



**UNI-K**

- **General**

**UNI-KRM2S/1/1**

# Section 1

## General

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# 1.1 Service information

## Model :UNI-K

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## 1.1.1 General

### Description and operation

#### About this manual

#### Introduction

This manual is written to meet the needs of the service technician and provides basic instructions for completing the service and maintenance. Maintenance according to this manual can improve the reliability of the work.

#### Replacement spare parts

The maintenance spare parts of Chang'an Automobile Co., Ltd. are manufactured according to the original standard. Therefore, only the genuine maintenance spare parts of Chang'an Automobile Co., Ltd. can be used for maintenance service.

#### Special tool

All special tools required for each service are provided in the special tools table provided prior to the start of each procedure. Additional illustrations are provided, if necessary, to help identify these specialized equipment. Special tools can be ordered through Chang'an Automobile Co., Ltd.

#### Important safety instructions

Proper maintenance methods and proper repair procedures are critical to the reliability of all motor vehicle operations and the safety of service personnel.

It is not possible for this manual to foresee all conditions and to prompt relevant warnings and suggestions. If any person fails to comply with this manual, it must be confirmed before maintenance that the selected maintenance methods, tools and parts neither endanger personal safety nor damage the integrity of the vehicle.

#### Warnings, Precautions and Reminders in this Manual

 **Warning:** Used to indicate that failure to follow this manual may result in Body injury.

 **Note:** It is used to indicate damage if the correct procedure is not followed. Vehicle and maintenance equipment used.

When you read this manual, you will encounter "Warnings," "Cautions"

Identification.

#### How to use this manual

This manual includes maintenance and repair service procedures.

This manual is described in chapters and sections, and chapters of specific system are concentrated in relevant chapters. Each chapter briefly describes a special part of the vehicle.

This manual is divided into five chapters: General, Chassis, Powertrain, Electrical, Body.

The first page of this manual has a catalogue of all the chapters. Each specific chapter generally includes the following contents: Specification, description and operation, general inspection, fault symptom diagnosis and test, DTC diagnosis and test, disassembly and installation, disassembly and assembly.

The left and right sides of the vehicle are determined in the driver's seat position looking forward.

The left and right sides of the engine are determined in the direction of the front camshaft pulley at the flywheel.

#### Specifications

The main contents of the specification part include material specification, component specification, general specification (refers to the parts that cannot be summarized into other specification tables) and torque specification. The table does not use English system except torque specification, only metric system.

#### Description and operation

The Description and Operation section mainly describes the system part composition and a brief description of the functions and principles of the new system. The new system here refers to the system that has not appeared in the vehicle model previously produced by the complete vehicle factory, in order to familiarize the maintenance technicians with the function and principle of the system. It includes component location diagram and component decomposition diagram of the system.

#### General inspection

The general inspection procedure section mainly

describes the general inspection procedure information of the system.

### **Fault symptom diagnosis and test**

The fault symptom diagnosis and test part is for the vehicle system fault that can not be determined only through visual inspection, excluding the component or system diagnostic test by computer inspection. Generally includes: Inspection and confirmation (appearance inspection table), fault symptom table and fault diagnosis process.

### **DTC diagnosis and test**

DTC diagnosis and test is the part of the diagnostic test of a component or system for a computer tester. It usually includes: Terminal list of control module, fault code table, data flow list, active test list, DTC diagnostic process.

## **Health and safety prevention**

### **Introduction**

Many operations related to vehicle maintenance and repair will bring threats and hazards to human health. A number of hazardous operations and their associated hazardous articles and equipment are listed below. Pay special attention to the following dangerous goods.

The list is not complete, so safety and health should always be at the forefront of actual operations.

Before using any product, consult the material safety specification sheet provided by the manufacturer or supplier of the product.

### **Acid, base and metal**

- Corrosive soda ash, sulfuric acid.
- Electrolyte and cleaning materials.
- Irritating and corrosive substances to skin, eyes, nose, throat and clothing, inflammable substances, which can destroy ordinary protective suit substances.

Avoid splash on skin, eyes and clothing. Wear suitable protective clothing, protective gloves and goggles. Do not breathe acid mist. Place some eye wash bottles, cleaning water and soap near the workplace so that they can be used in the event of an accident.

Place "hazardous eyes" sign.

### **Airbag**

[Reference: Chemicals.](#)

Flammable, explosive substances - Smoking prohibitions must be observed.

The airbag is installed on the steering wheel and the instrument panel in front of the passenger to protect the life safety of the front passenger.

The airbag contains high explosive substances, which will produce high temperature and high pressure gas (2500 ° C) when ignited.

The gas generator used for airbag is sodium azide. This substance is sealed in the module and will be completely released when the airbag is deployed. Do not attempt to open the airbag by yourself,

which will result in sodium azide explosion. If the gas generator breaks, wear fully protected work clothes when handling.

After the airbag is deployed normally, it is necessary to wear protective gloves and goggles when handling the site.

Used airbags must be packed in plastic bags in strict accordance with local regulations and discarded in designated chemical waste treatment yard.

After direct contact with the generated gas, thoroughly clean the site (affected area) with water. Seek medical assistance if needed.

#### 1. Airbag-Operation to be performed:

- Position airbag vertically.
- Keep airbag dry.
- When transporting the airbag, face the unsealed side of the airbag toward the body.
- The airbag should have the sealing face up.
- Carefully inspect the airbag for damage.
- When connecting the airbag, stand on the side.
- It shall be confirmed that all test equipment is correctly calibrated and maintained.
- Clean hands after transporting deployed airbags.

#### 2. airbag-operation to be prohibited:

- Never put flammable substance or gas generator together with airbag.
- The storage temperature of the gas generator shall not exceed 80 ° C.
- Airbag cannot be placed upside down.
- Do not open the gas generator housing.
- Do not allow the gas generator to approach open flame or heat source.
- Do not place anything on the airbag.
- Do not use damaged airbags.
- Do not touch the airbag and gas generator within 10 minutes after combustion.
- Never use the meter probe on the airbag circuit.

### A/C refrigerant

[Reference: Chemicals.](#)

Flammable substances - No smoking must be observed.

Contact of refrigerant with skin may cause frostbite.

The manufacturer's instructions must be strictly followed. Wear protective gloves and glasses to avoid strong light.

If the refrigerant accidentally touches the skin or eyes, rinse with water immediately. Inadvertently touch the eyes with refrigerant and rinse them with the correct cleaning agent. Do not rub them. Seek medical assistance if necessary.

A/C refrigerant - Prohibited:

- Do not expose A/C refrigerant to sunlight or heat.
- When filling refrigerant, do not put the filling bottle vertically and the filling port should be facing down.
- Prevent frosting on A/C refrigerant bottle.
- Prevent the A/C refrigerant bottle from dropping.
- In any case, it is prohibited to discharge the modulated refrigerant to the atmosphere.
- Do not mix refrigerants, such as Fluoride R12 and R134a.

### Sealant and adhesive

[Reference: Chemicals.](#)

Flammable substances - No smoking must be observed.

In general, the sealant and adhesive should be stored in the non-smoking area and must be kept clean and tidy, such as on the shelves covered with disposable paper towels, preferably removed from the packing box and placed separately; Packing boxes, including sub-packing boxes, shall be affixed with corresponding labels.

#### 1. Solvent sealant and adhesive

The manufacturer's instructions must be followed.

#### 2. Water-soluble sealant and adhesive

Such water-soluble viscose based on polymer emulsion and rubber latex may contain a small amount of volatile toxic substances and

chemicals harmful to human beings. Avoid contact with eyes and skin, and ensure good ventilation when using.

### 3. Hot melt adhesive

The solid state of such substances is safe. In a molten state they can cause combustion and release toxic gases that are harmful to health. When working, you must wear correct protective work clothes, use thermostatic heater with automatic power-off function, and have enough suction equipment.

### 4. Resin type sealants and adhesives such as epoxides and resin formaldehyde

The adhesive must be mixed in a well-ventilated place because it can release harmful or toxic volatile substances.

Skin contact with undried resin and hardener will cause dermatitis, and some toxic and harmful chemicals will be absorbed by the skin.

If the spilled material enters the eyes, it will cause damage to the eyes. Therefore, keep good ventilation and avoid contact with skin and eyes when working.

### 5. Anaerobic cyanoacrylate and acrylic adhesives

Most of these adhesives are irritating, cause allergies or damage to the skin and respiratory tract. Some of them are highly irritating to the eyes. Avoid contact with skin and eyes and follow the manufacturer's instructions.

Do not allow cyanoacrylate adhesive to contact skin and eyes.

If it is accidentally touched, please put on a clean wet cloth or see a doctor immediately. Do not touch the injured part by hand. Choose a well-ventilated place because water vapor can irritate the nose.

### 6. Isocyanate (polyurethane) sealant and adhesive

[Reference: Resin adhesive.](#)

No person suffering from asthma or other respiratory system disease shall have access

to or access to such substances.

Excessive exposure to these substances can irritate eyes and respiratory system. Too high a concentration stimulates nervous system and can cause loss of consciousness when the situation is serious. Prolonged exposure to these substances can affect your health.

Prolonged contact with the skin will irritate the skin, and severe dermatitis will occur. If you accidentally enter your eyes, it will damage your eyes. Any spraying action must be carried out in a well-ventilated place and keep the vapor and sprayed particles away from the breathing area.

Proper gloves and glasses and mask must be worn when working.

## Antifreeze

[Reference: Flammable substances, solvents.](#)

Antifreeze includes: Isopropyl alcohol, ethylene glycol, methanol.

Highly flammable, flammable and combustible.

It is used for solution in vehicle cooling system and wiper spray.

Antifreeze produces vapor when heated. Avoid inhalation of such gases.

Antifreeze or other harmful substances may enter the body through the skin. If you inadvertently drink antifreeze may be fatal, you must seek medical attention in time.

It is prohibited to use such substances in any cooling or industrial water systems associated with food processing or drinking water systems.

## Electrolyte

[Reference: Acids, bases and metals.](#)

The gas released by the battery during charging can cause explosion. Do not use open flame or Mars when charging the battery. Good ventilation must be ensured.

## Brake fluid

[Reference: Fire protection.](#)

Brake fluid may cause slight irritation to the skin and eyes. Contact with skin and eyes should be avoided as far as possible. Because the vapor pressure is relatively low, the vapor harmful to human body will not be inhaled at normal temperature.

## Brazing

[Reference: Welding.](#)

## Chemicals

[Reference: Legal Affairs.](#)

Chemicals include solvent, sealant, adhesive, paint, resin foam, electrolyte, antifreeze, brake fluid, fuel, oil and grease. Care must be taken when using and storing such substances. They may be toxic, harmful, corrosive and irritating, flammable and produce some harmful gases and dust.

Exposure to such chemicals for extended periods of time can affect human health to varying degrees.

### 1. Chemistry? Operation to be performed:

- Carefully read the label on the dangerous goods container and the corresponding publicity materials and instructions to obtain relevant safety information. A safety and health data sheet for the substance is available from the manufacturer.
- If the skin and clothes are contaminated with such chemicals, clean them in time. Replace the seriously contaminated clothes and clean them.
- Work instructions shall be prepared and protective clothing shall be worn to prevent such substances from contaminating the skin and eyes and to prevent inhalation of harmful gases, acid mist, dust, smoke, etc., and combustion and explosion caused by such substances.
- Wash hands immediately after contact with such substances.
- The work area shall be clean, tidy and free from leaks.
- Chemicals should be managed and stored in strict accordance with national and local regulations.
- Prevent child contact.

### 2. Chemicals-Prohibited Operations:

- Mixing chemicals without the manufacturer's instructions is prohibited. Mixing certain chemicals will produce toxic and harmful substances; Release toxic and harmful gases or explosions.
- It is forbidden to spray chemicals, especially solvent chemicals, in narrow spaces, such as in a vehicle.
- It is forbidden to heat or burn chemicals without following the manufacturer's instructions. Some chemicals are flammable and some release toxic or harmful gases when burning.
- Do not place the container open. The gas emitted from the container will poison the human body or cause explosion. Some gases heavier than air are concentrated in narrow areas.
- Do not transport chemicals in unlabeled containers.
- Do not wash hands or clothes with chemicals. Chemicals, especially solvents and fuel, can dry the skin, irritate the skin with epithelial dermatitis, or absorb some toxic and harmful substances through the skin.
- It is forbidden to store other articles in empty tanks where chemicals have been stored without special treatment.
- Do not smell chemicals. Instantaneous high concentrations of gas can cause poisoning or injury.

## Anticorrosive substance

[Reference: Solvent and Fire Protection.](#)

It is a flammable substance and must comply with the regulations on prohibiting smoke and fire.

There are many types of such substances, please follow the manufacturer's instructions. It may contain solvents, resins or finished oil. Contact with skin and eyes should be avoided. Such substances shall not be sprayed in the enclosed space and shall only be applied with good ventilation.

## Cutting

[Reference: Welding.](#)

## Dewaxing

[Reference: Solvent and Fuel \(Kerosene\).](#)

## Dust

Dust can be toxic and irritating to human skin. Avoid inhaling dust or other dust from powdery chemicals. Wear mask in case of poor air circulation.

Extremely fine dust of flammable substances can cause explosion. Explosion critical limits and sources of ignition shall be avoided.

## Electric shock

Improper use or use of defective electrical equipment can cause electric shock.

All electrical equipment shall be inspected periodically to ensure that it is in good condition. Defective equipment shall be clearly identified and removed from the work area. Ensure that the wires, cables, plugs, sockets are free from wear, knotting, cutting, cracking, or other damage. Do not allow the electrical equipment and wires to come into contact with water, and ensure that the electrical equipment is fused.

If electrical equipment is properly used and equipment with problems is not used, there is a fatal risk of violating this operation.

When lifting the vehicle, ensure that the wires of electrical tools are not cut off or damaged. Ensure the electrician is trained in first aid.

If shocked:

- Turn off the power before touching the victim.
- If the power cannot be switched off, use dry non-conductive material to push or drag the victim away from the power supply.
- Perform CPR immediately.
- Seek medical assistance.

## Engine oil

[Reference: Lubricating oil and grease.](#)

## Exhaust

Exhaust gases include toxic and harmful, asphyxiating chemicals such as carbon monoxide, nitric oxide, acetaldehyde, aromatic hydrocarbons and lead-containing gases. The engine must be started after rule out exhaust or in a ventilated area.

## Gasoline engine

Gasoline engine will not have signs before toxic and harmful exhaust gas is generated. Their hazards may be immediate or latent.

## Soundproofing

[Reference: Dust.](#)

Soundproofing is used to isolate sound and noise. Cellulose and chips cause skin irritation. This is usually a physical effect rather than a chemical reaction. Work practice guidelines and gloves must be prepared to avoid prolonged contact with the skin.

## Fire protection

[Reference: Welding, Foam and Legal Matters.](#)

Many substances related to vehicle maintenance are flammable substances. Some of them release toxic or harmful gases after burning. Pay strict attention to fire safety when storing and using flammable substances or solvents, especially when welding or being close to electrical equipment. Before using welding or heating equipment, ensure that there is no flammable material around and place fire extinguishers nearby.

## First aid

The workshop must be equipped with first aid trained personnel in addition to meeting legal requirements.

Any substance must be rinsed with clean water for at least 10 minutes after splashing into the eye.

Clean the skin with water and soap after it is contaminated with chemicals. Flush with cold water to cool down immediately after being burned by some substances. If smoke is inhaled, immediately turn to a place with fresh air. If it still does not work, please send it to the hospital immediately.

If you accidentally drink some liquids, please see the doctor immediately and tell the name and composition of the liquids. Do not attempt to vomit unless otherwise specified on the label.

## Foam - Polyurethane

[Reference: Fire protection.](#)

### 1.1.1 -7

### General

### 1.1.1 -7

Foam is used to isolate sound and noise. Foam is also present in the seats and spring struts.

Operate in strict accordance with the manufacturer's instructions. Unreacted ingredients are irritating and can damage skin and eyes. Wear gloves and protective glasses.

Persons with chronic respiratory system disease, asthma, bronchitis trachea or history of allergy are not allowed to work at or near unvulcanized materials. Some ingredients, vapors or sprays are irritating and may be toxic.

Never breathe vapor and spray. Use these substances in a well-ventilated place and take measures to protect respiratory system. After spraying, do not immediately remove the mask until the mist is completely dispersed.

Burning immature components and matured foams produces toxic and harmful gases. Do not smoke, use open flame or electric tools when handling foam. Any heat cutting of the foam must be done in a ventilated area.

## Refrigerant

[Reference: Air conditioning refrigerant.](#)

## Fuel

[Reference: Fire protection, chemical solvents and legal matters.](#)

Avoid skin contact with fuel as much as possible. If not, clean with water and soap.

## Gasoline

Flammable substances - No smoking must be observed.

Accidentally swallowing gasoline will stimulate mouth and throat, and will cause sleepiness and confusion if absorbed by stomach. A small amount of petrol can also kill children. Inhaled liquid can cause serious injury when reaching the lungs. Long-term gasoline exposure can dry and irritate the skin. Gasoline entering into the eye may cause blindness. Gasoline contains a large amount of benzene, and inhalation of benzene can cause poisoning. The gasoline concentration must be very low, and the high concentration can stimulate the eyes, nose and throat, vomit, dizziness, chest distress shortness of breath and even make the person unconscious.

Gasoline shall be transported or used where air is circulated. Care must be taken to avoid operating in closed areas.

There must be a special preventive measure for cleaning and maintenance of the gasoline depot. Gasoline cannot be used as cleaning agent or siphon with the mouth.

## Kerosene(Paraffin)

Kerosene is also used as heating fuel, solvent and detergent.

Kerosene is a flammable substance - smoking prohibition must be observed.

Accidentally swallowing kerosene will stimulate mouth and throat. Long-term contact with such substances will dry and irritate the skin. For example, splashing into the eyes will cause slight irritation. In general, a small amount of volatilization does not produce harmful vapor. Volatilization due to high temperature should be avoided (acid mist can occur during dewaxing). Avoid contact with skin and eyes as much as possible and ensure airflow.

## High-pressure gas cylinder

[Reference: Fire protection.](#)

High-pressure gas cylinders usually contain oxygen, acetylene, argon and propane at 138 bar. Special care should be taken when handling such high-pressure cylinders to avoid mechanical damage to the high-pressure cylinders or the high-pressure cylinder switchgear. The gas in each high-pressure gas cylinder shall be clearly marked out.

High-pressure gas cylinders shall be stored in a well-ventilated place and shall be protected from rain, snow or direct sunlight. Acetylene and propane cylinders should not be placed near oxygen cylinders.

Strictly avoid leakage of high-pressure gas cylinder and avoid fire source.

## Gas

[Reference: High-pressure gas cylinder.](#)

## Universal service tools/equipment

All tools and equipment shall be kept in good

condition, and correct safety equipment shall be used if necessary.

Do not use service tools/equipment beyond its design scope. Maintenance equipment such as hoist and jack cannot be overloaded. Damage to the equipment due to overload is generally less obvious, but may be fatal when you next use the equipment.

Do not use damaged or faulty tools/equipment, especially high-speed running equipment such as grinding wheel. Damaged grinding wheels can break without any warning and cause serious injury.

Wear protective glasses when using grinding wheels, chisels or sandblasting equipment. Wear a suitable mask when using sandblasting or spraying equipment. And confirm to operate in a well-ventilated place to prevent dust, acid mist and smoke.

## High-pressure air, lubricating oil and fluid test equipment

[Reference: Lubricating oil and grease.](#)

High-voltage equipment, especially joints, shall be inspected regularly and kept in good condition.

It is forbidden to direct the high-pressure nozzle, such as diesel filler, to human skin, because oil can penetrate human subcutaneous tissue and cause serious disease.

## Legal Affairs

The use and handling of materials in the workshop must comply with legal provisions on safety and health.

In order to create a safe working environment and avoid environmental pollution, workshop personnel must be familiar with the national legal provisions on safety and health.

## Lubricating oil and grease

Prolonged exposure to mineral oil should be avoided. All lubricants and greases are irritating to eyes and skin.

### 1. Waste engine oil

Prolonged exposure to mineral oil will dry the

skin, irritate the person and develop dermatitis. In addition, skin cancer can occur if mineral oil containing toxic and harmful substances is used. Proper skin protection and cleaning equipment must be provided.

Do not use spent engine oil as lubricating oil or in any equipment that may come into contact with the skin.

### 2. Health protection:

- Avoid long contact with oil, especially engine oil.
- Wear protective clothing including gloves.
- Do not put greasy cloth in your pocket.
- Avoid oil contamination of clothing.
- Do not wear greasy clothes and shoes. protective suit should be cleaned regularly.
- In case of accidental injury, first aid shall be provided immediately.
- Use protective cream to protect your hands before working.
- Clean the grease with soap and water. Do not use gasoline, diesel, kerosene, diluent and solvent to clean the skin.
- If skin is abnormal, please see a doctor immediately.
- If possible, please degrease the oil first.
- If oil can cause eye injury, wear goggles.

### 3. Environmental protection

The spent engine oil can only be burned in the approved place. If the location is uncertain, please confirm with the local authority.

Waste engine oil must be disposed of at a designated location by an approved waste contractor or recycler. If in doubt, consult your local authority.

It is illegal to directly dump waste engine oil on the ground, sewer, drain or water source.

## Noise

Some operations produce high decibel noise, which may damage the hearing. Wear ear protectors at this time.

## Sound insulation material

[Reference: Foam, insulation fiber.](#)

## Coating

Reference: [Oil and chemical substances.](#)

Paint is a flammable substance, and smoking is prohibited.

### 1. Single component

It may contain some toxic and harmful pigments, desiccants and other solvents. Spray only in well-ventilated places.

### 2. Multicomponent

It may contain some toxic and harmful unreacted resins and resin curing agents. The manufacturer's instructions must be followed,

Reference: [Resin adhesive.](#)

Painting must be done in a well-ventilated place away from the crowd. The operator shall wear protective mask.

## Pressurization equipment

Reference: [High pressure gas, lubricating oil and fluid test equipment.](#)

## Solder

Solder is a mixture of many metals with a lower melting point than the metals (usually lead and tin). There is usually no toxic lead gas generated during welding. Oxygen-containing acetylene flames cannot be used because they can produce lead-containing smoke at very high temperatures.

Some smoke may be generated when the flame is sprayed onto the grease-bearing surface. Avoid inhalation. Care must be taken to remove excess solder and ensure that no fine lead dust is produced. If inhaling lead dust, it will be harmful to human body. Gas mask must be worn. Solder leaks and filings must be uniformly collected and disposed of quickly to prevent air contamination by lead. Lead ingestion or dust ingestion of solder shall be avoided.

## Solvent

Reference: [Chemicals, Fuel and Fire Protection.](#)

Common solvents include acetone, petroleum solvent oil, toluene, xylene and chloroform. Use clean and dewaxing substances, paints, plastics,

resins and diluents. Some substances are flammable. Prolonged contact with such substances will dry the skin with irritation. Some toxic and harmful substances will be absorbed through the skin.

If accidentally splashed into the eye, there will be strong irritation and even blindness. High-concentration solvent exposure to steam or smoke generated in the air can irritate the eyes and throat, causing dizziness and headache. Severe can cause loss of consciousness.

Excessive exposure of low-concentration solvents to the air for a long time will produce vapors and fumes. As there is no obvious symptom, it will often cause more serious toxicity.

Avoid splashing such substances on people's eyes, skin and clothes. Wear protective work clothes, protective gloves and protective glasses.

When using such substances, ensure that the site is well ventilated, that smoke, vapor and spray are avoided as much as possible, and that the container is sealed.

Do not use in narrow spaces.

When spraying materials with solvents such as paint and adhesive, it shall be ensured that the site is well ventilated and gas mask shall be used when the air circulation is not smooth.

Heating or burning may only be carried out under the special guidance of the manufacturer.

## Suspension load

 [Warning: Temporary piecing of lifting equipment is forbidden.](#)

Heavy objects are dangerous when lifted or suspended. Never work on unsupported, suspended or lifted objects, such as suspended engines.

Ensure that lifting equipment such as jacks, lifters, axle supports and harnesses are in good condition and regularly inspected.

## Underbody seal

Reference: [Anticorrosive substances.](#)

## Welding

Reference: Fireproof, electric shock, high-pressure gas cylinder.

Welding procedures include spot welding, arc welding and gas welding.

### 1. resistance welding

During spot welding, a large number of high-speed melted metal particles will be released. Care must be taken to protect the skin and eyes.

### 2. arc welding

During arc welding, there is a large amount of ultraviolet radiation, which can damage the skin and eyes of the operator and other nearby people. Gas shielded welding is quite dangerous and personal protective suit must be worn and shielded to protect others.

When using arc welding, it is recommended that contact lens wearers resume wearing normal glasses. Arc light will release microwave to dry the contact lens wearer's cornea and lens due to water loss, and even blindness. There will be metal splash when using arc welding, and proper eye and skin protection must be taken.

When the welding core or its protective layer is polluted, the heat of welding arc will make the metal molten pool generate smoke and gas during welding. These gases may be toxic. Avoid inhalation of such gases. The toxic gas in the working area must be rule out, especially when the air is not flowing smoothly or when a large amount of welding is known in advance. In special cases or in narrow areas, the oxygen hood must be worn.

### 3. gas welding(Gas cut)

If oxyacetylene flame is used for welding and cutting, special care shall be taken to avoid leakage of such gas, which may cause combustion and explosion.

Metal splashes may occur when using gas welding. Appropriate measures must be taken to protect skin and eyes. The welding flame is very dazzling and the eyes must be protected. As the ultraviolet radiation generated by gas

welding is less than that by arc welding, protective glasses can be used.

Some toxic gases are generated when using gas welding, but such toxic gases are generated by welding coating, especially cutting damaged parts. Inhalation of such gases shall be avoided.

During brazing, the metal in the brazing electrode will produce toxic gas. If there is cadmium in the brazing electrode, it will be very dangerous. When such a situation occurs, take special care to avoid inhaling toxic gases and seek the help of an expert.

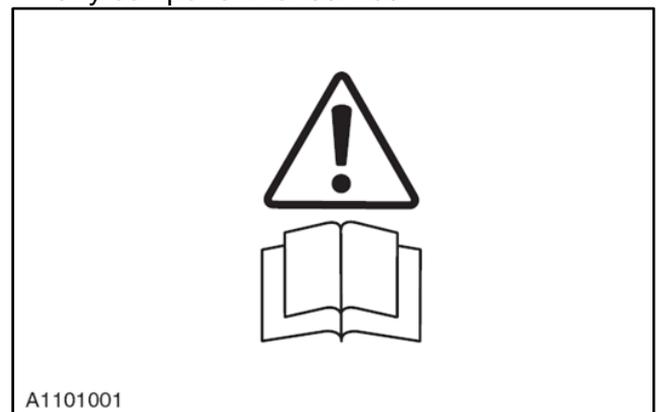
Special precautions shall be taken before welding or cutting in vehicles with flammable substances, such as fuel volatilization or vaporization from the fuel tank.

## Warning signs on the vehicle

Warning signs are visible on various vehicle components. Do not move these signs. The owner or maintenance personnel must pay attention to such warning signs.

The most common warning signs are listed below and annotated.

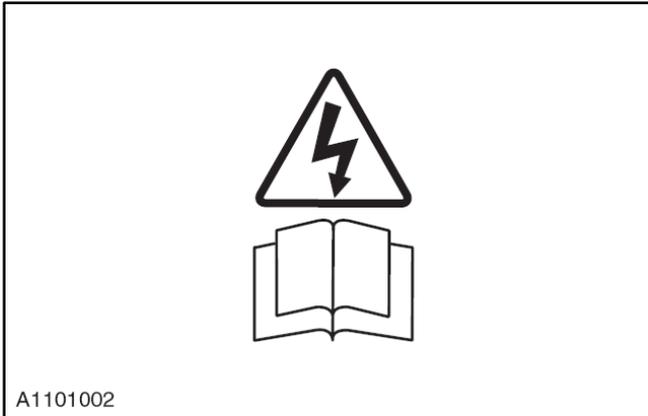
1. Refer to the relevant part of the professional manual when touching or attempting to adjust any component for service.



### 1.1.1 -11

2. Indicates being careful of the internal high voltage. Do not touch while the engine or ignition is running.

Reference: Shock.



3. This logo indicates caution that the component contains corrosive substances.

Reference: Acids and alkali metals.



4. This means that flammable and explosive liquids or vapors nearby are not allowed to use open flames.

Reference: Fire protection.



### General

### 1.1.1 -11

5. This sign (usually connected to the above 4 warning signs) indicates an object that may explode nearby.



6. This sign means that children are not allowed to enter unmanaged places.



### Petroleum solvent oil

Reference: Solvent.

## Standard Workshop Manual

### Vehicles in workshop

When servicing a vehicle in a workshop, ensure that:

- Apply parking brake or fixed wheels to prevent the vehicle from moving back and forth.
- When working in front of the vehicle, remove the ignition key.
- If you want to start the vehicle engine, make sure the site is well ventilated, or use exhaust manifold to rule out exhaust.
- If necessary, there should be enough space to lift the vehicle to replace the tire.
- Fender pads shall be provided for maintenance in the engine compartment.
- Cut off the power supply of the battery before repairing the engine, performing repairs under the vehicle or lifting the vehicle.

**Warning:** When performing arc welding on the vehicle, disconnect the harness of the generator to avoid damaging the generator internals with excessive current.

If welding equipment is used on the vehicle, place a fire extinguisher nearby.

### Towing vehicle

**Warning:** During vehicle towing, the ignition switch of the vehicle turns to "ACC" position. (Turn on the steering lock and start the warning lamp) so that the steering lamp, horn and brake lamp can operate normally, otherwise personal injury may occur.

**Note:** The movable tow hook has a left-hand thread, which must be tightened completely before towing the vehicle. When a towing vehicle is required, use a towing hook. The towing rope must fasten the hook, and the towing rope must be connected to another vehicle to prevent the rope from entangling the vehicle body.

When towing an auto-shift vehicle, the gear must be in position N. The towing speed of the automatic transmission vehicle must not exceed 50 km/h or the trailer distance exceeds 50 km. In the case of a towing vehicle with an excessive distance, the drive wheels must be completely off the ground.

The vehicle can be transported with a low floor trailer or tractor.

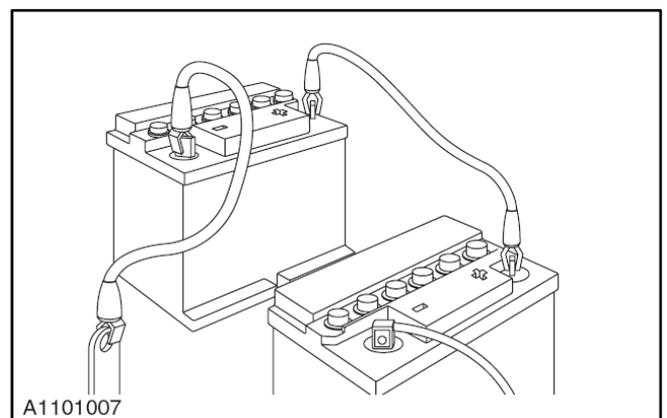
### Connect auxiliary battery with jumper wire

**Warning:** If the auxiliary battery has been charged and treated with gas, apply a plug or cover the vent with wet clothes when connecting the jumper to reduce the explosion hazard caused by arc ignition when connecting the jumper. Personal injury can occur if this procedure is not followed.

**Warning:** Short circuit of current will discharge the battery. If there is discharge phenomenon, live circuit still exists after normal circuit is cut off. When the jumper wire is connected, the battery housing will deform.

**Warning:** When the vehicle cannot be started, jumper start is considered the only feasible method for starting the vehicle. In this case, the battery discharged after startup must be recharged immediately to avoid permanent damage.

- It is necessary to check whether the jumper wire can bear the load, and it is necessary to use heavy-duty conductor.
- The auxiliary battery must be guaranteed to have the same voltage as the vehicle battery. The two batteries must be connected in parallel.
- Before jumping the wiring, the wiring controlled by the switches must be checked for disconnection. This reduces the risk of arcing during final wiring.



**Warning:** When connecting the wire to the battery, it must be checked that the terminals of the jumper are not in contact with each other or grounded through the vehicle body. Fully charged battery, such as short circuit through

jumper wire, can discharge with current above 1000 A and generate strong arc. Rapid heating of jumpers and terminals can even cause the battery to explode. Failure to comply with this rule may result in personal injury.

Jumper wires must be connected in the following order:

- Connect the positive pole of the auxiliary battery first, and then the positive pole of the vehicle battery.
- The negative pole of the auxiliary battery, and then the other end is connected to the grounding terminal at least 300 mm from the battery end of the vehicle, such as the lifting lug of the engine.

Lower the engine speed before disassembling the jumper wire. Before removing the jumper wire from the vehicle with an undercharged battery, turn on the blower or rear stop glass defrosting to reduce the high voltage generated when removing the jumper wire.

Remove the jumper wire in the reverse order of the connection, and do not short the terminal of the jumper wire.

Do not rely on the alternator to restore battery power. If the alternator is used for charging, the engine must operate continuously for more than 8 hours without any other load on the battery.

## Component cleaning

To prevent dirt on the entrance, remove dirt deposits, grease, exploded parts or assemblies before removing the jumper. When reassembling, carefully clean the parts before inspecting and assembling.

Cleaning method:

- Dry cleaning
- Remove accumulated dirt with a soft brush.
- Scrape dirt off with metal sheet or wooden strips.
- Wipe with a cloth.

 **Warning:** Compressed air has high water content sometimes, especially when used in hydraulic system.

- Clean dirt with compressed air. (Wear protective glasses when using this method)

- Clean dry dust with a vacuum cleaner. This method is commonly used to clean the friction plate dust.
- Steam cleaning method.

 **Warning:** Most solvents are harmful to human body and need to be handled carefully. Refer to "Safety Health Prevention" and manufacturer's safety precautions. Failure to do so will result in injury to the human body.

There is a large amount of solvent suitable for component cleaning. Some components such as brake hydraulic component and electrical assembly must be cleaned by special cleaning agent.

Reference: Guidelines for solvents, sealants and adhesives.

## Calibration of important measuring equipment

 **Warning:** Failure to follow the following recommendations may result in personal injury or damage to components.

Some important equipment are quite important, such as torque wrench, multimeter, exhaust gas analyzer and test line, etc. Such equipment must be calibrated regularly according to the manufacturer's instructions.

## Solvent, sealant, adhesive

### Introduction

**Warning:** Be very careful when using all solvents, sealants and adhesives. Certain chemicals or volatile aerosols pose a threat to human health. Strictly follow the manufacturer's instructions and do not use any substances with safety questions.

**Warning:** If you have questions about the suitability of any special solvent or sealant, please contact the manufacturer for storage, handling and application of the substance.

Sub-section "Safety and Health Prevention" describes some commonly used chemicals, dangerous goods, their use methods and corresponding safety measures to be taken.

## Road test or roller test bench test

In many cases, a road test or a roller bench test is required. A detailed description of the pre-test inspection procedure will be detailed below, starting the engine and stopping, pre-drive inspection, in-test inspection and final inspection after completion of the test.

The vehicle may not be subjected to a test drive until all performance tests have been completed. However, optional testing may be performed for those items related to the system being inspected.

**Warning:** If the brake system pressure is low, the brake pedal travel is too large, or the hydraulic system leaks, do not perform road test. Test drive is not allowed until the problem is found and corrected.

It is recommended to perform the pre-inspection test before road test. Perform functional tests on these systems/lines that affect the safe driving of the vehicle (e.g. brakes, lights, steering, etc.):

- Engine oil level.
- Engine coolant level.
- Whether the tire pressure is qualified, whether the type and pattern are applicable, and whether the wear limit is exceeded.
- Is there enough fuel in the tank for a test drive.
- Whether oil (engine oil, hydraulic oil, fuel) and water leak around the engine and transmission and under the vehicle. Note the location of the possible leakage and

wipe the nearby area clean so that the degree of leakage can be easily checked after the test.

## Starting the engine

**Note:** The accelerator pedal shall not exceed half of the stroke when starting the engine in cold state or within 1.5 km time of initial driving. Do not run the engine at high speed or depress the accelerator pedal to the bottom when the vehicle is cold.

## Check when ignition is switched off

- Apply parking brake.
- Whether the shift lever is in neutral position.
- Do all gauge (except fuel gauge) pointers point to zero.

## When turning on the ignition switch, confirm

- Does the ignition switch indicator light come on.
- Does the engine temperature pointer read correctly.
- Does the fuel pointer read the tank level.
- Display the park brake indicator and level indicator.

## Road or roller test bench test check

**Warning:** During road test, check the brake system when the vehicle is running at a relatively slow speed. If the brake runs off or other problems, please find out the problem and adjust it. Do not go on the road until the problem is solved.

- Shift gear smoothly, and there is no abnormal noise or vibration in the transmission.
- The engine output power is normal, the output power is normal, the acceleration is stable, the accelerator pedal is free to operate, and the engine idle speed returns to normal.
- There is no excessive or abnormal smoke emission from the engine during normal driving, heavy load or overspeed driving.
- Steering operation includes whether the power steering is normal, stable, accurate, the steering wheel is too heavy or too light, and direction swing.
- The steering wheel returns automatically

after turning.

- Odometer, oil pressure warning lamp, coolant temperature pointer, tachometer pointer reading is correct or working normally.
- The switch and control system work normally, the warning light (indicator light) works normally and goes out automatically after the steering wheel returns.
- The heating and ventilation system works properly.
- Brake system works normally.

## Brake test

 **Warning:** When detecting the brake, avoid inhaling the smoke released by the hot brake. Smoke may contain asbestos dust harmful to human body.

Avoid detecting brakes on many roads, which may cause inconvenience or danger to others.

 **Warning:** Brake tests, including heavy step braking, should not be performed on new brake shoes/discs or friction pads/discs unless the component is already running in because the new brake friction component cannot be fully effective until it is fully running in.

Depress the brake pedal lightly and heavily, and test the brake under various vehicle speed conditions with normal operation of each gear. Let the vehicle slide, pay attention to the tendency of vehicle deviation, or brake sticking phenomenon.

After the vehicle stops (stop of non-emergency brake), carefully check the brake temperature. If the brake disc is very hot or much more hot than other brake discs, there is brake sticking phenomenon.

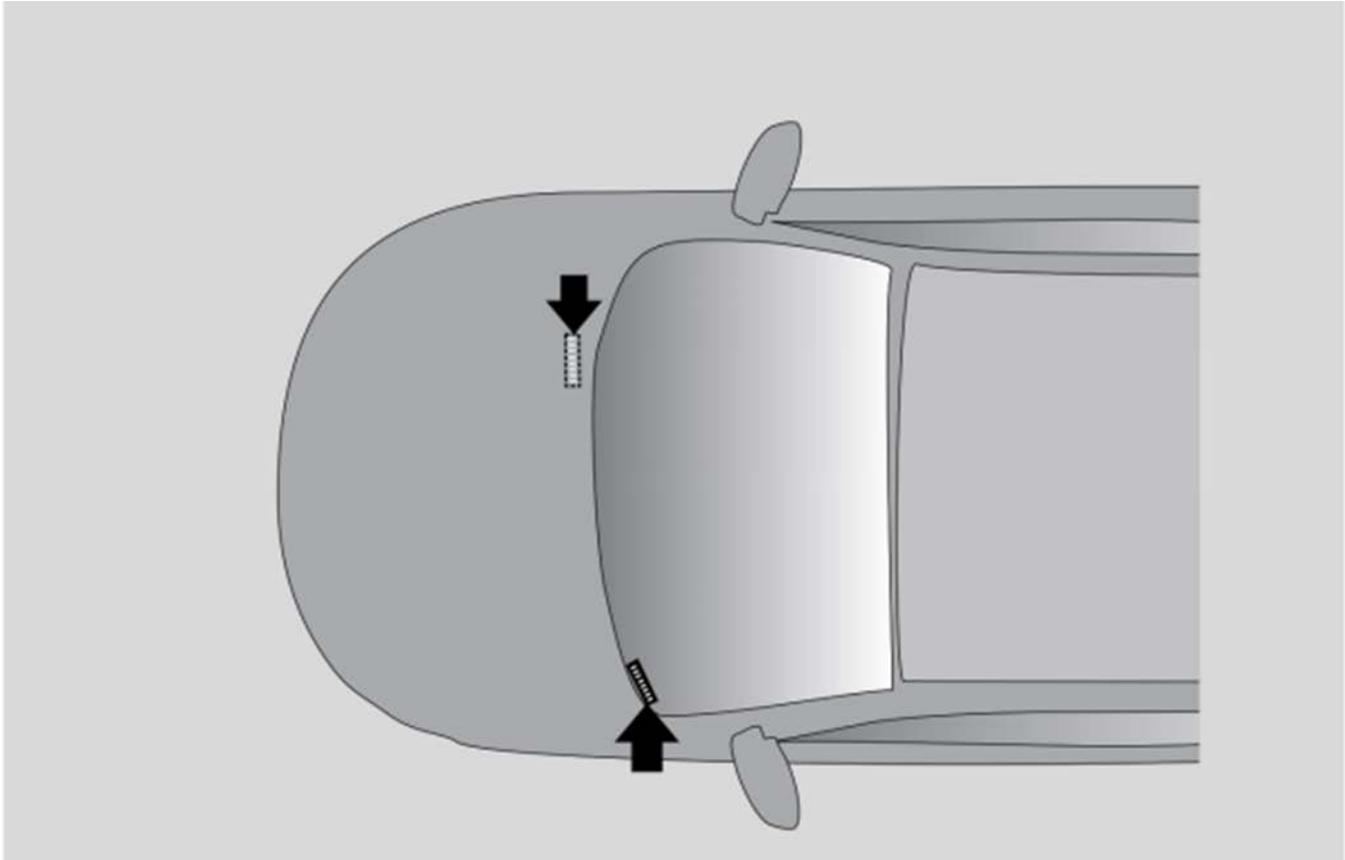
## After completing the test, check

- Whether there is leakage of engine oil, coolant, hydraulic pressure, air and fuel.
- Abnormal high temperatures of any rotating component or assembly, such as wheel hub, transmission, axle, etc., may indicate tight assembly or insufficient lubrication.

## 1.1.2 Identification code

### Description and operation

#### Vehicle identification code(VIN)

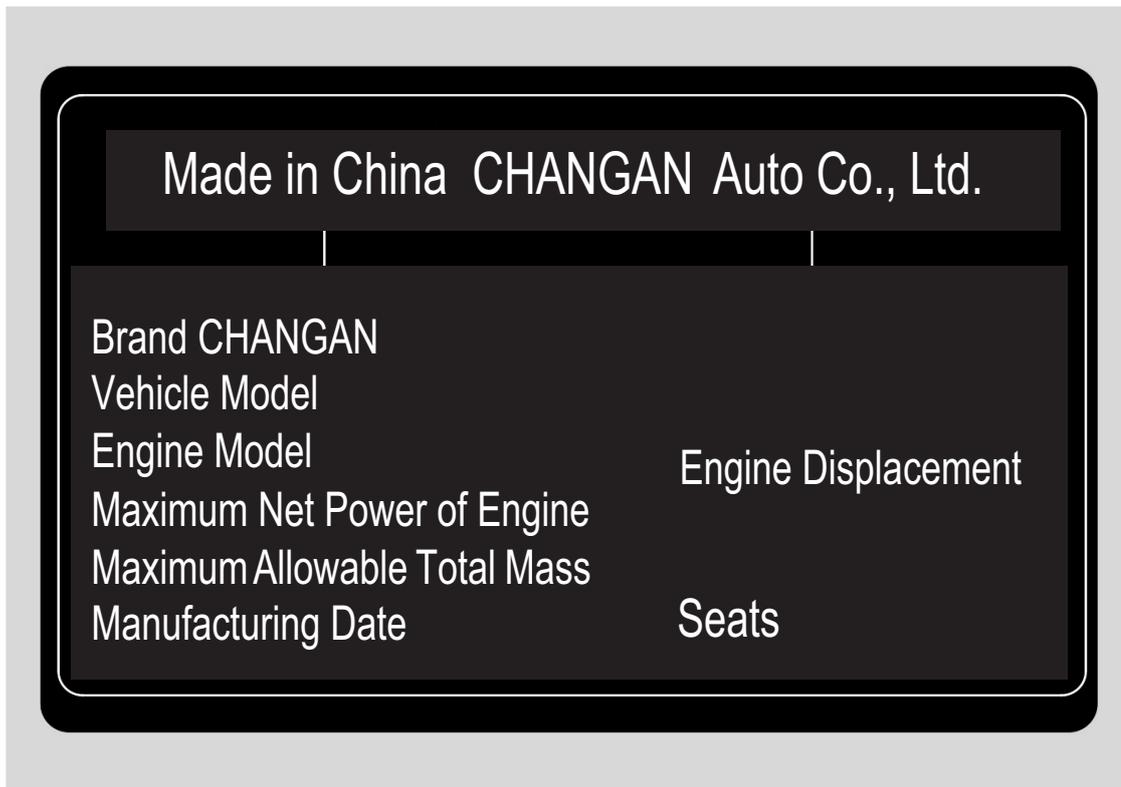


Note: The picture is for position reference only. Please refer to the actual model.

Project	Description	Project	Description
1	Body VIN printing position	2	Sticking position of instrument panel VIN number

### Meaning of VIN code

Project	Description	Project	Description
1 -3	Manufacturer identification code	8	Drive type
4	Vehicle category code	9	Check number
5	Vehicle master parameter code	10	Year code
6	Engine type	11	Manufacturer code
7	Body type	12 - 17	Production No.

**Product label**

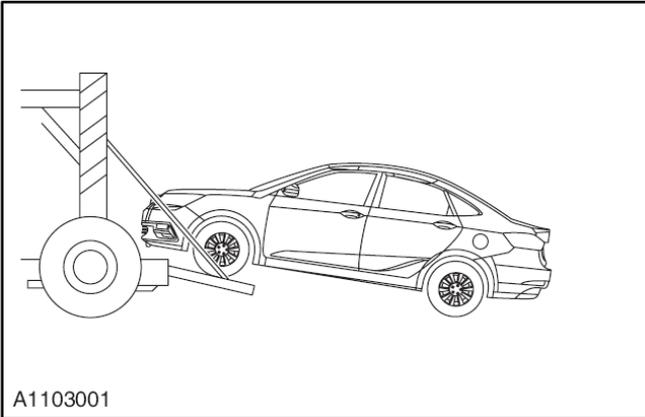
Note: The picture is for position reference only. Please refer to the actual model.

## 1.1.3 Lifting and towing

### Description and operation

#### Towing

**⚠**Note: The model picture in this section is only a schematic diagram of operation. Please refer to the actual model.



For vehicles driven by front wheels, when towing, lift the front wheels to the rear wheels, turn the ignition switch to "ACC" position, and unlock the steering wheel so that the front wheels are in front. The steering wheel is locked by a special locking mechanism and a hazard warning lamp is illuminated.

For four-wheel drive vehicles, a flat trailer is required.

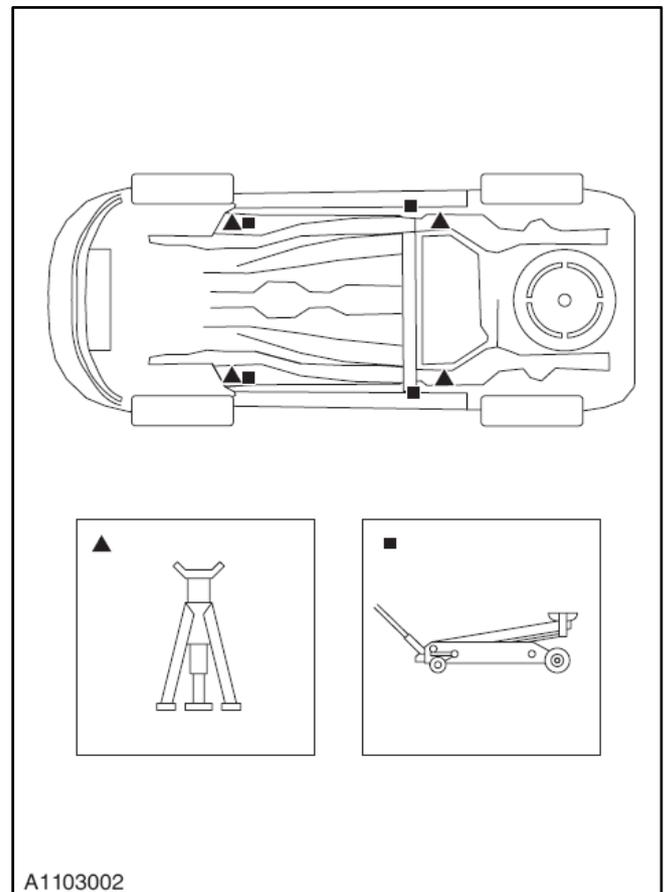
**⚠**Warning: Do not touch the front wheels during towing, otherwise the transmission may be damaged.

**⚠**Note: The trailer distance shall not exceed 80 km, and the trailer speed shall not exceed 50 km/h.

#### Support

**⚠**Warning: Always park the vehicle on a hard flat ground. If you want to jack up the vehicle on soft ground, you must place the load dispersing block under the jack. Always place the stop in the opposite direction of the diagonal wheel position at the jacking point. Failure to follow these instructions may result in personal injury.

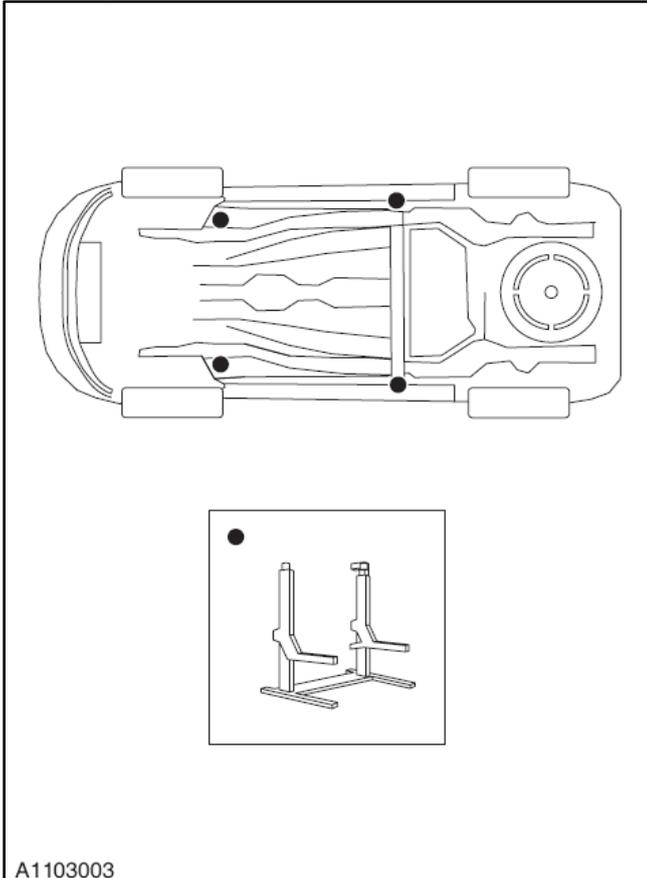
When the vehicle needs to be repaired with a jack, it is essential to fully understand the following instructions. The correct support points must be confirmed, usually in the open area between the front and rear wheels. When using a jack, use a gasket to protect the paint from damage.



## Lifting

 **Warning:** Using the correct lifting position is very important for lifting safety. Otherwise, it may damage the vehicle or cause personal injury.

 **Note:** When lifting the vehicle with a two-pillar lift, the horizontal pad must be used in the lifting position.



## 1.1.4 Maintenance interval

### Description and operation

#### Maintenance items

1. Do not start the engine where it is prohibited to start.
2. When it is necessary to start the engine for maintenance, the parking brake must be fully braked and the shift lever must be in neutral.
3. Do not touch any components of the ignition system after the engine is started.
4. When the engine is running, hands, clothes, tools and other objects shall not contact cooling fan, drive belt and other rotating parts.
5. Do not touch any heat removal parts, such as exhaust manifold, A/C high-pressure pipe, muffler, etc. to avoid burns.
6. Do not make any conductive objects close to the positive and negative poles of the battery to avoid short circuit, resulting in battery damage, fire, explosion and other accidents.
7. Do not discharge any liquid on the vehicle at will, such as gasoline, engine oil, coolant, brake fluid, power steering fluid (if equipped), etc. These liquids pollute the environment.
8. Prevent water from entering the control unit during cleaning and maintenance.
9. For electronic throttle valve faults, do not disassemble it for repair.
10. The fuel system maintains high-pressure gasoline in the fuel circuit even if the engine is not running. Therefore, the replacement of fuel pipe and fuel filter should be carried out in a well-ventilated place.
11. Do not allow the ECU temperature to exceed 80 °C when performing a thermal simulation of a fault or service work that may increase the vehicle temperature.
12. When disconnecting the harness connector of the control module, the ignition switch must be turned to the "OFF" position.
13. Equipment that may cause electromagnetic interference should not be installed near the ECU to avoid interference.
14. When welding the vehicle, disconnect the harness connector of each control module and disconnect all battery connection harnesses.

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**Routine maintenance plan**

Daily maintenance refers to insisting on three inspections, that is, inspecting the fastening of safety mechanism and components before, during and after driving. Keep the engine oil, air filter, fuel filter and battery clean. Prevent four leakage, that is, water leakage, oil leakage, gas leakage and electric leakage.

## 1.1.5 Noise, vibration and irregularity

### Description and operation

This chapter gives a general overview of how noise and vibration are generated and eliminated on the vehicle.

 **Note:** The model picture in this section is only a schematic diagram of operation. Please refer to the actual model.

### Meaning of NVH in Automotive Engineering

N = Noise - Sound, audible.

V = Vibration - vibration, can be felt.

H = Irregularity - jitter, tremble, can be heard and felt.

### Type of noise in vehicle engineering

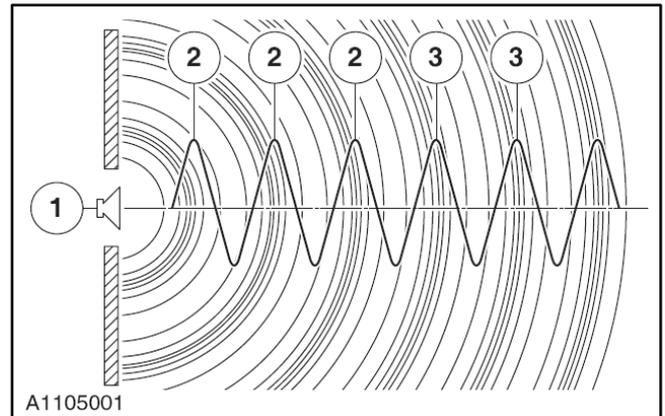
Noise in vehicle engineering is classified according to sound intensity as follows:

- Low Noise - Low rumble, buzzing.
- Medium Noise - Rapid buzzing.
- High Noise - a loud howl, a harsh whistle.
- Loud howling and whistling can stab ears.

Production position of sound of different intensity on vehicle:

- Low-key noise mostly comes from the engine.
- Low-profile noise can also be generated on the road surface, especially on rough road surfaces. This is also a form of low noise, just as the driver feels the vibration of the vehicle.
- High-profile noise (such as howling and sharp whistling) is usually caused by airflow or accessories (such as generator, power steering pump and drive belt).
- Clicking occurs when the vehicle travels on uneven surfaces. These unstable noises are usually caused by shock absorbers, chassis components or interior loose components.

### Sound is transmitted by air



Project	Component name	Description
1	-	Sound source(Such as engine)
2	-	Sound wave
3	-	Amplitude

### Sound travels through the object

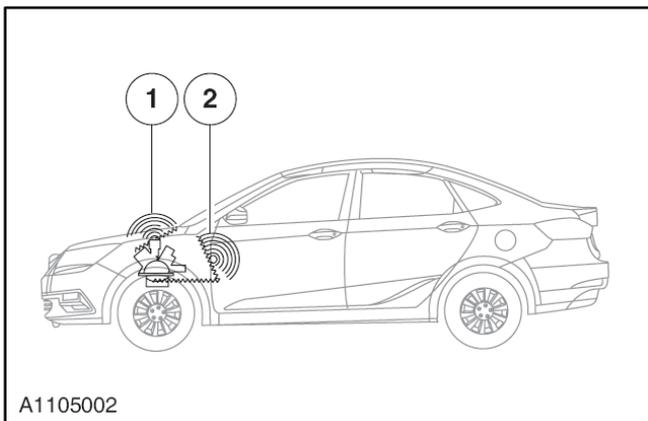
Sound is transmitted through a liquid or solid (e.g. body).

The speed of sound transmission (speed of sound) depends on the material of the object. Generally, the speed of sound transmission in liquid or solid is greater than that in air (about 5 times faster).

### Sound travels through air and objects

**⚠ Note:** Noise transmitted through air and objects is the main concern of automobile engineering.

### Noise propagation in the vehicle



Project	Component name	Description
1	-	Air-borne noise
2	-	Body noise

Examples:

- Noise from the engine.
- Directly through the air.
- It is transmitted from the engine to the vehicle body by vibration and radiated to the driver compartment by sound wave.

### Vibration technology

- No one can hear vibration waves with frequency lower than 20 Hz (low frequency) or frequency higher than 20000 Hz (20 kHz: High frequency).
- The engine is installed flexibly and can vibrate up and down when driving on uneven road surface.
- When the flexible installation fails, the vibration will be transmitted from the engine to the body to the cab.

The following rules apply:

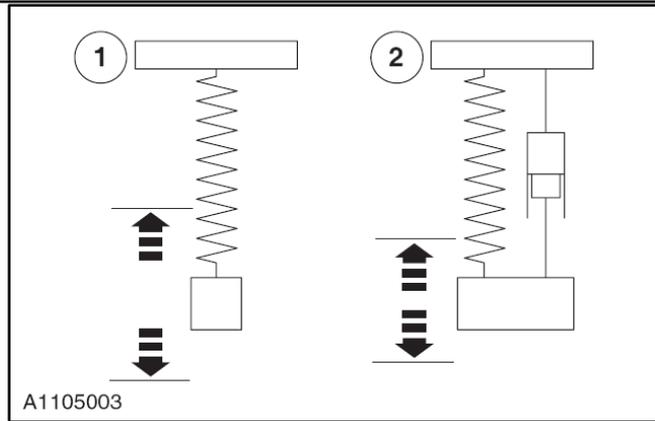
- Automotive technology is concerned not only with low frequency vibration but also with un audible high frequency vibration.
- Low frequency vibration is usually visible.
- High frequency vibration can be heard or felt by the floor and steering wheel.

### Resonance

- Each object has its natural vibration frequency.
- If a system vibrates the object at its natural frequency, it will resonate.
- When the engine reaches resonance frequency, the engine will show uneven operation (engine critical speed).
- Once the engine speed exceeds this speed, it runs smoothly.

### Damping

- If a damper is connected in parallel with the spring, the vibration of the object will be attenuated.
- The vehicle damper is made according to this principle.
- Damping affects the resonance of the object or system.
- The vibration is attenuated by the action of the shock absorber, so as to eliminate the body vibration.
- The vehicle damper is actually a damper, which damps the vibration of the vehicle body.



A1105003

Project	Component name	Description
1	-	Undamped vibration
2	-	Damping vibration

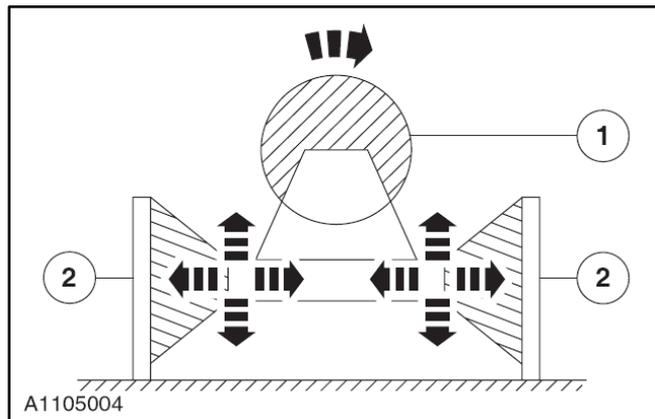
**Sound insulation**

In vibration science, sound insulation means decoupling of components and systems.

Examples:

- The engine is mounted on an elastic support seat to allow as little vibration as possible to pass into the body.
- In automobile engineering, rubber cushion is the closest to sound insulation technology. It acts like a spring.
- The effect of decoupling depends on the structure of the component.

**Directional mounting of rubber gasket for optimum sound insulation**

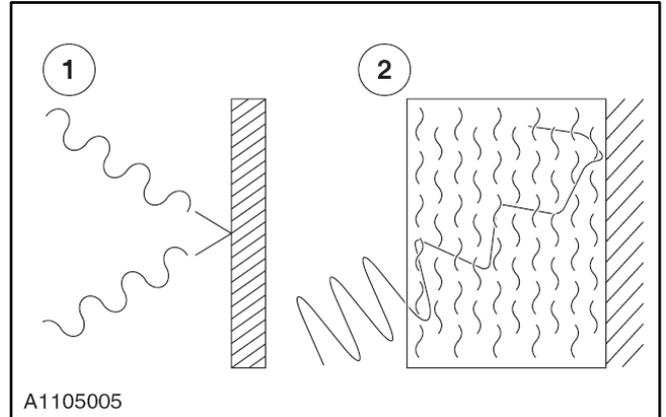


A1105004

Project	Component name	Description
1	Engine	Power unit
2	Engine bracket	Engine installation

**Absorption**

- Sound is reflected against a hard surface.
- If it encounters a soft outer surface, it will be absorbed. Its effect depends on the material and thickness of the absorbed object.



A1105005

Project	Component name	Description
1	-	Reflected wave
2	-	Suction wave

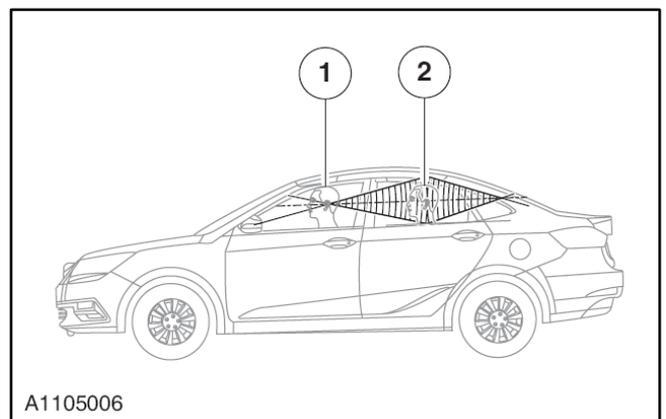
Examples:

- All sound insulation components such as door trim panel, carpet, headliner, luggage rack and seat are related to body quarantine.
- This will directly reflect the sound wave and reduce the occurrence of Hall effect.

**Noise and vibration phenomena on the vehicle**

The noise level varies depending on the location of the passenger on the vehicle.

**Vehicle sound/noise wave(Standing wave)**



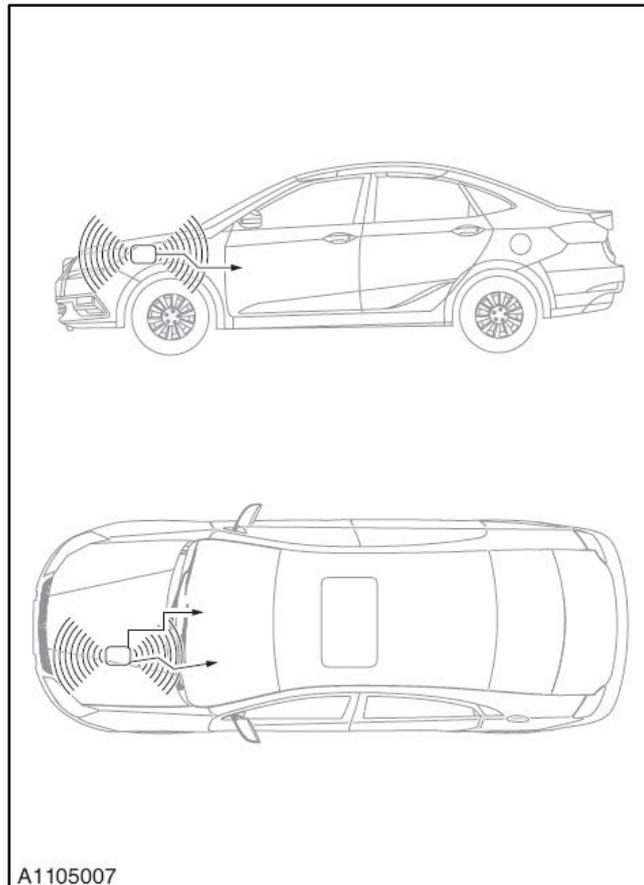
A1105006

Project	Component	Description
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	name	
1	-	Driver in "trough"
2	-	Rear passenger in "wave crest"

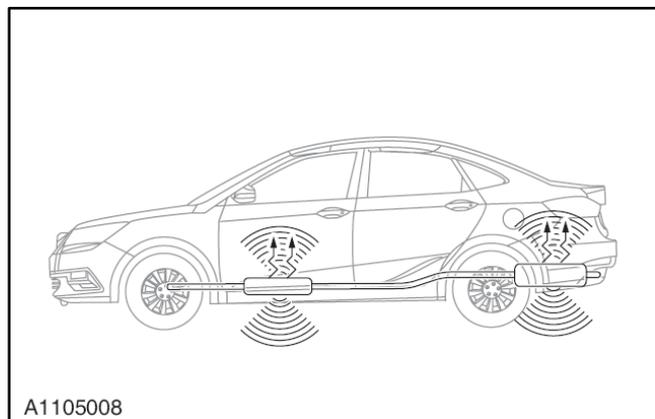
### Noise and vibration caused by intake and exhaust systems

The intake system serves as the vehicle's source of air and solid noise.



A1105007

The exhaust system serves as the vehicle's source of air and solid noise.

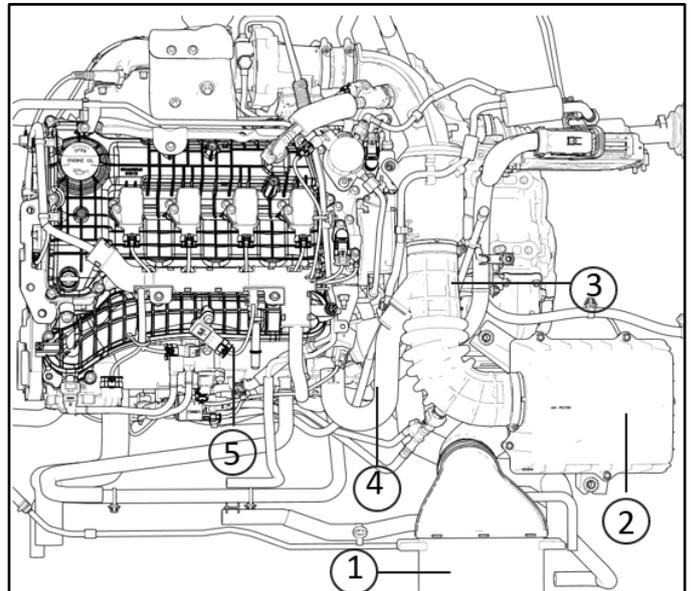


A1105008

Sound propagation path:

- The figure above shows the mode of transmission of the noise generated by the intake and exhaust systems.
- In addition to air noise, solid noise is the main source of noise in the intake and exhaust systems. In order to minimize noise, the sound insulation pads must be installed securely.
- The exhaust system is a typical vibration component. Good sound insulation device is required during installation, and the system layout, direction and connection points with the body shall be selected properly to reduce the transmission of solid noise.

### Intake system



Project	Component name	Description
1	Air filter inlet trachea assy.	-
2	Air filter assembly	-
3	Air filter outlet trachea assy.	-
4	Intercooler inlet trachea assembly	
5	Water-cooled intercooler assembly	

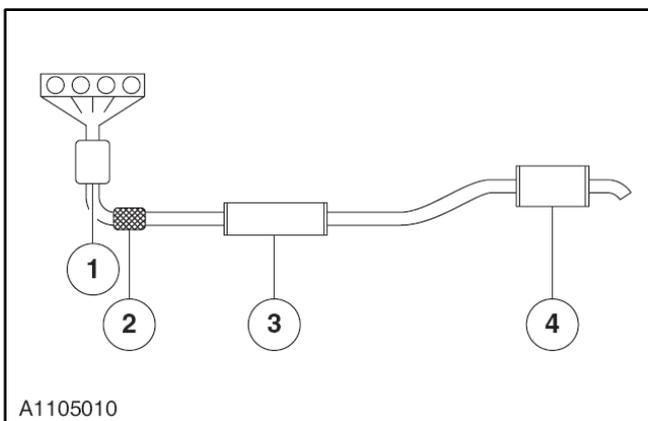
- The length and volume of the intake system are fixed and cannot be changed during service operations. Pay attention to the fastening between the connecting parts during operation, so as not to leak air.
- The surface of the intake system component is subject to great changes in gas pressure, which is most likely to produce strong vibration.

- The effect of temperature, such as heating the air filter, will change its rigidity. (Thus affecting the degree of vibration)
- In order to prevent the solid vibration generated on the surface of the intake system from being transmitted to the body, pay attention to the following points during maintenance operation: A) The whole intake system and the body quarantine are installed on the rubber pad and maintain proper degree of freedom; B) Road trachea cannot be in direct contact with the vehicle body. Foam sound insulation pads must be installed in contact with the vehicle body or other components.

Simple question test:

- The exhaust system removes all suspension gaskets.
- Hang the exhaust system with a rope (maximum two-point suspension).
- Check the noise level of the cockpit during the road test.
- If the noise is eliminated, the exhaust gasket is the source of noise.
- Then conduct a road test every time one gasket is installed back to check the noise level.
- Use this procedure to find the gasket causing the noise.

## Exhaust system



Project	Component name	Description
1	Three-way catalytic converter	Catalytic converter
2	-	Decoupling device
3	Front muffler	Auxiliary muffler
4	Rear muffler	Main muffler

The exhaust system must not be installed too tightly.

**⚠ Note:** The rubber cushion used for suspension of exhaust system can also transmit vibration, and in some cases it is the source of noise. It is therefore necessary to leave an appropriate degree of freedom when installing the exhaust system.

The rubber pads must not be installed too tightly.

The exhaust manifold and catalytic converter (if directly connected to the engine) must be rigidly connected to the engine (no gap should be left at the connection to the bracket).

## Body

### Function

- Vehicle requirements are multifaceted, especially for vehicles in motion. It is emphasized here that other main components causing noise in the vehicle, such as engine and gasket. However, the body is one of the most important components involved in the NVH.
- The components described herein refer specifically to places where vibrations or noises occur according to their functions. The body contains or is associated with all of these components.
- The body produces not only air but also solid noise.
- The body must be able to absorb vibrations from all components and do not propagate them to the interior of the body as far as possible.
- The main parts of NVH in the vehicle body are roof steel plate, side wall and floor. Due to its structure, when vibration or noise propagates, it will be greatly enhanced as a loudspeaker.

### Higher body requirements

- Excellent fall or crash performance.
- Spacious interior.
- Corrosion resistance.
- Light weight.
- Good aerodynamic profile.

Because sometimes these requirements cannot be met at the same time, only one compromise can be taken. For example, to meet the NVH performance, it is necessary to ensure the overall rigidity of the vehicle body as far as possible, and to ensure the good cushioning during collision, it is necessary to ensure the vehicle body has certain flexibility as far as possible. Therefore, only crinkle or bend parts of the vehicle body.

Examples:

The following factors must be taken into account to ensure the watertightness of the body but not the requirements for noise or vibration at the same time:

- Fit window correctly.
- Correctly install sealing strip.

Other points for attention:

- All access to the engine compartment.

- Door and window sealing strip.
- Heater and vent.
- Sunroof drain channel pipe.

Cross parts between side wall and body are often vibration or noisy transmission channels. Possible corrective measures are:

- Block mounting (e.g. A-pillar and side wall) in critical locations for good sound insulation.

 **Note:** Using foam block or filling foam is a good sound insulation method. If there is noise such as wind, tire, engine or road surface, check the foam block in the corresponding part.

- Fit foam blocks in the affected area.
- Fill the appropriate notch or cavity with foam.

## Fault symptom diagnosis and test

### Inspection and confirmation

1. Operate the vehicle to reproduce the condition and confirm the customer's problem.
2. Visually check whether obvious fault cause can be found.
3. If a visual inspection or customer-described problem is found to be obvious, fix it (if possible) before proceeding to the next step.
4. If the problem persists after inspection, identify the symptoms and refer to the symptom table.

### How to use this diagnostic procedure section

Noise, vibration and NVH issues, which become more and more important because the vehicle is more and more sensitive to these vibrations. This section is used to assist in identifying these problems.

This section presents diagnostic procedures based on symptoms. For example, if the condition occurs at high speed, the most likely starting point for diagnosis is "rocking and vibration while driving."

The road test procedure can identify the type of condition and how to identify vibration from shaking.

Road test quick check is used to confirm whether the cause has been found or rule out.

Confirm the condition, review the appropriate sections and perform the correct diagnosis. When the situation has been confirmed, the work is half done.

Perform according to diagnostic procedure.

Quick checks are described in the steps, while other relevant tests and adjustments are listed in the general procedure.

Be sure to perform the steps and make records for future reference of important data.

## Customer Interview

Road testing and customer interviews (if possible) can provide information to identify the problem and provide the correct diagnostic starting point.

## Condition confirmation

NVH usually occurs in four areas:

- Tire
- Engine accessories
- Suspension
- Drive train

It is therefore important to be able to bring the NVH question quarantine to a specific area as soon as possible. The easiest and quickest way to do this is to perform a road test according to the instructions. An approved appropriate NVH diagnostic tester may be used to aid in diagnostic and test procedures.

## Noise diagnosis procedure

### Off-axle noise

The five most common non-axle noises are exhaust, tires, roof frame, trim and transmission.

Therefore, before performing the drive train removal and diagnosis, verify that the following conditions are not the cause of the noise:

- In some cases, the sound of exhaust sounds very much like gear noise. Some may be mistaken for rumbling of wheel bearing.
- Tyres, especially snow tyres, emit a high-pitched rumble similar to gear noise. Radiant tyres also have this feature. At the same time, any non-standard tyre with a unique tread pattern may also rumble.
- The trim panel will also whistle or whine.
- When the automatic transmission is engaged, or when the throttle is applied or released, there may be metal tapping sound. This is due to backlash somewhere in the drive train.

- The rumbling of the bearing sounds like a marble roll. This is usually caused by wheel bearing damage.

## Noise condition

- Gear noise is usually the roar or whine caused by gear damage or improper bearing preload. It occurs at different speeds and driving conditions or may be continuous.
- A typical chuckle sounds like a wooden stick inserted into a rotating bicycle wheel. It occurs when the 64 km/h decelerates and usually continues until the vehicle stops. The frequency varies with vehicle speed.
- Knock sounds like a gibberish, which occurs and becomes louder during acceleration or deceleration. The location of the repair can be found by removing some parts.

## The rattling sound, knocking sound or friction sound may be the following original

### Due to:

- Wear, damage or incorrect installation of wheel bearings, suspension or brake components.
- Before disassembling the transmission for diagnosis and maintenance of gear noise, check and rule out tires, exhaust and trim panels.

## Vibration condition

Vibration on the road may be caused by:

- The front or rear wheels are not balanced.
- Tire is out of circle.

Jitter or vibration during acceleration may be caused by the following reasons:

- Damaged powertrain/drive train mount.
- Constant velocity (CV) joint too high operating angle due to incorrect body height. Check body height, confirm correct spring rate and check items under inoperable conditions.

## Road test

The part driven by the gear produces a certain amount of sound. Certain noises are acceptable and may only be heard at certain speeds or under different driving conditions, e.g. on newly paved asphalt surfaces. A little noise must be considered

normal.

Road testing and customer interviews, if possible, provide the information needed to confirm the condition and provide direction for the correct diagnostic start point.

1. Record the entire diagnostic process. Even the smallest information must be recorded as it may become the most important.
2. Do not touch any part until you have completed the road test and a thorough visual inspection of the vehicle. Keep the tire pressure and the load of the vehicle in the state when it is first discovered. Adjusting the tire pressure, vehicle load or other adjustments may reduce the strength of the condition to a level that cannot be clearly confirmed. It may also cause something to enter the system, preventing correct diagnosis.
3. A visual inspection is considered part of the initial inspection procedure and any seemingly abnormal conditions are noted. Record the tire pressure, but do not adjust them first. Record leaks, loosened nuts and bolts, or traces of possible friction between components to gloss. Check the loading space for unusual loads.
4. Perform a road test and copy the condition several times for confirmation.
5. Perform a road test quick check as soon as the condition reappears. This helps to find the correct diagnostic procedure. Perform more than one quick road test check to confirm correct results. Remember, road test quick checks may not tell you where the problem is, but they can tell you that the problem is not there.

### Road test quick check

1. 24~80 km/h:

Slight acceleration, a whimper is heard, the front baseplate may also feel vibration. It is particularly obvious when the engine speed is specified and the throttle opening is accelerated at the specified speed. It also emits a whimpering sound depending on the component causing the noise. Refer to the sobs in the symptom table.

2. Acceleration/deceleration:

During slow acceleration and deceleration, sometimes the steering wheel/pillar, seat, front floor panel, front door trim panel or front end

sheet metal feel rocking. It is a low frequency vibration (about 9~15 cycles per second). It sometimes increases due to slightly pressing the brake. Refer to Idle rumble/shake/vibration in the symptom table.

3. High speed:

The front floor panel or seat feels an invisible vibration but is accompanied by a sound or rumbling or humming. When the shift lever is in neutral (automatic transmission) and the engine idles downwards. If you still feel vibration, it may be the wheel, tire, front brake disc, wheel hub or front axle. Refer to Shaking and Vibration on Motion in the Symptom Chart.

4. Engine speed sensitivity:

When the engine reaches a certain speed, it will feel vibration. It disappears when coasting in neutral. This vibration is more pronounced when the vehicle is stationary and the engine is operated at the speed of the fault. It may be caused by any component, from the accessory drive belt to the clutch, or the torque converter running with the engine when the vehicle is stopped. Refer to Shaking and Vibration on Motion in the Symptom Chart.

5. Noise and vibration (rattling, snapping or friction) during steering

Sound), which may be caused by:

- Front wheel bearing is worn, damaged or installed incorrectly.
- Damaged powertrain/drive train mount.

### Road condition

All experienced technicians will choose a road test route for NVH diagnosis. The road selected shall be fairly flat and free from undulations (unless special conditions are to be confirmed). A flat asphalt road with different speeds is preferred. Gravel or rough roads are not suitable because of additional road noise. Once the route is established and used, the road noise variable can be removed from the test results.

 **Note:** Some problems only occur on a flat asphalt road.

If a customer complains that noise or vibration occurs on a particular road, it may be caused by the

road surface. If possible, the vehicle can be tested on the same type of road.

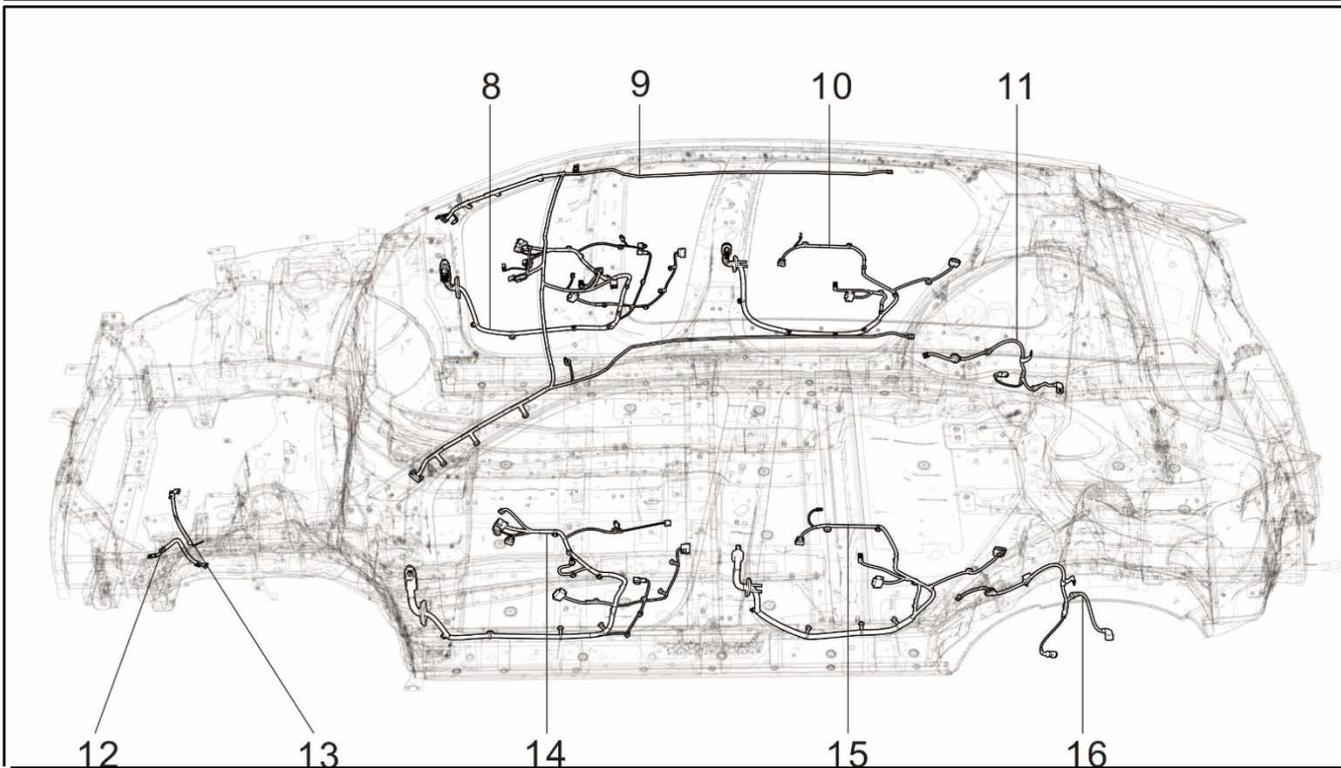
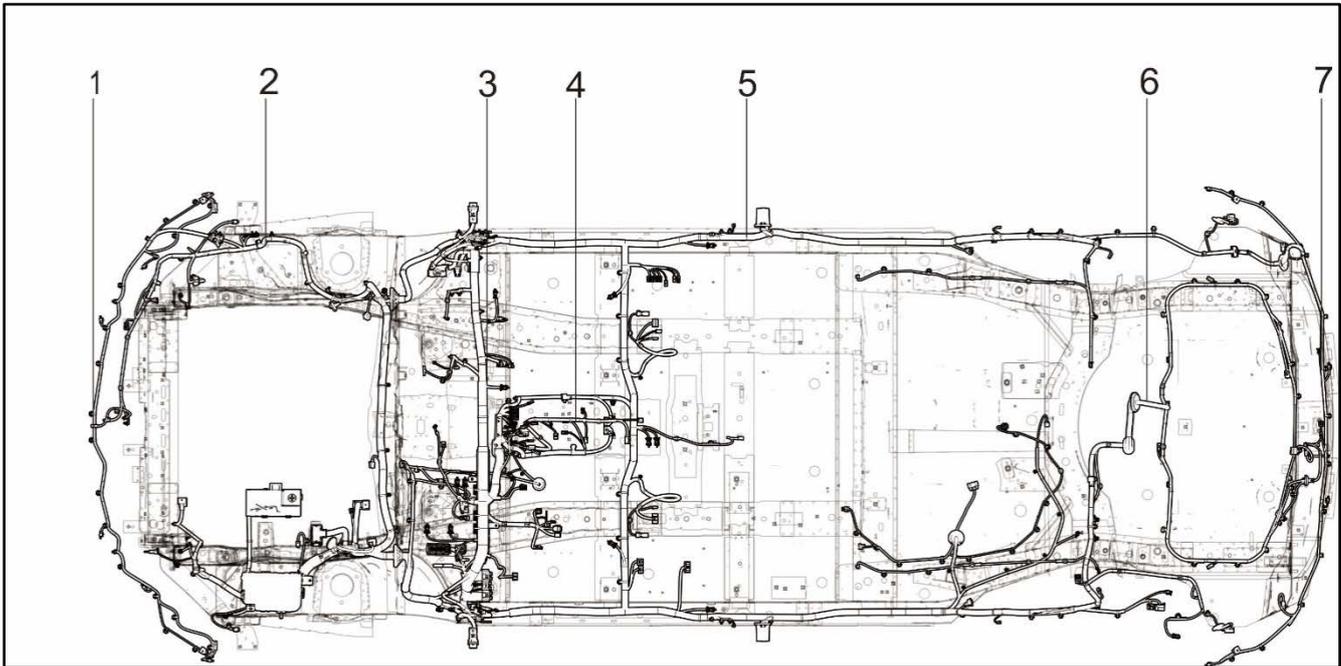
### **Vehicle preparation**

Perform a thorough visual inspection of the vehicle before performing a road test. Record any seemingly abnormal conditions. Do not perform any repairs or adjustments until the road test is complete, unless the vehicle is inoperable or in a condition that may cause injury to the technician.

After confirming the condition, always install all removed parts back.

# 1.1.6 General schematic

## Vehicle harness distribution diagram

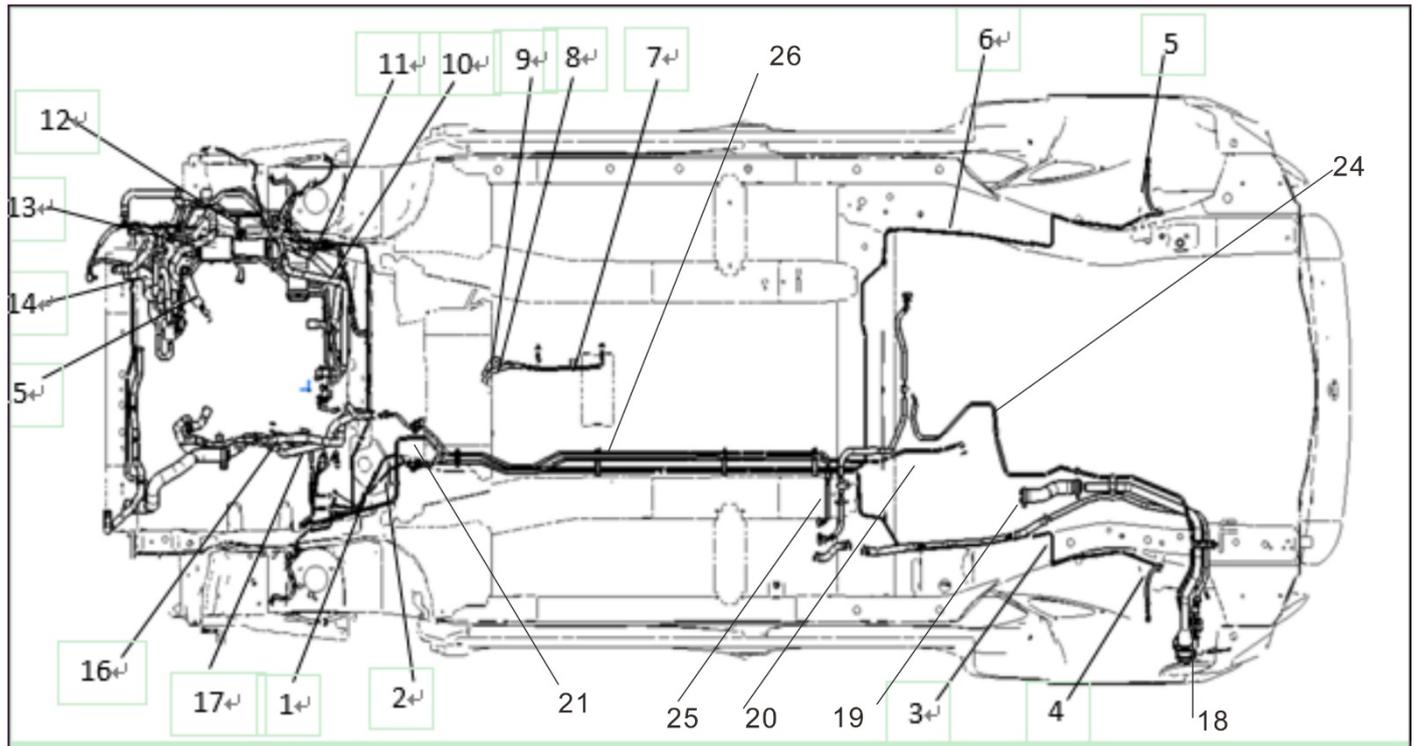


Serial number	Part number	Name	Remarks
1	4000310-CR01	Front bumper electric harness assembly	
2	4000030-CR01	Engine compartment electric harness assembly	
3	4000010-CR01	Instrument panel electric harness assembly	
4	4000260-CR01	Auxiliary instrument panel electric harness assembly	

**1.1.6 -2****General schematic****1.1.6-2**

5	4000020-CR01	Chassis electric harness assembly	
6	4000120-CR01	Tailgate electric harness assembly	
7	4000200-CR01	Rear bumper electric harness assembly	
8	4000060-CR01	Front right door electric harness assembly	
9	4000040-CR01	Roof wire harness assembly	
10	4000080-CR01	Rear right door electric harness assembly	
11	4000340-CR01	Electronic handbrake wire motor harness assembly(Right)	
12	4000190-CR01	Transmission ground wire assembly	
13	4000140-CR01	Battery grounding wire assembly	
14	4000050-CR01	F.L. door electric harness assy.	
15	4000070-CR01	Rear left door electric harness assembly	
16	4000330-CR01	Electronic handbrake wire motor harness assembly(Left)	

## Schematic diagram of complete vehicle pipeline distribution



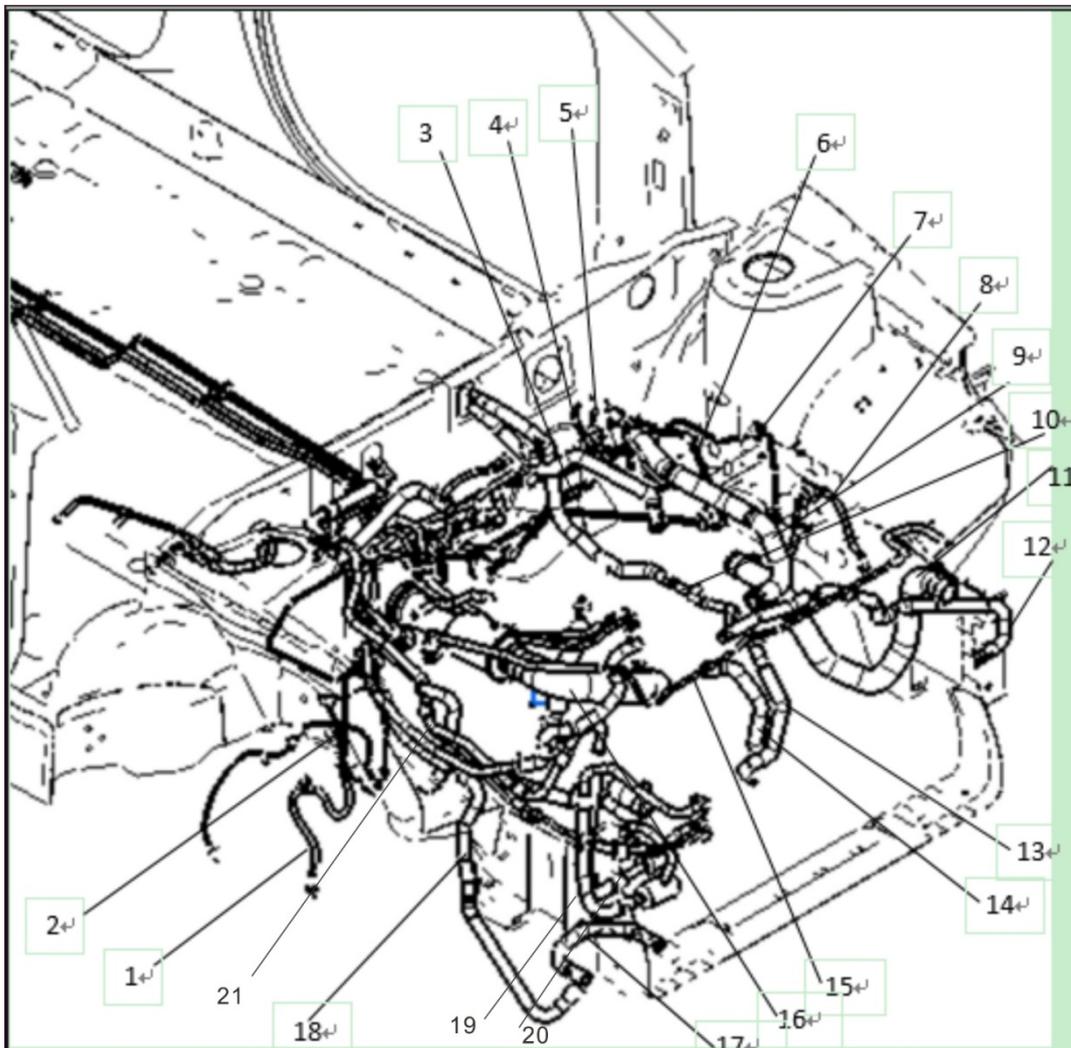
Serial number	Part number	Name	Remarks
1	3506210-CR01	Brake oil pipe assy.(HECU- Rear left brake)	
2	3506220-CR01	Power oil pipe assy.(HECU- Rear right brake)	
3	3506230-CR01	Brake oil pipe assy.(HECU- Rear left brake II)	
4	3506030-CR01	Rear brake hose assembly(Left)	
5	3506040-CR01	Rear brake hose assembly(Right)	
6	3506240-CR01	Brake oil pipe assy.(HECU- Rear right brake II)	
7	1213030-CR01	Differential pressure sensor metal pipe assy.	
8	1213041-CR01	Differential pressure sensor hose I	
9	1213042-CR01	Differential pressure sensor hose II	
10	1301331-CR01	Water cooler inlet pipe	
11	1301341-CR01	Water cooler water outlet pipe	
12	1303051-CR01	Engine overflow trachea	
13	1311021-CR01	Water bottle makeup pipe	
14	1303031-CR01	Radiator water outlet pipe	
15	1014070-CR01	Through trachea assembly	
16	1312011-CR01	HVAC water inlet pipe	

1.1.6 -4

General schematic

1.1.6-4

17	1312021-CR01	HVAC water outlet pipe	
18	1101200-CR02	Filler pipe assy.	
19	1101511-CR01	Fuel tank filling hose	
20	1104040-CR01	Oil supply connecting pipe assy. I	
21	1104050-CR01	Oil supply connecting pipe assy. II	
22	1130411-CR01	Canister atmospheric connecting pipe	
23	1130420-CR01	Canister atmospheric connecting pipe assy. I	
24	1130210-CR01	Canister adsorption connecting pipe assembly	
25	1130320-CR01	Canister desorption connecting pipe assembly	
26	1130340-CR01	Canister desorption connecting pipe assy. II	

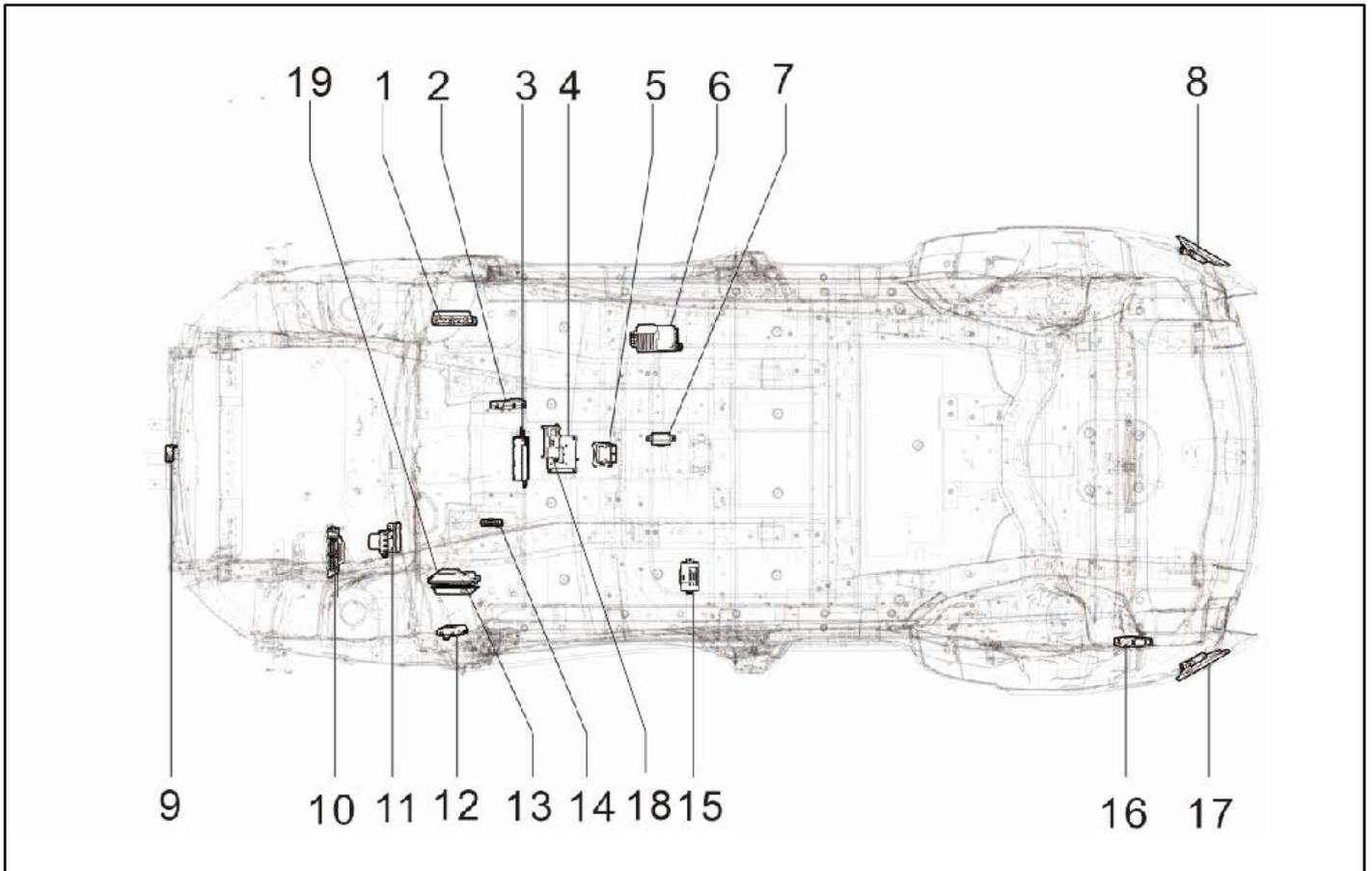


Serial number	Part number	Name	Remarks
1	3506020-CR01	Front brake hose assembly(Right)	
2	3506160-CR01	Brake oil pipe assy.(HECU- Front right brake II)	

**1.1.6 -5****General schematic****1.1.6-5**

3	3506140-CR01	Brake oil pipe assy.(HECU- Front right brake)	
4	3506110-CR01	Brake oil pipe assy.(Master cylinder cavity -HECU)	
5	3506120-CR01	Brake oil pipe assy.(Master cylinder chamber 2 -HECU)	
6	3510010-CR01	Brake vacuum pipe assy.	D20T
7	3506130-CR01	Brake oil pipe assy.(HECU- Front left brake)	
8	3506010-CR01	Front brake hose assembly(Left)	
9	1133022-CR01	Intake relief valve hose	
10	1503320-CR01	Oil heater water inlet pipe assy.	
11	1303031-CR01	Radiator water outlet pipe	
12	1303140-CR01	Low-temperature radiator water outlet pipe assy.	
13	1503321-CR01	Oil heater water inlet pipe	
14	1503331-CR01	Oil heater water outlet pipe	
15	1303090-CR10	Radiator overflow trachea assembly	
16	1119110-CR01	Intercooler inlet trachea assembly	
17	1303061-CR01	Low-temperature radiator inlet pipe	
18	1303430-CR01	Electronic auxiliary water pump water outlet pipe assy.	
19	8111040-CR01	Compressor discharge pipe assembly	
20	8111010-CR01	Compressor suction pipe assembly	
21	8111190-CR01	Evaporator connecting pipe assembly	
22	1104060-CR01	Oil supply connecting pipe assy. III	
23	1130350-CR01	Canister desorption connecting pipe assy. III	
24	1130360-CR01	Canister control valve outlet trachea assembly	

## Distribution diagram of complete vehicle controller



Serial number	Part number	Name	Remarks
1	3621020-CR01	Electronic gear shift actuator controller assembly	
2	6308190-CR02	Back door automatic opening and closing system ECU controller assembly	
3	3658100-MK06-CR01	Airbag controller assembly	
4	8112400-CR01/8112400-CR02	Dual-temperature zone automatic A/C control panel and controller assembly	
5	3603010-CR01	Parallel auxiliary controller assembly(Left)	
6	3604010-CR01	Adaptive cruise control assembly	
7	7917030-CR01	Lane departure controller assembly	
8	3609010-CR01	High-precision map positioning controller	
9	3600140-CR01	Motion domain controller assembly	
10	3600070-CR01	Body intelligent controller assembly	
11	3600050-CR02	Gateway controller assembly	
12	3600060-CR02	Ethernet gateway controller assembly	
13	7917020-CR01	Reversing radar controller assembly	
14	9112704-CR01	Panoramic controller flash application assembly	
15	3602010-CR02	Automatic parking controller assembly	
16	2108010-B01	Powertrain controller assembly	

# Section 2

## Chassis

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