
ENGINE

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2.1 SERVICE INFORMATION

1 How to Use This Manual

(1) General information

This manual includes all necessary procedures for service operations.

These procedures can be divided into following three categories:

- Diagnosis.
- Removal and installation, replacement, disassembly and assembly, inspection and adjustment.
- Inspection.

Following procedures are omitted from this manual. However, they must be performed.

- Use a transmission tray or lifter to perform operations.
- Clean all removed parts.
- Perform a visual check.

WARNING	This indicates that injuries to you or other people may happen.
CAUTION	This indicates that damage to repairing components may happen.
HINT	Provide additional information to help you with service operations.

(2) Service procedure

Illustrations for service procedures are used to identify components, show the assembling relevance of parts, and explain the visual check for parts. Removal and installation procedures are explained in words.

Service procedures include:

- Detailed removal and installation instruction
- Illustration
- Torque specifications
- Specifications

Sometimes, the illustrations of similar models are used. In this case, minor details may be different from actual vehicle.

(3) Diagnosis procedure

Diagnosis procedures are divided as below:

- Diagnostic Trouble Code (DTC)
DTC is an important hint when troubleshooting is difficult to simulate. The malfunction can be diagnosed quickly and accurately by performing specified DTC diagnosis and check.

- Problem Symptoms Table

Malfunction locations can be determined quickly by troubleshooting in accordance with symptom type.

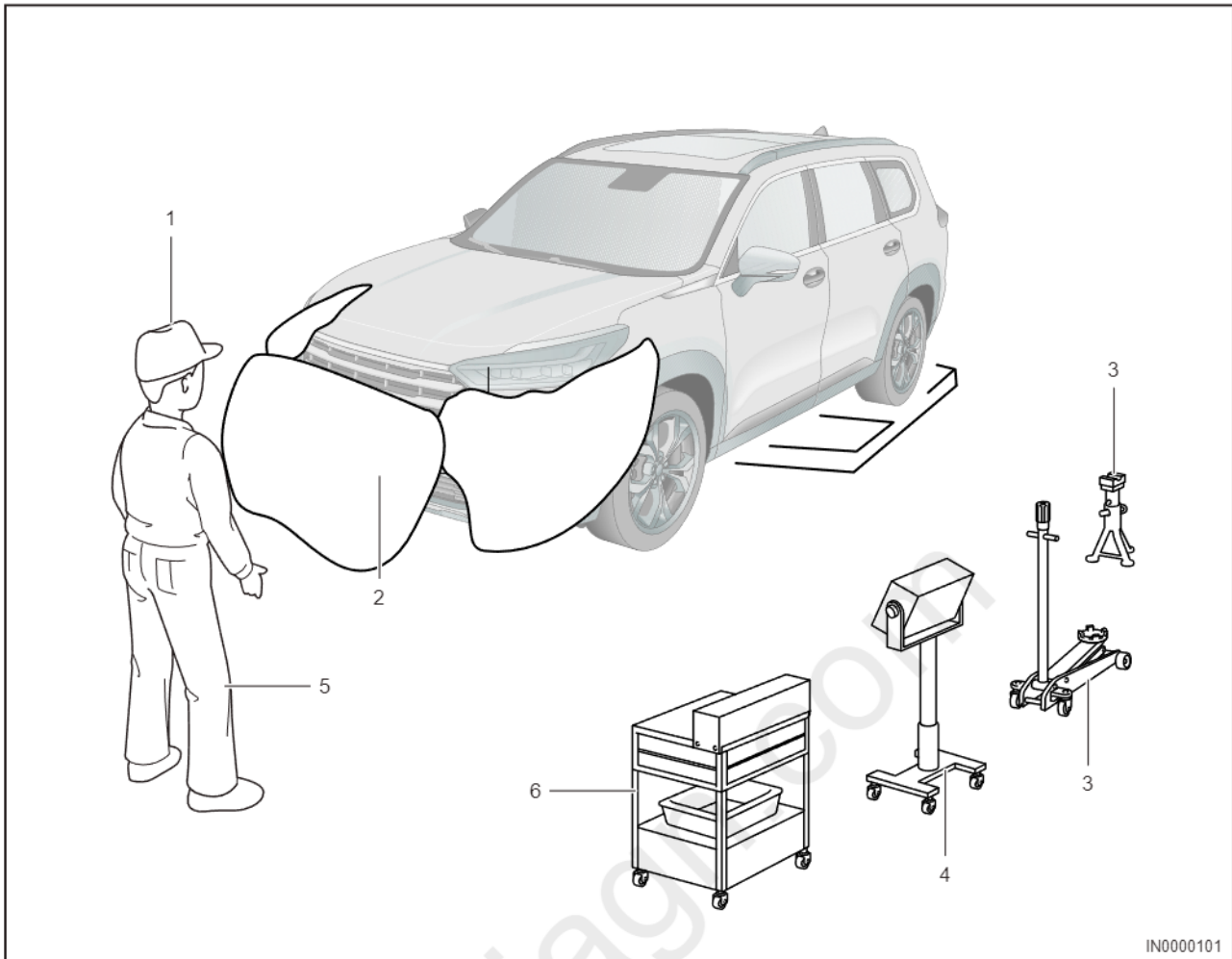
(4) Specifications

This manual categorizes specifications as below:

- Torque specifications
- Clearance specifications
- Capacity specifications

2 Preparation

(1) Preparation for vehicle service



IN0000101

1	Attire	• Always wear a clean uniform. • A hat and safety shoes must be worn.
2	Vehicle Protection	• Before starting work, prepare radiator grille cover, wing cover, seat cover and floor mat.
3	Safety Operation	• When working with two or more persons, be sure to check safety each other. • When working with engine running, make sure to provide ventilation for exhausting gas in the workshop. • When repairing high temperature, high pressure, rotating, moving, or vibrating parts, be sure to wear appropriate safety equipment and take extra care not to injure yourself or others. • When jacking up vehicle, be sure to support specified location with a safety stand. • Use appropriate safety equipment to lift vehicle.
4	Preparation for Tools and Measuring Gauge	• Before starting work, prepare a tool stand, special tools, gauge, oil and replacement parts.

5	Removal and Installation, Disassembly and Assembly Operations	• Diagnose after thoroughly understanding proper service procedures and reported problem. • Before removing parts, inspect general condition of assembly to check for deformation or damage. • Take notes for complicated assembly. For example, record total number of electrical connections, bolts or hoses that are removed. • Add matchmarks to ensure that each component is assembled to its original position. Temporarily mark hoses and their joints if necessary. • Clean and wash removed parts if necessary and assemble them after a thorough inspection.
6	Removed Parts	• Place removed parts in a separate box to avoid mixing them up with new parts or contaminating new parts. • For non-reusable parts (such as gaskets, O-rings, and self-locking nuts), replace them with new ones as instructed in this manual. • Retain removed parts for inspection, if requested by customers.

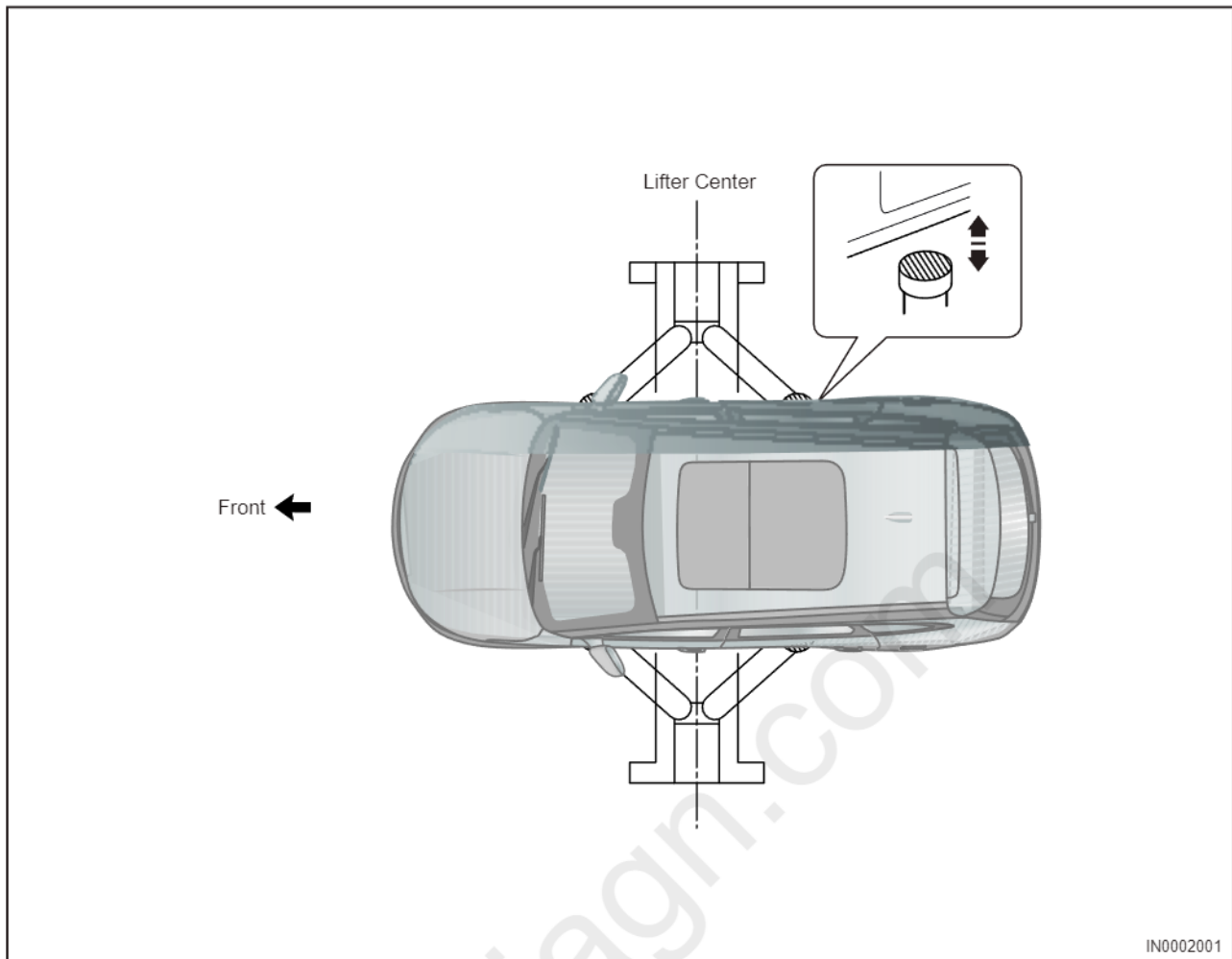
(2) Jacking up and supporting vehicle

Care must be taken when jacking up and supporting vehicle. Be sure to jack up and support vehicle at proper locations.

Sometimes, similar illustrations may be used. In this case, minor details may be different from actual vehicle.

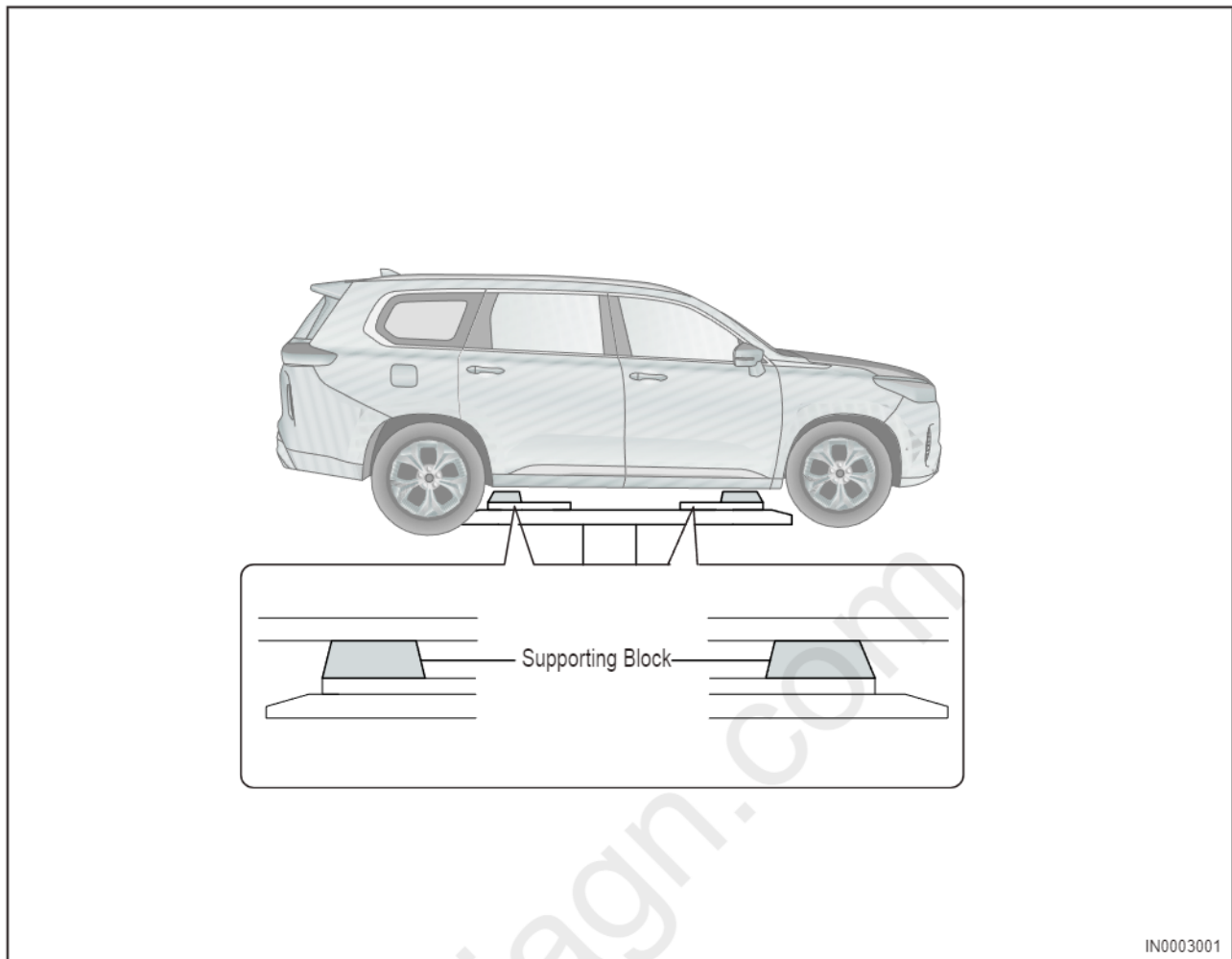
1) Precautions for using a swing arm type lift

- Follow safety procedures described in the instruction manual.
- Keep vehicle stable when using a lift to prevent vehicle from tilting during operation. Stabilize vehicle by adjusting the length of lift arm and vehicle position.



2) Precautions for using a plate type lift

- Follow safety procedures described in the instruction manual.
- Use plate type lift attachments (rubber lifting blocks) on the plate surface.



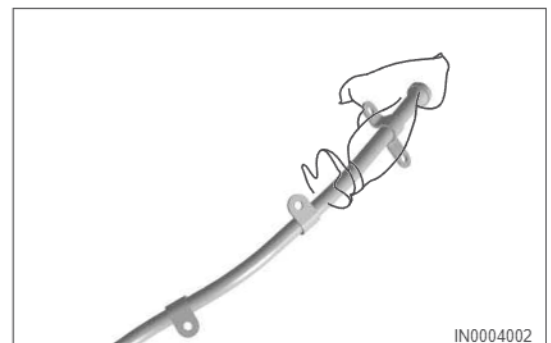
3 Service Operation

(1) How to use fasteners

- Using incorrect fasteners may cause damage to components. Injury and death may occur without observing the instructions below.
- Reference values of fasteners and torque specifications in this service manual use metric unit.
- Recycling all fasteners (nuts, bolts, etc.) during maintenance and service operation is important for assembly.

(2) Remove parts

When repairing malfunction, try to determine the cause. Before starting work, parts or sub-assemblies that have to be removed and replaced should be confirmed first. After removing parts, block all holes and ports to prevent foreign objects from entering.



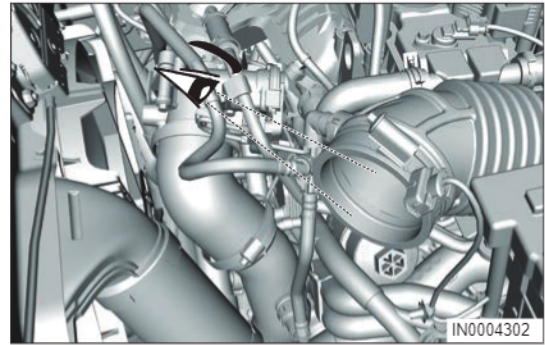
(3) Disassemble components

If disassembly procedures are complicated and multiple parts need to be disassembled, make sure that disassembly methods won't affect the performance or appearance of parts. Identify each part for assembly.

(4) Installation check

2 - INTRODUCTION

After removal, it is necessary to check if there is foreign matter that enters new or used parts when installing new part or resetting used part, preventing unnecessary damage to the vehicle.



(5) Check parts

After removal, check each part for deformation, damage or other problems.

(6) Arrange parts

Carefully arrange all disassembled parts to make assembly easier. Always separately arrange replaced parts and reusable parts, and make marks on them.

(7) Clean parts

Make a thorough and careful cleaning for reusable parts.

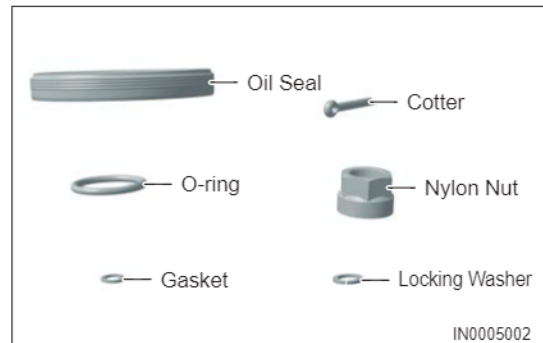
Caution

Blowing out the dirt or other particles with compressed air may hurt your eyes. Be sure to wear goggles during operation.

(8) Assemble components

When assembling parts, always strictly use standard values (-tightening torque and clearance value, etc.). If following parts need to be replaced, replace them with new ones.

- Oil seal
- Gasket
- O-ring
- Lock washer
- Cotter pin
- Nylon nut



(9) Lubrication and seal

Use seal gum and gasket based on position.

If seal gum is applied, install components before the seal gum dries to prevent leakage.

Apply lubricant to the movable area and friction area of components.

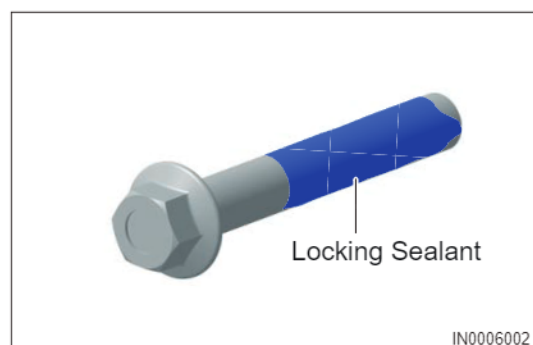
During assembly, apply permitted lubricant or grease to the specified area (such as oil seal).

(10) Adjust

Use proper meter and tester for adjustment.

(11) Pre-coated parts

Pre-coated parts are bolts and nuts that are coated with seal lock adhesive in the factory. If a pre-coated part is retightened, loosened, or moved in any way, be sure to reapply the specified adhesive.



(12) Rubber parts and rubber hoses

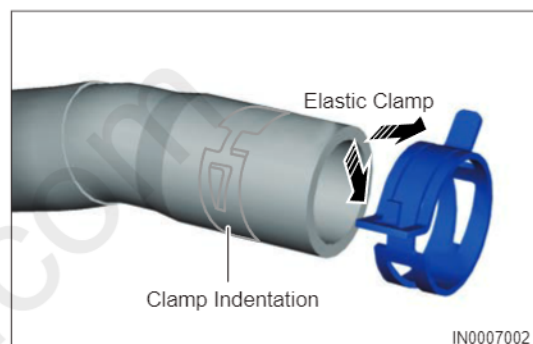
Avoid gasoline or oil dripping on rubber parts or rubber hoses.

(13) Hose clamp

Before removing a hose, observe the position of clamp so as to reinstall it to the same position.

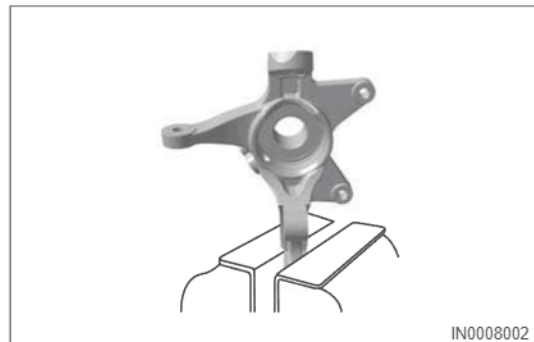
Replace deformed or dented clamps with new ones. When reusing a hose, fix the clamp on the clamp track portion of hose.

For elastic clamp, push tabs in direction of arrow as shown in illustration after installation to widen the tabs slightly.



(14) Vise

When using a vise, install protective plates on jaws of vise to prevent parts from being damaged.



(15) Dynamometer

When testing vehicle on dynamometer, pay attention to the following:

- Place a fan in front of vehicle. It is best to use a fan of which the power changes in proportion to vehicle speed.
- Connect an exhaust gas ventilator.

Caution

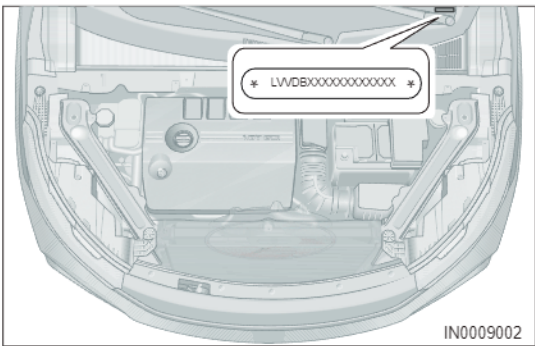
Exhaust gas may cause injury and death. There is odorless, colorless Carbon Oxide (CO) in the exhaust gas. People will faint and get poisoned after inhaling it.

- Cool the exhaust pipe with a fan.
- Keep the area around vehicle clean and tidy.
- Monitor engine coolant thermometer.

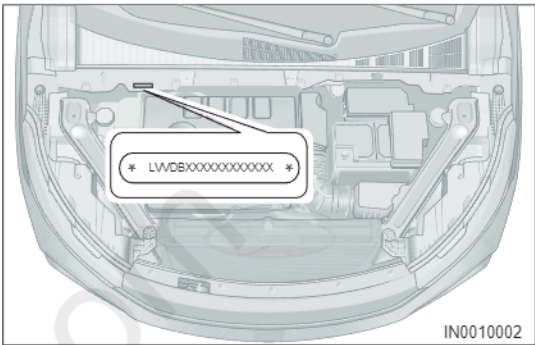
4 VEHICLE INFORMATION

- (1) Vehicle Identification Number (VIN) on actual vehicle

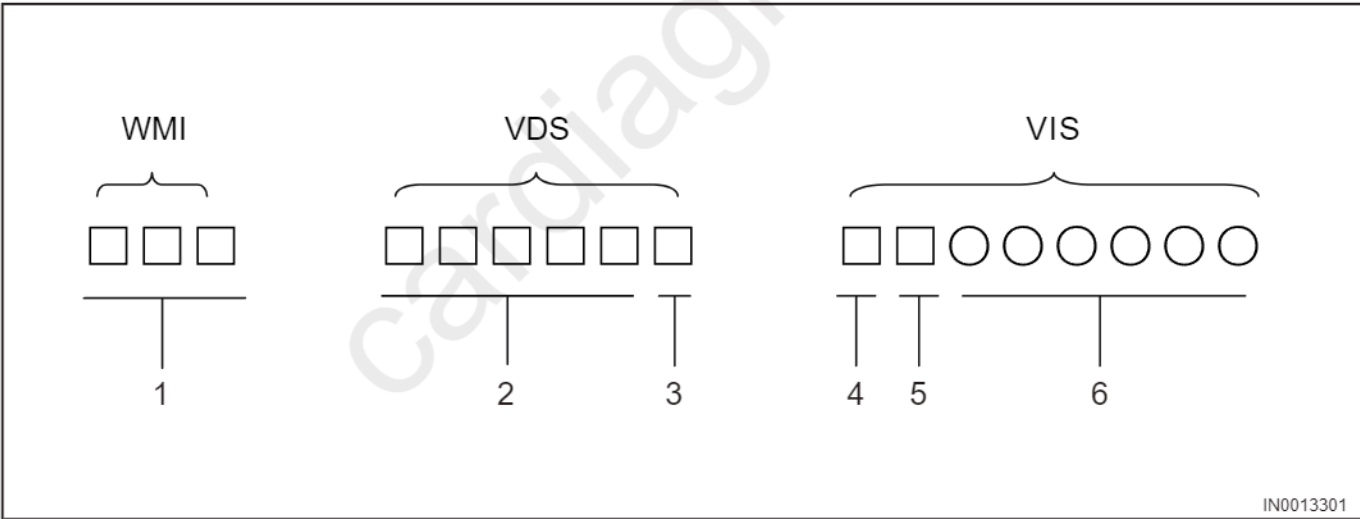
VIN is located on upper left of driver side instrument panel, and can be seen from the outside through the windshield.



VIN is stamped on right of engine compartment drip channel garnish.



(2) Vehicle Identification Number (VIN)
Vehicle Identification Number (VIN) consists of World Manufacturer Identifier (WMI), Vehicle Descriptor Section (VDS) and Vehicle Indicator Section (VIS), with a total of 17-digit characters. Refer to the following details:



□: represents a letter or a number (letters I, O and Q cannot be used); ○: represents a number.

No.	Definition
1	World Manufacturer Identifier
2	Vehicle Features
3	Accuracy Check Digit
4	Model Year
5	Production Plant
6	Sequential Number

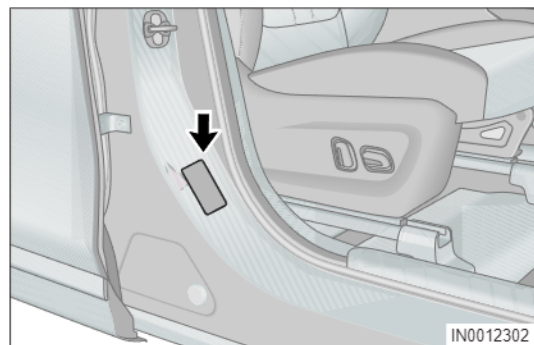
- The first three digits of VIN represent world manufacturer identifier.

No.	WMI Code	Vehicle Category
1	LVV	Category M1 (for vehicle type number started with 7)

- Fourth digit of VIN represents vehicle type.
 - Letter "D" means all vehicles in category M1.
- Fifth digit of VIN represents vehicle body type and drive type.
 - Letter "B" means 5-door 2-box 4 × 2 type.
- Sixth digit of VIN represents transmission type.
 - "1" means manual transmission.
 - "2" means automatic transmission.
- Seventh digit of VIN represents dynamic characteristics.
 - "1" means gasoline engine that is 1.5 - 2.0 L (2.0 L excluded).
- Eighth digit of VIN represents restraint system.
 - "B" means seat belt and airbag.
- Ninth digit of VIN represents check digit.
 - It is used to check the accuracy of VIN record, and made out through computation after confirming the other sixteen digits of VIN.
- Tenth digit of VIN represents model year.
 - "K" represents 2019.
- Eleventh digit of VIN represents assembly plant code.
 - "D" represents Chery Automobile Co., Ltd.
- Last six digits of VIN represent production sequence number.
 - This number means real production serial number of this model.

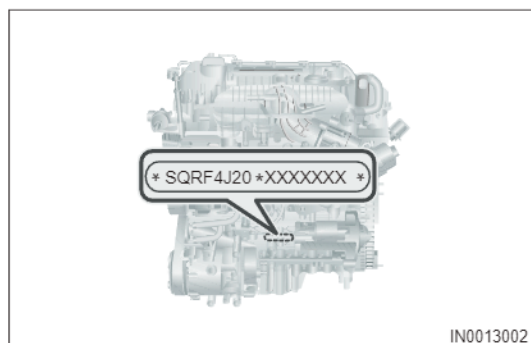
(3) Vehicle data plate

The vehicle data plate is fixed on right quarter outer panel.



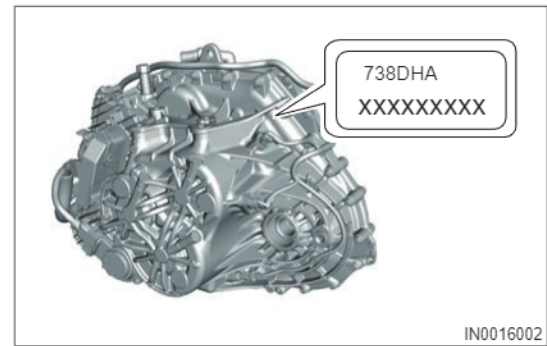
(4) Engine number

Engine number is located on engine block as shown in the illustration.



(5) Transmission number

Transmission number (for 7DCT model) is stamped on front part of transmission case.



5 Symbols

The symbols below are instrument cluster display symbols and some international standard symbols.

					
1	2	3	4	5	6
					
7	8	9	10	11	12
					
13	14	15	16	17	18
					
19	20	21	22	23	24
SPORT	EPC	ECO			
25	26	27	28	29	30

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1	Parking Brake Indicator	16	Rear Fog Indicator
2	EPB Warning Light	17	Position Indicator
3	ABS Warning Light	18	Turn Signal Indicator

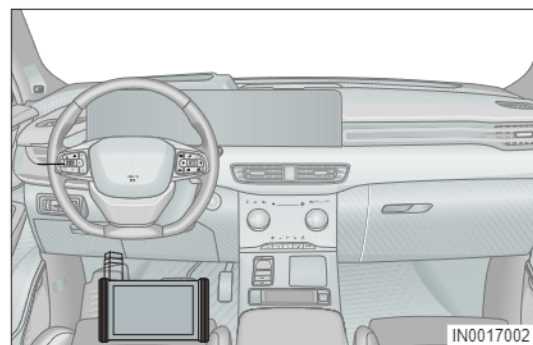
4	Brake System Warning Light	19	Transmission Malfunction Warning Light
5	Engine Oil Pressure Warning Light	20	HDC Indicator
6	Charging System Warning Light	21	Tire Pressure Malfunction Indicator
7	Engine Malfunction Indicator Light	22	Electronic Steering System Warning Light
8	High Coolant Temperature Warning Light	23	Start and Stop System Indicator
9	Low Fuel Level Warning Light	24	Cruise Indicator
10	Driver Seat Belt Reminder Light	25	SPORT Mode Indicator
11	Front Passenger Seat Belt Reminder Light	26	EPC Warning Light
12	SRS Warning Light	27	ECO Mode Indicator
13	Headlight High Beam Indicator	28	ESP OFF Indicator
14	Front Fog Indicator	29	ESP Warning Light
15	Daytime Running Indicator	30	Fatigue Driving Warning Light

6 CIRCUIT DIAGNOSIS INFORMATION

(1) How to Use Tester

Connect tester cable to DLC, turn ignition switch ON and try to use tester. If communication malfunction appears on the display, it indicates that vehicle or tester is defective.

- If communication is normal when the tester is connected to another vehicle, inspect DLC on original vehicle.
- If communication is still not possible when the tester is connected to another vehicle, the tester itself is probably defective.



(2) ECM Control System Troubleshooting

This model uses ECM control system. Most malfunction inspection procedures only involve in checking circuits of ECM control system one by one. An adequate understanding of the system and a basic knowledge of electricity are enough to perform effective troubleshooting, accurate diagnosis and necessary repairs.

(3) Diagnosis and Troubleshooting

1) Diagnosis basis and troubleshooting methods

Procedure Type	Detail	Troubleshooting Method
Diagnosis based on DTCs	Diagnosis based on symptoms (no DTC stored)	Use eliminating method to determine malfunctioning parts in accordance with DTC detection conditions. Inspect relevant parts with tester and eliminate possible malfunctions one by one.
Diagnosis based on symptoms (no DTC stored)	Diagnosis procedure is based on problem symptoms.	Inspect relevant parts with tester and eliminate possible malfunctions one by one.

2) Detailed troubleshooting steps

Step	Description
1	Obtain detailed information when electrical malfunction occurs.
2	Operate affected system, and perform a road test as necessary.
	Confirm malfunction parameter.
	If it is impossible to duplicate malfunction, refer to "Electrical Malfunction Simulation Test".
3	Collect proper diagnosis materials, which includes:
	Circuit Diagram
	System Schematic Diagram
	Relevant Chapter in Service Manual
	Service Bulletin
	Perform diagnosis according to system operation knowledge and customer feedback that we possess.
4	Check if there is any bonding, loose connector or damaged wire harness in the system. Determine related circuits and components, and diagnose according to circuit diagram and wire harness layout diagram.
5	Repair circuit and replace component as necessary.
6	Operate system in all modes. Confirm that system can operate normally in all conditions. Confirm that you have not inadvertently created new malfunctions during your diagnosis or repair steps.

(4) Circuit Simulation Test

Non-regular malfunctions and other malfunctions that cannot be detected through a road test can be detected by circuit simulation test. Possible vehicle malfunction can be determined efficiently by simulating condition/environment when the malfunction occurs.

Simulation test can be classified into following 7 types:

- Vehicle vibration test
- Thermosensitive test
- Freezing test
- Leakage test
- Load test
- Cold/hot start test
- Voltage drop test

Hint:

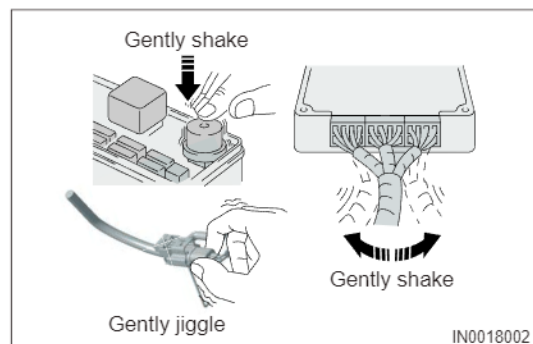
It is extremely important to listen carefully to customer's description about the malfunction for simulating the conditions when symptoms occur.

(5) Vehicle vibration test

When vehicle is running on an uneven road or engine is vibrating (A/C is on and engine is idling), malfunctions may occur. In this case, check conditions related to vibration. Check following areas on vehicle:

1) Connectors and wire harnesses

Determine connectors and wire harnesses that may affect the electrical system being inspected. When monitoring whether the system has malfunctions that are being simulated, vibrate or wiggle each connector and wire harness slightly. This test may show loose or poor electrical connections.

**Hint:**

When a connector is exposed to humid environment, a layer of corrosive film may be formed on its terminals. With connector connected, this condition may not be found by visual check. If an intermittent malfunction occurs, it may be caused by corrosion. It is recommended that terminals of relevant connectors in system should be checked and cleaned after disconnecting the connectors.

2) Sensors and relays

Slightly vibrate sensors and relays in system being checked. The sensors or relays that are loose or poorly installed may be found through this test.

3) Engine compartment

- There are many reasons for electrical malfunction that occurred due to vehicle vibration, and it is necessary to check following conditions:
 - Connectors are not installed correctly.
 - Wire harness is not long enough, so it is extended when engine is vibrating or shaking.
 - Wire harness hangs over brackets or movable components.
 - Ground wire is loose, dirty or corrosive.
 - Wire harness is too close to high temperature components.
- To inspect components under the engine hood, first confirm if ground connection is in perfect condition (refer to the grounding inspection described below). First confirm that system is correctly grounded. Then slightly vibrate the wire harness or components as previously instructed method to check if connection is loose. Refer to the circuit diagram to check continuity of wire harness.

4) Backside of instrument panel

- Improper wire clamping will cause wire harnesses to be entangled when installing accessories. Vibration of vehicle will cause wire harnesses near the bracket or mounting screw to wind excessively.
- When vehicle vibrates, unclamped or loose wire harness will be stuck in seat components (such as slide guide). When wire harness passes through the underside of mounting area, check if it is damaged or stuck.

(6) Thermosensitive test

In hot weather or after vehicle is parked for a short time, some users may worry about the vehicle condition. At this time, it is necessary to perform thermosensitive test. Perform test by heating components with a heat gun or equivalent.

⚠ Caution

- **DO NOT heat components to a temperature higher than 60°C (140°F).**
- **If malfunction occurs when performing heating test for components, replace or properly insulate the components as necessary.**

(7) Freezing test

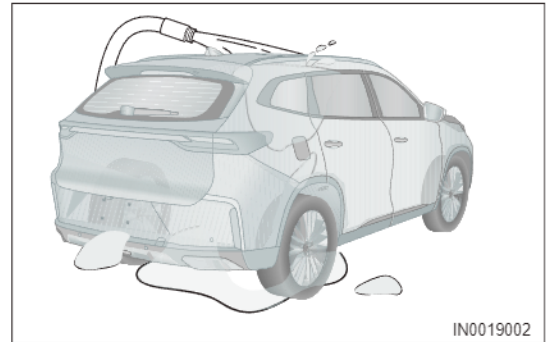
If malfunction disappears after warming up vehicle in winter, it may be caused by freeze of some parts in the wire harness/electrical system. Use following two methods to check this condition:

Method 1: Put vehicle outdoors overnight. Make sure that temperature is low enough to duplicate the malfunction. Perform a quick and thorough diagnosis for component that may be affected in the morning.

Method 2: Put suspected part in refrigerating room and wait until it is frozen. Reinstall the part to vehicle and check if malfunction reoccurs. If malfunction occurs, repair or replace the component.

(8) Leakage test

Malfunction may occur only during high humidity or in rainy or snowy weather. In this case, malfunction may occur due to the water entering electrical parts. Leakage can be checked by spraying water to vehicle (similar to car wash).



(9) Load test

Malfunction occurs only when electrical equipment is turned on. Turn on electrical equipment (A/C, rear window defogger, radio and fog lights, etc.) one by one and determine the relationship between electrical equipment and malfunction. Determine the malfunction by a load test.

(10) Cold/hot start test

Some malfunctions occur in cold start and disappear when engine warms up. In this case, park vehicle without operation for a whole night and restart it the next day. Perform test and determine the cause quickly.

(11) Voltage drop test

Generally, voltage drop test is used to find out the possible causes that affect normal function of electrical components or circuits.

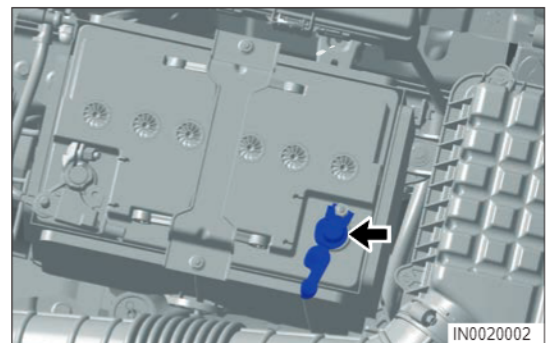
Check circuit with a digital multimeter.

If resistance of single wire harness measured by a digital multimeter is very low ($0\ \Omega$ or close to $0\ \Omega$), the wire harness or circuit is normal.

Unnecessary resistance in circuit may be caused by poor, loose grounding, corrosive switch contact and loose wire harness connector or adapter.

(12) Precautions for Control Module and Electrical Components Inspection

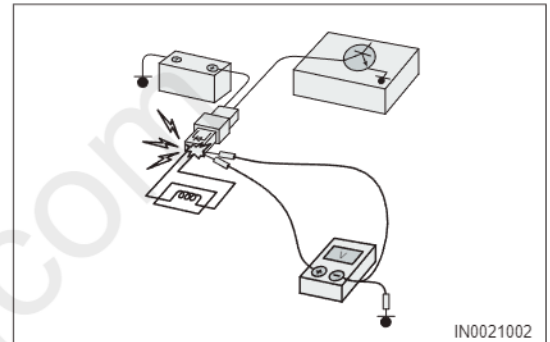
- Before performing electrical operations, turn ignition switch to LOCK and disconnect negative battery cable (- arrow), then wait for 2 minutes until backup power supply of airbag module is depleted (w/ airbag system).



- Disconnecting battery cable will delete the clock, audio and DTC records. Therefore, it is necessary to confirm these records before disconnecting the cable.
- Never connect electrodes of battery terminals reversely.
- Only install components that meet the vehicle specifications.

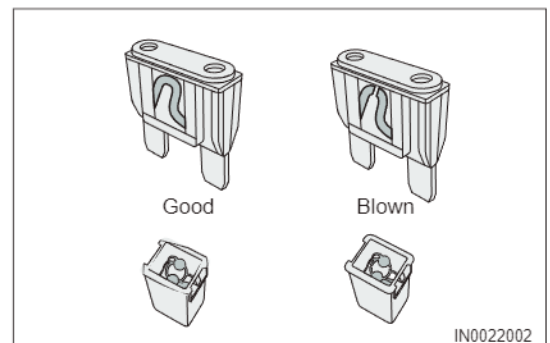
(13) Inspect input and output conditions of components and their functions before replacing control module.

- When disconnecting components:
 - Do not use excessive force when disconnecting connectors.
 - If connector is installed with a tightening bolt, loosen bolt and then disconnect the connector by hand.
- When connecting components:
 - Make sure that terminals are not bent or damaged, and then connect connectors correctly before installation.
 - Tighten bolt until painted area of connector is flush with the surface when installing connector with a tightening bolt.
- Never drop or hit control modules to prevent excessive impact.
- Avoid that condensation is formed on control modules due to extreme change of temperature, and keep them free from water drop or rain. If water is found on the control module, dry it thoroughly and then install it to vehicle.
- Be careful not to allow fluid to adhere to control module connectors.
- Avoid cleaning the control module with volatile fluid.
- When using digital multimeter, be careful not to get testing probes to contact with each other to result in a short circuit. Avoid damaging the battery due to short circuit in power transistor inside a control module.



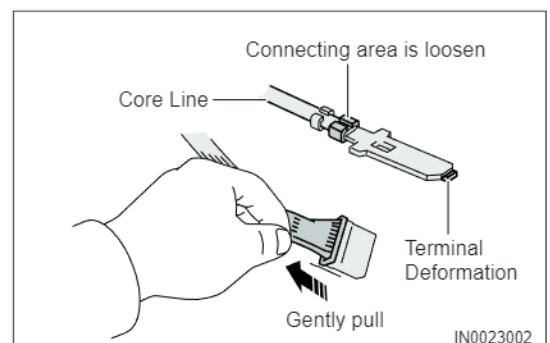
(14) Check fuse

- Check that fuse wire is connected.
- If fuse wire is blown, confirm that there is no short in circuit.
- A fuse with the same rated amperage must be used for replacing.



(15) How to check connector

- Many electrical malfunctions are caused by electrical connections or wire malfunctions, and also may be caused by the bonding of components or relays. Before determining if malfunction is caused by components or wire harness assembly, check if connection of the connectors is good.



(16) Check connector with a digital multimeter

- Damaged connectors and poor connections are caused by incorrect connector detection during circuit inspection.

- Probes of digital multimeter may be connected incorrectly with socket of connector. To detect the connector correctly, use a "T" shaped pin and follow procedures below. To obtain optimal connection, clamp the "T" shaped needle with a spring clamp.

1) Detect from wire harness side

- If there is a back cover for connector, remove the back cover before detecting terminal.
- Do not detect the water-proof connector from wire harness side. Failure to do this may damage the seal between wire harness and connector.

2) Detect from terminal side

- Female terminal : Do not insert any object that is bigger than male terminal into the female connector.
- Male terminal : Carefully detect contact surfaces of each terminal with a "T " shaped needle. Do not bend the terminal.

(17) Check terminal contact spring for proper tension

- Contact spring on terminal may produce intermittent signals in circuit.
- If intermittent open circuit occurs, follow procedures below to check open wire harness and contact spring on female terminal.
 - Use a male terminal matched with female terminal.
 - Disconnect the suspected defective connector and secure terminal side upward.
 - When securing wire harness of male terminal, try to insert male terminal into female terminal.
 - Move connector and check if male terminal can be inserted easily.

Hint:

If male terminal can be inserted into female terminal easily, replace the female terminal.