Plate Work Flattening (I)

A. Impact point B. Concaved point after impact  
C. Convex point after impact

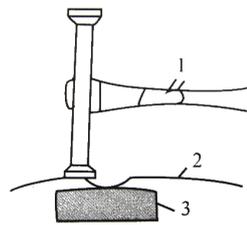


Fig. 5-27 Plate Work Flattening (II)

A. Hammer B. Plate work  
C. Sizing block

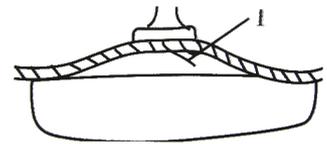


Fig. 5-28 Heating & Planishing

Convex Point  
1. Heating point

In the beating process, beat the work piece heavily at the beginning and lightly at the end. Attention shall be paid to reduce the number of beating as possible as it can. Don't beat the same points repeatedly to prevent the metal plate extending locally, which can complicate the repair work.

For the larger arc concave, a sizing block can be used under the center of the concave. The area of the sizing block shall be a little larger. Jack the concaved plate up with a supporting tool. Sometime, heat the concaved part to wine color to reduce the force. When jacking the plate up, a little excess is acceptable. (Fig. 5-28)

#### (b) Thermal contraction

When the concave is jacked up, if the plate extends seriously and the area is large, the thermal contraction method can be used in case that the traditional methods don't work. (Fig. 5-29)

Heat the work piece to cerise color with oxyacetylene flame. The heating scope depends on the degree of extension. If the extension is serious or the area is large, the heating point shall be larger relatively (diameter: approx.20-30mm). If the extension is not serious or the area is small, the heating point shall be a little smaller (diameter: approx.10-15mm). After the heating, beat the heating point immediately. In the beating process, a proper sizing block is used under the plate. After it is cooled down, beat it lightly with the hammer.

The contraction starts from the highest point to the center, and then to the edge. Heat and flatten the extended part repeatedly till the plate is flattened fully. If the convex part is too high, compress it to one half of the original height. After it is cooled down, heat it at the original heating point till the other half of convex part is removed.

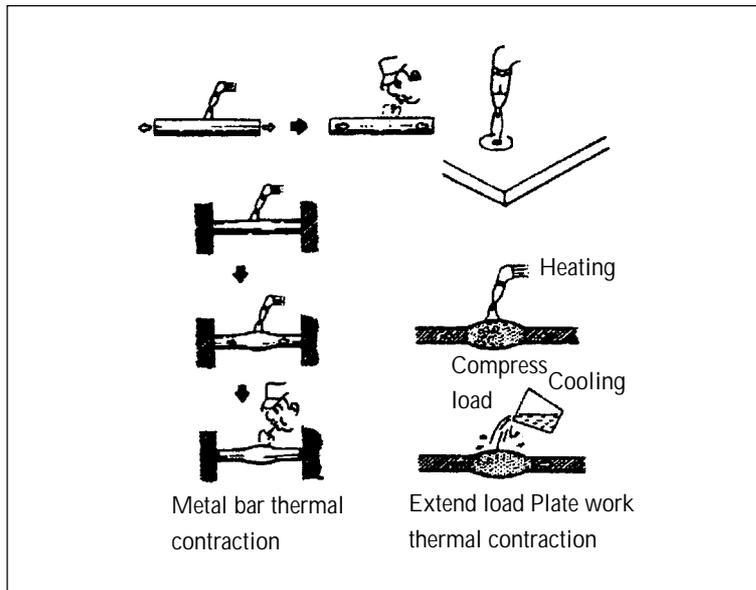


Fig. 5-29 Thermal Contraction Method

For those parts that are not sure whether they will contract or not, the thermal contraction method shall not be used to avoid any side effect. Especially for those thin plates, great attention shall be made to prevent them from melting down or burning through.

(c) Welding ring

The welding ring method is used to repair the most seriously damaged part of the concave on the plate work surface. Some rings are welded to connect the rods. (Shown as Fig. 11-30) When the area of the concave is large, several rings can be welded in a parallel manner, and gets through the rod to make the pulling force act on the plate surface evenly. The ring can be replaced by the washer. The rod pulls the washer or shaft through a coupling device. After the concaved plate is flattened by the inertia hammer puller, remove the ring or washer and finish the welding points.

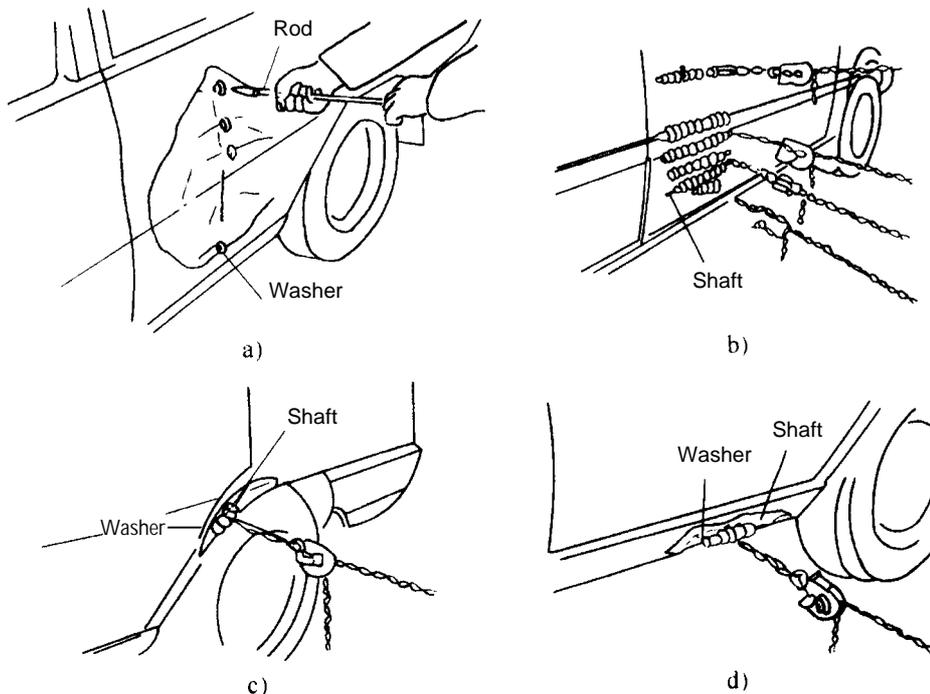


Fig. 5-30 Welding Washer Stretching

In addition, there are some other repair methods, such as beating repair (Fig. 5-31), plate reshaping repair (Fig. 5-32), damaged plate work cutting repair (Fig. 5-33) and welding point cutting repair (Fig. 5-34).

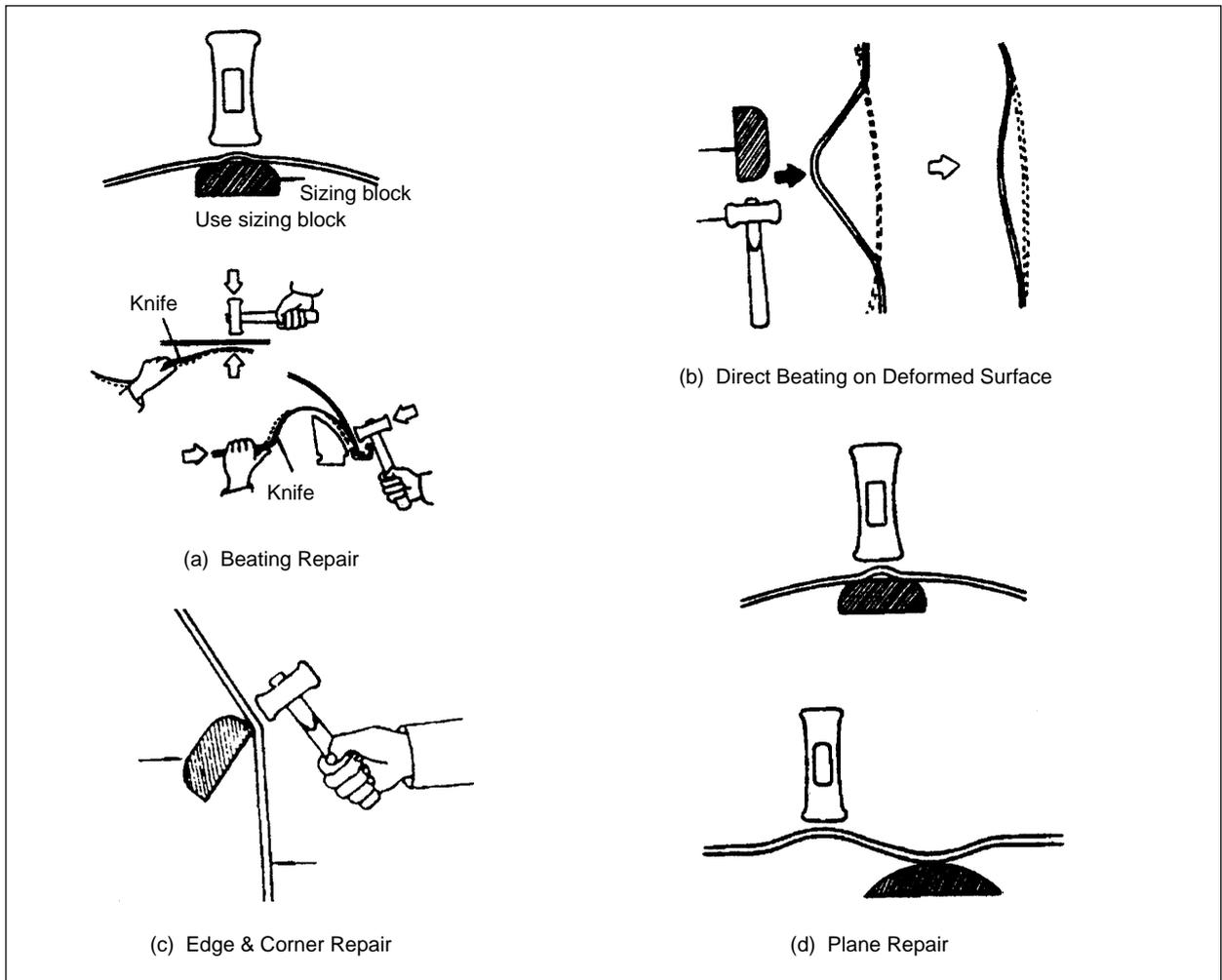


Fig. 5-31

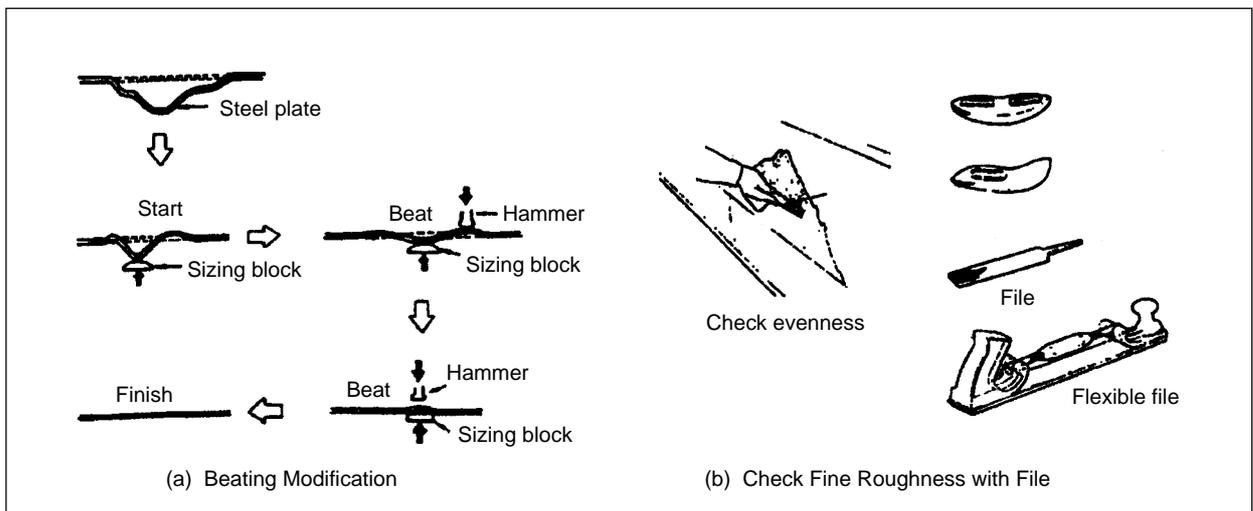


Fig. 5-32

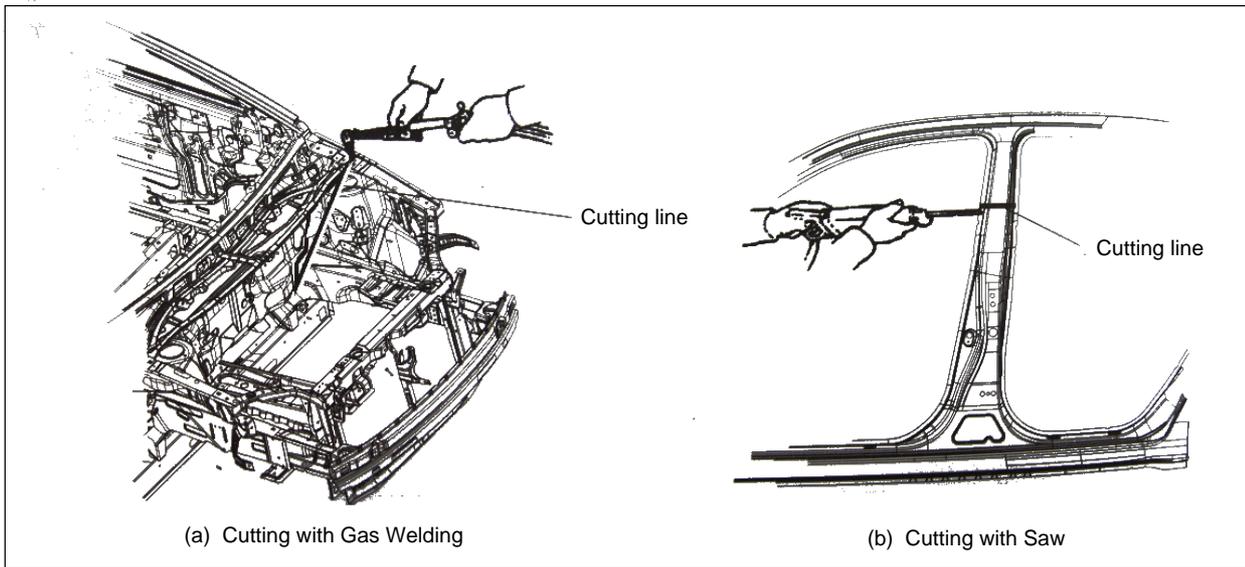


Fig. 5-33

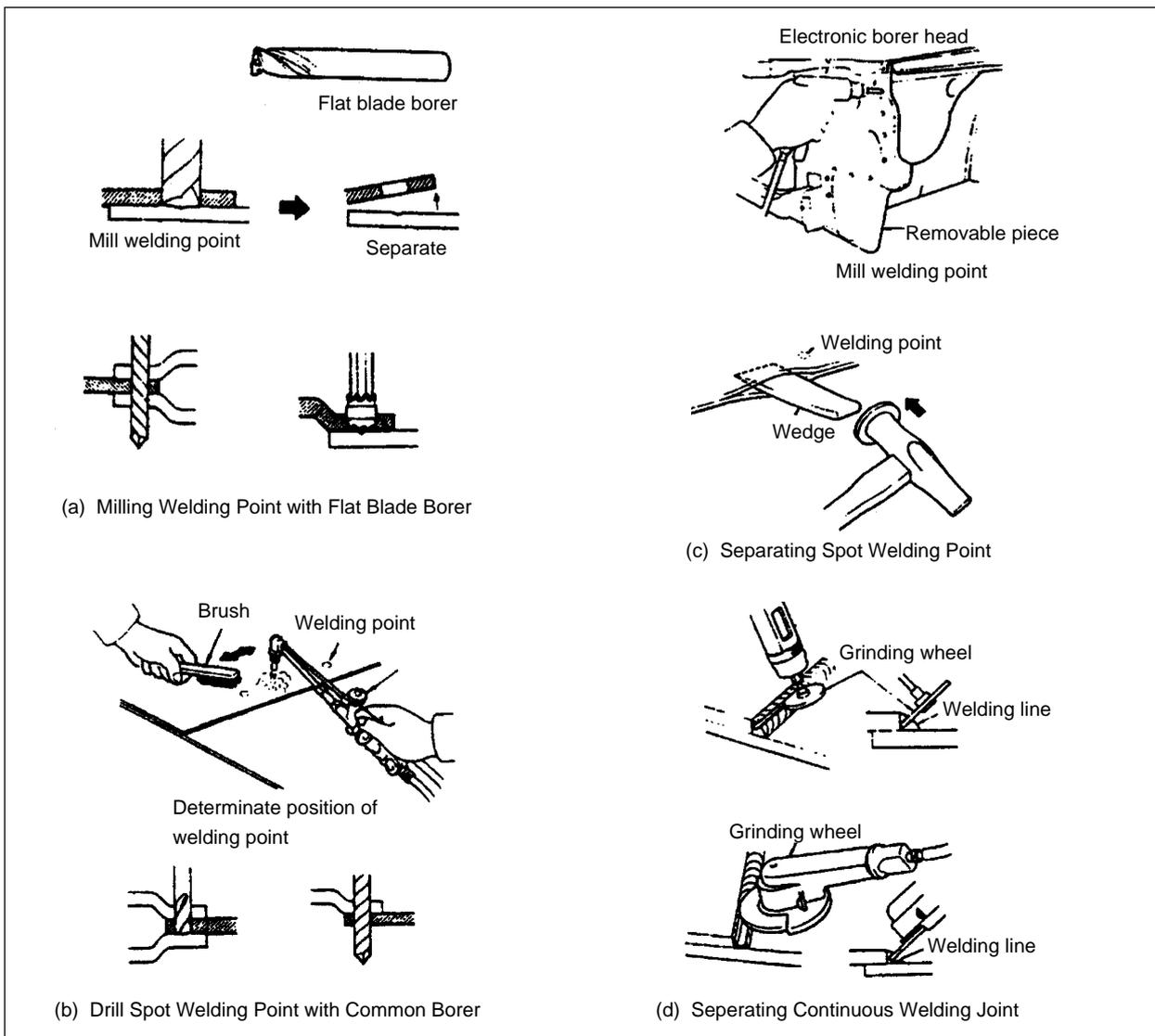


Fig. 5-34

If the collision is not serious and the concave belongs to elastic deformation, the plate can be returned to its original shape by pressing from the inside surface.

For some concaved parts, they can be repaired in a prizing method. The prizing method is a repair method that needs not to disassemble the parts. According to the degree of deformation, repair the plate by means of various clearances and the lever principle. As the prizing method doesn't disassemble the parts, it can keep the original installation quality and improve the work efficiency.

d. Repair for Unsoldering

The unsoldering is mostly caused by the poor fusion between the welding bar and the metal plate. For the common unsoldering, weld the metal plate again after remove the welding bar accumulated in the welding line. For the unsoldering of the spot weld, weld the metal plate near the unsoldered point with a single-side spot welder. The new welding point is about 10-15mm from the original point. Before the spot welding, remove the oil dirt and rust in the welding point to ensure the plates are jointed in a good status.

For the unsoldering in some hems, after the two plates are jointed, weld the plates spasmodically on the edges to make the plates joining together. The welding line at every block is about 30mm long. The line space depends on the original welding space.

Another repair method for the unsoldering is plug welding. This method needs CO2 welding. Bore a dia. 6mm hole on the outside plate, and then join the two plates. Weld the hole with the CO2 welding method. In the welding process, the welding bare shall point to the inner plate and move in a circular manner, which can make the two plates welded together. After the welding, finish and paint it.

## Section 4 Features and Composition of Automobile Body

### I. Body Feature

The body is an integral structure. Its main structure also is a frame, which can carry all loads. The vehicle is designed with three compartments and five doors. With the same overall length, the space is utilized fully, which is helpful to arrangement of passengers. (Fig. 5-35)

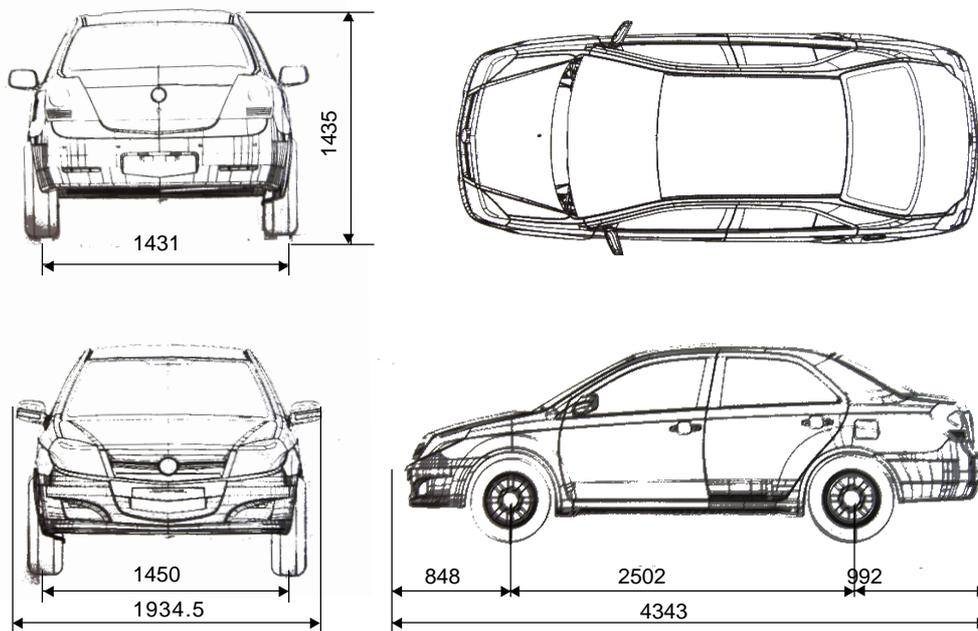


Fig. 5-35 Outline & Dimensions

#### 1. Material of Punch Piece

In order to improve the body's rigidity, high-strength steel plates are used at many key parts on the body. For the parts under forces, reinforced measures are carried out. (Fig. 5-36)

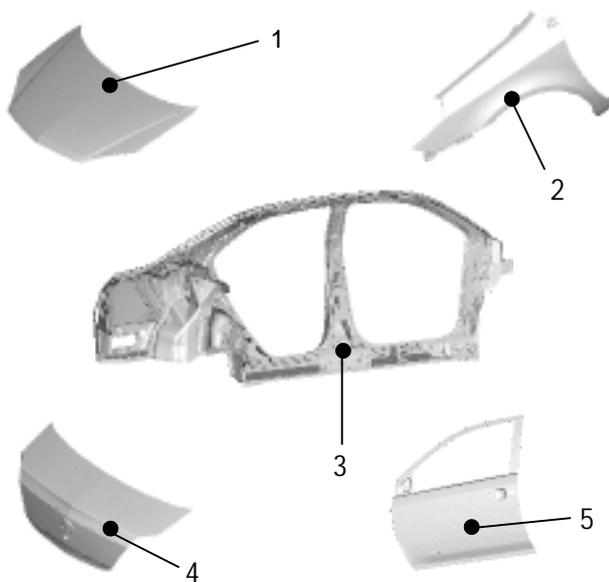


Fig. 5-36 High-strength Steel Panel

1. Engine compartment hood outside panel
2. Left/right fender
3. Left/right mid-door post inside panel
4. Luggage cover outside panel
5. Left/right door outside panel

2. Shock Absorption & Noise Isolation

(1) Body structure (Fig. 5-37)

- a. Arrange the reinforced bar reasonably to improve the parts' rigidity, reduce the shock and lower the noise.
- b. Apply the sealant in the floor seam to improve the floor sealing and reduce the noise in the cabin.

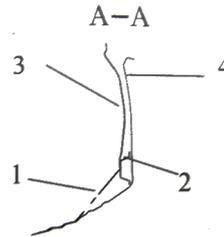
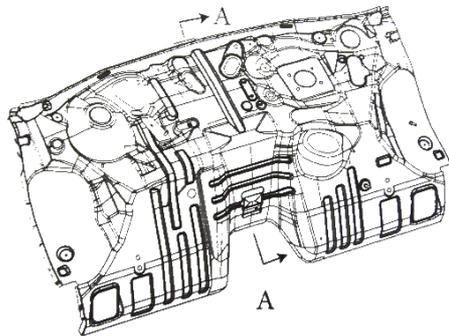


Fig. 5-37 Front Wall Panel  
 1. Front wall bridge reinforced panel  
 2. Front wall mid-frame panel  
 3. Front wall lower main panel  
 4. Heat-isolated pad

(2) Deadening

It is an interactive and systemic work to make the body isolate heat, shock and noise. Besides the measures carried out to improve the body's stiffness and sealing performance, the following measures shall be taken in the design and manufacture process.

- a. Sound isolation material: add sound isolation pad on the front wall and floor.
- b. Sound absorption material: add molded carpet on the front floor and rear floor.

3. Sealing

Special consideration has been given to the sealing of the body both in design process and in manufacture process. Sealing plays an important role in many aspects, such as dust resistance, water resistance, corrosion resistance, heat resistance, heat preservation, and noise reduce etc. Especially when the body floor and front wall stay in a tough external condition, the mud, dust, noises (from the tire and engine) and hot air will invade into the cabin any time.

After the body assembly is welded, sealant will be employed on all joints to prevent the water and steam penetrating into the metal seam and ensure the quality of subsequent painting.

In addition, a thick layer of impact-proof PVC coat is applied on the base of the body, which has excellent sealing performance. For the sealing to those assemblies, the traditional sealing method is used, such as rubber seal

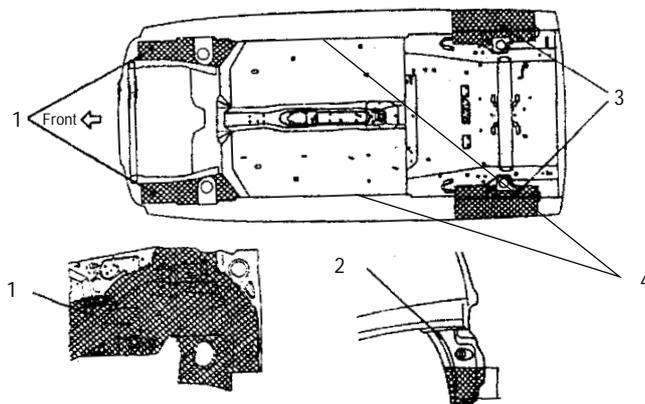


Fig. 5-38 (a) Body floor

1. Front mud guard 2. Rear side wall 3. Rear wheel housing 4. Floor sides

ring, cover, tape and dust shield etc. But these parts are more precise both in design process and in manufacture process. For those contact seal pieces, the two-way dimension relation is more reliable. For the front windshield and rear wall glass, a naturally hardened high-strength sealant is used, whose reliability and practicability reach the state-of-the-art level. (Fig.5-38)

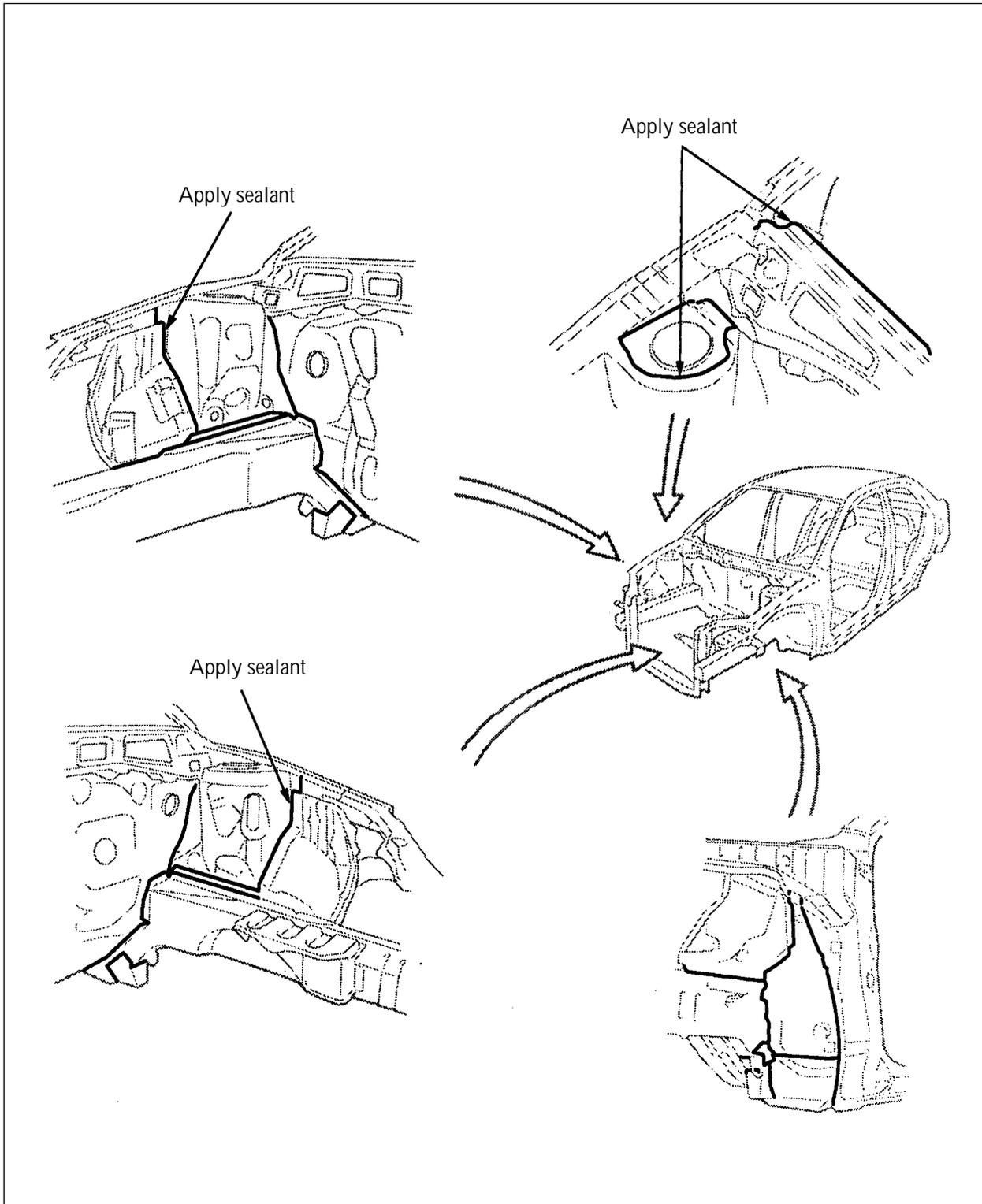


Fig. 5-38 (b) Engine Compartment

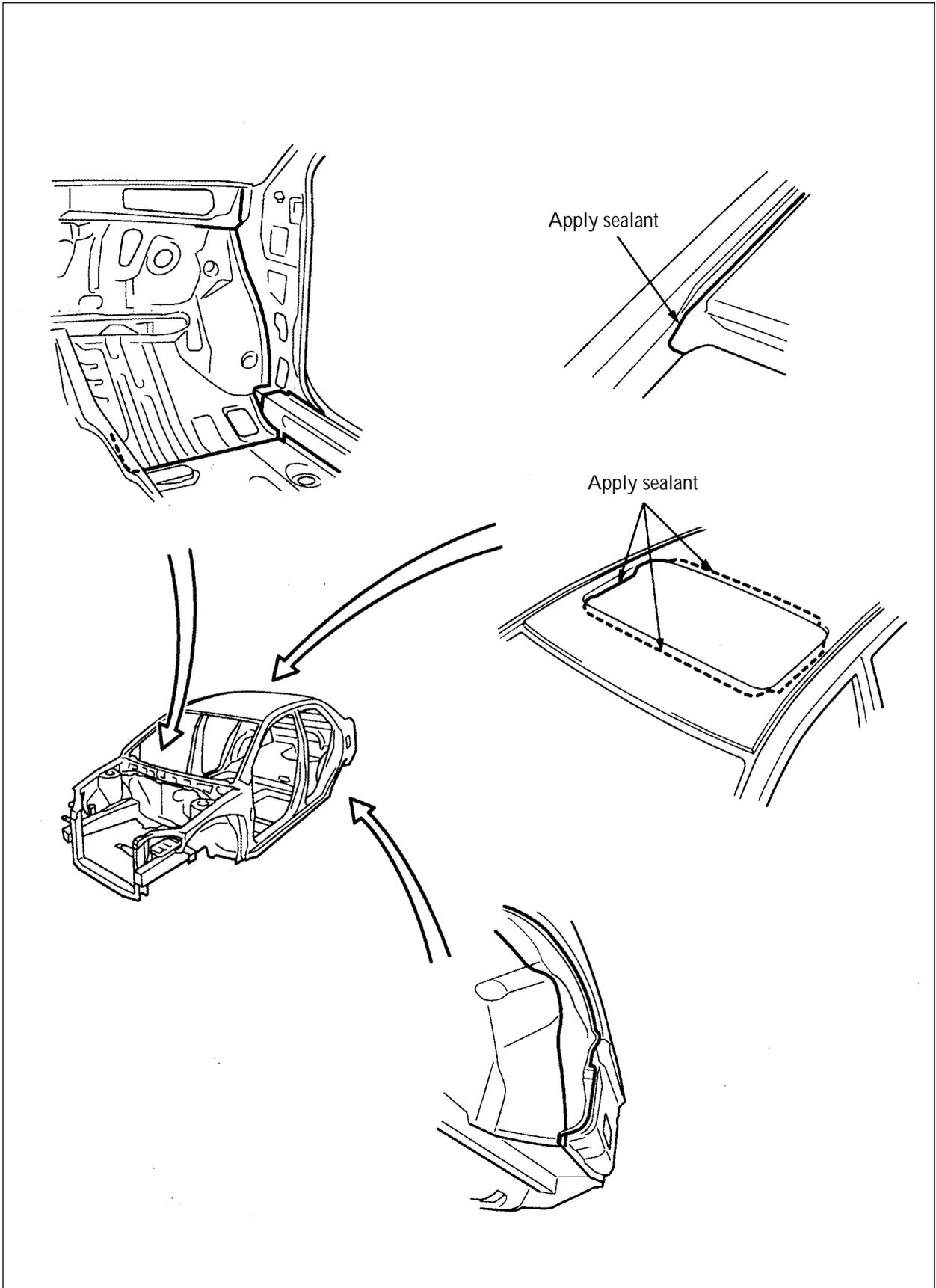


Fig. 5-38 (c) Body Inside (I)

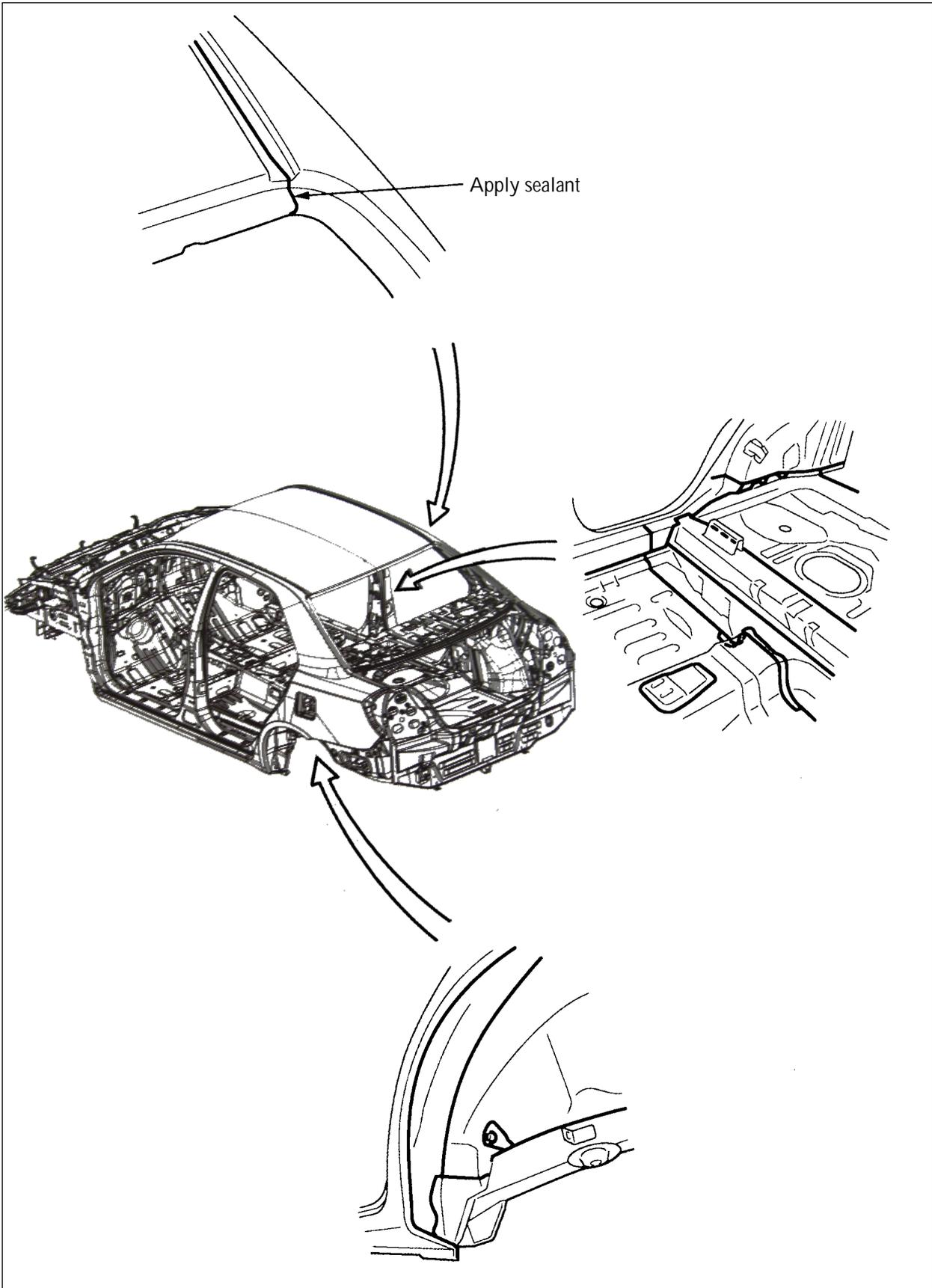


Fig. 5-38 (d) Body Inner (II)

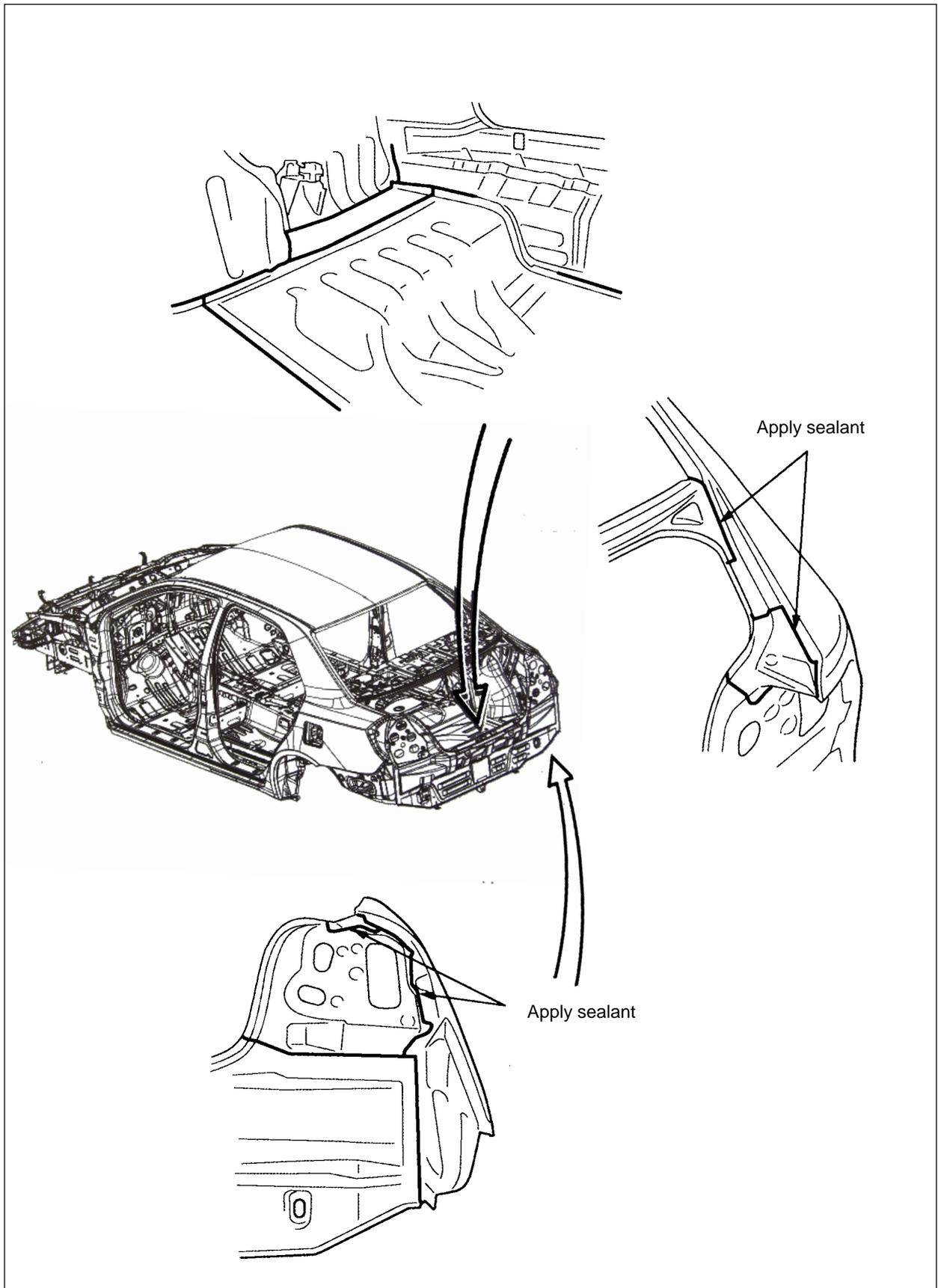


Fig. 5-38 (e) Luggage Compartment

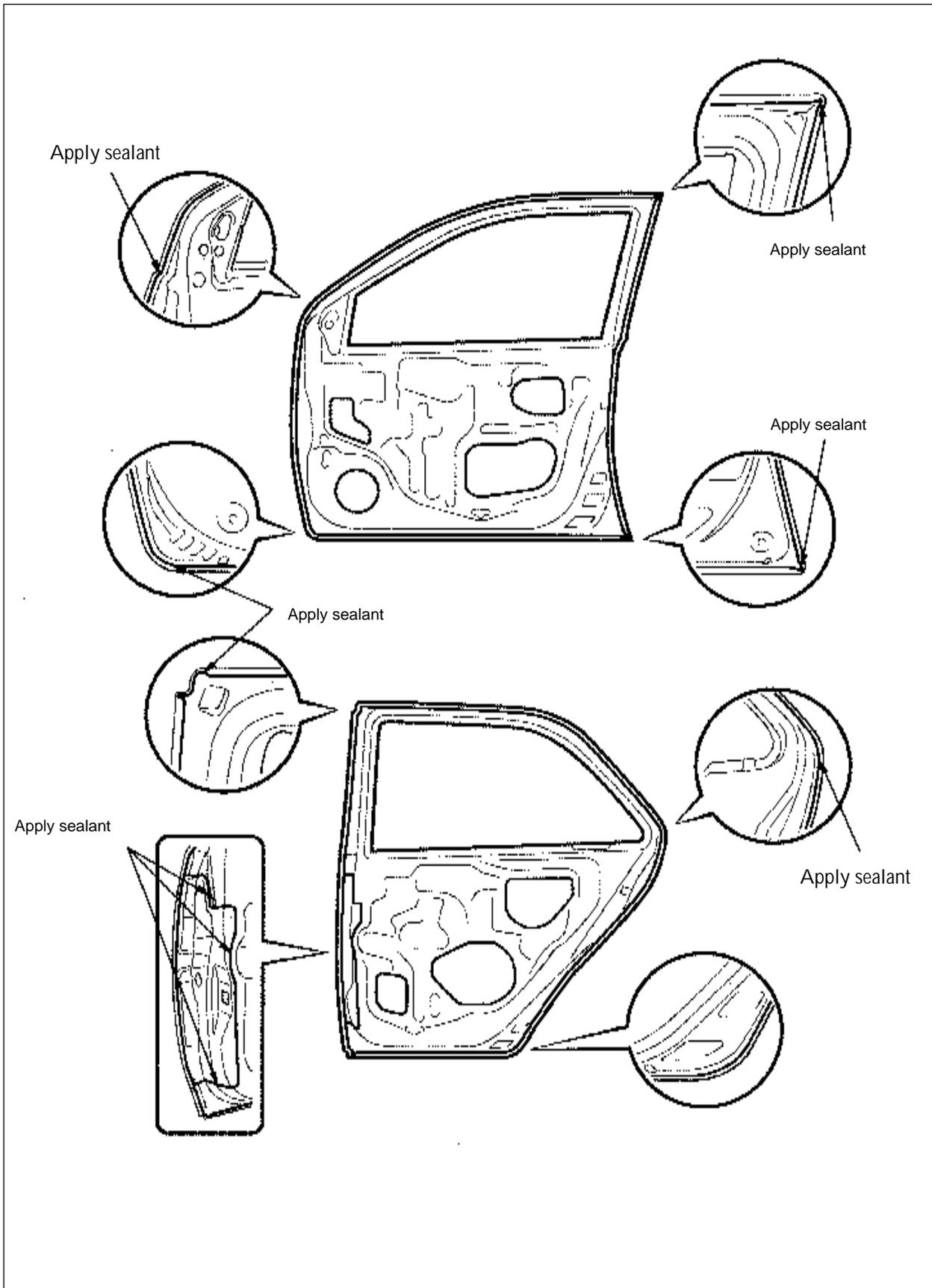


Fig. 5-38 (f) Door

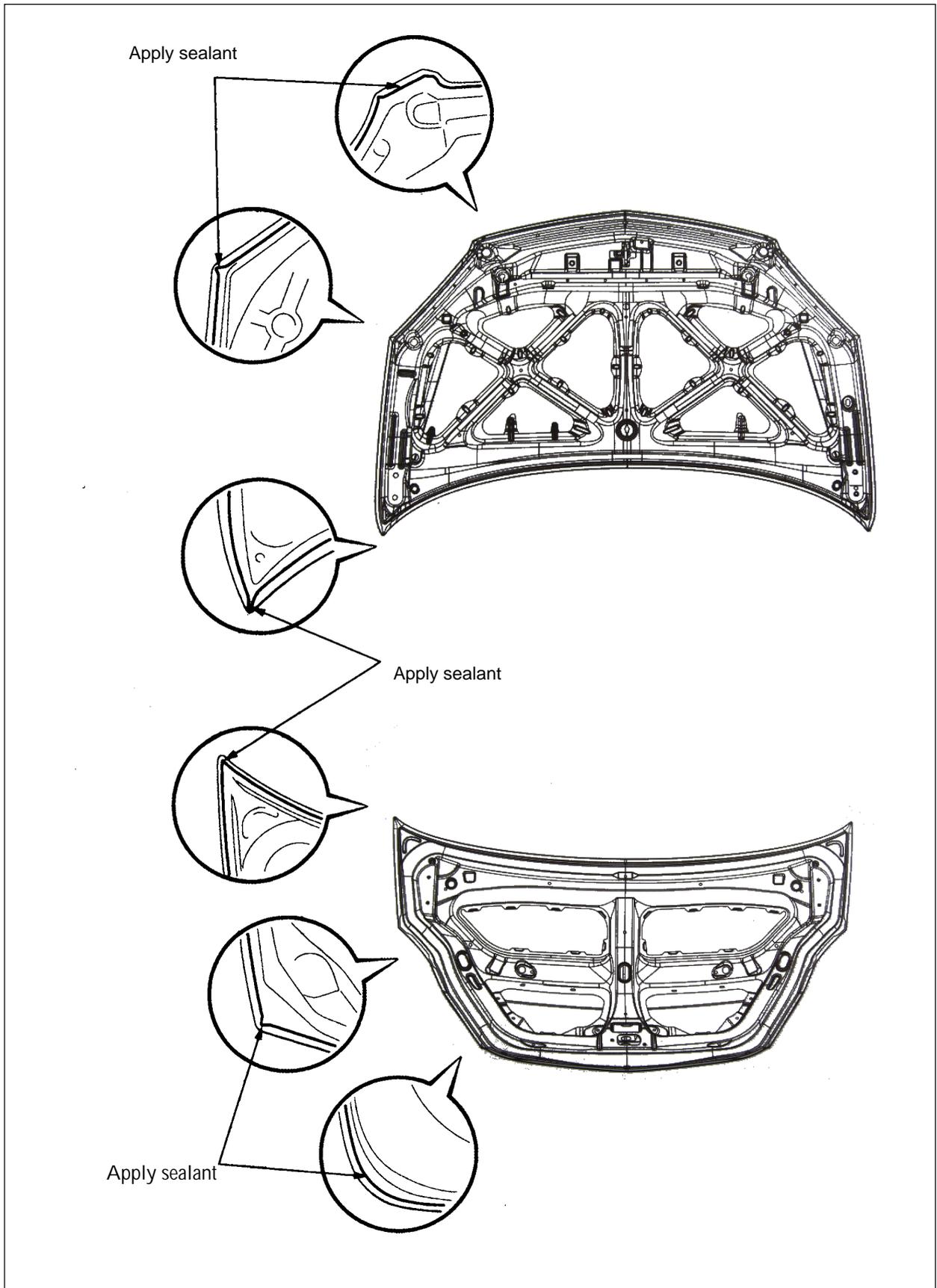


Fig. 5-38 (g) Engine Hood & Luggage Compartment Lid

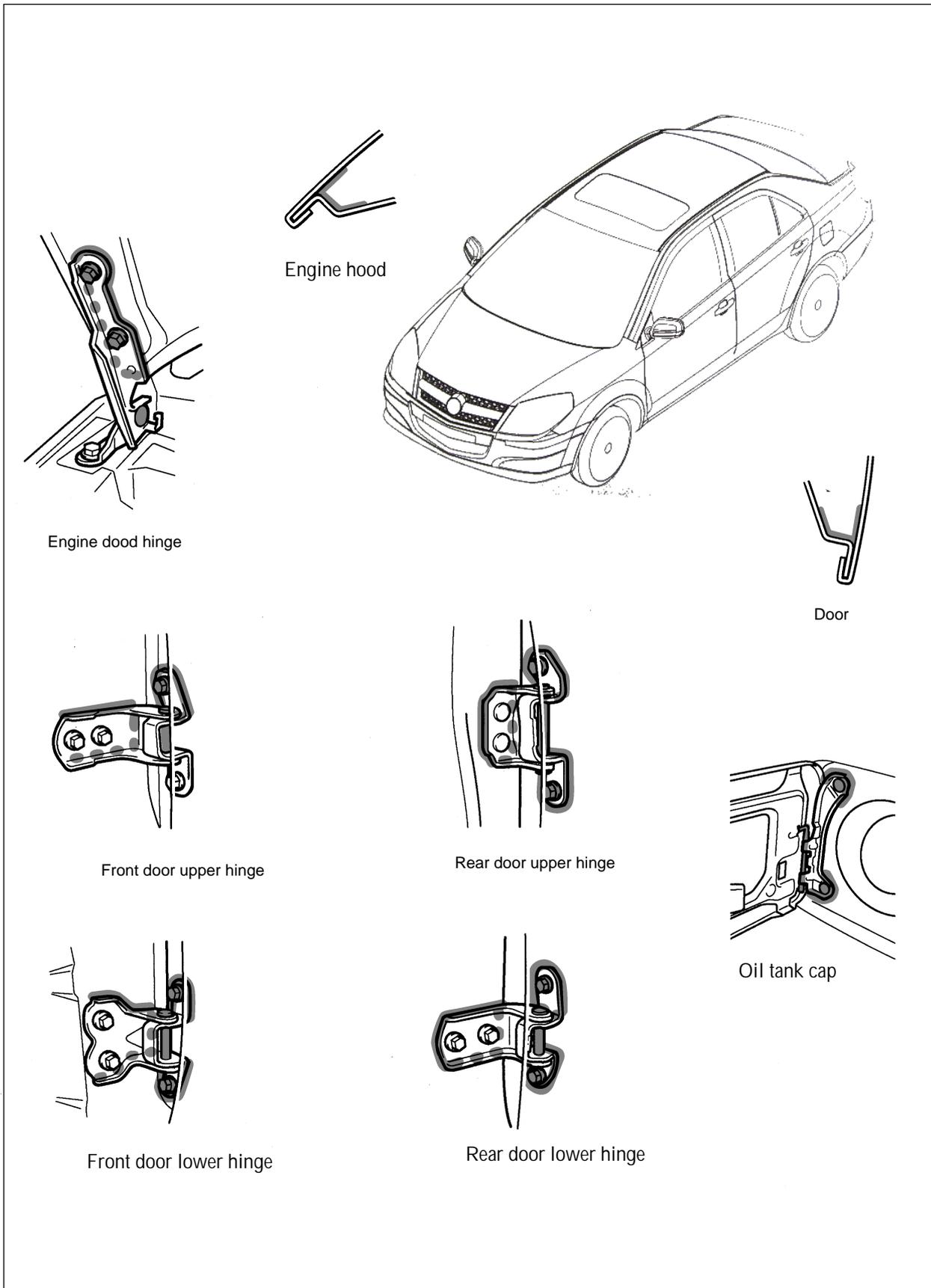


Fig. 5-38 (h) Antirust Position on Body Steel Panel

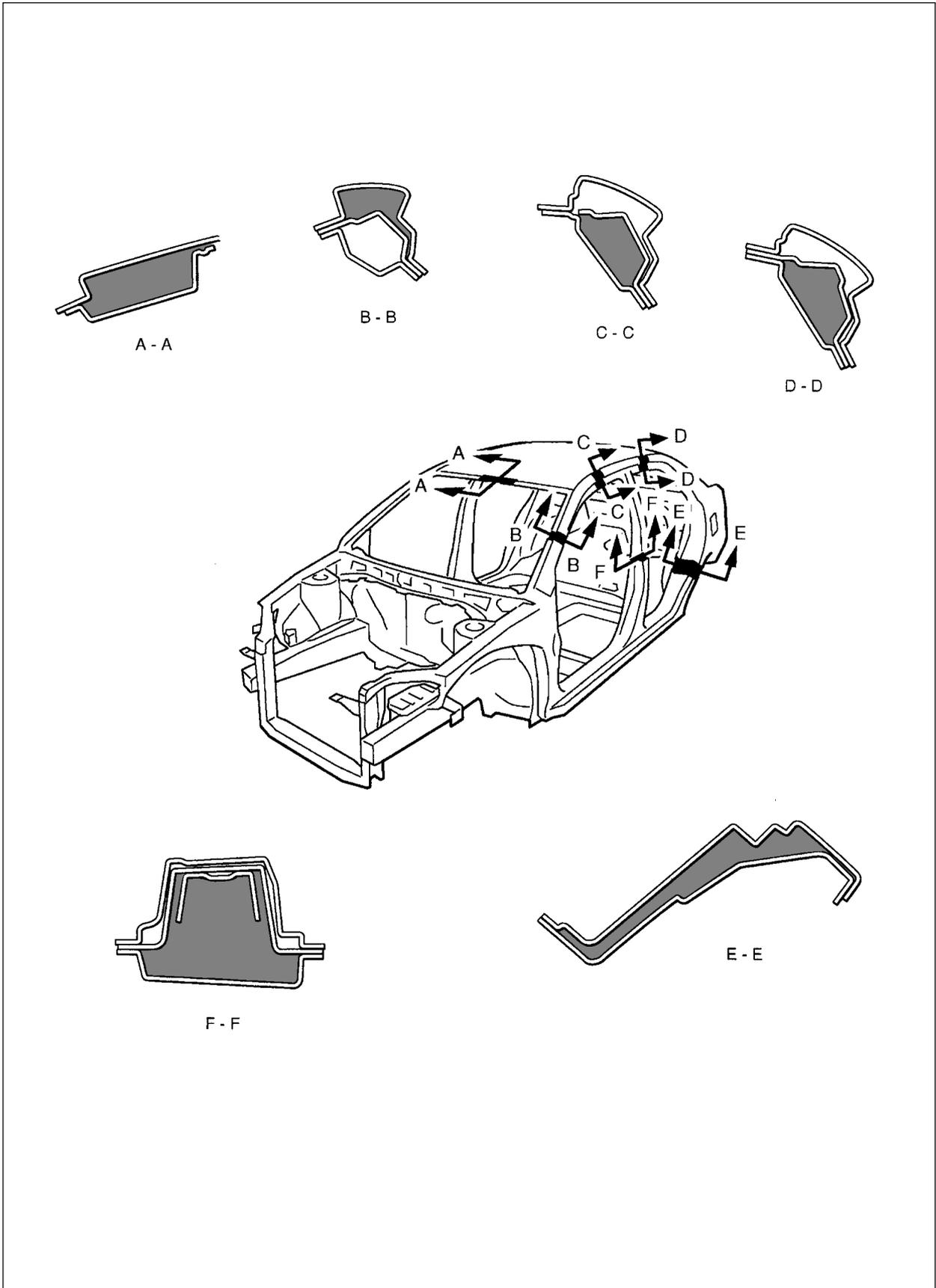


Fig. 2-38 (i) Filling Position of Foaming Material

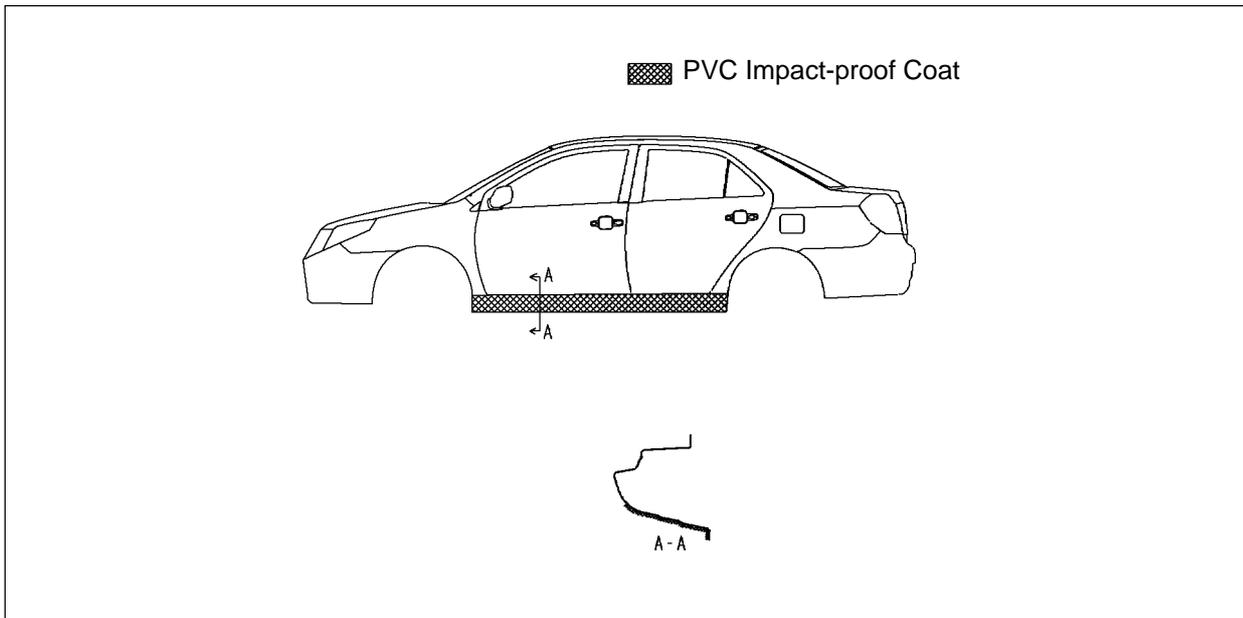


Fig. 5-38 (j) Painting Position of Impact-proof Coat

#### 4. Surface Treatment

Surface treatment shall be strict, careful and all-around. Though this car is not a deluxe sedan, it nearly has no difference with the deluxe sedan in the surface treatment.

##### a. Phosphoric acid processing

Phosphoric acid processing is also called pretreatment before painting. After removing the grease on the body by washing, apply zinc phosphate onto the body, with a thickness under  $3 \mu\text{m}$ . It not only can protect the work piece, but also can help to increase adhesion in the next coating process.

##### b. Cathode electrophoresis

In the practical application, the electrophoresis painting shows many advantages, such as high efficiency, good quality, safety and cost effectiveness. It is accompanied with four electrochemical phenomena including electroanalysis, electrophoresis, electrodeposition and electroosmosis. The cathode electrophoresis is much better than the anode electrophoresis both in the features and advantages. Incomparably, the process is strict extremely.

##### c. Intermediate coat

The intermediate coat is also called intermediate layer, which is located between the primer and the surface paint. Its function is to improve the evenness of the painted work piece and the primer and provide the surface paint with a good base to improve the paint's brightness and richness and improve the decoration of the entire coat.

##### d. Surface paint

The surface paint is the last coat in the multiple coats, which directly affect the vehicle's decoration, weatherability and appearance etc. Great attention shall be made when selecting the surface paint, including its adaptability, cost-effectiveness and usability. All performance indexes shall meet the national standard and industrial standard. The paint shall be even and smooth.

##### e. Protective coat

For those vehicles parked outside for a long time (more than three months) or used for shipping, water-soluble protective wax shall be applied on the outside surface of the body. This agent contains ultraviolet absorbent. Before selling the vehicle, wash it with soap detergent and flush it with clean water, to make the paint brighter.

## Section 5 Painting Techniques After Body Repair

In the practical use, various factors may cause painting damage, such as traffic accident, component rust, premature damage due to bubble, and local color change etc. It is necessary to make repair locally as the following steps:

### I. Base Processing (Pretreatment)

1. Remove the paint, and remove the coating on the plate work.
2. Cut the edges and corners, and polish the metal plate without paint and the uneven paint at the edge.
3. Blow and clean the dust and dirt, and remove the grease with degreasant.

### II. Primer Processing

1. Apply the self-drying primer on the bare metal surface.
2. Leave the primer drying naturally, or dry it with the infrared radiator.
3. Apply the self-drying oily putty or polyester putty on the plate work surface.
4. Leave the putty drying naturally or artificially.
5. Polish the putty manually to remove the uneven parts.
6. Polish it manually in water to clear the sandpaper lines.
7. Wash the dirt, polish the oil dirt and putty slurry.
8. Wipe the oil dirt on the polishing surface.
9. Cover the part not to be repaired with protective shield or paper.

### III. Painting Intermediate Coat

1. Paint the second primer.
2. Leave the primer drying naturally or dry it.
3. Find out the sand hole or sandpaper line.
4. Polish it manually in wet condition.
5. Wash the part clean, and leave it drying naturally. (The number of putty applying and polishing depends on the evenness of the surface to be repaired.)

### IV. Preparing to Paint Surface Paint

1. Paste paper on the surface not to be painted.
2. Remove the dust and grease on the local surface paint.
3. Mix the color the same with that of the vehicle's surface paint.
4. Prepare the paint.

### V. Painting Surface Paint

1. Paint the part with fast-drying surface paint 3-4 times and synthetic resin paint 2-3 times.
2. Leave it drying naturally or dry it.

### VI. Polishing

1. After painting, burnish the part with wax to clear the shadow and improve the effect.
2. After painting, tear off the paper and wipe the ground paint.
3. Check the appearance and quality.

## Section 6 Service Data For for Body

### I. Technical Repair Data (Table 5-1)

Table 5-1

Technical Repair Data

Item (Clearance)	Repair Data
Front fender and side wall outside plate	2.5mm(+1,0mm)
Front fender and front door outside plate	5mm± 1mm
Side wall outside plate and front/rear door	5.5mm± 1.5mm, Height Difference 2 mm± 1.5mm
Door outside plate and side wall outside plate	6mm± 1.5mm, Height Difference 2.5mm± 1.5mm
Front door and rear door	5.5mm± 1mm
Rear windshield and side wall outside plate	7mm± 1.5mm
Luggage outside plate and side wall outside plate	4.5mm± 1.5mm
Side wall outside plate and taillight & bumper	2mm± 0.5
Luggage outside panel and rear taillight	5.5mm± 0.5mm
Taillight and rear bumper	3mm(1,-0.5mm)
Side wall outside plate and refill opening	3.5mm(1,0mm)
Front bumper and headlight	3mm± 1mm
Left fender and front bumper	1mm(1,0mm)
Engine cover outside plate and left front fender	4mm± 1mm
Roof and front windshield	4mm± 0.5mm
Roof and rear windshield	3mm± 0.5mm
Left front fender and headlight	3mm± 0.5mm
Engine cover outside plate and headlight	4.5mm± 1mm
Side wall outside plate and front windshield	11mm± 0.5mm

## II. Supplemental Specifications on Tightening Torque

For those fastening pieces either not specified in the "Body" part or not stated in other assemblies, the following specifications shall apply.

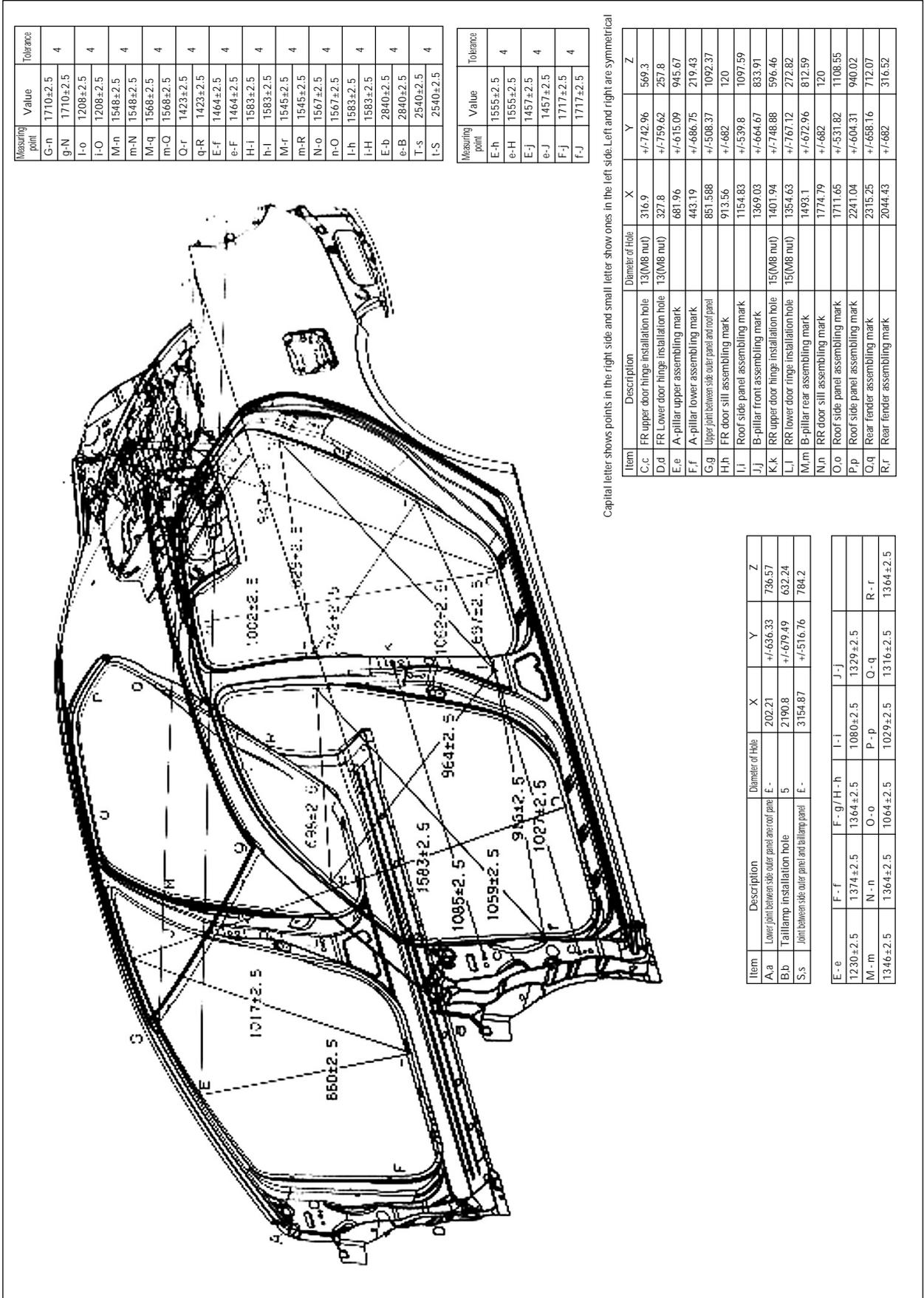
Table 5-2

Supplemental Specifications for Vehicle Body and All Assembly Fastening Piece

Thread Dia. (mm)	Thread Pitch (mm)	Tightening Torque		
		Standard Value (N.m)	Max. Value(N.m)	Min. Value(N.m)
6	1	9	12	6
8	1.25	23	26	16
8	1	25	28	17
10	1.5	59	75	37
10	1.25	63	79	45
10	1	64	80	46
12	1.75	95	111	73
12	1.5	97	113	75
12	1.25	99	115	78
14	2	160	185	122
14	1.5	180	205	146
16	2	215	245	182
16	1.5	240	270	199
18	2.5	268	298	229
18	1.5	316	346	287
20	2.5	430	470	389
20	1.5	440	480	396



2. Left/Right Side Wall Parts



Measuring point	Value	Tolerance
G-n	1710±2.5	4
g-N	1710±2.5	4
I-o	1208±2.5	4
i-O	1208±2.5	4
M-n	1546±2.5	4
m-N	1546±2.5	4
M-q	1568±2.5	4
m-Q	1568±2.5	4
O-r	1423±2.5	4
o-R	1423±2.5	4
E-f	1464±2.5	4
e-F	1464±2.5	4
H-i	1583±2.5	4
h-I	1583±2.5	4
M-r	1545±2.5	4
m-R	1545±2.5	4
N-o	1567±2.5	4
n-O	1567±2.5	4
I-h	1583±2.5	4
i-H	1583±2.5	4
E-b	2840±2.5	4
e-B	2840±2.5	4
T-s	2540±2.5	4
t-S	2540±2.5	4

Measuring point	Value	Tolerance
E-h	1555±2.5	4
e-H	1555±2.5	4
E-j	1457±2.5	4
e-J	1457±2.5	4
F-j	1717±2.5	4
f-J	1717±2.5	4

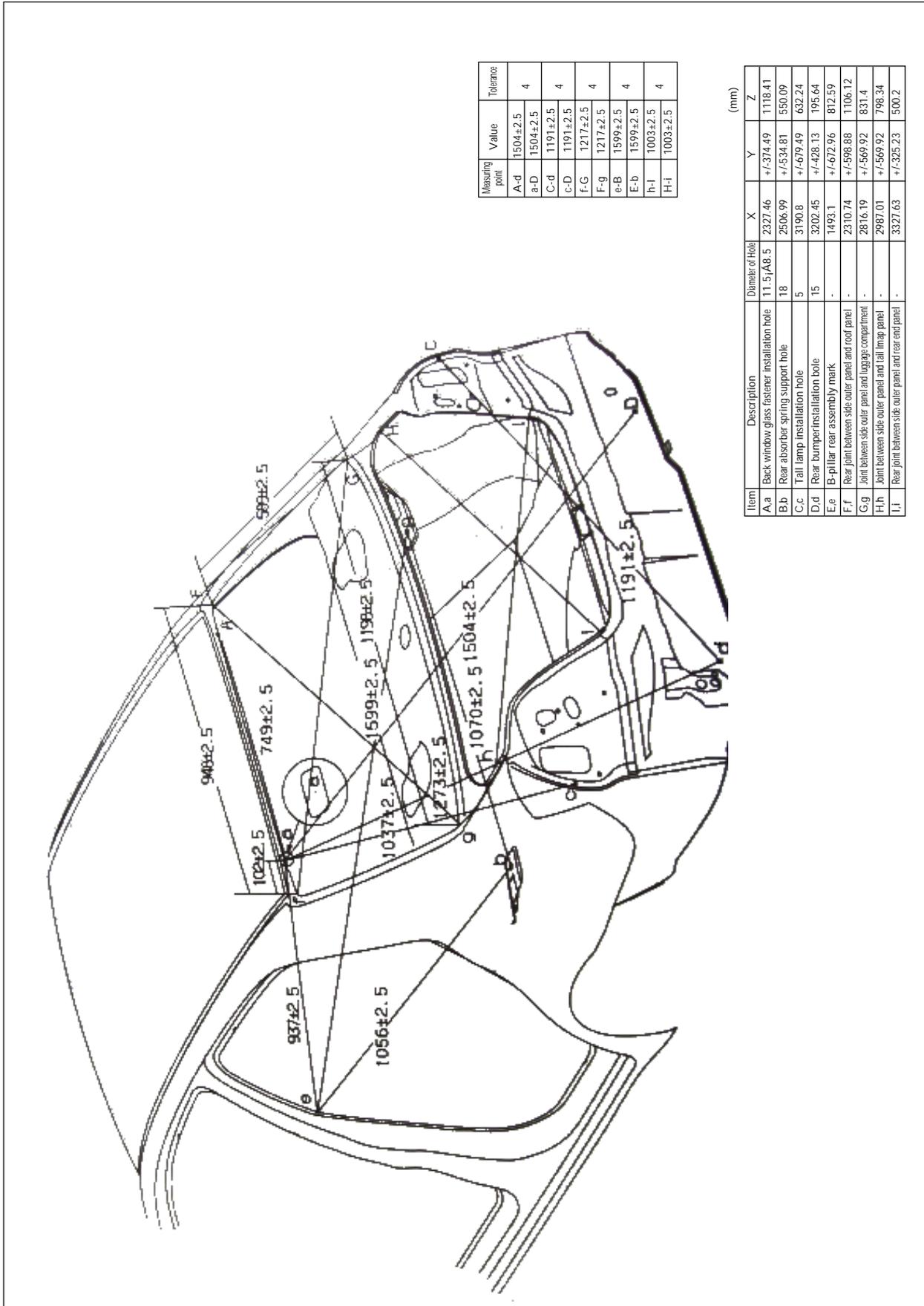
Capital letter shows points in the right side and small letter show ones in the left side. Left and right are symmetrical

Item	Description	Diameter of Hole	X	Y	Z
C.c	FR upper door hinge installation hole	13(M8 nut)	316.9	+/-742.96	569.3
D.d	FR Lower door hinge installation hole	13(M8 nut)	327.8	+/-759.62	257.8
E.e	A-pillar upper assembling mark		681.96	+/-615.09	945.67
F.f	A-pillar lower assembling mark		443.19	+/-686.75	219.43
G.g	Upper joint between side outer panel and roof panel		851.588	+/-508.37	1092.37
H.h	FR door sill assembling mark		913.56	+/-682	120
I.i	Roof side panel assembling mark		1154.83	+/-539.8	1097.59
J.j	B-pillar front assembling mark		1369.03	+/-664.67	833.91
K.k	RR upper door hinge installation hole	15(M8 nut)	1401.94	+/-748.88	596.46
L.l	RR lower door hinge installation hole	15(M8 nut)	1354.63	+/-767.12	272.82
M.m	B-pillar rear assembling mark		1493.1	+/-672.96	812.59
N.n	RR door sill assembling mark		1774.79	+/-682	120
O.o	Roof side panel assembling mark		1711.65	+/-531.82	1108.55
P.p	Roof side panel assembling mark		2241.04	+/-604.31	940.02
Q.q	Rear fender assembling mark		2315.25	+/-658.16	712.07
R.r	Rear fender assembling mark		2044.43	+/-682	316.52

Item	Description	Diameter of Hole	X	Y	Z
A.a	Lower joint between side outer panel and roof panel	E-	202.21	+/-636.33	736.57
B.b	Tail lamp installation hole	5	2190.8	+/-679.49	632.24
S.s	Joint between side outer panel and bill lamp panel	E-	3154.87	+/-516.76	784.2

E-e	F-f	F-g/H-h	I-i	J-j	
1230±2.5	1374±2.5	1364±2.5	1080±2.5	1329±2.5	
M-m	N-n	O-o	P-p	O-q	R-r
1346±2.5	1364±2.5	1064±2.5	1029±2.5	1316±2.5	1364±2.5

3. Body Opening Part (Back View)



Measuring point	Value	Tolerance
A-d	1504±2.5	4
a-D	1504±2.5	4
C-d	1191±2.5	4
c-D	1191±2.5	4
F-g	1217±2.5	4
e-B	1599±2.5	4
h-I	1003±2.5	4
H-I	1003±2.5	4

Item	Description	Diameter of Hole	X	Y	Z
A.a	Back window glass fastener installation hole	11.5/A8.5	2327.46	+/-374.49	1118.41
B.b	Rear absorber spring support hole	18	2506.99	+/-534.81	550.09
C.c	Tail lamp installation hole	5	3190.8	+/-679.49	632.24
D.d	Rear bumper installation hole	15	3202.45	+/-428.13	195.64
E.e	B-pillar rear assembly mark	-	1493.1	+/-672.96	812.59
F.f	Rear joint between side outer panel and roof panel	-	2310.74	+/-598.88	1106.12
G.g	Joint between side outer panel and luggage compartment	-	2816.19	+/-569.92	831.4
H.h	Joint between side outer panel and tail lamp panel	-	2987.01	+/-569.92	798.34
I.i	Rear joint between side outer panel and rear end panel	-	3327.63	+/-325.23	500.2

## Appendix: Torque Table of the Fasteners for Important Assembly

No.	Area	Fastener	Torque N.m	
			JL7132HU JL7152HU	JL7132U JL7152U JL7162U
1	Engine right insulator x body	JQ184C1025(3 pcs)	43~58	43~58
2	Brake pedal with bracket assy. x central cross member	Q151B0820(1 pcs)	22~29	22~29
3	Brake pedal with bracket assy. x brake master cylinder with vacuum booster assy.	Q32008(4 pcs)	22~29	22~29
4	Clutch pedal x central cross member	Q1840816(1 pcs)/		22~29
5	Clutch pedal x clutch master cylinder	Q32208(2 pcs)/		22~29
6	Accelerator pedal	Q32208(2 pcs)	22~29	22~29
7	LH/RH front brake pipe component x HECU controller	Null	13~18	13~18
8	LH/RH rear brake pipe component I x HECU controller	Null	13~18	13~18
9	Brake master cylinder No. 1 and No.2 pipe component x HECU controller, brake master cylinder	Null	13~18	13~18
10	Clutch hydraulic hose assy. x master cylinder oil outlet pipe component	Null	13~18	13~18
11	Steering column assy. x universal joint assy.	Q151B0820TF2(1 pcs)	22~29	22~29
12	(LH & RH) front shock absorber component x body	front suspension support sub-assy. Mounting nut (6 pcs)	37~45	37~45
13	(LH & RH) rear shock absorber component top nut	Q341C10(2 pcs)	22~29	22~29
14	(LH & RH) front shock absorber piston rod x front suspension bracket sub-assy.	Q330B12(2 pcs)	31~38	31~38
15	(LH & RH) rear seat belt assy. x body	7/16" bolt ( )	39~53	39~53
16	(LH & RH) front seat belt assy. x body	7/16" bolt( )	39~53	39~53
17	(LH & RH) front buckle assy. x body	7/16" bolt( )	39~53	39~53
18	RR seat belt buckle and lap belt assy. x body	7/16" bolt( )	39~53	39~53
19	LR buckle assy. x body	7/16" bolt( )	39~53	39~53
20	Rear axle assy. x body	JQ14012110TF2(2 pcs)	73~103	73~103
21	(LH & RH) rear shock absorber x rear axle	JQ320B12(2 pcs)	47~56	47~56
22	LH & RH brake pipe component III x LH & RH rear drum brake with wheel hub assy.	Null	13~18	13~18
23	LH & RH rear brake hose x LH & RH rear brake pipe component III	Null	13~18	13~18
24	LH/RH rear drum brake with wheel hub assy. x rear axle	Mounting nut (8pcs)	60~72	60~72
25	LH/RH rear brake pipe component I x LH/RH rear brake pipe component II	Null	13~18	13~18

### Appendix: Torque Table of the Fasteners for Important Assembly

No.	Area	Fastener	Torque N.m	
			JL7132HU JL7152HU	JL7132U JL7152U JL7162U
26	LH/RH rear brake pipe component II x rear brake hose assy.	Null	13~18	13~18
27	front suspension cross member (front part) x body	JQ1401280TF2(2 pcs)	94~110	94~110
28	Front suspension cross member (rear part) x body	JQ1401455TF2(2 pcs)	110~130	110~130
29	Engine right mount x right insulator	JQ319B10(1 pcs)	49~60	49~60
30	Engine left mount x left insulator	JQ184C1030(2 pcs)	43~58	43~58
31	Engine left LH x body	JQ184B12140(1 pcs)	94~110	94~110
32	Engine x automatic transmission	JQ140BD1255TF2(2 pcs)	/	55~70
33	Engine x automatic transmission	JQ140BD1260TF2(1 pcs)	/	55~70
34	Engine x automatic transmission	JQ140C1040TF2(1 pcs)	/	43~58
35	Engine x automatic transmission	JQ140C1020(3 pcs)	/	43~58
36	Engine x automatic transmission	JQ140BD1255TF2(2 pcs)	55~70	/
37	Engine x automatic transmission	JQ140BD1045TF2(1 pcs)	43~58	/
38	Engine x automatic transmission	JQ140C1040TF2(1 pcs)	43~58	/
39	Engine x automatic transmission	JQ140C0820(3 pcs)	22~29	/
40	Starter x transmission	JQ146C1040TF2(2 pcs)	30~60	30~60
41	Engine left bracket x transmission	JQ184C1030(3 pcs)	43~58	43~58
42	Engine rear bracket x engine	JQ184C1025(2 pcs)	43~58	43~58
43	Engine rear bracket x engine	JQ184C1020(1 pcs)	43~58	43~58
44	Compressor bracket x engine	JQ146C1035(1 pcs)	43~58	43~58
45	Compressor bracket x engine	JQ146C1030(3 pcs)	43~58	43~58
46	Power steering pump with bracket assy. (without reservoir) x engine	Q1420825(3 pcs)	22~29	22~29
47	Power steering pump with bracket assy. (without reservoir) x engine	Q14201030(1 pcs)	43~58	43~58
48	Oil pump adjustment bracket x engine	JQ146C1030(2 pcs)	43~58	43~58
49	Oil pump adjustment bracket x power steering pump with bracket assy. (without reservoir)	JQ146C1030(1 pcs)	43~58	43~58
50	Oil pump mounting bracket x power steering pump with bracket assy. (without reservoir)	JQ142C1085(2 pcs)	43~58	43~58
51	Oil pump mounting bracket x power steering pump with bracket assy. (without reservoir)	Q40110(1 pcs)	43~58	43~58
52	Oil pump mounting bracket x power steering pump with bracket assy. (without reservoir)	Q361C10(1 pcs)	43~58	43~58
53	Rear insulator x front suspension cross member	JQ184C1060(1 pcs)	43~65	43~65

## Appendix: Torque Table of the Fasteners for Important Assembly

No.	Area	Fastener	Torque N.m	
			JL7132HU JL7152HU	JL7132U JL7152U JL7162U
54	Rear insulator x front suspension cross member	JQ319C10(2 pcs)	43~65	43~65
55	Front stabilizer bar x front suspension cross member	Q1400825(4 pcs)	22~29	22~29
56	Power steering gear with tie rod assy. x front suspension cross member	JQ184B1265(2 pcs)	125~152	125~152
57	High/low pressure oil pipe assy. x power steering gear with tie rod assy.	Null	25~32	25~32
58	LH & RH lower suspension swing arm x front suspension cross member rear	JQ1401280TF2(2 pcs)	125~152	125~152
59	LH & RH lower suspension swing arm x front suspension cross member rear	JQ320B12(2pcs)	125~152	125~152
60	LH & RH lower suspension swing arm x front suspension cross member front	JQ1401280TF2(2 pcs)	83-103	83-103
61	Front stabilizer bar x LH & RH lower suspension swing arm assy.	JQ33808(2 pcs)	22~29	22~29
62	(LH & RH) front brake hose x (LH & RH) front disk brake with steering knuckle assy.	brake hose union bolt (2 pcs)	13~18	13~18
63	Engine rear insulator x rear bracket	Q184C10105(1 pcs)	61~74	61~74
64	High pressure oil pipe assy. x power steering pump with bracket assy.	Union bolt	51~63	51~63
65	(LH & RH) lower swing arm ball joint x (LH & RH) disk brake with steering knuckle assy.	JQ38312(2 pcs)	83~103	83~103
66	LH & RH brake with steering knuckle assy. x power steering gear assy. with tie rod assy.	Q383B10(2 pcs)	30~40	30~40
67	(LH & RH) front disk brake with steering knuckle assy. x (LH & RH) front shock absorber	JQ1841450TF2(4 pcs)	125~152	125~152
68	(LH & RH) front disk brake with steering knuckle assy. x (LH & RH) front shock absorber	JQ320C14(4 pcs)	125~152	125~152
69	LH/RH constant velocity drive shaft assy.	Set nut	190~230	190~230
70	(LH & RH) front brake hose x (LH & RH) front brake pipe	Null	13~18	13~18
71	Front suspension reinforcement member x front suspension cross member, body	JQ1401020(4 pcs)	43~58	43~58
72	Oil tank component x body	JQ146Db0835A(4 pcs)	22~29	22~29
73	3-way catalytic converter assy. x engine exhaust manifold	JQ189C1058TF2E(4 pcs)	40~60	40~60
74	Intermediate muffler x 3-way catalytic converter assy.	JQ1461035(2 pcs)	40~60	40~60
75	Intermediate muffler x 3-way catalytic converter assy.	JQ32010(2 pcs)	40~60	40~60
76	Primary muffler x intermediate muffler	JQ1461035(2 pcs)	40~60	40~60

### Appendix: Torque Table of the Fasteners for Important Assembly

No.	Area	Fastener	Torque N.m	
			JL7132HU JL7152HU	JL7132U JL7152U JL7162U
77	Primary muffler x intermediate muffler	JQ32010(2 pcs)	40~60	40~60
78	Engine right mount x right insulator	JQ184C1040(2 pcs)	49~60	49~60
79	Wheel rim x wheel hub	Hub nut (16 pcs)	88~117	88~117
80	Universal joint x power steering gear	Q151B0820TF2(1 pcs)	22~29	22~29
81	Steering wheel x steering column assy.	Steering wheel nut	33~59	33~59