Chery A13/A13A Service Manual

FOREWORD

This manual contains on-vehicle service and diagnosis procedures for the Chery A13/A13A.

A thorough familiarization with this manual is important for proper repair and maintenance. It should always be kept in a handy place for quick and easy reference.

The contents of this manual, including drawings and specifications, are the latest available at the time of printing. As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Chery dealers. This manual should be kept up-to-date.

Chery Automobile Company, Ltd. reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

CONTENTS

Chery Automobile Company, Ltd. Wuhu, Anhui Province, CHINA

Chery Automobile Company, Ltd. Wuhu, Anhui Province, CHINA

Contents

0001 Forward

00

1 Service Information

1.1 How to use this manual

Subject

This manual contains the standard operation process of service items, the required special tools and notes for service operation as well as the parts inspection. It mainly falls into the following categories:

1. Removal and installation.
2. Use of special tools.
3. Warnings, tips and notes.
4. Diagnosis and inspection.

Diagnosis and inspection

Diagnosis and Inspection is divided into two parts:

1. Diagnostic trouble code (DTC) - troubleshooting according to fault codes and circuit diagrams.
2. Fault symptoms - determining the service range according to the symptoms and inspecting the faults based on their difficulties.

Product specifications

This manual contains the following technical specifications:

1. Torque.
2. Clearance.
3. Capacity.

Reading process

Most chapters begin with the operation principle of the whole system and its service notes and represent their main contents via a breakdown drawing of the system. The next is about product specifications and service technical data required during the service operation for different chapters, followed by the removal and installation methods of main components of the system and the related notes, finally the inspection of main components. In addition, this service manual contains important information, including:

Warnings

It may cause severe or fatal injuries if the warnings are ignored.

Notes

The notes provide additional information helpful to perform a specific procedure.

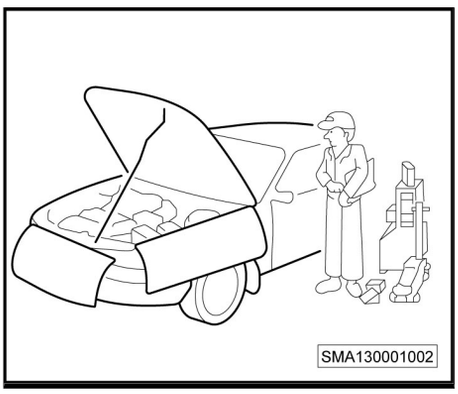
Tips

It may result in vehicle or parts damage if the tips are ignored.

1.2 Service preparation

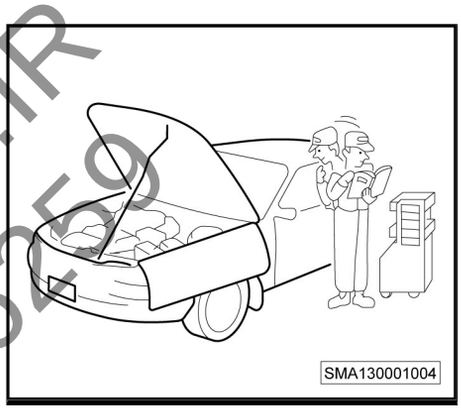
Service preparation

1. Make sure you prepare all necessary tools and measuring equipment before starting every service work.
2. Arrange a disposable three-piece set (including the steering wheel cover, the seat cover and the floor mat) in the cockpit.



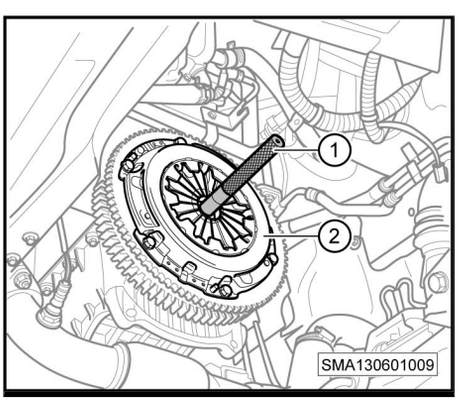
Tools and inspection equipment

1. Make sure you have prepared all tools and inspection equipment before service.
2. Inquiry the vehicle service information and read relevant service data before starting the service work.



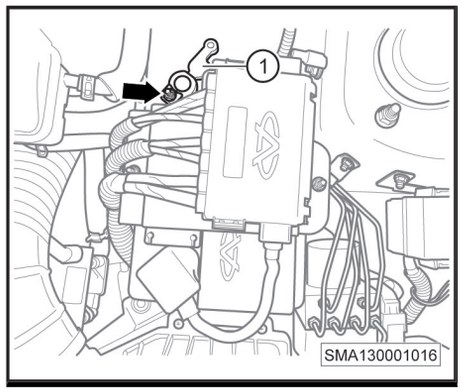
Special tools

1. Special tools shall be used during the service work for components that require the use of special tools - as shown in the figure, use the clutch installation tool (-1-) to install the clutch pressure plate (-2-). Otherwise it may cause damage to vehicle components and even a risk of injury.



00

Disconnecting the battery negative terminal

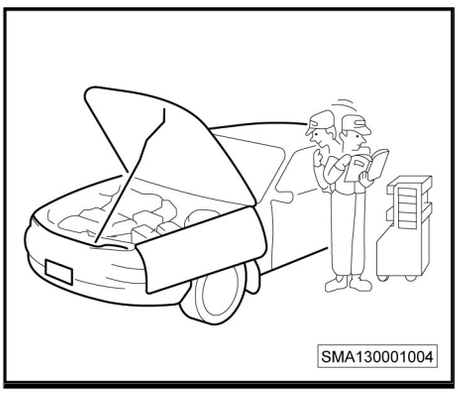


1. The procedures for disconnecting the battery negative terminal are as follows:
   - **a.** Switch off all electrical equipment and pull out the key.
   - **b.** Read and record the vehicle information and the fault information with the vehicle diagnostic tester.
   - **c.** Unscrew the nut (-arrow-).
   - **d.** Disengage the connector of the battery negative terminal (-1-).
2. Before removing electrical components, disconnect the battery negative terminal first and perform the service work for the electrical system after a few minutes when its components run out of electricity.
3. The clock memory, audio memory and fault codes will be deleted after the battery negative terminal is disconnected; therefore, read and store the fault information before disconnecting the battery.

1.3 Standard service methods

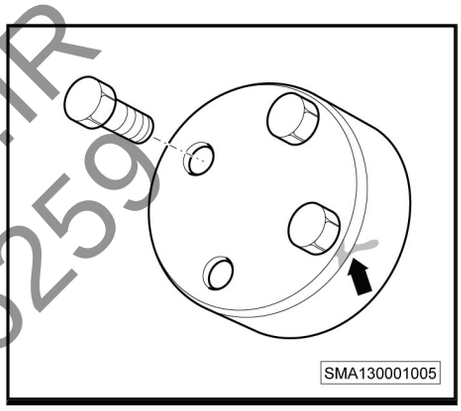
Removing components

1. During fault diagnosis, first analyze the fault and determine to remove, replace or repair.
2. You shall place the removed components in a clean and dust-free environment and cover the holes and openings of the component with clean plugs or glabrous cloths to prevent the entry of foreign matters.



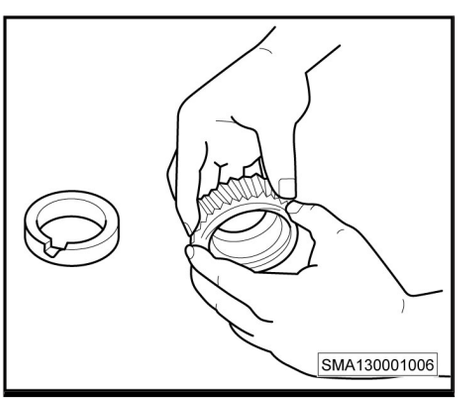
Disassembling components

1. If the removal procedure is complicated and many parts needs to be disassembled, you shall mark all parts without affecting their functions or appearance to make distinctions and facilitate reassembly.



Checking components

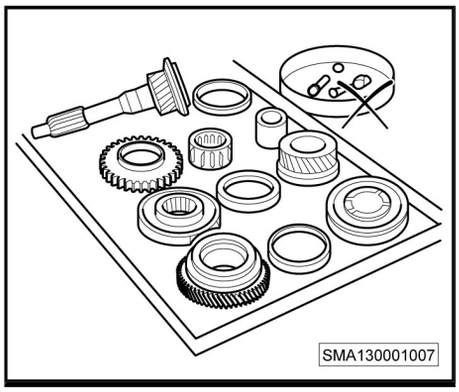
1. Carefully check the removed components for deformation, damage or other failures.



00

Placing components

1. All removed components shall be grouped and placed in a clean and dust-free environment for reassembly.
2. Components to be replaced and reused shall be placed or marked individually.

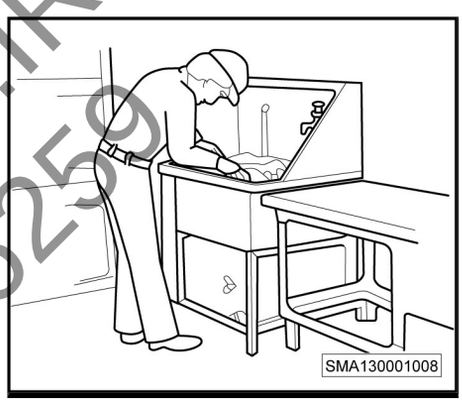


Cleaning components

⚠ Warning

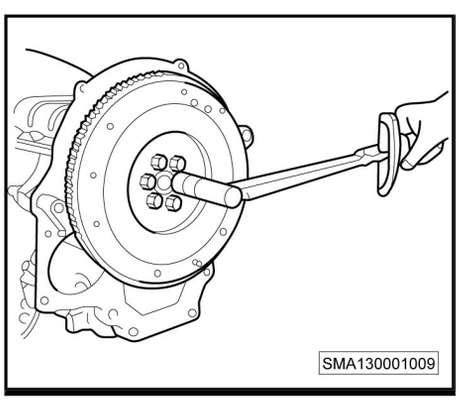
- Always wear protective goggles when using compressed air; otherwise, splashed dust particles and foreign matters may result in damage to eyes.

1. All components to be reused shall be cleaned properly and completely.



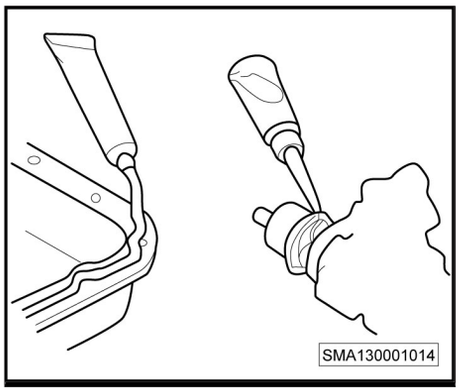
Reassembling

1. Always strictly observe the standard data such as tightening torque and clearance when reassembling each component.
2. Oil seals, gaskets, O-rings, lock washers, cotter pins and other disposable parts shall be replaced with new ones after removal.



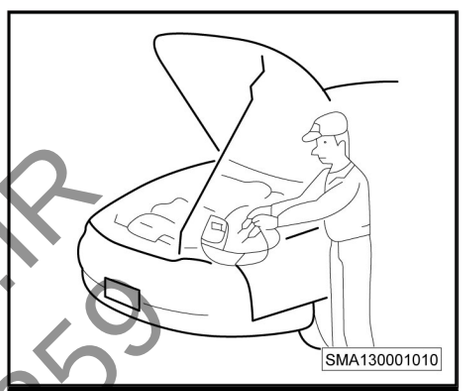
Lubricating and sealing

1. Use sealant or gasket at special locations.
2. If sealant is applied, install the component before the sealant dries to avoid leakage.
3. Apply lubricant to the moving and rubbing locations on the component.
4. Apply approved lubricant or grease at specified locations (such as oil seal) during reassembly.



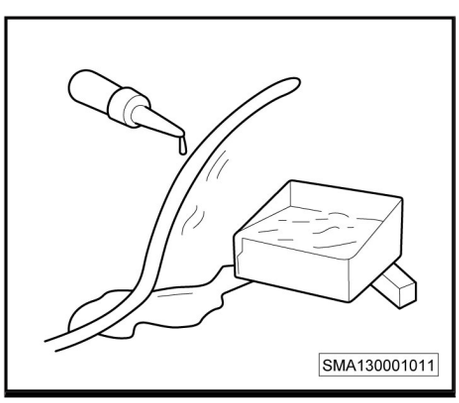
Inspection

1. Perform the inspection with appropriate measuring equipment.



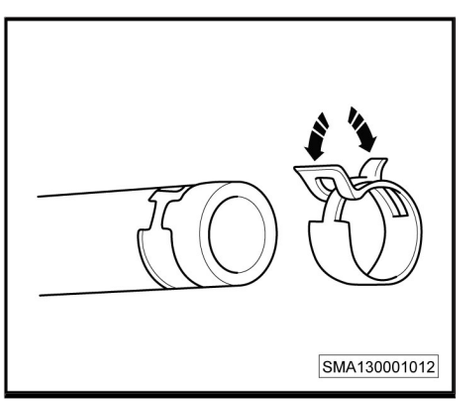
Rubber components

1. Prevent petrol, lubricant or other fluid from leaving on rubber components.



Hose clamps

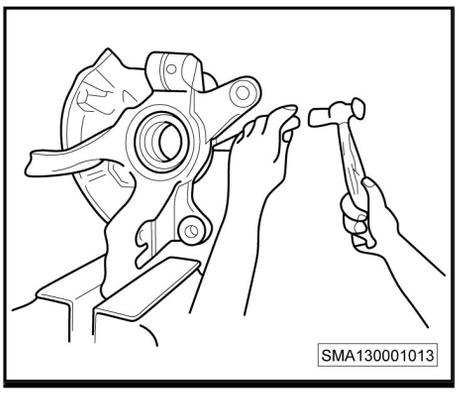
1. Mount the hose clamp at the original location with a special plier during reassembly to avoid leakage.



00

Bench vise

1. Put a protective plate at the clamps of the bench vise when using the bench vise to avoid damage to components.

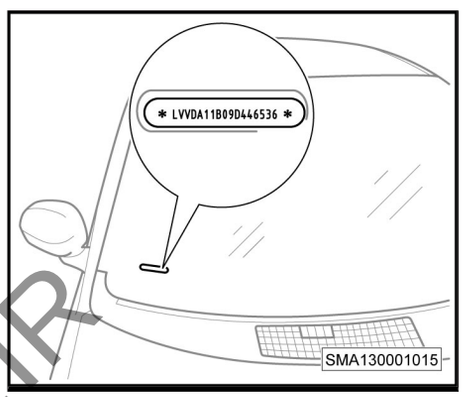


2 Vehicle Information

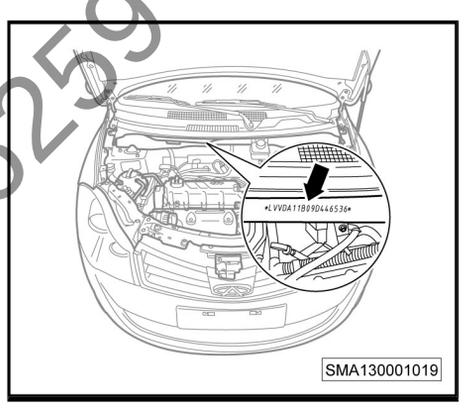
2.1 Vehicle Identification Number (VIN)

Locations of VIN

1. It is located at the upper right of the instrument console and can be seen from the lower right of the front windshield.



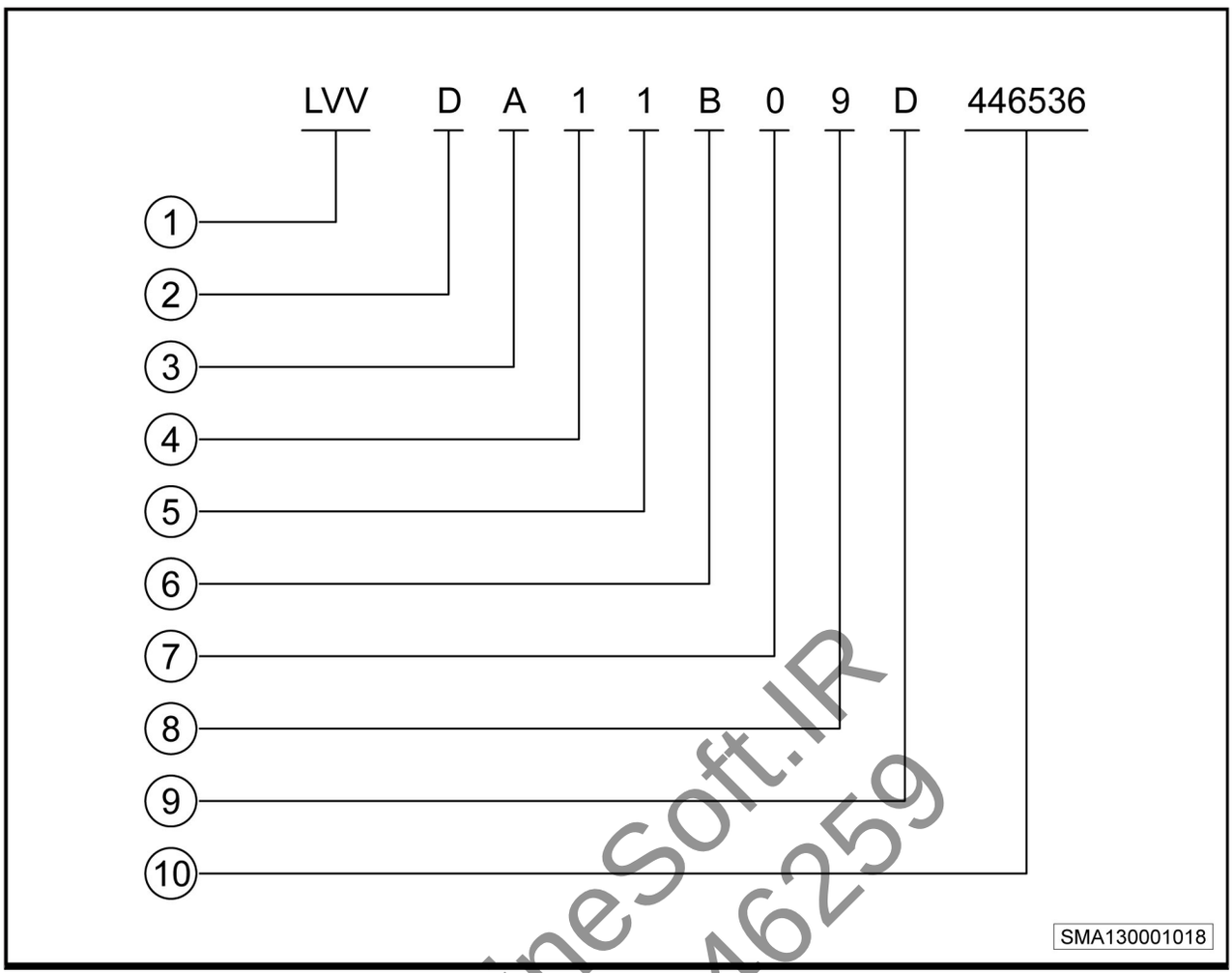
2. It is printed in the engine compartment (-arrow-).



Components of VIN

A vehicle identification number (VIN) is comprised of 17 digit characters, containing information about the vehicle manufacturer, the model year, the model, the body style and code, the engine code and the manufacturing location, etc.

00



Meanings

VIN character	Meaning
1	Digits 1-3: world manufacturer identifier (WMI)
2	Digit 4: vehicle brand code
3	Digit 5: vehicle feature code
4	Digit 6: transaxle type code
5	Digit 7: engine type code
6	Digit 8: restraint system code
7	Digit 9: check bit
8	Digit 10: model year
9	Digit 11: assembly plant
10	Digits 12-17: factory serial number

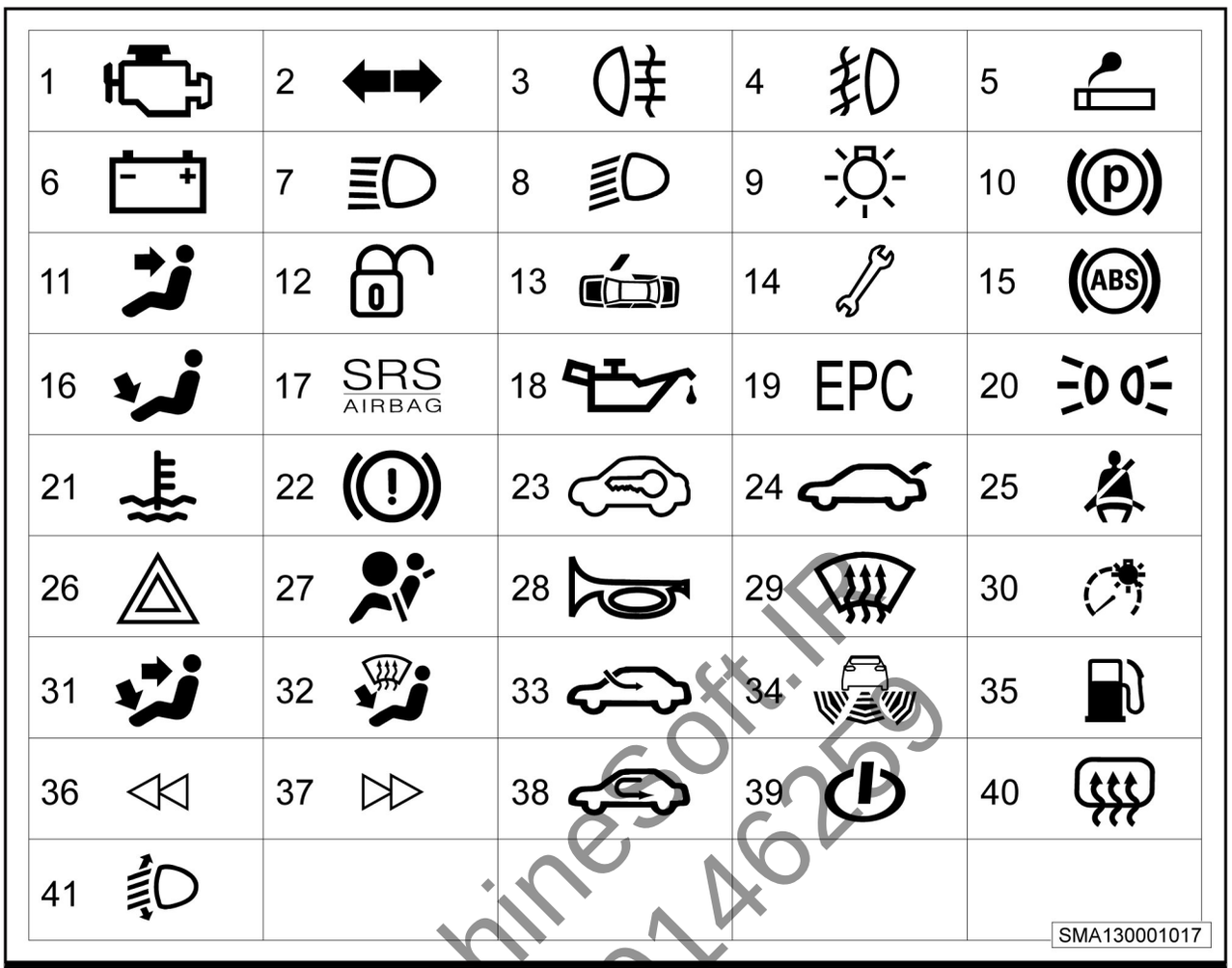
Notes

1. Digits 1-3 indicate the WMI: "LVV" stands for Chery Automobile Co. Ltd.
2. Digit 4 indicates the vehicle brand code: "D" stands for Chery brand.
3. Digit 5 indicates the vehicle feature code: "A" stands for three compartments, five doors and 4×2 chassis; "B" for two compartments, five doors and 4×2 chassis; "C" for three compartments, four doors, two lids and 4×2 chassis; "D" for two compartments, five doors and 4×4 chassis.
4. Digit 6 indicates the transaxle type code: "1" stands for manual transaxle, while "2" for automatic transaxle.

5. Digit 7 indicates the engine type code: "1" stands for EFI petrol engine of 1.5 L-2.0 L (except 2.0 L); "2" for EFI petrol engine of below 1.5 L (except 1.5 L); "4" for EFI petrol engine of 2.0 L-2.5 L (except 2.5 L).
6. Digit 8 indicates the restraint system code: "A" stands for manual safety belts; "B" for manual safety belts plus front airbags.
7. Digit 9 indicates the check bit: to prevent input errors via special calculation.
8. Digit 10 indicates the model year code: the model year specified by the manufacturer is not always the actual year of production.
9. Digit 11 indicates the assembly plant code: "D" stands for Chery Automobile Co. Ltd.
10. Digits 12-17 indicate the factory serial number: the actual quantity of this model; generally, the vehicle recall is aimed at the vehicles within a certain range of serial numbers, i. e. the vehicles of one batch.

00

2.2 Symbols



1. Engine failure indicator	2. Turn signal and hazard warning lamp
3. Rear fog lamp indicator	4. Front fog lamp indicator
5. Cigarette lighter	6. Charging system indicator
7. High beam headlamp indicator	8. Low beam headlamp indicator
9. Headlamp combination switch	10. Parking brake indicator
11. Upper air outlet	12. Unlock/lock
13. Door ajar indicator	14. Vehicle service indicator
15. ABS warning lamp	16. Lower air outlet
17. Airbag symbol	18. Engine oil pressure indicator
19. Electronic throttle indicator	20. Parking position indicator
21. Coolant temperature indicator	22. Brake system indicator
23. Anti-theft indicator	24. Trunk lid ajar indicator
25. Driver's side seat belt indicator	26. Hazard warning lamp switch
27. Airbag system indicator	28. Horn
29. Windshield air outlet	30. Backlight brightness adjustment
31. Upper and lower air outlets	32. Lower and front windshield air outlets
33. Air outer circulation	34. Reversing radar display
35. Low fuel level indicator	36. Rewind
37. Fast forward	38. Air recirculation
39. Power switch	40. Exterior mirrors/rear window defrosting
41. Low beam headlamp height adjustment	

3 Diagnostic Information of Electrical Wiring

3.1 Diagnosis of electrical faults

The procedures of troubleshooting and diagnosing circuit faults are as follows:

Procedures	Descriptions
Step 1	Inquire of the customer about the failure symptoms, the conditions and the time when the failure occurs and further information.
Step 2	Inquire the operations performed when the failure occurs; take the road test if necessary to verify the effect of corresponding operations on the failure; record relevant data and analyze possible failure causes.
Step 3	Organize the thoughts and refer to the following technical materials: • • Circuit diagrams • System principle descriptions • Service manuals • Vehicle service tips and so on. Perform the diagnosis based on the feedbacks from the customer and the knowledge of system service.
Step 4	Confirm the circuits and components involved in the fault according to the circuit diagram after determining the possible failure coverage. Check the mechanical failure and exclude the causes such as a loosened connector, damaged circuit, poor contact and rusted earth terminal.
Step 5	Repair or replace the necessary circuit and component and retest to see if the failure occurs again.
Step 6	Test if all functions of the repaired system are normal, verify the operation of the system in all conditions and confirm that no new failure occurs during the inspection.

00

4 Analog Circuit Test

4.1 General information

Analog circuit test:

For sporadic failures or fault symptoms that cannot be detected via road test, the analog circuit test can be applied. Simulating the environment/condition in which the failure occurs can be effective to determine the potential vehicle failures.

Examples will be given to explain the simulated environment/condition test to determine the electrical fault.

The analog circuit test is divided into the following types：

- Vehicle vibration test
- Heat sensitivity test
- Freezing test
- Leakage test
- Load test
- Cold/warm start test
- Low voltage test

Note

- It is especially important for the analog circuit test to listen carefully to the customer about the fault symptoms, the time and conditions when the failure occurs and further information.

4.2 Vehicle vibration test

When the vehicle fails when driving on a bumpy road, the air conditioning system must be switched off if the engine vibrates excessively.

Check the vehicle in the following aspects during the vehicle vibration test:

Adaptors and wiring harnesses:

- Check the wiring harness connectors and adaptors of the failed system, gently shake each harness connector to determine if the failure is caused by a loosened connector or adaptor.

Note

- A wetted connector may form a film due to the rusted terminal metal, resulting in poor electrical contact, which cannot not be detected via visual check. In this case, check and clean the terminal of each wiring harness connector in the system.

Sensors and relays:

Gently shake the sensors and relays in the failed system and test if the failure is caused by a loosened sensor or improperly installed relay.

Engine compartment:

1. For failures in the engine compartment caused by vehicle or engine vibration, check the following items:
   - if the harness connector is installed properly
   - if the harness is not long enough, causing disengagement or poor contact due to engine vibration
   - if the harness is routed on the bracket or moving parts resulting in harness interference
   - if the earth wire is dirty, rusty or loosened
   - if the wiring is too close to a heating element resulting in wiring damage
2. Firstly check the earth terminal conditions for each part of the engine; start the electrical equipment, gently shake the earth wire and check if the earth terminal is loosened; then check if the system harness circuit is open according to the circuit diagram.

Rear of the dashboard:

The wiring harness is damaged by squeezing and vibration during driving due to improper installation or routing.

4.3 Heat sensitivity test

If the failure only occurs in hot weather or near a heat source, the heat sensitivity test is required. You can heat relevant components with a heat gun or heating wire to perform a test.

Note

- The heating temperature shall be no more than 60°C (140°F); replace or separate the test component as required and keep away from heat.

4.4 Freezing test

If the feedbacks from the customer shows that the failure occurs under cold conditions (in winter), the possible cause may be the wiring harness/electrical system is affected by water or ice. In this case, the freezing test shall be performed by two methods:

1. Leave the vehicle outdoors overnight in cold weather and test relevant electrical parts at failure locations quickly and thoroughly in the next morning and determine the fault.
2. Place the possible failed electrical part in the freezer and then install it onto the vehicle quickly for testing. Repair or replace the test electrical component if the failure occurs again.

00

4.5 Leakage test

For failures that frequently occurs in wet or rain/snow weather, the cause is generally the moisture vapor getting in the electrical system. Spray water on the vehicle and test if the failure is caused by leakage.

4.6 Load test

Potential failures only occur after the electrical equipment is switched on. Switch on the electrical equipment in sequence (including the air conditioner, the rear window defroster, the audio system, the headlamp, etc.) to determine the relationship between the electrical equipment and the fault. Determine the fault via the load test.

00

4.7 Cold/warm start test

Certain failures may occur when the vehicle starts from cold and disappear after the engine warms up. In this case, leave the vehicle for one night, restart the vehicle on the next day, test and determine the fault cause quickly.

4.8 Voltage drop test

The voltage drop test is usually used to find out the resistance that affects the normal operation of the electrical components or the circuits.

- Check the circuits with a digital multimeter (DMM).
- If the measured resistance value of single lead or circuit is small with the DMM, the lead or the circuit is in good condition.
- The unnecessary resistance in the circuit may be caused by: poor grounding, loosening, switch contact erosion, loosened wire connector or adaptor.

00

5 Notes on Inspecting Control Modules and Electrical Parts

- Do not reverse the positive and negative terminals of the battery.
- Only use the electrical equipment that complies with the specifications of this vehicle.

When inspecting the input and output functions of control modules and disconnecting the wiring harness, please note:

1. Do not apply too much pressure.
2. When disengaging the connector or the wiring harness with fixing clips or screws, first loosen the screws or clips, then hold the connector housing by hand to disconnect the connection.

When connecting components:

1. Make sure that the connection of terminals is in good condition without bending or damage.
2. You must properly install and fix the clips when installing the connectors to avoid loosening or poor contact.

- Do not knock any of the control modules with force to prevent them from violent vibration or falling.
- Do not place the control module in the dramatically changing temperature to avoid wetting or frosting; otherwise, it may easily damage the internal electrical components.
- Prevent oil/water contaminant from contacting the connectors of control modules and the wiring harness.
- Do not use volatile oil solutions to clean the control module.
- When using the digital multimeter (DMM), please avoid the test probes from short circuits due to contacting with each other; otherwise, it may damage the power transistor.
- You shall use the specified test adapter to inspect the input and output signals of the control module.

How to inspect the wiring harness connector

- Many electrical system faults are caused by improper installation and incorrect wiring harness connection; thus, you shall first check the fitting and connection of the wiring harness connector before inspecting the electrical system fault.
- When inspecting the wiring harness connector with the DMM probe, it may easily cause poor contact of the connector and sporadic electrical system faults due to improper use of the probe.
- Please select the appropriate DMM probe and use the alligator clamp to test the wiring harness cable.
- When inspecting the wiring harness connector with the DMM probe, you shall insert the probe via the terminal to contact the wiring harness terminal. Do not insert it via the connector; otherwise, it may easily damage the water-proof tightness of the connector.
- For accidental open circuit, you shall recheck the connection end of the wiring harness connector. Disconnect the male and female connectors with possible poor contact, check if the connection is normal, then reinstall the terminal, engage the connector and tighten the clip.

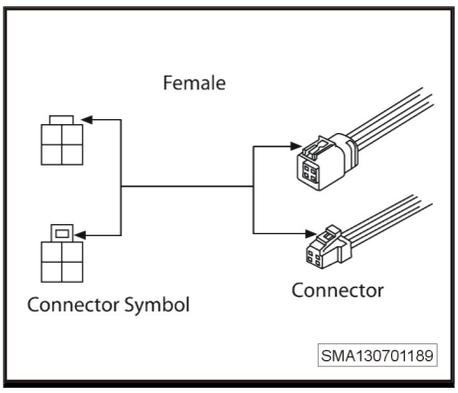
Note

- If the male connector is normal, check and replace the female connector, and reconnect the wiring harness terminal.

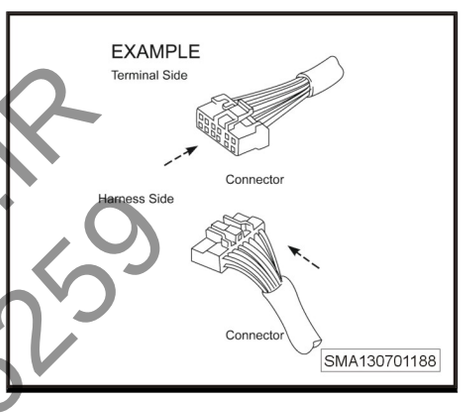
6 How To Read Circuit Diagram

Connector symbols

- The connectors are shown at the bottom of the circuit diagram in schematic plan figures.



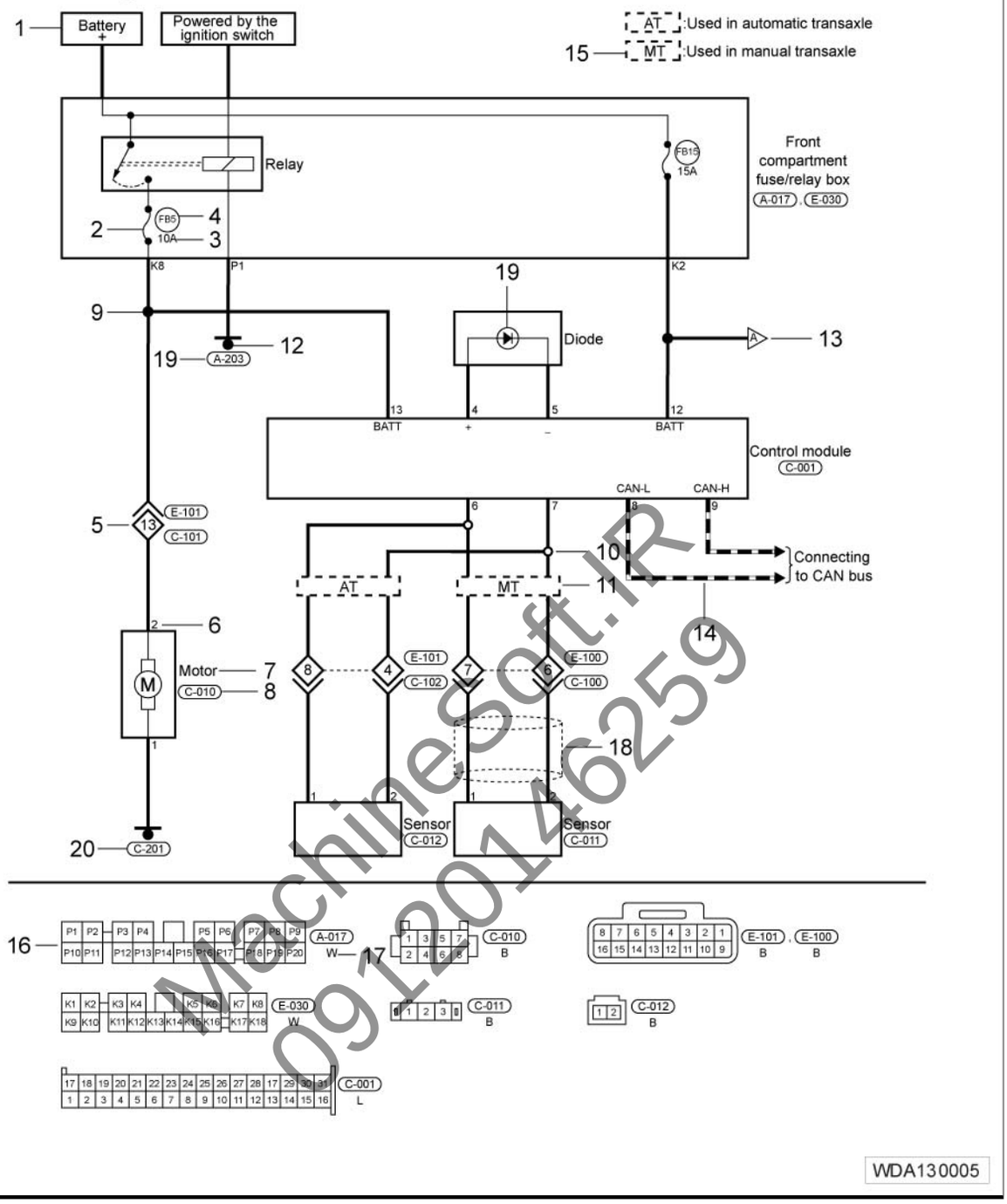
- Most connectors are marked with pin numbers, which are marked at the connector terminal side or the wiring side.
- Only the plan figure of one wiring connector side is shown in the circuit diagram.



Circuit diagram - illustrations

00

Circuit diagram



No.	Item	Illustration
1	Power	Supply power to the electrical equipment
2	Fuses	Indicated in single wavy line
3	Rated current	Rated current rage of the fuses
4	Fuse numbers	Distinguish the positions and numbers of the fuses in the front compartment fuse/relay box or the instrument fuse/relay box
5	Connectors	Indicates the connector E-101 as the female connector and C-101 as the male one

No.	Item	Illustration
6	Connector pin code	Number of the connector pin
7	Component name	Name of the component
8	Connector code	Name code of the connector
9	Connection point	Black points indicate the connection between wires
10	Option connection point	Hollow points indicate the circuit connection of vehicle components with options
11	Option abbreviation	Wires depend on the actual model equipment
12	Grounding	Indicates earth connection
13	Connected to...	The wire is connected to the circuit in the next page. Letter "A" corresponds to the "A" in the next page's circuit diagram.
14	USB cable	The cable for data transmission between the system and the other
15	Option legend	Illustrations of option abbreviations in the circuit diagram
16	Connector pin figures	Number description of the component side connector
17	Connector colors	The followings are the indicated connector colors by letters: B = black W = white R = red G = green L = blue Y = yellow BR = brown O = orange GR = grey
18	Shield wire	Indicated in dotted line with circles
19	LED	Used as illumination device in the circuit or instrument

The distribution of connector pins is shown at the bottom of the circuit diagram.

Index of component names

00

Term	Abbreviation
Antilock Brake System	ABS
Accelerator Sensor	AES
Accelerator Pedal Position Sensor	APPS
Automated Manual Transaxle	AMT
Body Control Module	BCM
Brake Pressure Sensor	BPS
Camshaft Position Sensor	CMP Sensor
Clutch Pedal Position Switch	CPP Switch
Crankshaft Position Sensor	CKP Sensor
Data Link Connector	DLC
Diagnostic Trouble Code	DTC
Engine Control Module	ECM
Engine Coolant Temperature Sensor	ECT Sensor
Engine Speed	RPM
Evaporative Emission	EVAP
Evaporative Emission Canister	EVAP System
Evaporative Emission System	EVAP System
Front Left Wheel Speed Sensor	FLS
Front Right Wheel Speed Sensor	FRS
Rear Left Wheel Speed Sensor	RCS
Rear Right Wheel Speed Sensor	RRS
Ground	GND
Heated Oxygen Sensor	O2S
Idle Air Control	IAC
Ignition	IGN
Ignition Control	IC

0101 Maintenance

1 Maintenance Items

1.1 Maintenance schedule

Maintenance schedule

Maintenance items	Driving every A km	Driving every B km	Driving every C km
Lights, warning lights, horn: Check the function		√	√
Windshield wiper and washer: Check the function and add washer fluid if necessary		√	√
Check clutch pedal free travel and clutch oil level: Adjust if necessary		√	√
Cooling system: Check coolant level and replace if necessary	√	√	√
Engine oil: Replace	√	√	√
Engine oil filter: Replace	√	√	√
Engine: Check for leakage (engine oil, antifreeze, fuel, etc.)	√	√	√
Timing belt: Check for wear and tension; adjust or replace if necessary			√
Hood hinges and release catch: Lubricate	√	√	√
Door hinges and door locks: Lubricate	√	√	√
Spark plugs: Check and replace if necessary		√	√
Ignition timing: Check	√	√	√
Fuel filter: Replace		√	√
Exhaust system: Check for leakage or damage		√	√
Poly V-belt: Check for tension; adjust or replace if necessary		√	√
Transaxle: Check for leakage or damage		√	√
Constant velocity (CV) universal joint boot: Check for damage	√	√	√

Maintenance items	Driving every A km	Driving every B km	Driving every C km
Tie rod end: Check the clearance and boot for damage	√	√	√
Steering universal joint assembly bushing: Check for alignment and damage		√	√
Power steering system: Check power steering fluid level and whether the clearance between the steering gear and rack is appropriate		√	√
Brake system: Visually check for leakage, damage and check brake fluid level	√	√	√
Parking brake: Check the stroke (5-7 times) and adjust if necessary	√	√	√
Brake pads: Check the thickness and replace if necessary	√	√	√
Underbody protection layer: Visually check for damage			√
Toe-in and camber angle: Check and adjust if necessary		√	√
Ball joint: Check clearance		√	√
Rear axle rubber bushings: Check for damage		√	√
Engine oil pan bolts: Check for proper torque and tighten if necessary			√
Control arm rubber sleeve: Check for damage		√	√
Brake hose: Check for aging and damage		√	√
Brake tube: Check for damage, corrosion and leakage of all connections		√	√
Fuel system port: Check for aging, damage, irregular loosening and wear			√
Tires (including spare tire): Check the tread depth and tire pressure; adjust tire pressure if necessary	√	√	√

Maintenance items	Driving every A km	Driving every B km	Driving every C km
Bolts connecting chassis and vehicle body: Check torque and tighten if necessary		√	√
Wheel: Check torque	√	√	√
CO content during idling: Check and adjust if necessary	√	√	√
Test drive: Check whether all the mechanisms regularly function	√	√	√

- Manual transaxle gear oil shall be replaced every year or every 30,000 km.
- Brake fluid shall be replaced every 2 years or every 50,000 km.
- Engine timing belt shall be replaced every 40,000 km.
- We recommend that tire replacement be carried out after first 5,000 km and every 10,000 km afterwards.

Reference table of maintenance schedule

Maintenance options	A	B	C
Mileage	5,000 Km	15,000 Km	30,000 Km
	10,000 Km	45,000 Km	60,000 Km
	20,000 Km	75,000 Km	90,000 Km
	25,000 Km	105,000 Km	120,000 Km
	35,000 Km	135,000 Km	150,000 Km
	40,000 Km	165,000 Km	180,000 Km
	50,000 Km	195,000 Km	210,000 Km
	55,000 Km	215,000 Km	240,000 Km
	Every 5000 Km	Every 30,000 Km	Every 30,000 Km

- This table shall be referred according to the maintenance schedule.
- E.g.: For a mileage of 10,000 km, you shall check the corresponding maintenance items under the column of "driving every A km" in the maintenance schedule.
- E.g.: For a mileage of 45,000 km, you shall check the corresponding maintenance items under the column of "driving every B km" in the maintenance schedule.
- E.g.: For a mileage of 60,000 km, you shall check the corresponding maintenance items under the column of "driving every C km" in the maintenance schedule.

2 Replacement Instructions

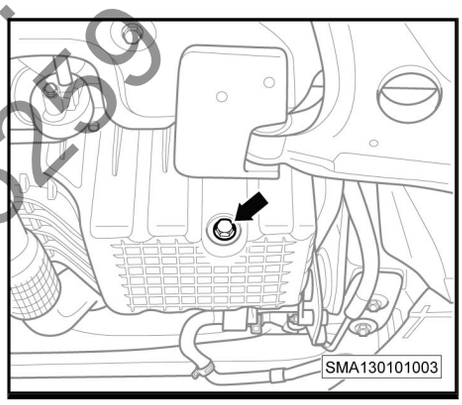
2.1 Replacing the engine oil and oil filter

Draining the engine oil

Caution

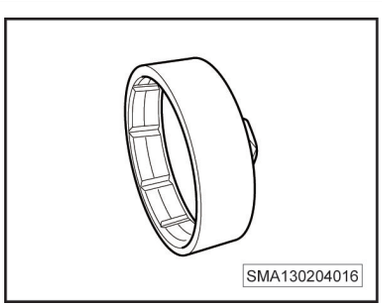
- Tighten the oil filter with the specified torque.
- Excessive tightening torque may cause the oil drain bolt to leak, and even damage the oil pan.
- Dispose the waste materials as stipulated.

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Open the engine oil filler cap.
3. Lift the vehicle.
4. Unscrew the oil pan drain bolt (-arrow-), and then drain the engine oil.
5. When the oil is drained out, replace the oil drain bolt gasket and tighten the drain bolt.
   - Tightening torque of the oil drain bolt: 25±3 N•m

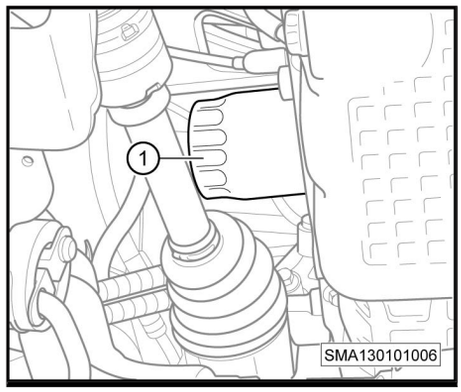


Replacing the oil filter

Maintenance tools and common equipment

	
Oil filter remover	

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Place a collection vessel under the oil filter and unscrew the oil filter (-1-) with the remover.
   - Tightening torque of the oil filter: 14±2 N•m

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Check the oil filter connector for tightening and tighten the loosened connector with the special tool. If the connector is unscrewed together with the oil filter, please proceed as follows:
   - Unscrew the connector out of the old oil filter, manually screw the connector into the cylinder liner and then tighten it with the special tool according to the specified torque.
   - Tightening torque of the oil filter connector: 17.5±3.5 N•m
2. Clean the contact surface of the oil filter and the cylinder block, and apply a small amount of engine oil on the oil filter gasket.
3. Manually screw on the oil filter until the gasket closely contacts the installation surface. Then tighten the oil filter with the remover according to the specified torque.
   - Tightening torque of the oil filter: 14±2 N•m

Adding the engine oil

Caution

- Only use the engine oil approved by Chery Automobile Co., Ltd..

1. Add 3.9 L engine oil as specified.
2. Start the engine and check the oil filter and oil drain bolt for leakage after tightening the engine oil filler cap.
3. Switch off the engine and check the engine oil level. Add oil if necessary.

Filling conditions	Standard specifications
Summer	Lubricant with the viscosity of SAE 10W-40 (SL or above)
Winter	Lubricant with viscosity of SAE 5W-40 (SL or above)
Filling capacity	3.9 L

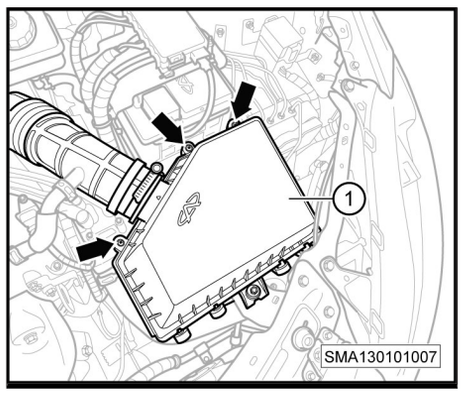
Note

- You shall reset the service indicator to zero by the diagnostic device every time after replacing the engine oil and the oil filter.

2.2 Replacing the air filter element

Removal

1. Switch off all electrical equipment and the ignition switch.
2. Unscrew the screws (-arrow-).
3. Disengage the upper housing (-1-) and remove the air filter element.



Installation

1. Clean the air filter housing and install a new air filter element.
2. Other installation shall follow the reverse sequence of the removal procedure.

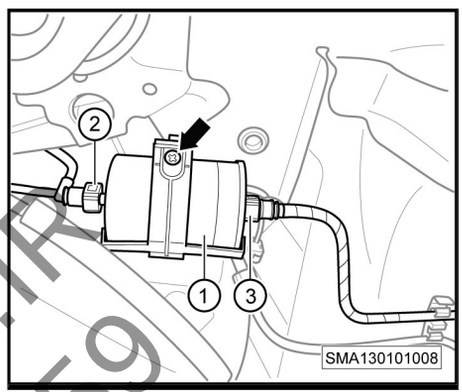
2.3 Replacing the fuel filter

Caution

- Good ventilation in the work area must be kept when the fuel system is under repair.
- The fuel system pipes and parts must be kept away from fire.
- Please clean the connections and the areas around before loosening the pipe connections to prevent the entry of small particles into the fuel pipes; otherwise, the injector may be blocked.
- Do not take new parts out of their packages before replacing old ones.

Removal

1. Switch off all electrical equipment and the ignition switch.
2. Pull out the fuel pump fuses.
3. Start the engine and wait until its natural flameout.
4. Place a collection vessel under the fuel filter.
5. Unscrew the fixing screw (-arrow-), press the lock pins of pipe connectors (-2-) and (-3-), and pull out the oil inlet and outlet pipes.
6. Remove the fuel filter (-1-) from the bracket.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Check the filter package for completeness before installation.
2. Make sure the arrow on the filter housing is towords the driving direction.
3. When starting the engine, please turn on the ignition switch repeatedly to build up a starting oil pressure for the fuel system.
4. Start the engine and check the fuel filter for leakage.

2.4 Replacing the spark plug

Caution

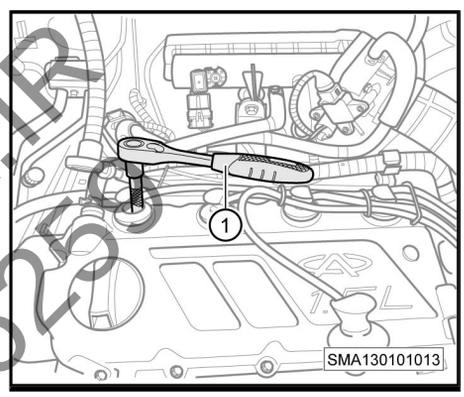
- Do not remove the spark plug when the engine is hot; otherwise, it may cause damage to the spark plug threaded hole on the cylinder head and scald to the maintenance staff.

Note

- Remove the high voltage wires from the spark plug one by one, and make marks to avoid incorrect installation.
- Remove dust and impurities around the spark plug hole before removal to prevent them from falling into the cylinder.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key. Wait until the engine cools down.
2. Pull out the ignition cable.
3. Unscrew the spark plug with a special spark plug socket wrench (-1-).



Installation

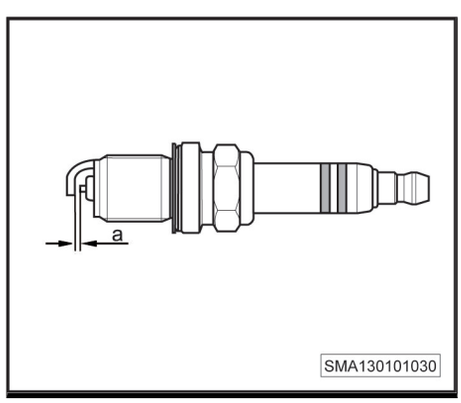
Note

- Check the spark plug type to see if it is applicable.
- Lower the spark plug along the spark plug socket wall gently during installation to avoid the plug knocking against the cylinder wall and breaking the normal spark plug electrode clearance.

1. First manually screw the spark plug into the cylinder head and then tighten the spark plug with a torque wrench during installation.

   - Tightening torque of the spark plug: 30±3 N•m

2. Check the spark plug for clearance and the related data before installation.



Spark plug	Value
Standard electrode clearance	0.7±0.1 mm
Type	FR7DTC
Recommended replacement interval	Every 30,000 Km or 18 months

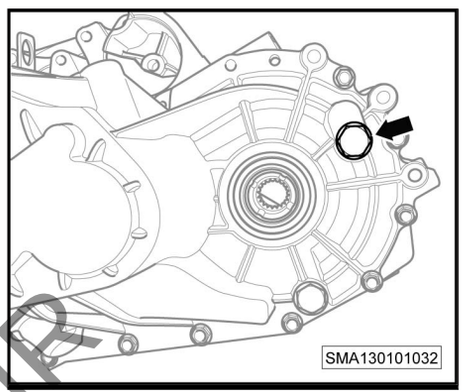
2.5 Replacing the manual transmission oil

Caution

- The transmission oil can only be replaced when the engine is switched off, the vehicle is parked on level ground and the transaxle is cooled down.

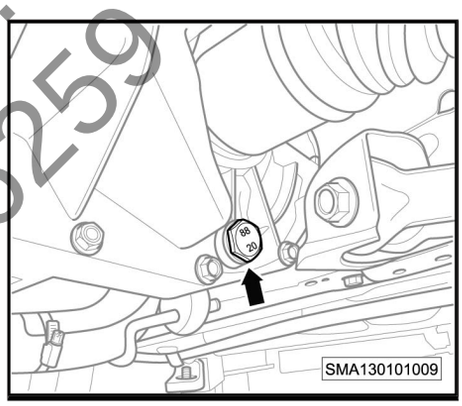
Discharge

1. Switch off all electrical equipment and the ignition switch.
2. Lift the vehicle horizontally.
3. Place a collection vessel under the oil drain hole of the transaxle.
4. Unscrew the filler bolt (-arrow-).



5. Unscrew the transmission oil drain bolt (-arrow-), and drain the transmission oil. When the oil is drained out, replace the oil drain bolt gasket and tighten the drain bolt.

   - Tightening torque of the transmission oil drain bolt: 44±3 N•m



Filling

1. Check the transmission oil type.
2. As shown in the figure, add transmission oil via the filler (-arrow-) by the filling tool as specified until it overflows.
3. After filling, replace the oil drain bolt gasket and tighten the filler bolt.

   - Tightening torque of the transmission oil filler bolt: 44±3 N•m

Transaxle type	QR515MHA
Transmission oil type	APIGL-4, 75W-90
Filling capacity	2.3 L

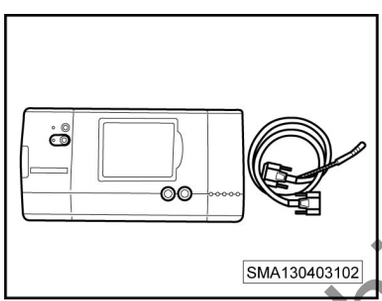
2.6 Replacing the brake fluid

Caution

- Only use the brake fluid approved by Chery Automobile Co., Ltd., as mixture of various fluid types may damage the brake system and cause dangers.
- The brake fluid reservoir shall be sealed to exclude moisture. The brake fluid stored in an unsealed container cannot be used further.
- Please dispose the waste materials as stipulated.
- When the vehicle exhausts, the brake fluid level shall not be below the lowest mark on the brake fluid reservoir.

Note

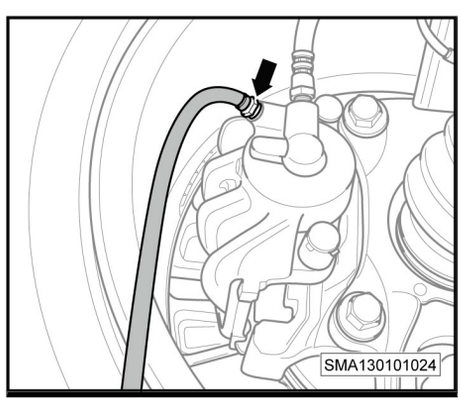
- The replacement process includes three steps:
- First, replace the brake fluid in the pipeline according to the regular procedures.
- Second, replace the brake fluid in the ABS control unit according to the X-431 procedures.
- Finally, replace the brake fluid in the pipeline again according to the regular procedures.



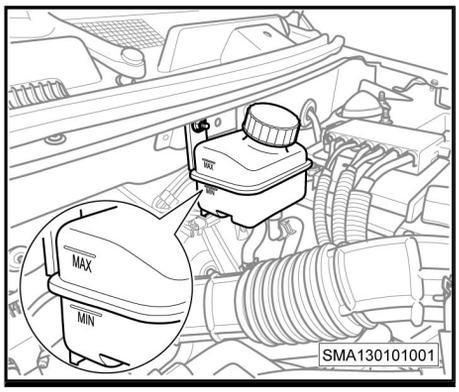
X-431 diagnostic device

Regular procedures

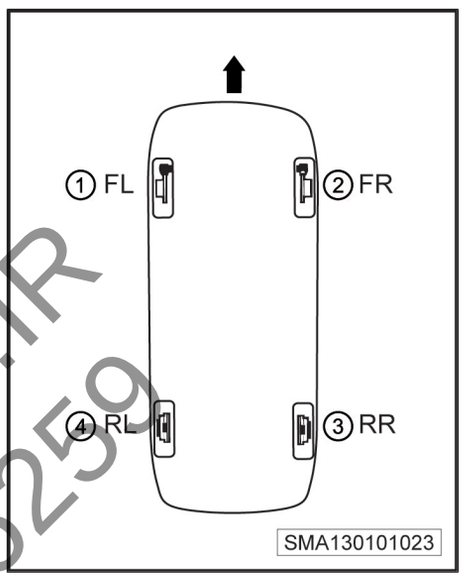
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Open the sealing cap of the brake fluid reservoir.
3. Insert one end of a plastic hose into the exhaust bolt of the brake caliper (-arrow-), and put the other end into the collection vessel.



4. Add brake fluid up to the "MAX" mark.

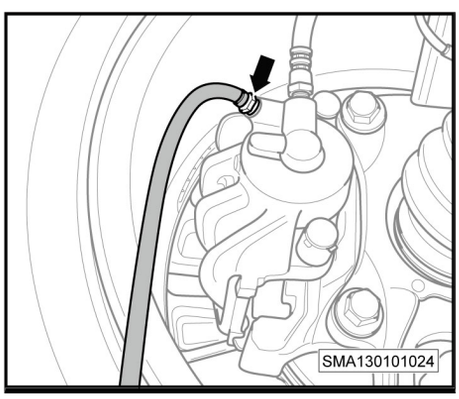


5. After another technician presses the brake pedal repeatedly, press and hold the brake pedal with force. Loosen the exhaust bolt of the brake caliper, drain out the brake fluid inside the brake system, and then tighten the exhaust bolt.
6. Operate on each wheel repeatedly in the sequence shown in the figure until the old brake fluid inside the brake system is fully drained out, and make sure that no air enters the system.



X-431 procedures

1. Use the X-431 diagnostic device to confirm if there is any fault code stored in the ABS control unit. If there is, rectify the fault according to the fault code.
2. Read the fault code again to ensure the fault has been rectified.
3. Discharge the air in the brake fluid of the ABS control unit according to the X-431 diagnostic device. (the brake fluid has been replaced in the unit during discharge)
4. Confirm the discharge of the ABS control unit and disconnect the X-431 diagnostic device.
5. Replace the brake fluid in the pipeline again according to the regular procedures to ensure there is no bubble in the brake fluid discharged.

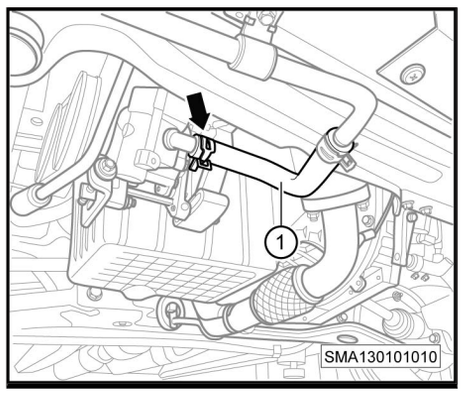


Brake fluid type	DOT-4
Filling capacity	1 L

2.7 Replacing the power steering fluid

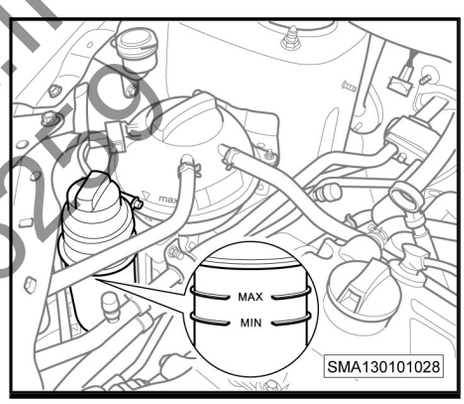
Discharge

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Open the sealing cap of the power steering fluid reservoir.
3. Lift the vehicle and place a collection vessel under the power steering pump pipeline.
4. Loosen the clamp (-arrow-) and disconnect the pipe connection (-1-).
5. Turn the steering wheel to the left and right repeatedly as far as it will go until the power steering fluid is completely drained out.
6. Install the connection pipe (-1-) and the fixing clamp (-arrow-).



Filling

1. Add power steering fluid until the fluid level is between the "MIN" and "MAX" marks.
2. Start the engine. Turn the steering wheel to the left and right repeatedly as far as it will go until the air in the pipe is completely discharged.
3. Switch off the engine. Check the power steering fluid for leakage. Add power steering fluid or repair the power steering system if necessary.



Power steering fluid type	ATF III
Filling capacity	0.6 L

3 Adjustment Items

3.1 Adjusting the headlamps

Note

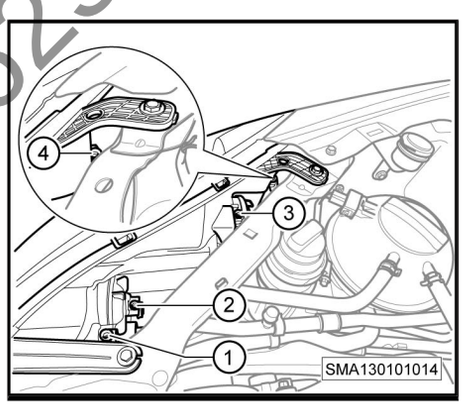
- The headlamps shall be adjusted in accordance with local laws and regulations.
- The adjustment methods applied to the right headlamp and the left headlamp are the same.

Preparations for adjusting or checking the headlamps

1. Unload the vehicle and park it on level ground.
2. Tire pressure is normal.
3. The fuel is more than half of the fuel tank capacity.
4. The internal structure of headlamps is normal.

Adjusting the headlamps

1. Adjustment bolt (-1-) is used to vertically adjust the high beam headlamp.
2. Adjustment bolt (-2-) is used to horizontally adjust the high beam headlamp.
3. Adjustment bolt (-3-) is used to vertically adjust the low beam headlamp.
4. Adjustment bolt (-4-) is used to horizontally adjust the low beam headlamp.

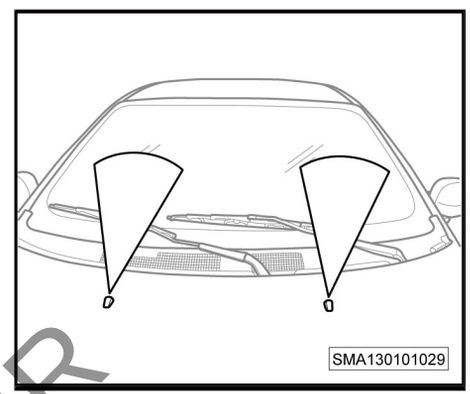


3.2 Adjusting the windshield washer nozzle

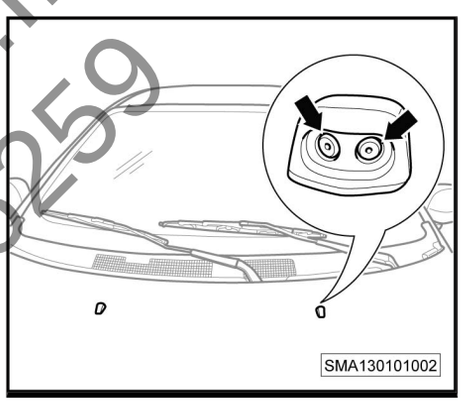
Note

- If the spray is uneven or weak when the washer fluid level is normal, the windshield wiper motor works properly and there is no leakage in piping, please replace the nozzle and washer fluid and clean the washer reservoir.

1. The proper spraying range is shown in the figure.



2. If the spray is normal while the nozzle angle is different, please use a pin to turn the adjustment device (-arrow-) until the nozzle is adjusted towards the proper direction.



4 Inspection Items

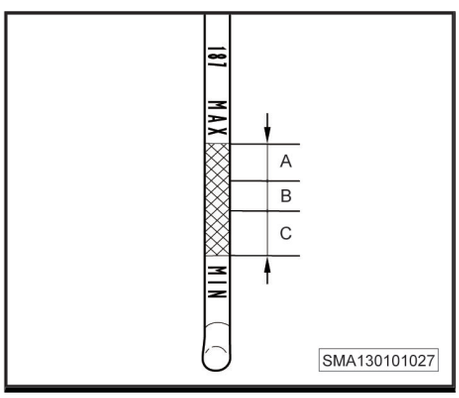
4.1 Checking the engine oil level

Note

- Excessive engine oil may lead to faults such as oil leakage, oil burning and deficient power.
- Inadequate engine oil may lead to heavy wear to the cylinder and damage to the bearing shell due to lack of lubrication in the engine.

Inspection

1. Park the vehicle on level ground.
2. After warming up the vehicle, switch off the engine and wait for about 3 minutes to let the engine oil flow back to the oil pan.
3. Pull out the oil dipstick, wipe it with a clean cloth and insert it again, pushing it all the way in.
4. Pull out the oil dipstick again along the tube and read the oil level. When the readout is in Area -B-, the oil level is normal; when the readout is in or above Area -A-, the oil level is excessive, which shall be drained; when the readout is in or below Area -C-, the oil level is inadequate, which shall be filled to Area -B-.



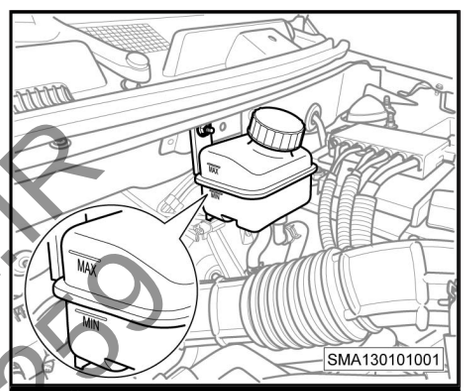
4.2 Checking the brake fluid level

Note

- Normally, the brake fluid level varies slightly with the wear of the brake pad, but it must be kept between the "MIN" and "MAX" marks.
- Only use the brake fluid approved by Chery Automobile Co., Ltd., as mixture of various fluid types may damage the brake system and cause dangers.
- The brake system and the clutch hydraulic system share one fluid reservoir. If either of them leaks, the other will be affected.
- Do not fill above the "MAX" mark to avoid overflow of the brake fluid reservoir.

Inspection

For brake fluid pipe without leakage:



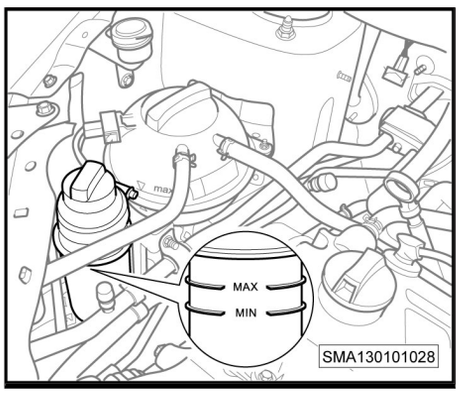
1. Check the brake fluid level and make sure it is between the "MAX" and "MIN" marks.
2. When the brake fluid level drops close to the "MIN" mark, the wear of the brake pad may come to its limit. Please check or replace the brake pad.
3. After the brake pad is replaced, the brake fluid level shall be at the upper point between the "MAX" and "MIN" marks.
4. If the brake fluid level drops below the "MIN" mark, please check the brake system for leakage.

Brake fluid type	DOT-4
Filling capacity	1 L

4.3 Checking the power steering fluid level

Inspection

1. Park the vehicle on level ground.
2. Start the engine, turn the steering wheel to the left and right repeatedly as far as it will go to park the vehicle straight towards the driving direction.
3. Switch off the ignition switch.
4. Check the power steering fluid level and make sure it is between the "MIN" and "MAX" marks.
5. If the level is above the "MAX" mark, please discharge the fluid; if the level is below the "MIN" mark, please add power steering fluid. Check the power steering system for leakage if necessary.

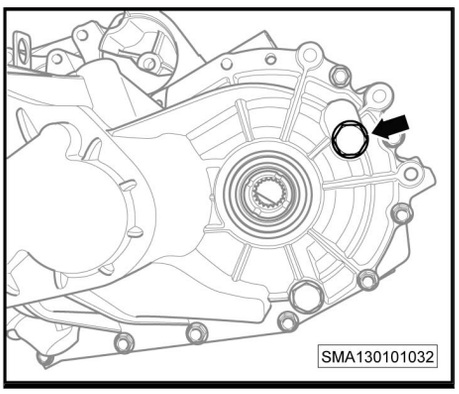


Power steering fluid type	ATF III
Filling capacity	0.6 L

4.4 Checking the manual transmission oil level

Inspection

1. Switch off all electrical equipment and the ignition switch, pull out the key and wait until the transaxle cools down.
2. Lift the vehicle horizontally.
3. Place a collection vessel under the oil filler of the transaxle.
4. Unscrew the transmission oil filler bolt (-arrow-), and check if the transmission oil overflows out of the filler. If it does not overflow, please add transmission oil until it overflows.

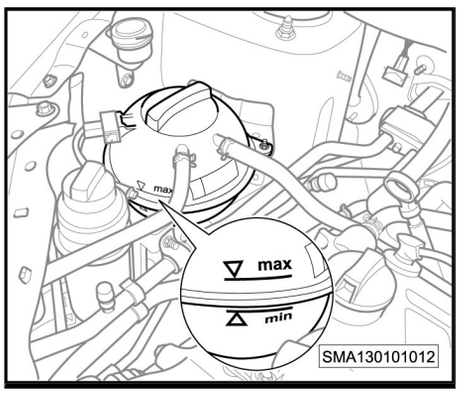


Transaxle type	QR515MHA
Transmission oil type	APIGL-4, 75W-90
Filling capacity	2.3 L

4.5 Checking the coolant level

Inspection

1. Park the vehicle on level ground.
2. Switch off all electrical equipment and the ignition switch, and pull out the key. Wait until the engine cools down.
3. Check the coolant level to see if it is between the "MAX" and "MIN" marks.
4. If the level is above the "MAX" mark, please discharge the excess coolant.
5. If the level is below the "MIN" mark, please add coolant. Check the cooling system for leakage and inspect the leak point if necessary.



Coolant type	50% glycol + 50% pure water (volume ratio)
Filling capacity	2.3 L

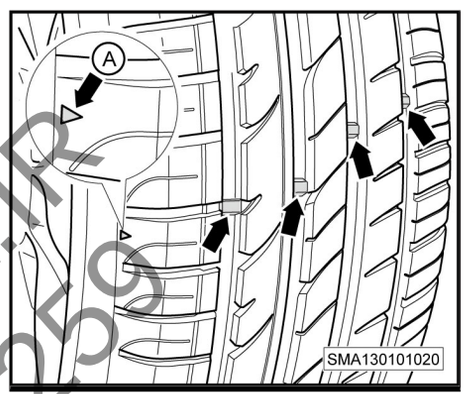
4.6 Checking the tire (including spare tire) tread, tread depth and inflation pressure

Checking the tire tread and sidewall

1. Check the tire sidewall for blisters and cracks. Replace if necessary.
2. Check if there is any abnormal wear on the inner or outer tire tread. If the wear is obvious, it shows that the toe-in or the chamber angle are incorrect. Please replace the tires and re-calibrate the camber angle and toe-in.

Checking the tread depth

1. Check the tread depth. The minimum wear limit is 3 mm.
2. The triangle mark (-arrow A-) on the tire sidewall is the thread wear indicator. When the tread is worn down to about 3 mm away from the groove bottom (-arrow-), the groove will begin to fracture resulting in a crack. Remind relevant staff and drivers to replace the tire immediately.



Inflation pressure of cold tire

Vehicle model	Tire type	Inflation pressure (unladen) (Kpa)	Inflation pressure (full-load) (Kpa)	Inflation pressure (spare tire) (Kpa)
SQR7150J150	185/60R15 84H	230/210	240/250	250
SQR7150A137	195/55R15 85V	230/210	240/250	250

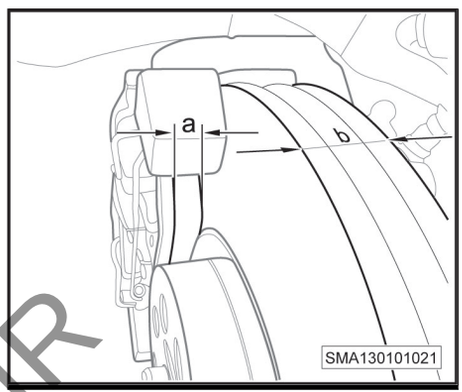
4.7 Checking the brake pad and brake disc

Note

- The wheels must be removed before checking the brake pads. Please check the thickness of the left and right brake pads.

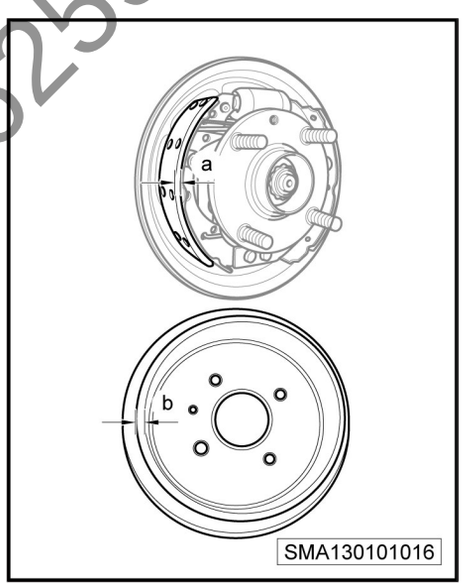
Checking the front brake pad and brake disc

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the front wheels.
3. The standard thickness of a new brake pad (-a-) is 11 mm. When the brake pad is worn down to the tread wear indicator, please replace it immediately.
4. Measure the thickness of the brake disc (-b-). The standard value is 22 mm; the wear limit of brake disc is 20 mm. When the measured value of brake disc thickness (-b-) is below 20 mm, please replace the brake disc immediately.



Checking the brake shoe and brake drum

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the rear wheels.
3. Remove the rear wheel brake shoes and measure the thickness of the brake pad (-a-). The standard value is 5 mm; the wear limit is 2 mm. When the measured value of brake pad thickness (-a-) is below 2 mm, please replace it immediately.
4. Measure the thickness of the rear brake drum (-b-). The standard value is 7 mm; the wear limit is 5.5 mm.When the measured value of brake drum thickness (-b-) is below 5.5 mm, please replace the brake drum immediately.



4.8 Checking the engine for oil leakage

Inspection

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lift the vehicle.
3. Check the crankshaft belt pulley for oil stains. If oil stains exist, please check the front engine crankshaft oil seal for leakage. If it does leak, please replace the front oil seal.
4. Check the connection between the engine and the transaxle for oil stains. If oil stains exist, please check the rear engine crankshaft oil seal for leakage. If it does leak, please replace the rear oil seal.
5. Check the oil pan and the oil drain bolt for oil stains. Any oil leakage must subject to repair.
6. If the front or rear crankshaft oil seal still leaks shortly after being replaced, it might be caused by the following three reasons: 1. wear of the crankshaft inner thrust washer; 2. blockage of the crankcase ventilation system; 3. excessive engine oil.

4.9 Checking the brake system pipe for leakage

Inspection

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lift the vehicle.
3. Check the brake system parts for oil stains. If oil stains exist (mostly on parts or connections), please repair immediately and replace the leak parts if necessary.Parts to be inspected mainly include:
   - **a.** Brake fluid reservoir pipe connection
   - **b.** ABS control unit pipe connection
   - **c.** Brake master cylinder
   - **d.** Brake slave cylinder

4.10 Checking the power steering system for leakage

Note

- Generally speaking, the leakage of the high pressure pipe of the power steering system may commonly occur.

Inspection

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lift the vehicle.
3. Check the power steering system. If oil stains are found on or around a part, please make further inspection to determine whether the part leaks oil. Replace the part if necessary. Parts to be inspected mainly include:
   a. Power steering pump
   b. Power steering fluid reservoir
   c. Steering booster
   d. Steering booster low pressure pipe
   e. Steering booster high pressure pipe

4.11 Checking the battery

Visual check

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Check the battery housing for damage. If it is damaged, please replace it immediately.
3. Check the battery positive and negative for oxides. The oxide may be caused by the loosening of the terminal fixing bolts. If that is the case, first use boiled water to wash the terminals, and then disconnect the terminals; then apply a layer of grease on the battery pile heads; and tighten the fixing nut with the specified tightening torque.

Testing the static battery voltage

Note

- Disconnect the negative terminal of the battery before testing.
- Within two hours before testing, it is not allowed to charge or discharge the battery.

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the positive and negative terminals of the battery.
3. Use a digital multimeter to measure the battery voltage.
4. The battery static voltage should not be below 12.3V normally.
5. If the digital multimeter shows a value below 12.3V, please charge the battery.
6. After charging the battery, please wait for at least two hours (do not charge or discharge during this period) before using the battery.
7. Use the digital multimeter to measure the battery voltage again. If the voltage is normal, the battery can be used further; if the voltage is below 12.3V, it is recommended that the battery be replaced.

Testing the dynamic battery voltage

1. Switch on the ignition switch to the "ON" position.
2. Use a digital multimeter to measure the battery voltage.
3. Switch on all high-power electrical equipment in the vehicle (e.g. headlamps, blower and audio system, etc.).
4. Within 15 seconds from the starting of the high-power electrical equipment, observe the voltage value shown on the digital multimeter.

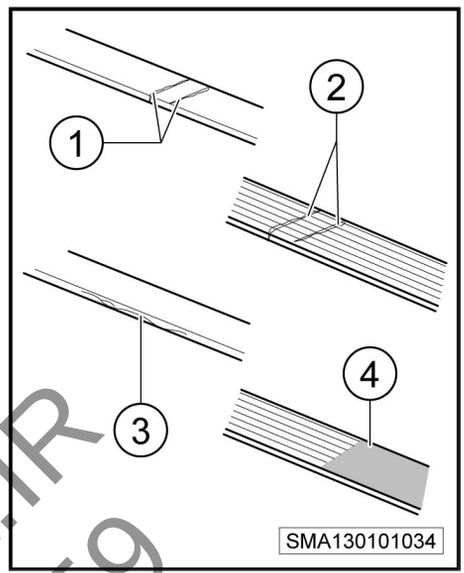
   - If the battery voltage drops slowly and does not come below 10.8V within 10 seconds, it indicates that the battery is in good condition.
   - If the battery voltage quickly drops below 9.8V, please replace the battery.

4.12 Checking the poly V-belt, power steering belt and timing belt

Note

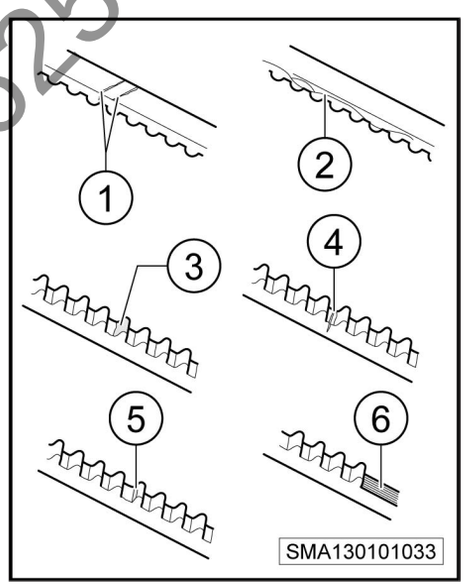
- A few cracks on the inner tooth of belts are normal.

Checking the poly V-belt



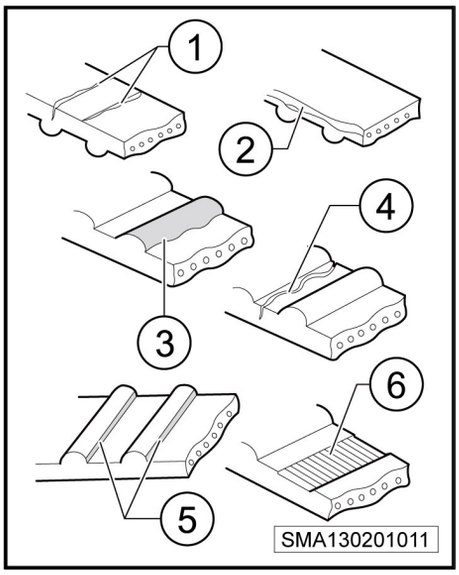
1. If one of the following occurs to the poly V-belt, please replace it as soon as possible.
   - **a.** Rubber cracks (-1-2-).
   - **b.** Loosened cord (-3-).
   - **c.** Wear (-4-).

Checking the power steering belt



1. If one of the following occurs to the power steering belt, please replace it as soon as possible.
   - **a.** Rubber cracks (-1-4-).
   - **b.** Loosened cord (-2-).
   - **c.** Wear (-3-).
   - **d.** Tooth disengagement (-6-).
   - **e.** Abnormal wear (-5-).

Checking the timing belt



1. If one of the following occurs to the timing belt, please replace it as soon as possible.

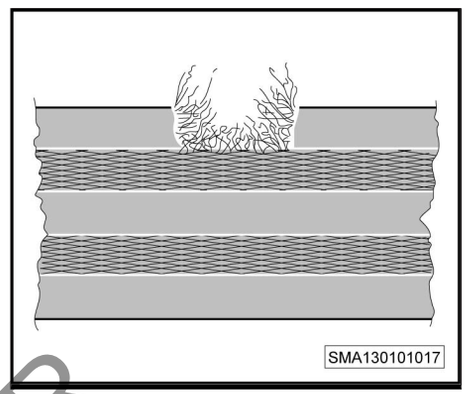
- **a.** Rubber cracks (-1-4-).
- **b.** Loosened cord (-2-).
- **c.** Wear (-3-).
- **d.** Tooth disengagement (-6-).
- **e.** Abnormal wear (-5-).

4.13 Checking the seat belt

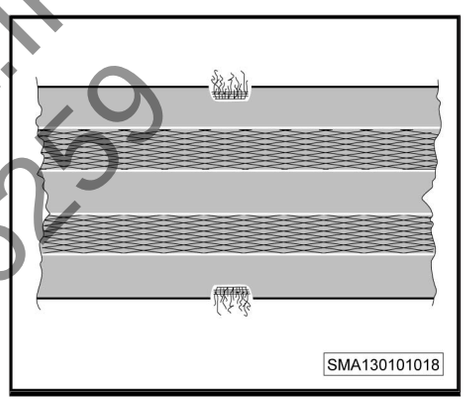
01

1. Draw the seat belt out of the automatic retractor as far as it will go and check it for oil stains. Wash it if necessary.
2. If one of the following occurs to the seat belt, please replace it as soon as possible.

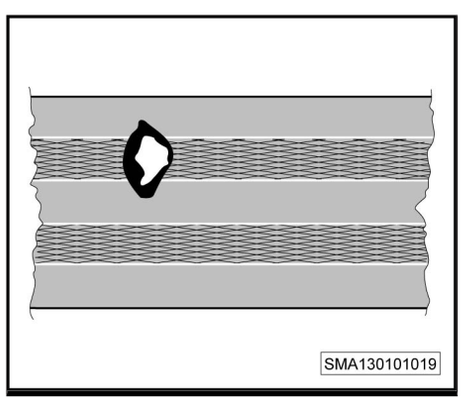
- **a**Rupture, tear or wear of the seat belt.



- **b**Rupture of seat belt edge fabric.



- **c**Scorch marks left by cigarette butts on the seal belt.



3. Check the seat belt buckle and the automatic retractor.

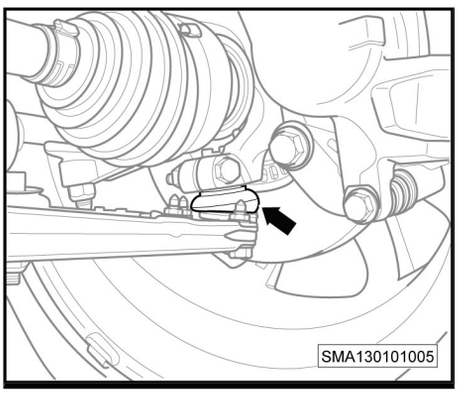
- Check the buckle and the seat belt retractor for damage. If there is damage, please replace the entire seat belt and the buckle.
- When the seat belt is static, pull the seat belt rearward repeatedly. As long as the automatic seat belt retractor fails to lock the seat belt for one time

during inspection, please replace the entire seat belt and the buckle.

- Engage the latch plate in the seat belt buckle, manually pull the seat belt repeatedly to check the engagement of the latch plate. As long as the buckle fails to lock the seat belt for one time, please replace the entire seat belt and the buckle.

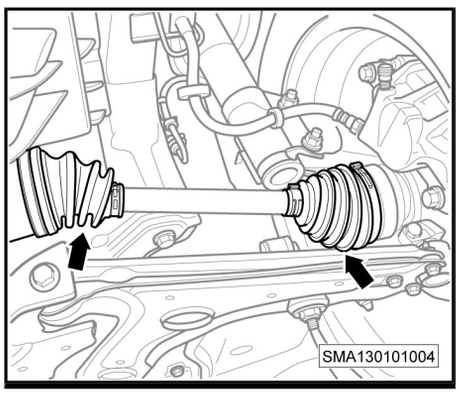
4.14 Checking the ball joint dust cover of lower control arm

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lift the vehicle to a proper height.
3. Check the ball joint dust cover of lower control arm (-arrow-) for damage.
4. If there is damage, please replace the control arm ball joint.



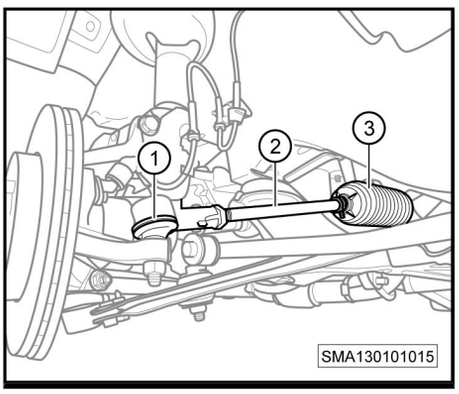
4.15 Checking the axle shaft protective sleeve

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lift the vehicle to a proper height.
3. Check the inner and outer protective sleeves of the axle shaft (-arrow-) for damage.
4. If there is damage, please replace the protective sleeve.



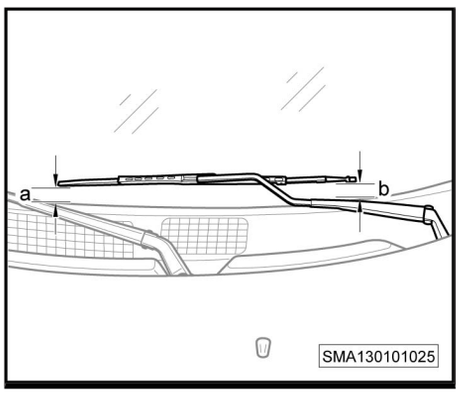
4.16 Checking the tie rod ball joint, the retainer and the dust cover

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lift the vehicle to a proper height.
3. Sway the ball joint (-1-) up and down to check for loosening. Replace it if necessary.
4. Sway the tie rod (-2-) in the axial direction to check the tie rod ball joint for clearance. Replace it if necessary.
5. Check the dust cover of the ball joint (-1-) and the dust cover of the tie rod (-3-) for damage. If there is damage, please replace them.



4.17 Checking the installation location of the wiper blade

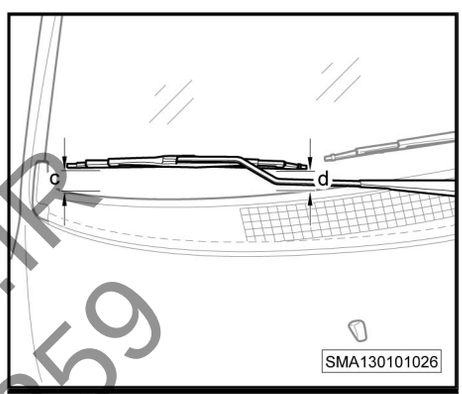
Driver's side



1. The distance between the wiper blade rubber and the lower edge of the windshield.

- Distance a: approx. 60 mm
- Distance b: approx. 30 mm

Front passenger's side



1. The distance between the wiper blade rubber and the lower edge of the windshield.

- Distance c: approx. 45 mm
- Distance d: approx. 30 mm

0201 Engine Assembly

02

1 General Information

1.1 Overview

- Engine SQR477F is developed based on SQR480 series and follows the SQR480 series in the product concept and structure, featuring vertical, inline four-cyclinder, water cooled, four stroke and single over-head camshaft (SOHC) as well as multi-point sequential electronic fuel injection. The product features advanced performance and stable design.
- The inline four-cyclinder engine with 1.5 L displacement has the following features:

  a. SOHC
  b. Four valves
  c. Aluminum cyclinder head
  d. Cast iron cyclinder block

Caution

- You should, before installing parts, remove impurities and moisture on the surface of parts and apply clean lubricant to areas that suffer from friction and need lubricating.
- When installing parts, you should not scrape precision contact surface and fitting surface. If parts are found to be scratched and incompatible with installation standards, they should be replaced.

1.2 Service notes

1. You should take care not to cause personal injuries when inspecting engine.

- When inspecting engine, you should adhere to the following safety standards. Switch off engine and inspect it after it cools down. Smoking and fire are prohibited. Ensure service site is equipped with fire extinguishers.
- Special tools must be used to remove some parts as the special tools greatly assure safety.
- You must strictly abide by the safety instructions provided by supplier when chemical products are used.
- You must take sound insulation protection actions in reparing the electronic ignition system as it can produce over 15,000 V voltage when it works.
- You should switch off all electrical equipment and ignition switch and disconnect battery negative terminal before inspecting the engine electrical system.

2. You must take care in service to abstain from damage to parts.

- You should use wooden or resin tools to set apart aluminum bonded parts.
- You must strictly follow the tightening torque specified in the service manual in service.
- Disposable gaskets, oil seals, clamps, safety plates, self-locking nuts, bolts and all nonfunctioning parts are replaced in strict accordance with the servive manual.
- You must take dust-proof actions when disassembling engine. Replace nonfunctioning parts with original parts to ensure that parts can work properly.
- Don't overly bend wirings and never operate in a violent manner to avoid collision so that electric elements such as oxygen sensors can save from damage when they are removed and installed.
- In a test drive, vehicle diagnostic device must be anchored to rear seats and operated by another person rather than driver. If the vehilce diagnostic device is operated in the front passenger seat, front passenger's airbag will burst in the event of an accident, thus resulting in personal injuries.

1.3 Product specifications

Overview of engine

Engine type	SQR477F
Fuel type	Gasoline with over 93#
Engine layout	Vertical, inline four-cyclinder, water cooled, four stroke, SOHC
Fuel supply	Multi-point sequential electronic fuel injection
Displacement	1,497 ml
Bore × stroke	77.4×79.52 mm
Cylinder type	L4
Rated power	80/6000 (kW(ps)/rpm)
Maximum torque	140/4500 N•m/rpm
Ignition order	1-3-4-2
Compression ratio	10.5:1
Minimum specific fuel consumption (total power)	260 g/kWh

Engine service data

Item			Value
Camshaft	Intake camshaft lifting		5.09 mm
	Exhaust camshaft lifting		5.34 mm
	Camshaft diameter		25.974±0.006 mm
	Camshaft axial clearance		0.124±0.029 mm
Cylinder head	Lower surface planeness		0.055 mm
	Overall height		97 mm
Valve	Valve head margin thickness	Intake valve	0.6 mm
		Exhaust valve	0.4 mm
	Valve stem diameter	Intake valve	5.98±0.008 mm
		Exhaust valve	5.96±0.008 mm
	Sealing strap width	Intake valve	2.83 mm
		Exhaust valve	2.86 mm
	Valve stem clearance	Intake valve	0.027±0.015 mm
		Exhaust valve	0.047±0.015 mm
	Tilt angle	Intake valve	68°
		Exhaust valve	70°
	Length	Intake valve	107.998 mm
		Exhaust valve	117.41 mm
Valve spring	Free height		47.7 mm
	Pretension		260±11 N
	Installation height		41 mm
Valve guide	Valve guide length		42±0.25 mm

Item			Value
	Inner diameter		6.007±0.007 mm
	Outer diameter		11.045±0.005 mm
	Press-in height		12.5±0.2 mm
Piston ring	Side clearance	Top ring	0.06±0.02 mm
		Second ring	0.05±0.02 mm
	Closed gap	Top ring	0.27±0.07 mm
		Second ring	0.47±0.07 mm
	Height	Top ring	1.98 ± 0.01mm
		Second ring	1.48±0.01 mm
		Oil ring	1.92±0.05 mm
Piston ring slot	Height	Top ring	1.24±0.01 mm
		Second ring	1.53±0.01 mm
		Oil ring	2.02±0.01 mm
	Depth	Top ring	70.4±0.1 mm
		Second ring	69.7±0.1 mm
		Oil ring	71.4±0.1 mm
Piston pin	Diameter	W	20.622～20.625 mm
		R	20.625～20.628 mm
		L	20.628～20.631 mm
	Length		61.4±0.4 mm
	Piston pin hole diameter	W	20.635～20.638 mm
		R	20.638～20.641 mm
		L	20.641～20.644 mm
Crankshaft	Axial clearance		0.198±0.105 mm
	Crankshaft main journal	Diameter	48.99.02±0.01 mm
		Radial runout	0.05 mm
		Cylindricity	0.008 mm
		Roundness	0.005 mm
	Conrod journal	Diameter	44.9±0.01 mm
		Parallelism to main journals	0.008 mm
Cyclinder block	Overall height		206±0.05 mm
	Cylinder bore roundness/straightness		0.008/0.01 mm
	Upper surface planeness		0.05 mm
Conrod	Radial clearance of conrod bearing shell		0.033±0.027 mm
	Conrod tip axial clearance		0.36±0.027 mm

Main structure features and parameters

Component	Features
Water pump	Centrifugal
Fuel pump	Electrical pump
Engine oil pump	Rotor
Gasoline filter	Integrated spin-on type
Spark plug	FR7DTC
Starter	Permanent-magnet deceleration type
Generator	14V/90A integrate alternator

Torque specifications

Component	Torque (N•m)	Use
Nut	65±5	Fasten accessory brackets to engine
Bolt	55±5	Fasten accessory brackets to engine
Bolt	25±2	Fasten poly V-belt tensioner
Bolt	18±2	Fasten timing belt tension pulley
Bolt	25±2	Fasten idler
Bolt	9±1	Fasten rear crankshaft oil seal
Bolt	110±5	Fasten crankshaft damping pulley
Bolt	21±2	Connect mount bracket of main three-way catalytic converter to body
Lock nut	50±5	Upstream and downstream of the three-way pre-catalytic converter
Lock nut	115±2	Upstream and downstream of the main three-way catalytic converter
Self-tapping screw	8±2	Fasten fuel filter
Bolt	22±2	Fasten fuel tank fixing strap I
Nut	22±2	Fasten fuel tank fixing strap II
Bolt	8±2	Fasten filler pipe bracket II
Bolt	8±2	Fasten activated carbon canister
Bolt	8±2	Fasten filler pipe bracket I
Screw	8±2	Fasten fuel tank guard
1 × Bolt	65±5	Fasten front mount rubber washer to front cross member
2 × Bolt	25±3	Fasten front mount rubber washer to front cross member
Bolt	46±5	Fasten front mount bracket to transaxle
Bolt	46±5	Fasten front mount bracket to engine
Self-locking nut	65±5	Fasten front mount bracket to front mount rubber washer

Component	Torque (N•m)	Use
Bolt	46±5	Fasten rear mount bracket to engine
Bolt	65±5	Fasten rear mount bracket to rear mount rubber washer
Bolt	65±5	Fasten rear mount rubber washer to subframe
Bolt(long)	65±5	Fasten rear mount rubber washer to subframe
Bolt	46±5	Fasten transaxle side mount bracket to transaxle
Bolt	65±5	Fasten transaxle side mount bracket to transaxle side mount rubber washer
Bolt	30±3	Fasten transaxle side mount rubber washer to subframe
Worm clamp	4±1	Fasten both ends of intake hose
Bolt	10±1	Fasten air filter assembly

Engine capacity specification

Item		Capacity Specification
Fuel type		Gasoline with over 93#
Lubricant type	Summer	Lubricant with the viscosity of SAE 10W-40 (SL or above)
	Winter	Lubricant with viscosity of SAE 5W-40 (SL or above)
Oil capacity		3.9 L
Coolant category		50％ glycol ＋ 50％ soft water (volume ratio)

2 Diagnosis and Inspection

2.1 Engine fault list

Symptoms	Possible causes	Maintenance recommendations
The engine cannot start	Low battery voltage	Check the battery and replace it if necessary
	Battery terminals are loose and corrosive	Clean the battery and tighten the connection
	Starter failure	Check engine and replace it if necessary
	Ignition coil failure	Check the igniton coil and replace it if necessary
	Excessive spark plug clearance	Replace spark plugs
	The fuel filter is blocked by excessive impurities in the fuel system	Clean the fuel system and replace the fuel filter
	Fuel pump failure	Test the fuel pump and replace it if necessary
	Timing belt slippage	Reinstall the timing belt
	Other related electrical components cannot work properly	Check related electrical components
Unstable idling speed of the engine	Blockage of air filter	Replace the air filter and clean its housing
	Idling stepper motor is blocked	Clean the idling stepper motor and throttle
	Leakage of the intake manifold	Check intake manifold, manifold gaskets and vacuum hoses
	Ignition coil failure	Check related harnesses and replace the ignition coil if necessary
	Other electrical components cannot work properly	Check other electrical components
Lack of engine power	Excessive spark plug electrode clearance	Replace spark plugs
	The fuel filter is blocked by excessive impurities in the fuel system	Clean the fuel system and replace the fuel filter
	Incorrect valve timing	Reinstall the timing belt
	Leakage of the cylinder head gaskets	Replace cylinder gaskets
	Low cylinder pressure	Measure the cylinder pressure and repair it if necessary
	Defective tightness in valve	Check valve and valve seat ring and replace them if necessary

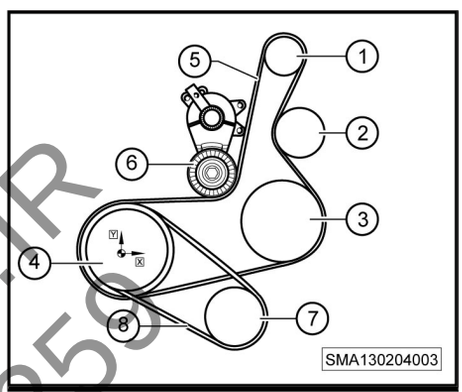
Symptoms	Possible causes	Maintenance recommendations
	Blockage of the three-way catalytic converter	Refill good fuel and replace the three-way catalytic converter
	Excessive ignition cable resistance	Test the ignition cable resistance and replace it if necessary
	Ignition coil failure	Test the ignition coil and replace it if necessary
	Poor atomization at the fuel injector	Replace the fuel filter and clean the fuel injector, and replace them if necessary
	Poor exhaust in the exhaust system	Check the exhaust system
	Insufficient air into the air intake system	Check the air intake system
	Ignition timing deviation	Check the related components like the knock sensor.
	Other electrical components cannot work properly	Check other electrical components

3 Engine Accessories

3.1 Poly V-belt and accessories

Engine belt arrangement diagram

1. Generator pulley
2. Idler
3. Air conditioner compressor pulley
4. Crankshaft damping pulley
5. Poly V-belt
6. Poly V-belt tension pulley
7. Power steering pump pulley
8. Power steering belt

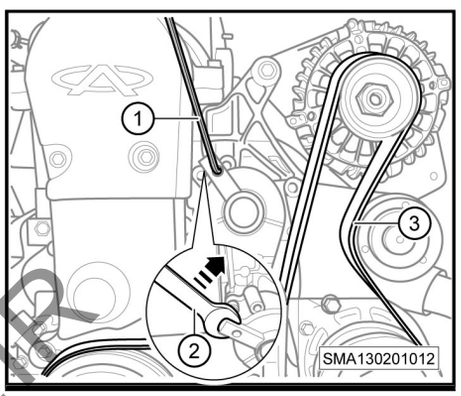


3.2 Removing and installing the poly V-belt

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the right front wheel.=> refer to page 760
3. Remove the right front wheel fender board.
4. Remove the power steering belt.

5. Use wrench (-2-) to pull the poly V-belt tension pulley in the (-arrow-) direction and insert a lock pin bar (-1-) into a lockhole of the tension pulley so as to lock it.After locking it, remove the poly V-belt (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

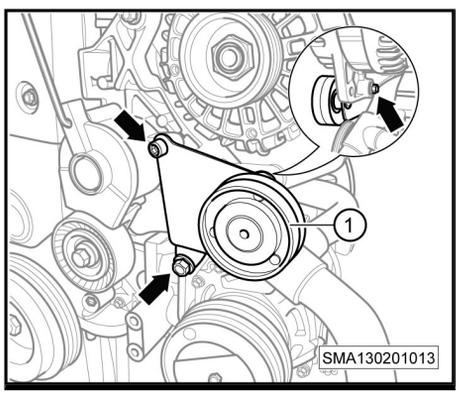
1. Remove oil stain and other impurities from the belt prior to installation.
2. Visually inspect the poly V-belt to check if there are excessively worn or inner cords are pulled out of the poly V-belt.
3. It is permissible that there are cracks on rack sides of the poly V-belt.
4. Replace the poly V-belt with missing racks.
5. After installing the poly V-belt, rotate the crankshaft damping pulley clockwise and check the rotation condition of the belt and ensure that the belt is properly installed into pulley grooves.

3.3 Removing and installing the poly V-belt tensioner and idler

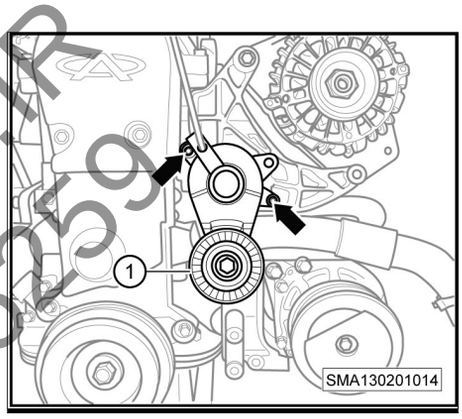
Removal

1. Remove the poly V-belt => refer to page 72.

2. Unscrew the fixing bolts (-arrow-) and remove the idler (-1-).
   - Tightening torque of the idler fixing bolt: 25±2 N•m



3. Unscrew the fixing bolts (-arrow-) and remove the poly V-belt tensioner (-1-).
   - Tightening torque of the tensioner fixing bolt: 25±2 N•m



Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

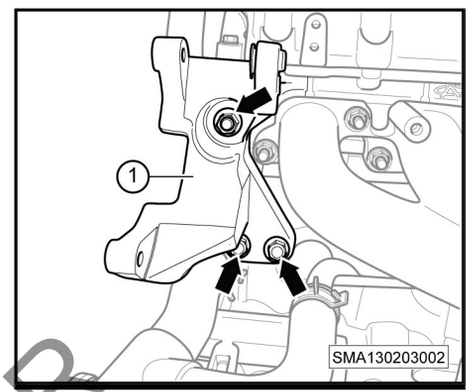
1. Rotate the poly V-belt tension pulley and idler to check whether they can rotate freely.
2. Shake the wheel to check whether the bearing is loose.

3.4 Removing and installing the accessory bracket

Removal

1. Remove the generator.=> refer to page 983
2. Remove the poly V-belt tensioner and idler . => refer to page 73

3. Unscrew fixing nuts and bolts (-arrow-) and remove the idler (-1-).
   - Tightening torque of the fixing nut: 65±5 N•m
   - Tightening torque of the fixing bolt: 55±5 N•m

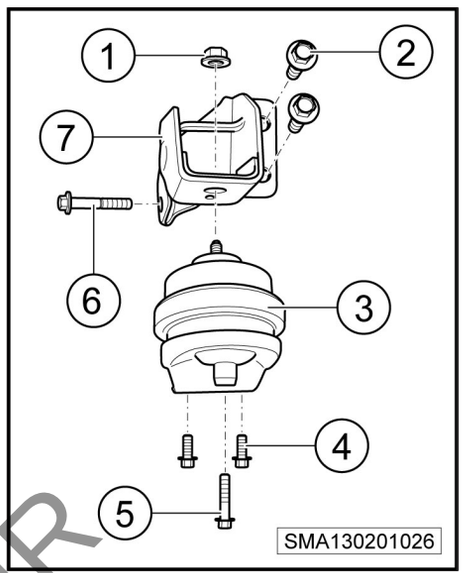


Installation

Installation shall follow the reverse sequence of the removal procedure.

3.5 Engine mount

The engine front mount assembly drawing



1. Nut

- To fasten front mount bracket to front mount rubber washer

2. Bolt

- To fasten front mount bracket to engine

3. Front mount rubber washer

- To connect front mount bracket to front crossrail

4. Bolt

- To fasten front mount rubber washer to front crossrail

5. Bolt

- To fasten front mount rubber washer to front crossrail

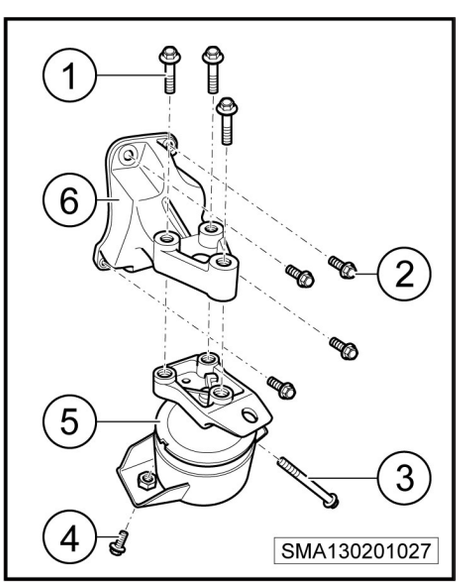
6. Bolt

- To fasten front mount bracket to engine

7. Front mount bracket

- To connect front mount rubber washer to engine

The engine rear mount assembly drawing



1. Bolt

- To fasten rear mount bracket to rear mount rubber washer

2. Bolt

- To fasten rear mount bracket to engine

3. Bolt

- To fasten rear mount rubber washer to subframe

4. Bolt

- To fasten rear mount rubber washer to subframe

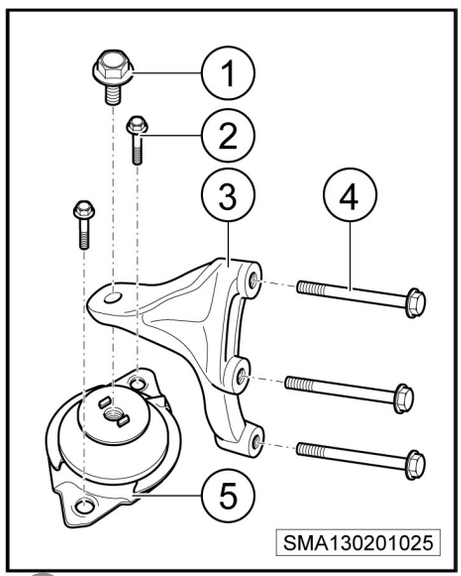
5. Rear mount rubber washer

- To connect rear mount rubber washer to subframe

6. Rear mount bracket

- To connect rear mount rubber washer to engine

The transaxle side mount assembly drawing



1. Bolt

- To fasten transaxle side mount bracket to transaxle side mount rubber washer

2. Bolt

- To fasten transaxle side mount rubber washer to subframe

3. Transaxle side mount bracket

- To connect transaxle to transaxle side mount rubber washer

4. Bolt

- To fasten transaxle side mount bracket to transaxle

5. Transaxle side mount rubber washer

- To connect transaxle side mount bracket to subframe

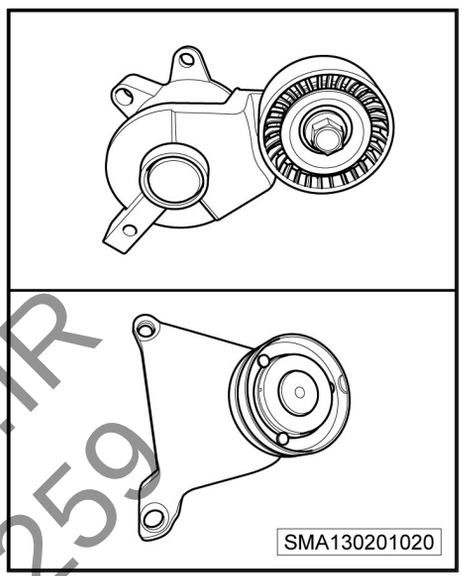
3.6 Inspection

Inspecting the poly V-belt tension pulley and idler

Note

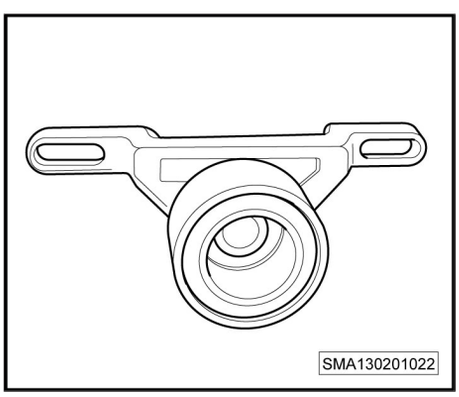
- Check every part of the pulley and idle carefully and replace those parts timely if they fail to meet requirements.

1. Manually rotate the poly V-belt tension pulley and idler to check whether they have abnormal noise and whether they can rotate freely.
2. Shake the poly V-belt tension pulley and idler radially and axially to check if they are too loose.
3. Check if working faces of poly V-belt tension pulley and idler are damaged.
4. Check if the tensioning return of tensioner is properly repositioned and if tensioning force suffices.



Inspecting the timing belt tension pulley

1. Manually rotate the timing belt tension pulley to check whether it has abnormal noise and whether it can rotate freely.
2. Pull the timing belt tension pulley radially and axially to check if it is too loose.
3. Check if the working face of the timing belt tension pulley is damaged.



4 Engine Oil Seal

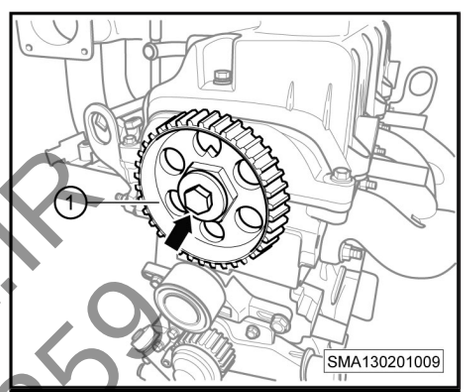
4.1 Removing and installing the camshaft oil seal

Removal

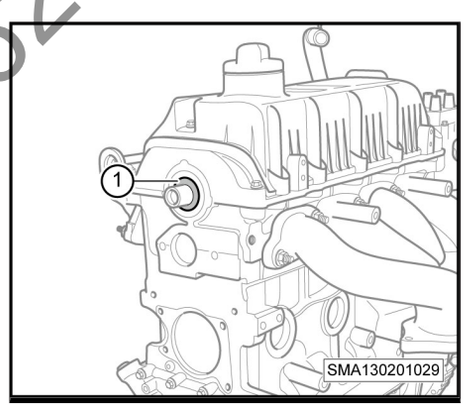
1. Remove the timing belt .=> refer to page 88

2. Unscrew the fixing bolt (-arrow-) and remove the camshaft timing pulley (-1-).

- Tightening torque of camshaft timing pulley fixing bolt: 95±5 N•m



3. Wrap some tapes on a flat tip screwdriver and carefully pry off the front camshaft oil seal (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

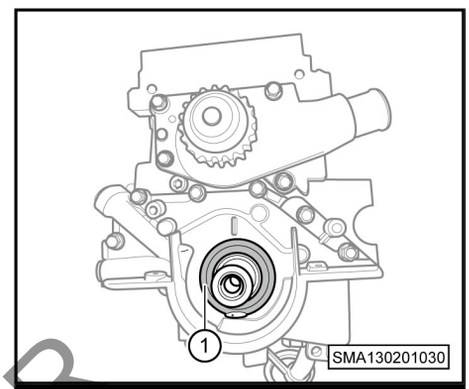
1. Clean impurities such as residual sealant and oil on seal installing surface.
2. Apply oil to the front camshaft oil seal lip to install it properly, otherwise, the seal is likely to be damaged.
3. Apply sealant to seal outer contact area.
4. Other installation shall follow the reverse sequence of the removal procedure.

4.2 Removing and installing the front crankshaft oil seal

Removal

1. Remove the right front wheel and its fender board .=> refer to page 760
2. Remove the timing belt .=> refer to page 88

3. Wrap some tapes on a flat tip screwdriver and carefully pry off the front camshaft oil seal (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

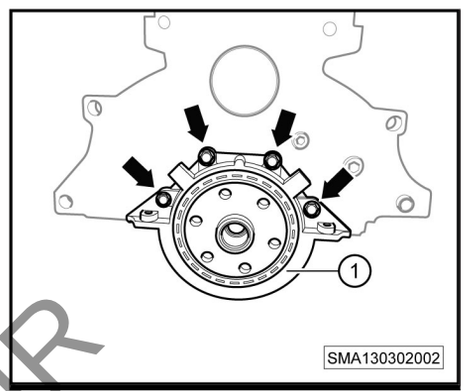
1. Clean impurities such as oil and residual sealant on seal installing surface.
2. Apply oil to the front camshaft oil seal lip to install it properly, otherwise, the seal is likely to be damaged.
3. Apply sealant to seal outer contact area.

4.3 Removing and installing the rear crankshaft oil seal

Removal

1. Discharge the oil .=> refer to page 31
2. Remove the oil pan .=> refer to page 160
3. Remove the transaxle .=> refer to page 920
4. Remove the flywheel .=> refer to page 102

5. Unscrew the fixing bolts (-arrow-) and remove the rear crankshaft oil seal (-1-).
   - Tightening torque of the fixing bolt of the rear crankshaft oil seal: 9±1 N•m



Installation

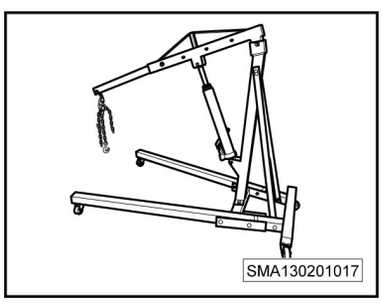
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Remove residual sealant and gaskets on the cyclinder block.
2. Apply oil to the rear camshaft oil seal lip to install it properly, otherwise, the seal is likely to be damaged.
3. Apply sealant to both sides of the rear crankshaft oil seal.

5 Engine Assembly

5.1 Removing and installing the engine assembly

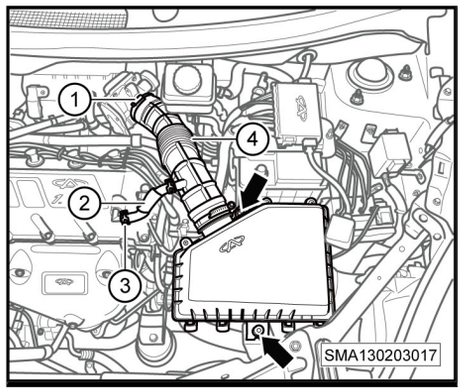
Maintenance tools and common equipment

	
Engine lifting tools Engine hanger	

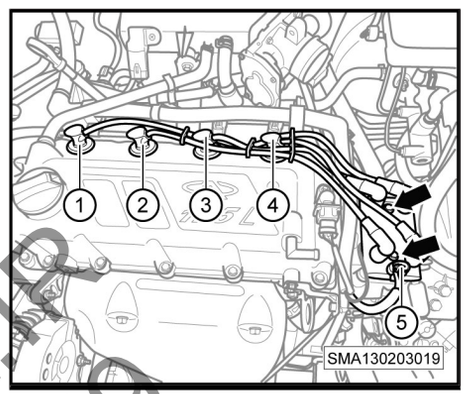
Removal

1. Switch off all electrical equipment and ignition switch and then pull out the ignition key.
2. Disconnect the battery negative terminal.
3. Discharge the oil .=> refer to page 31
4. Discharge the coolant . => refer to page 177
5. Recover the air conditioner refrigerant .=> refer to page 1247
6. Remove the three-way catalytic converter and the front exhaust pipe .=> refer to page 224
7. Remove the battery and the bracket .=> refer to page 976
8. Remove the radiator fans .=> refer to page 185
9. Remove the power steering belt .
10. Disconnect the power steering pump to engine and hang the power steering pump on the front cross member.=> refer to page 662
11. Remove the air conditioner compressor and its brakcet .=> refer to page 1257

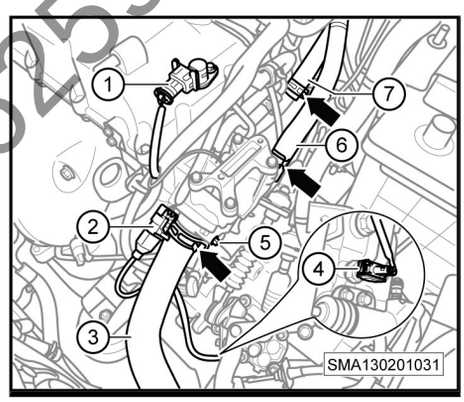
12. Unscrew the fixing bolts (-arrow-), loosen the clamps (-1-) and (-3-) and disengage the hoses (-2-) and (-4-) and then remove the air filter assembly.



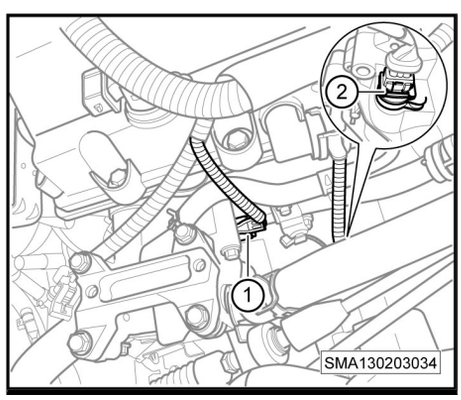
13. Disconnect the ignition coil connector (-5-), unscrew the fixing bolts (-arrow-) and pull out the ignition cable from cyclinder (-1-) to cyclinder (-4-) and then remove the ignition coil and igniton cable.



14. Disconnect the ignition coil connectors (-1-), (-2-) and (-4-), loosen the clamps (-arrow-), disengage the hoses (-3-), (-6-) and (-7-), unscrew the fixing bolt (-5-) and disconnect the earth cable.

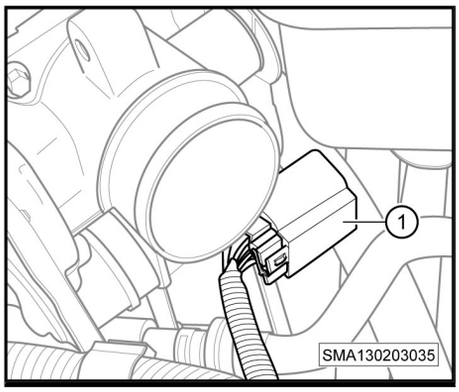


15. Disconnect the coolant temperature sensor connector (-1-) and the vehicle speed sensor connector (-2-).

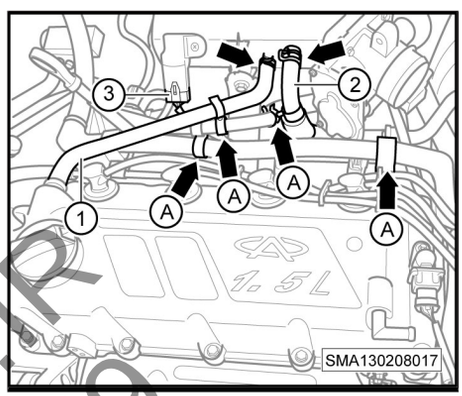


The following steps 16 and 17 are applied to vehicles equipped with electronic throttles

16. Disconnect the electronic throttle connector (-1-).

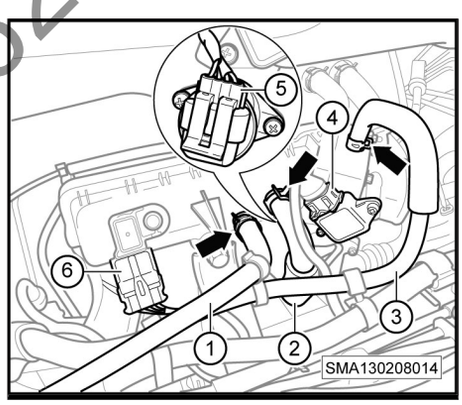


17. Disconnect the electronic throttle connector (-1-).



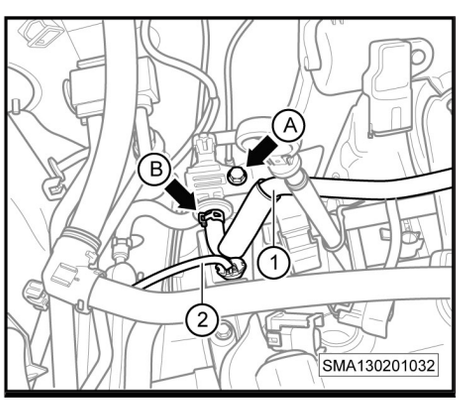
The following step 18 is applied to vehicles equipped with electronic throttles

18. Loosen the clamps (-arrow-), pull out the crankcase ventilation hose (-1-), the vacuum booster hose (-2-) and the activated carbon canister hose (-3-), and then disconnect the throttle position sensor connector (-4-), the stepper motor connector (-5-) and the intake air pressure/temperature sensor connector (-6-).

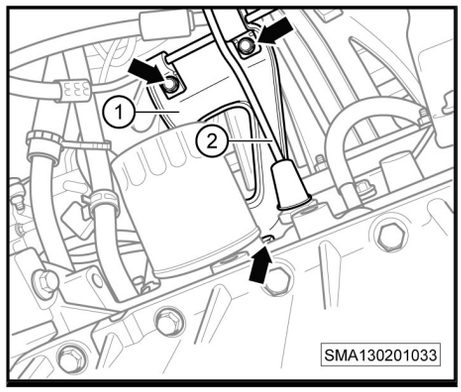


The following steps 19 to 33 are applied to all vehicles

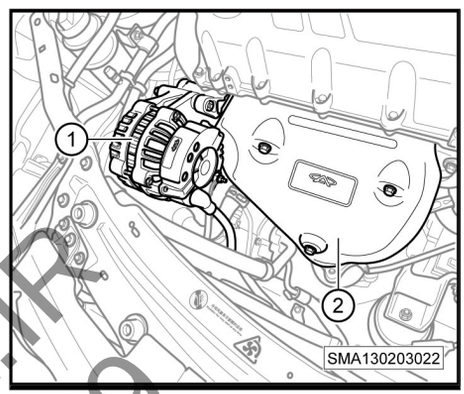
19. Loosen the clamp (-arrow B-) and pull out the fuel steam pipe (-1-), unscrew the fixing bolt (-arrow A-) and disengage the activated carbon canister solenoid valve from the intake manifold. Disconnect the knock sensor connector (-2-).



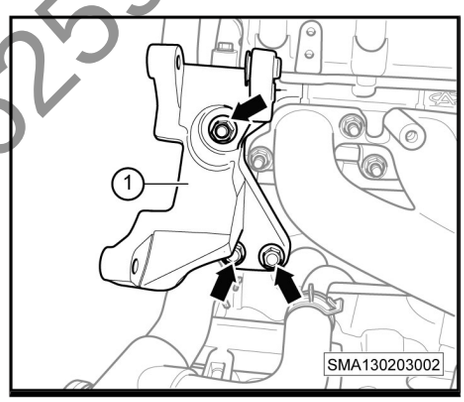
20. Disconnect the engine oil pressure switch connector (-2-), unscrew the fixing bolts (-arrow-) and remove the lower intake manifold bracket (-1-).
    - Tightening torque of the fixing bolt of the lower intake manifold bracket (upper): 18±2 N•m
    - Tightening torque of the fixing bolt of the lower intake manifold bracket (lower): 27±2 N•m



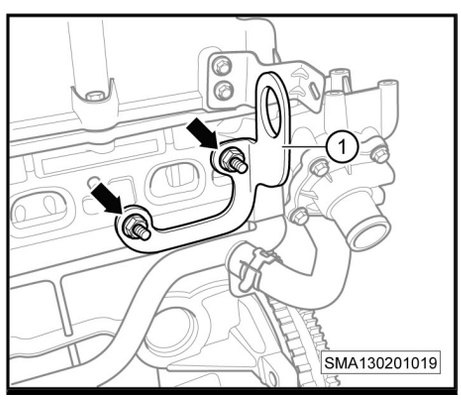
21. Remove the generator (-1-) .=> refer to page 983
22. Remove the exhaust manifold (-2-) .=> refer to page 221



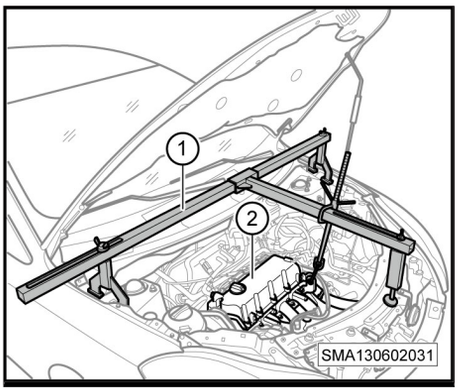
23. Unscrew the bolts (-arrow-) and remove accessory bracket (-1-).
    - Tightening torque of the fixing nut: 65±5 N•m
    - Tightening torque of the fixing bolt: 55±5 N•m



24. As shown in the figure, install the engine exhaust manifold side lug (-1-) and screw on nuts (-arrow-).



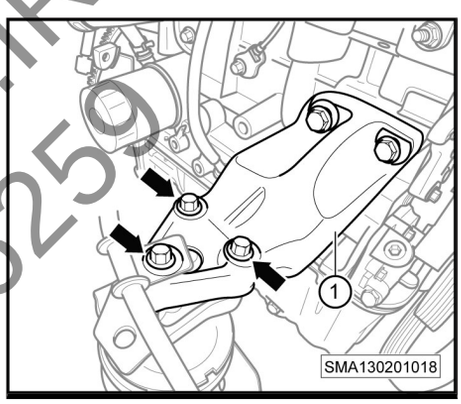
25. As shown in the figure, use the engine hanger (-1-) to fix the engine assembly (-2-).



26. Remove the transaxle .=> refer to page 920
27. Lower vehicle body and support the engine assembly with a mobile jack and then remove the engine hanger.
28. Use iron chains to fix the engine intake manifold side lug and exhaust manifold side lug respectively and use the engine lifting tools to fix the engine.

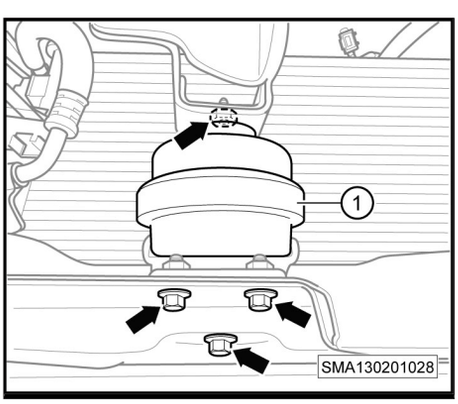
29. Unscrew the fixing bolts (-arrow-) and disengage the rear mount bracket (-1-) from the rear mount rubber washer.

- Tightening torque of the bolt connecting the rear mount bracket to the rear mount rubber washer: 65±5 N•m



30. Unscrew the fixing bolts and nuts (-arrow-) and remove the engine front mount rubber washer (-1-).

- Tightening torque of the nut connecting the front mount bracket to the front mount rubber washer: 65±5 N•m
- Tightening torque of the (two) bolts connecting the front mount rubber washer to the front cross member: 25±3 N•m
- Tightening torque of (one) bolt connecting the front mount rubber washer to the front cross member: 65±5 N•m



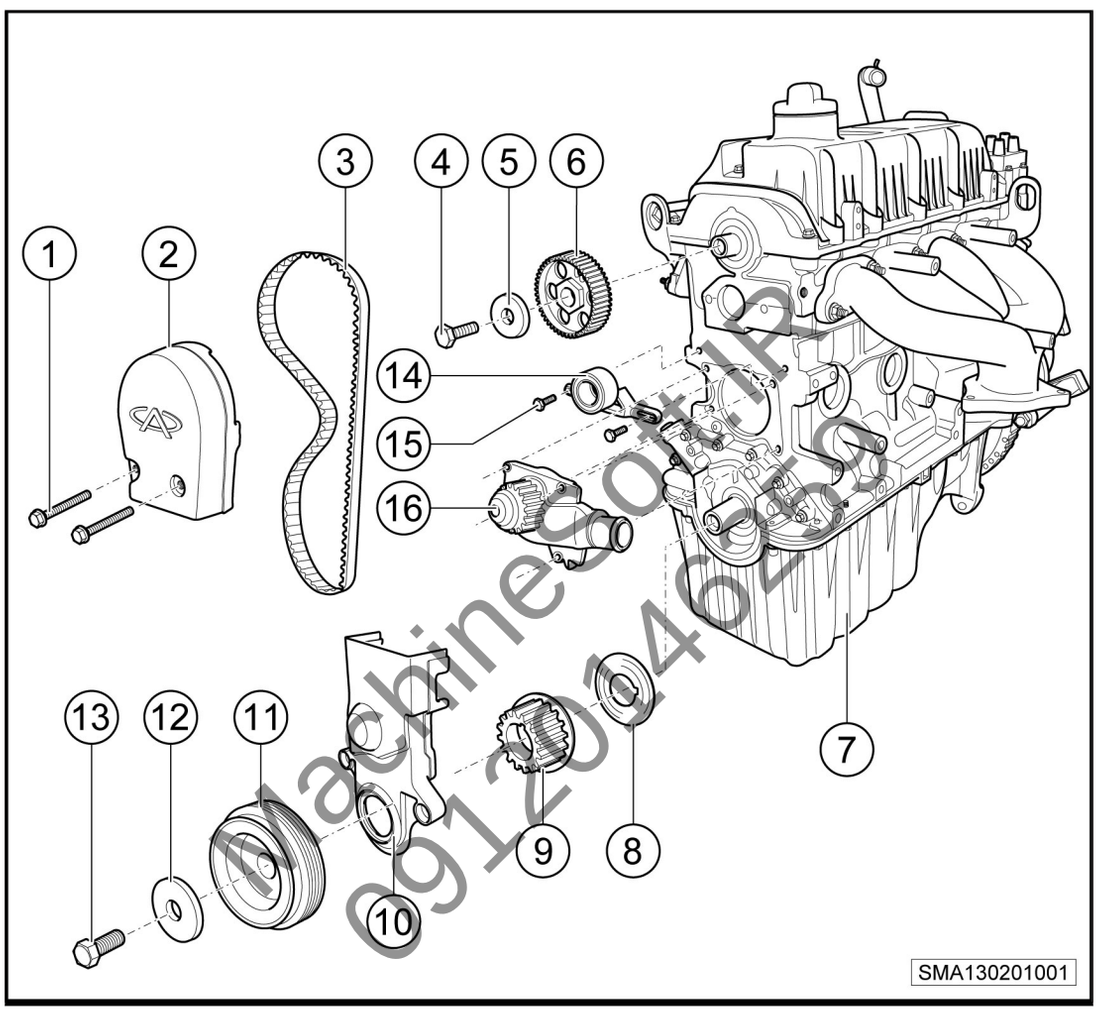
31. Remove the engine hood.
32. Use the engine lifting tools to lift the engine to a certain height and lift the engine assembly out of engine compartment.

Installation

Installation shall follow the reverse sequence of the removal procedure.

6 Timing Belt

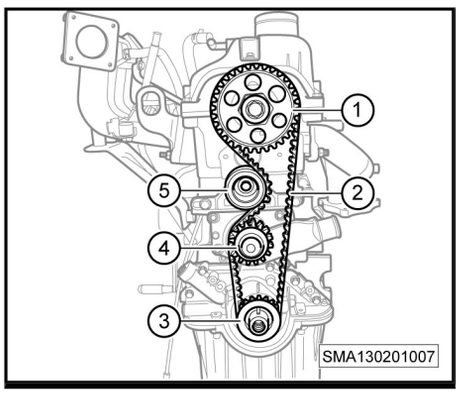
6.1 The timing belt assembly drawing



1. Bolt	2. Timing belt upper guard
3. Timing belt	4. Camshaft timing pulley fixing bolt
5. Gasket	6. Camshaft timing pulley
7. Engine	8. Gasket
9. Crankshaft timing pulley	10. Timing belt lower guard
11. Crankshaft damping pulley	12. Gasket
13. Fixing bolt of the crankshaft damping pulley	14. Timing belt tensiong pulley
15. Bolt	16. Coolant pump

6.2 Timing belt flow chart

1. Camshaft timing pulley
2. Timing belt
3. Crankshaft timing pulley
4. Coolant pump
5. Timing belt tensiong pulley



6.3 Removing and installing the timing belt

Note

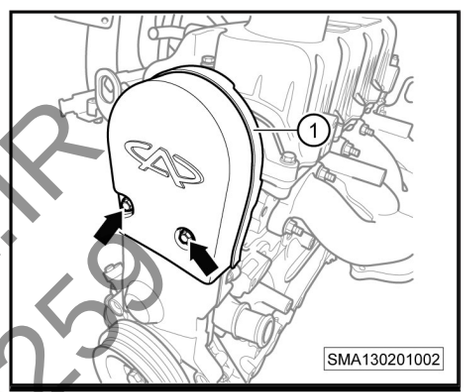
- You must fasten the crankshaft or flywheel when removing the fixing bolt of the crankshaft damping pulley.

02

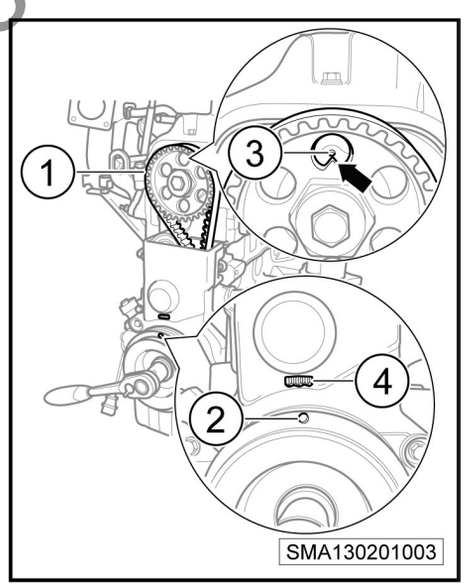
Removal

1. Remove the right front wheel and its fender board .=> refer to page 760
2. Remove the power steering belt .
3. Remove the poly V-belt .=> refer to page 72

4. Unscrew the fixing bolts (-arrow-) and remove the timing belt upper guide (-1-).

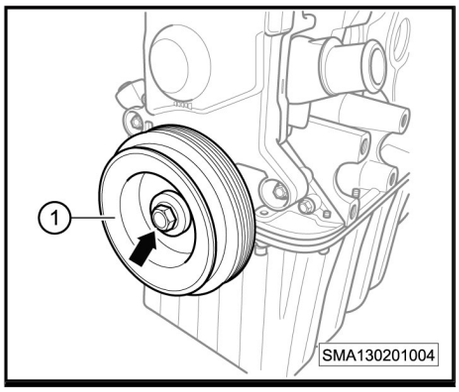


5. As shown in the figure, rotate the crankshaft damping pulley so that the mark (-arrow-) on the camshaft timing pulley (-1-) is aligned with the mark (-3-) on the cyclinder head.The mark (-2-) on the crankshaft damping pulley should be aligned with the fifth protrudent mark (-4-) on the timing belt lower guide.

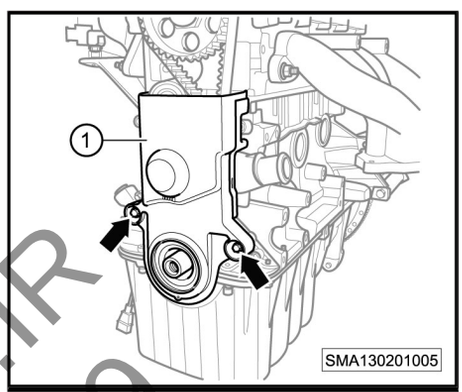


6. Engage the reverse gear in the transaxle so that crankshaft is connected with the transaxle. Another technician holds down the brake pedal to lock the crankshaft with the aid of the mechanical drive mechanism.

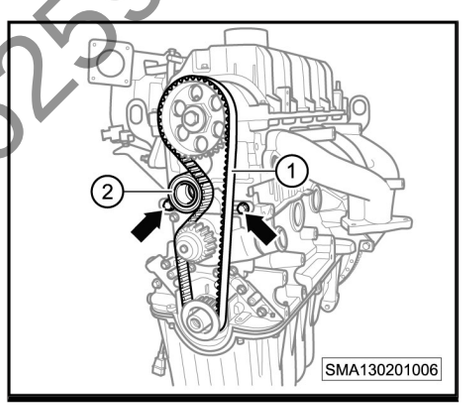
7. Unscrew the fixing bolts of crankshaft damping pulley (-arrow-) and remove the crankshaft damping pulley (-1-).
   - Tightening torque of the fixing bolt of the crankshaft damping pulley: 110±5 N•m



8. Unscrew the fixing bolts (-arrow-) and remove the timing belt lower guide (-1-).

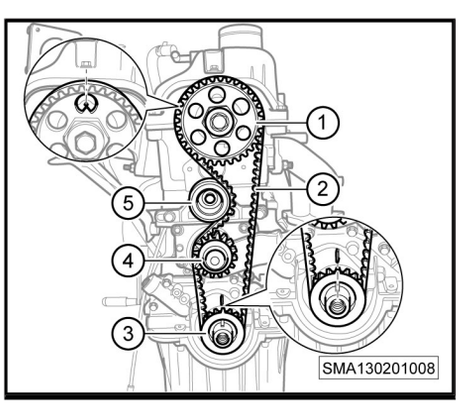


9. Unscrew the fixing bolts (-arrow-), loosen the timing belt tension pulley (-2-) and then remove the timing belt (-1-).



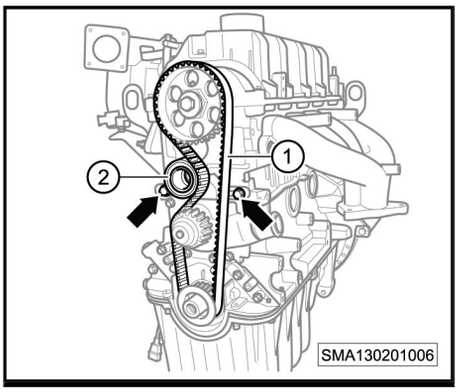
Installation

1. Install the timing belt (-2-) and verify that the mark ARROW on the camshaft timing pulley hole is aligned with the mark DOT on the cyclinder head (top left sectional drawing) and the raised mark on the crankshaft timing pulley is alinged with the mark on the oil pump housing (bottom right sectional drawing). Check if the timing belt is properly installed in the camshaft timing pulley (-1-), the timing belt tension pulley (-5-), the coolant pump pulley (-4-) and the crankshaft timing pulley (-3-).



2. Adjust the timing belt tension pulley (-2-) and screw on the fixing bolt (-arrow-) so that the timing belt is in a proper tension.

- Tightening torque of the bolt: 18±2 N•m



3. Rotate the crankshaft for one turn to check if the timing mark is deviated. If it is deviated, remove the belt and reinstall it.

4. Other installation shall follow the reverse sequence of the removal procedure.

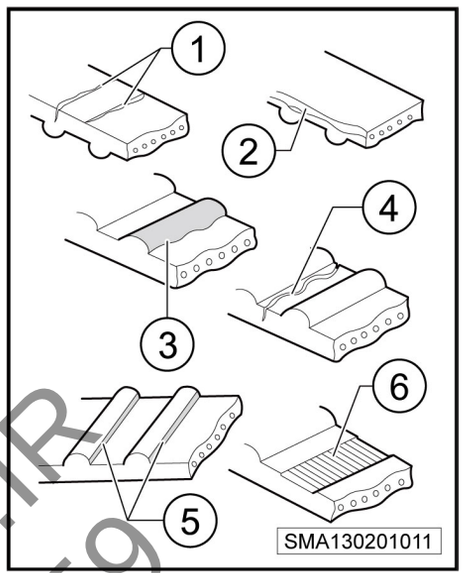
6.4 Inspecting the timing belt

Note

- A few cracks on the inner tooth of belts are normal.

1. If one of the following occurs to the timing belt, please replace it as soon as possible.

a. Rubber cracks (-1-4-).
b. Loosened cord (-2-).
c. Wear (-3-).
d. Tooth disengagement (-6-).
e. Abnormal wear (-5-).



0202 Crank/Conrod Mechanism

02

1 General Information

1.1 Overview

1. Crank/conrod mechanism is to transform the thermal energy generated by the fuel combustion into the mechanical energy that fuels the piston alternative motion and then the energy is transmitted through the flywheel during the piston alternative motion into the crankshaft motion of rotation.
2. Crank/conrod mechanism is the main parts that help the engine realize the working cycle and complete the energy conversion.
3. During the power stroke, the mechanism uses the thermal energy generated by the fuel combustion to push the piston for alternative motion and then the piston drives the crankshaft motion of rotation, thus converting it into the mechanical energy and outputing power.During other strokes, the conrod drives the piston to move alternatively by virtue of the revolution inertia of the crank and the flywheel, thus creating conditions for the next work.
4. The crank/conrod mechanism consists of the following parts:

   a. Cylinder block
   b. Crankshaft
   c. Piston
   d. Piston ring
   e. Piston pin
   f. Conrod
   g. Flywheel

Caution

- Before installing parts, remove impurities and moisture on the surface of parts and apply clean lubricant to areas that suffer from friction and need lubricating.
- When installing parts, do not scrape precision contact surface and fitting surface. If parts are found to be scratched and incompatible with installation standards, they should be replaced.

1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Main bearing cap bolt and stud	95±5
Fixing bolt of the conrod cap	33±3
Fixing bolt of the flywheel	110±5
Cylinder block oil passage screwed plug	22±2

Cylinder block

Item	Standard value (mm)
Upper surface planeness	0.05
Cylinder block wear limit	0.05
Sum of wear limits for cylinder block and cylinder head	0.20
Overall height	206±0.05
Cylinder bore roundness/straightness	0.008/0.01

Crankshaft

Item	Standard value
Axial clearance	0.198±0.105

Crankshaft conrod journal

Item	Standard value
Diameter	44.9±0.01
Parallelism to main journals	0.008

Crankshaft main journal

Item	Standard value (mm)
Diameter	48.99±0.01
Radial runout	0.05
Cylindricity	0.008
Roundness	0.005

Conrod

Item	Standard value (mm)
Radial clearance of conrod bearing shell	0.033±0.027
Conrod tip axial clearance	0.36±0.027

Piston pin

Item		Standard value (mm)
Diameter	W	20.622～20.625

Item		Standard value (mm)
	R	20.625～20.628
	L	20.628～20.631
Piston pin hole diameter	W	20.635～20.638
	R	20.638～20.641
	L	20.641～20.644
Length		61.4±0.4

Piston

Item	Standard value (mm)
Piston skirt diameter	77.345±0.02

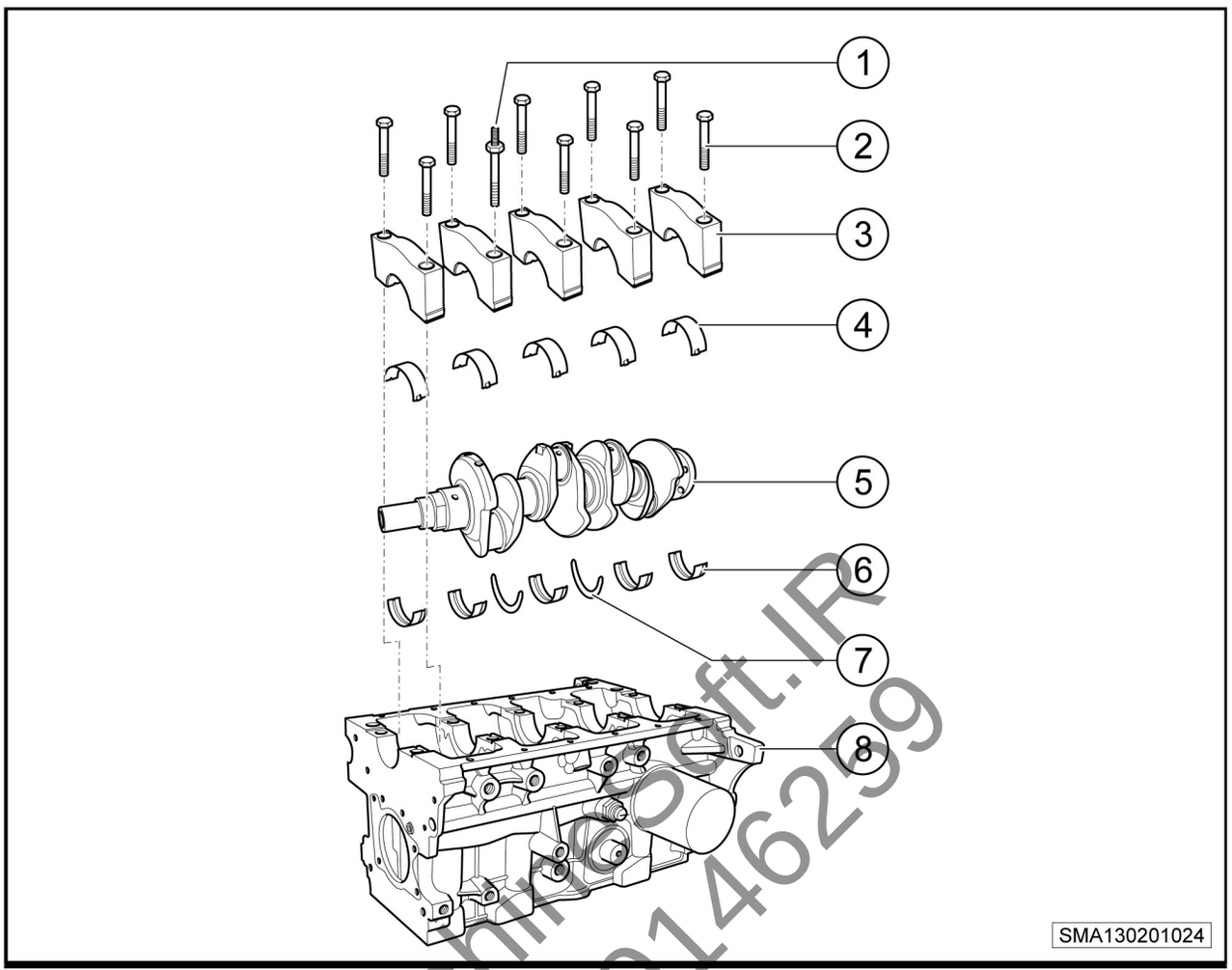
Piston ring

Item		Standard value (mm)
Side clearance	Top ring	0.06±0.02
	Second ring	0.05±0.02
Closed gap	Top ring	0.27±0.07
	Second ring	0.47±0.07
Height	Top ring	1.98±0.01
	Second ring	1.48±0.01
	Oil ring	1.92±0.05

Piston ring slot

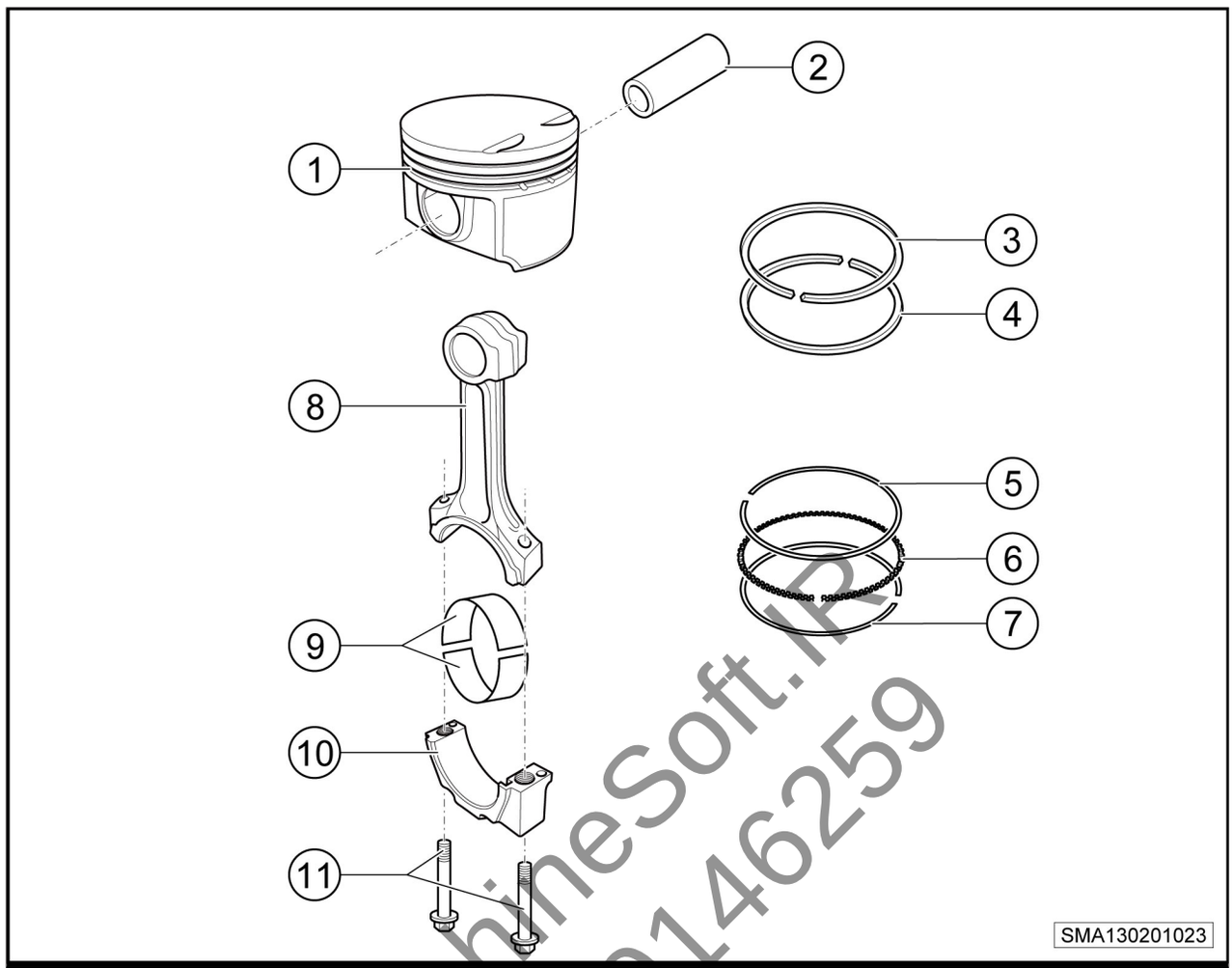
Item		Standard value (mm)
Height	Top ring	1.24±0.01
	Second ring	1.53±0.01
	Oil ring	2.02±0.01
Depth	Top ring	70.4±0.1
	Second ring	69.7±0.1
	Oil ring	71.4±0.1

1.3 The crankshaft mechanism assembly drawing



1. Fixing stud of the crankshaft main bearing cap	2. Fixing bolt of the crankshaft main bearing cap
3. Crankshaft main bearing cap	4. Crankshaft main bearing shell (Upper)
5. Crankshaft	6. Crankshaft main bearing shell (Lower)
7. Thrust washer	8. Cylinder block

1.4 The piston conrod mechanism assembly drawing

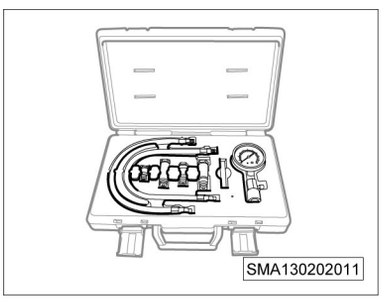


1. Piston	2. Piston pin
3. Top compression ring	4. Second compression ring
5. Upper oil ring rail	6. Oil ring expander
7. Lower oil ring rail	8. Conrod
9. Conrod bearing shell	10. Conrod cap
11. Bolt	

2 Diagnosis and Inspection

2.1 Inspecting the cylinder pressure

Maintenance tools and common equipment

	
Cylinder pressure tester	

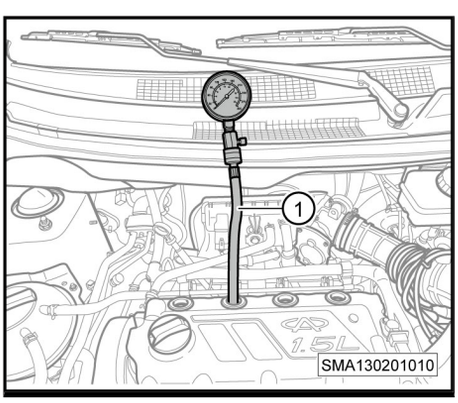
Preconditions:

1. Preheat the engine to a normal temperature (cooling fan starts).
2. Oil level is in standard range.
3. Wide-open throttle.
4. Pull out the fuel pump fuses.

Inspection

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Pull out the igniton cable and unscrew all spark plugs.

3. As shown in the figure, install the cylinder pressure tester onto the cylinder to be inspected and preload the instrument.



4. Depress the accelerator pedal fully, start the engine and keep it running for three to five seconds and record the measured pressure indication. Then press the bleed button on the cylinder pressure tester to zero out the instrument. Measure it for three times

with the same method, taking the mean value among them.The standard cylinder compression pressure should be 12±2 bar.

5. If an individual cylinder has a too low pressure, you should first fill 20 to 30 ml oil to the cylinder. The oil will penetrate into the clearance between the piston and the cylinder wall in 1 to 2 min, which can seal the cylinder clearance briefly. You can use the cylinder pressure tester to measure the pressure again. If the cylinder pressure rises significantly, it indicates that the too low cylinder pressure is caused by a too wide clearance of piston rings or pistons and cycliner walls. Conversely, if the cylinder pressure does not change notably, it indicates valve or cylinder gasket faults.

2.2 Crank conrod mechanism fault list

Symptoms	Possible causes	Maintenance recommendations
High cylinder pressure	Poor fuel quality leads to excessive carbon deposit in the combustion chamber	Clean the fuel system, remove the carbon deposit and replace the fuel
	Too thin cylinder gaskets	Replace cylinder gaskets
	Excessive wear on the contact area between cylinder head and cylinder block	Replace cylinder head
Low cylinder pressure	Wrong valve timing	Recorrect vavle timing
	Defective tightness or damage in cylinder gasket	Replace cylinder gaskets
	Defective tightness in valve	Repalce valve and valve guide
	Defective tightness in clearance between the piston and the cylinder wall	Replace pistons
	Piston ring fracture	Replace the piston ring and check the piston
	Piston ring ends are aligned	Adjust the piston ring ends or replace the piston ring
Abnormal sound in the crankshaft main bearing	Clogged oil conduit and poor lubrication	Clean the oil conduit and repair the engine
	Loose main bearing cap bolts	Repalce the bearing shells and bolts
	Excessive wear on main bearing shell	Check the main journal and replace the main bearing shell
	Poor fit between the bearing shell and the journal	Check the main journal and replace the main bearing shell
Abnormal sound in the conrod bearing	Wear on the conrod bearing shell or journal and too wide alignment gap	Check the main journal and replace the main bearing shell
	Low oil pressure, oil deterioration or clogged oil conduit lead to poor lubrication	Replace the oil and check the conrod journal and the conrod bearing shell. Replace them if necesary
	Loose conrod cap bolts	Replace the conrods and the bearing shells
	Excessive wear on the conrod bearing shell	Replace the conrod bearing shell and check the conrod journal
Piston knock	Too wide clearance between the piston and the cylinder wall	Replace the pistons and check the cylinder wall
	Excessive wear between the cylinder wall and the piston	Replace the pistons and check the cylinder wall
	Eccentric wear occurs on the piston due to individual conrod deformation	Replace the conrod, the piston and the cylinder
	Ignition timing fault	Read the fault code and rectify the fault according to the fault code

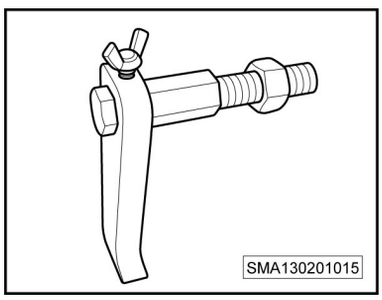
Symptoms	Possible causes	Maintenance recommendations
Abnormal sound in the piston pin	Excessive wear on the piston pin and the wrist-pin bush leads to loose fit	Repalce the pistons and the conrod
	Excessive wear on the piston leads to loose fit	Repalce the pistons and the conrod

3 Flywheel

3.1 Removing and installing the flywheel assembly

02

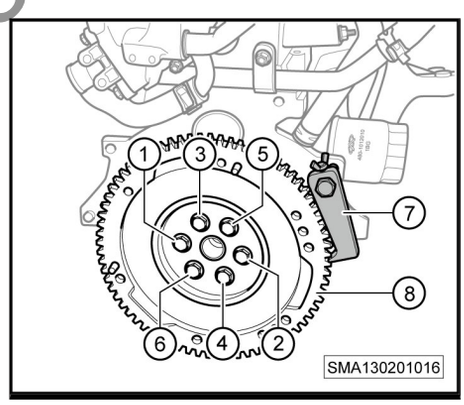
Maintenance tools and common equipment

	
Flywheel locking tool	

Removal

1. Remove clutch disc and clutch pressure plate .=> refer to page 899

2. As shown in the figure, using special tool (-7-), lock the flywheel, unscrew the fixing bolts (-1-) to (-6-) and then remove the flywheel (-8-).



Installation

Caution

- It is impermissible to reuse the removed flywheel fixing bolts as they are scrapped.

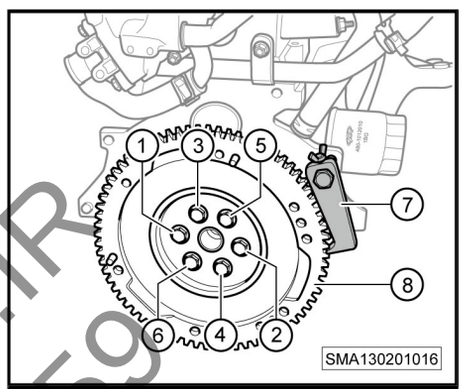
Note

- Six bolt holes of the flywheel are arranged asymmetrically.There are fitting marking holes on the flywheel. When the first cylinder of the engine is at the top dead center, adjust the marking hole on the flywheel over the 12 O'clock position and the flywheel fixing bolts match the crankshaft bolt holes.

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Check if the crankshaft position signal teeth are distorted or deformed. Clean the signal teeth prior to installation.
2. Check if the wear on the starter drive gear rings is normal. Replace them in case of excessive wear.
3. The flywheel installation holes and the crankshaft locating journals employ clearance fit. When installing, try to push them slightly after centering. Do not knock them.

4. As shown in the figure, install the flywheel (-8-) and screw on the bolts firstly. Then using the flywheel locking tool (-7-), lock the flywheel. Finally using the cross method (the tightening sequence for bolts (-1-) to (-6-) shown in the figure), tighten the flywheel fixing bolts in two steps.Step 1: tighten the bolts to the torque 55±5 N•m; Step 2: tighten the bolts to the torque 110±5 N•m.



4 Conrod

Note

- The conrod small end hole and the piston pin adopt interference fit.
- The conrod body and conrod cap are fixed via dowel pins.
- When selecting the conrod bearing shell, two thicknesses are available.
- When assembling, be sure to face the label "F" on the conrod toward the belt pulley direction.

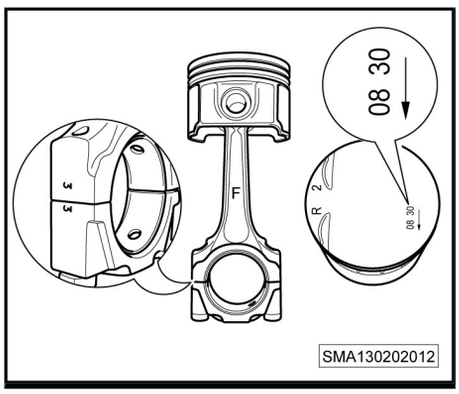
4.1 Product specifications

Product specifications

Item	Standard value
Crankshaft conrod journal diameter	44.9±0.01 mm
Parallelism of the crankshaft connrod journal to the main journals	0.008 mm
Radial clearance of the conrod bearing shell	0.006～0.06 mm
Conrod assembly mass (excluding bearing shells)	550±6.5 g
Conrod tip axial clearance	0.092～0.268 mm

4.2 Assembling relationship of conrod

1. As shown in the figure, install the letter "F" on the conrod and the forward-facing mark "Arrow" on the piston crown toward the belt pulley.
2. The numeral at one side of the conrod is in the same direction as that on the conrod cap. The numerals represent the number of cylinder to be installed. For example, the numeral "3" means the conrod is installed in the third cylinder.

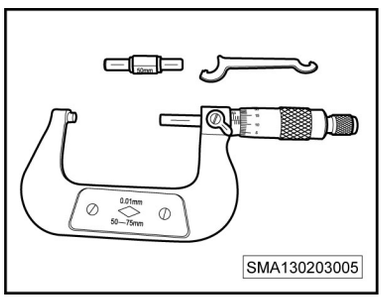


4.3 Selecting method of conrod bearing shell

1. There are two types of conrod bearing shells. The first one has the wear value of the crankshaft conrod journal of less than 0.25 mm and a green mark "0.25 mm" is etched on the back of the conrod bearing shell. The second one is used to correct the conrod bearing shell with bearing clearance and a yellow mark "0.025 mm" is etched on the back of the conrod bearing shell.
2. The upper bearing shell and lower bearing shell of the conrod are universal. An oil hole rather than an oil channel is present.On one and the same engine should be used a set of conrod bearing shell and main bearing shell that are manufactured by one supplier.Apply engine lubricant on the internal surfaces of the conrod bearing shell and the main bearing shell prior to the installation. Oil and impurities should be removed from the back of the shells when assembling.
3. The conrod and the conrod cap are fixed using dowel pins. The dowel pins and the dowel pin holes adopt interference fit.
4. When assembling, some engine lubricant should be sprayed onto the joint face of the conrod and the conrod cap dowel pin holes and on the dowel pins.
5. After the dowel pins are installed, some lubricant should be sprayed onto the joint face of the conrod and the conrod cap and into the threaded holes.Manually drive in the conrod nuts. Then using the torque wrench, tighten nuts in two steps. Tighten them to the torque 20±1.0 N•m in the first step and then tighten them to the torque 33±3 N•m in the second step.

4.4 Inspecting the mainshaft conrod journal

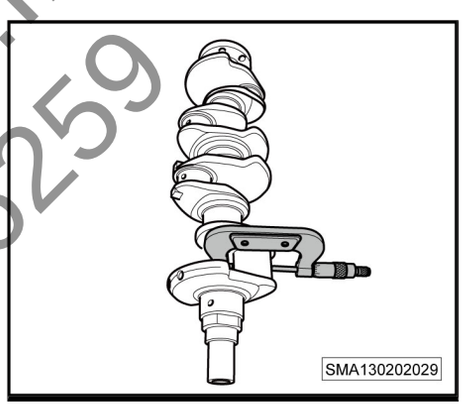
Maintenance tools and common equipment

	
Outer diameter micrometer	

Inspection

1. Clean the mainshaft conrod journal.

2. As shown in the figure, using the outer diameter micrometer, measure the mainshaft conrod journal.The standard value of the mainshaft conrod journal should be 44.9±0.01 mm.



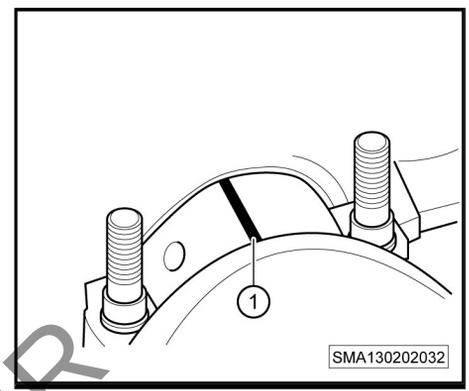
4.5 Inspecting the conrod bearing shell

Caution

- When measuring, do not rotate the crankshaft!

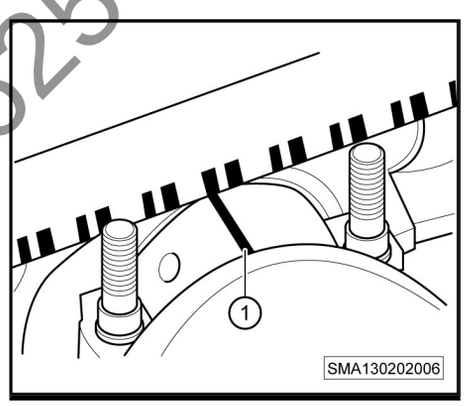
Inspection

1. Clean the conrod journal and the conrod bearing shell. Place the clearance gauge (-1-) on the journal. Install the conrod bearing shell and the conrod cap and tighten the fixing bolts of the conrod cap to the specified torque.



2. Loosen the conrod cap bolts and remove the conrod cap.

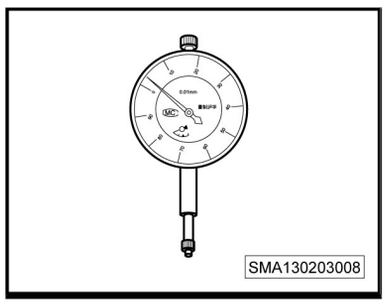
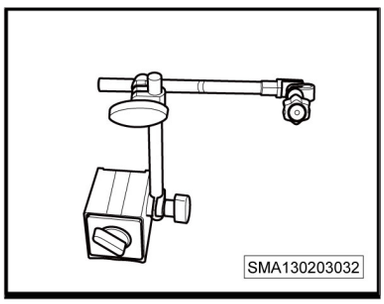
3. As shown in the figure， using the measuring scale on the packet of the clearance gauge, measure the width of the widest part of the flattened gauge (-1-) and then produce the clearance value.



Item	Standard value (mm)
Conrod journal diameter	44.9±0.01
Parallelism of the conrod journal to the main journals	0.008
Radial clearance of conrod bearing shell	0.006～0.06

4.6 Inspecting the conrod axial clearance

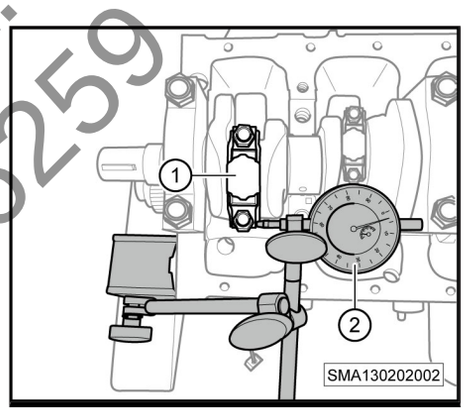
Maintenance tools and common equipment

	
Dial indicator	Bracket

Inspection

1. Tighten the fixing bolts of the conrod cap to the specified torque.

2. As shown in the figure, install a dial indicator (-2-) onto the bracket.
3. Hold the measuring rod of the dial indicator against the side end of the conrod (-1-) and zero out the dial indicator.
4. Push the conrod backwards and forwards (do not rotate the crankshaft) and read the axial clearance value on the dial indicator.The axial clearance should be 0.36±0.027 mm.



5 Piston and Piston Ring

5.1 Product specifications

Piston

Item	Standard value (mm)
Piston skirt diameter	77.345±0.02

Assembly of the piston and piston pin

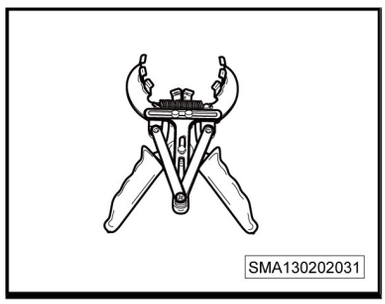
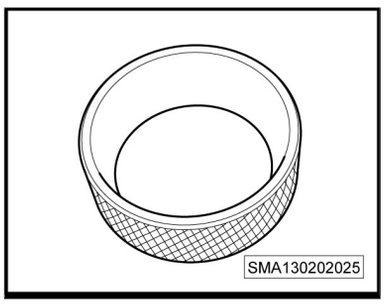
Group	Piston pin outer diameter group (mm)	Piston pin hole internal diameter (mm)	Piston pin group identification
1	20.622～20.625	20.635～20.638	W
2	20.625～20.628	20.638～20.641	R
3	20.628～20.631	20.641～20.644	L

Matching between pistons and cylinders

Piston diameter (mm)	Cylinder bore diameter (mm)	Matching cylinder clearance (mm)
7.325～77.335	777.36～77.37	0.025～0.045
77.335～77.345	77.37～77.38	
77.345～77.355	77.38～77.39	
77.355～77.365	77.39～77.40	

5.2 Removing and installing the piston rings

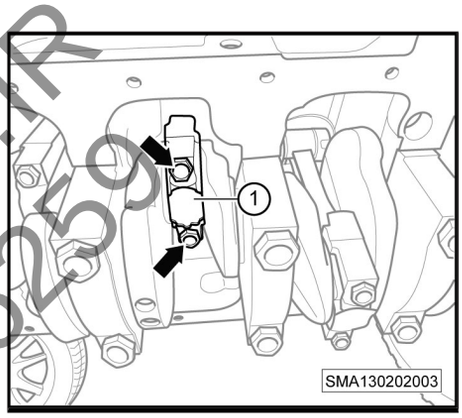
Maintenance tools and common equipment

	
Piston ring remover	Piston mounting tool

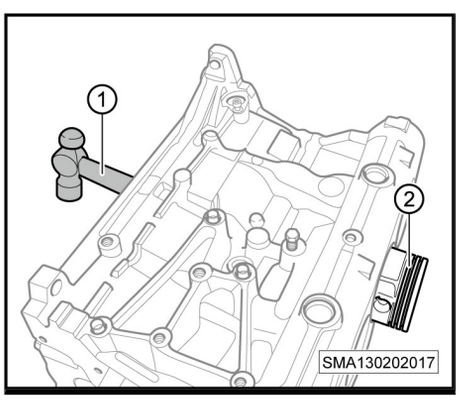
Removal

1. Unscrew the fixing bolts (-arrow-) and remove the conrod cap (-1-).

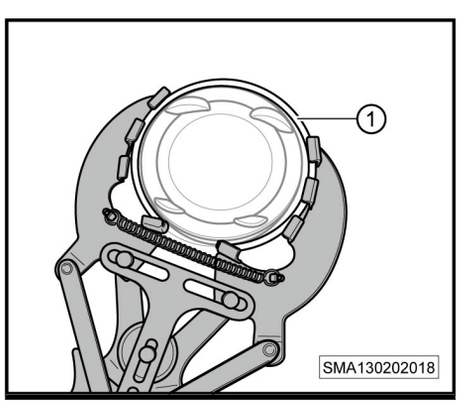
- Tightening torque of fixing bolts of the conrod cap: 33±3 N•m



2. As shown in the figure, using soft materials (such as wooden or rubber hammer handle (-1-)), push out the piston component (-2-).



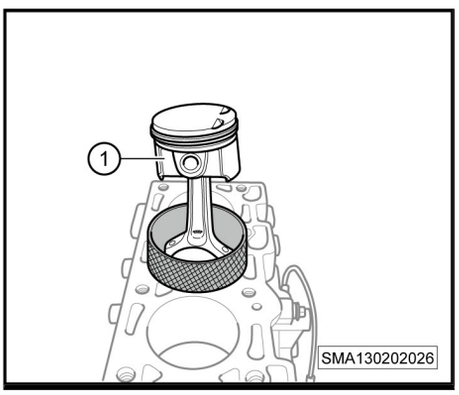
3. As shown in the figure, using the piston ring remover, remove the piston ring (-1-).



Installation

1. Install the piston ring.=> refer to page 113
2. Apply engine lubricant on the piston surface and the cylinder wall.

3. As shown in the figure, using the piston mounting tool, install the piston （-1-） into the cylinder.



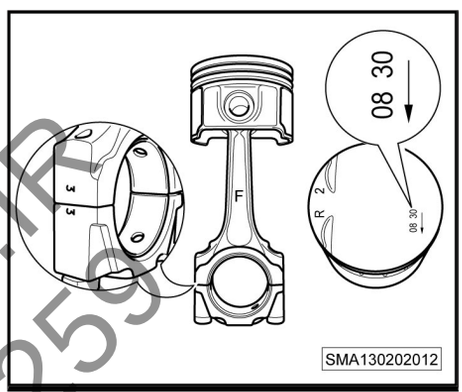
4. Other installation shall follow the reverse sequence of the removal procedure.

5.3 Assembling relationship of pistons

Assembling relationship between the piston and the conrod

1. The conrod small end hole and the piston pin adopt interference fit.Before installing the piston pin, spray some engine lubricant on the piston pin circumcircle and into the piston pin hole.Heat the conrod small end to 130～200℃ firstly and then press the piston pin into the conrod small end hole and the piston pin hole. After the piston pin is installed into the piston pin hole, the distance from one end of the piston pin to the piston pin boss outer edge indent must be less than 0.5 mm.

2. As shown in the figure, install the letter "F" on the conrod and the forward-facing mark "Arrow" on the piston crown toward the belt pulley.
3. The numeral at one side of the conrod is in the same direction as that on the conrod cap. The numerals represent the number of cylinder to be installed. For example, the numeral "3" means the conrod is installed in the third cylinder.

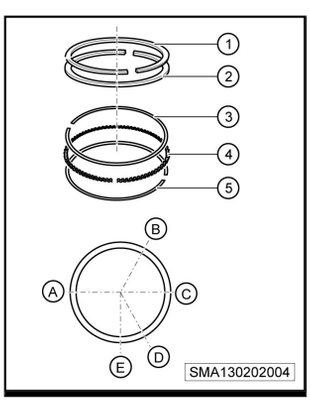


Assembling relationship between the piston and the piston ring

Caution

- The piston ring ends must not face toward the piston pin.
- The piston ring must rotate freely in the ring slot and abstain from blockage.
- When installing the piston ring, spray some engine lubricant into the piston ring slot and the piston.
- The opening between two adjacent rings should form 120°.

As shown in the figure:



1. Top compression ring (-1-) is rectangular and the side marked with a letter should face torward the piston crown when installing.Second compression ring (-2-) is a tapered ring and the side marked with a letter should face torward the piston crown when installing.
2. Oil ring, a steel strip ring, consists of the upper rail (-3-), the lower rail (-5-) and the expander (-4-).
3. When installing, be sure to keep the opening between two adjacent rings at 120°. Apply engine lubricant on the pistons and the piston ring surface.Installation order is as follows:

   a. Install the oil rings.Install the expander (-4-) into the oil channel firstly and then install two rails.The expander overlap gap (-E-) and the upper rail opening (-A-) form 90°. The expander overlap gap (-E-) and the lower rail opening (-C-) form

90°. The upper rail opening (-A-) and the lower scraper opening (-C-) form 180°.

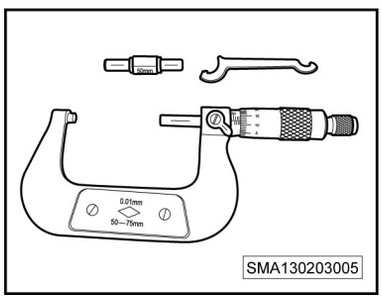
b. Install the second compression ring (-2-). When installing, the side marked with a letter should face torward the piston crown. The second compression ring end (-B-) and the upper rail opening (-A-) form 120°.

c. Install the top compression ring (-1-). When installing, the side marked with a letter should face torward the piston crown. The top compression ring end (-D-) and the second compression ring end (-B-) form 120°.

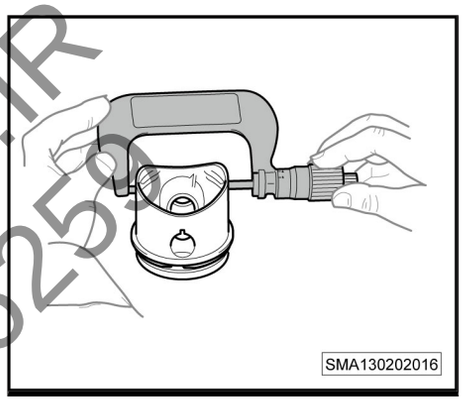
5.4 Inspection

Inspecting the piston diameter

Maintenance tools and common equipment

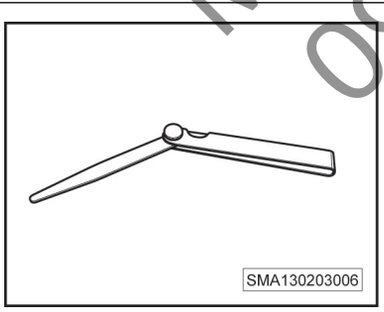
	
Outer diameter micrometer	

1. Using the outer diameter micrometer, measure in the vertical direction of the piston pin at a position 11 mm from the lower end of the piston skirt.
2. In accordance with the matching between the piston and the cylinder, four different diameters of pistons are available.

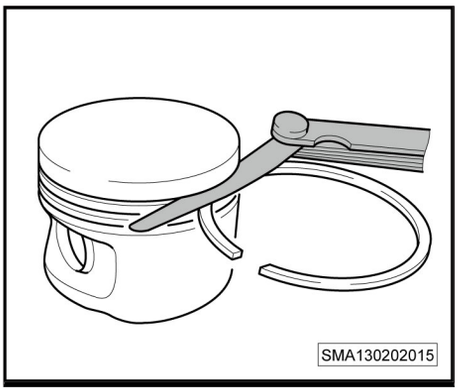


Inspecting the clearance between the piston ring and the ring slot

Maintenance tools and common equipment

	
Clearance gauge	

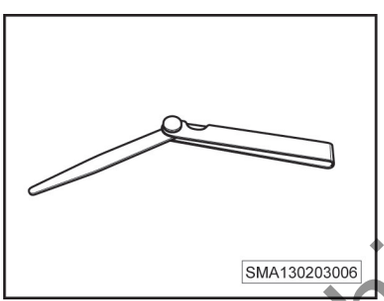
1. Remove the carbon deposit in the ring slot.As shown in the figure, using the clearance gauge, inspect the clearance between the piston ring and the ring slot.



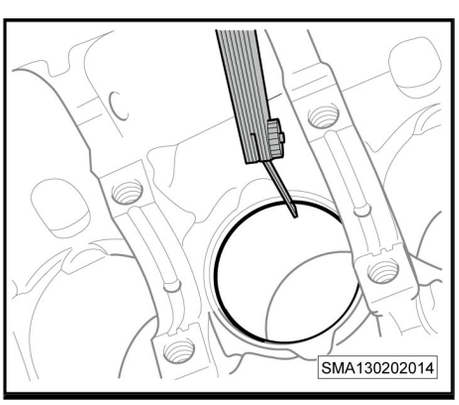
Clearance between the piston ring and the ring slot	Standard value (mm)
Top piston ring slot	0.06±0.02
Second piston ring slot	0.05±0.02

Inspecting the piston ring closed gap

Maintenance tools and common equipment

	
Clearance gauge	

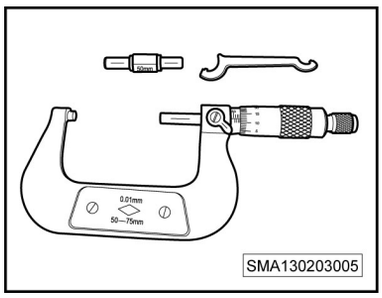
1. Using the piston without ring, push it along the cylinder wall into the cylinder vertically until it reaches a position 45 mm from the cylinder bottom.
2. Using the clearance gauge, measure the piston ring closed gap.



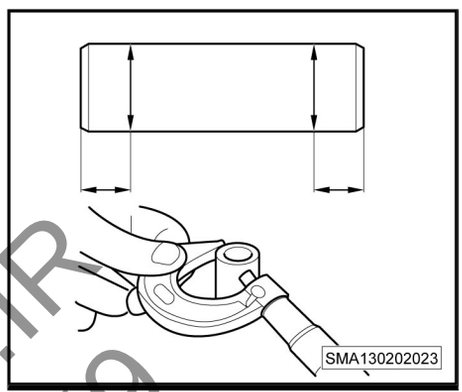
Piston ring closed gap	Standard value (mm)
Top ring	0.27±0.07
Second ring	0.47±0.07

Inspecting the piston pin diameter

Maintenance tools and common equipment

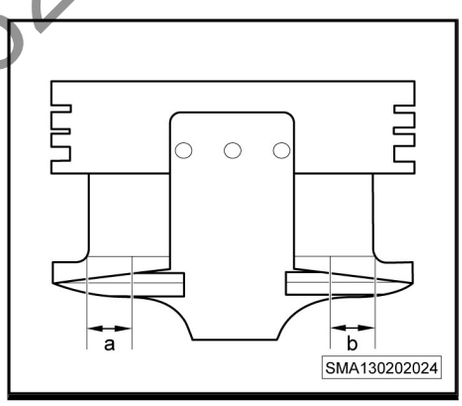
	
Outer diameter micrometer	

1. Using the outer diameter micrometer, measure the circumference of the piston pin according to the locations illustrated in the following figure. The maximum value is taken as the dimension of the piston pin diameter.



Inspecting the piston pin hole internal diameter

2. As shown in the figure, measure the piston pin hole internal diameter from every side in the range a and b and take the minimum value as the dimension of the piston pin hole internal diameter.



Group	Piston pin outer diameter (mm)	Piston pin hole internal diameter (mm)	Piston pin group identification
1	20.622～20.625	20.635～20.638	W
2	20.625～20.628	20.638～20.641	R
3	20.628～20.631	20.641～20.644	L

6 Crankshaft

6.1 Product specifications

Crankshaft

Condition	Standard value (mm)
Axial clearance	0.198±0.105

Crankshaft main journal

Condition	Standard value (mm)
Diameter	48.99±0.01
Radial runout	0.05
Cylindricity	0.008
Roundness	0.005

6.2 Tightening order of the crankshaft main bearing cap bolts

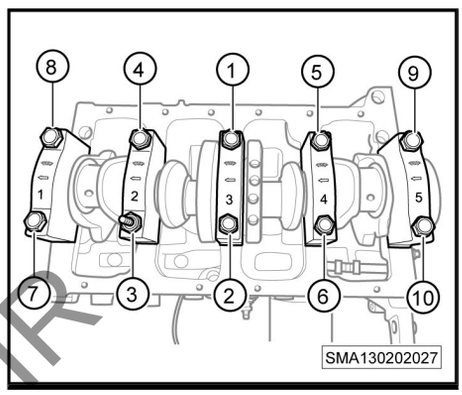
Caution

- When failing to manually drive in the bolts, unscrew them and spot the reason or replace them or check the threaded holes.

1. Manually tighten the bolts firstly.

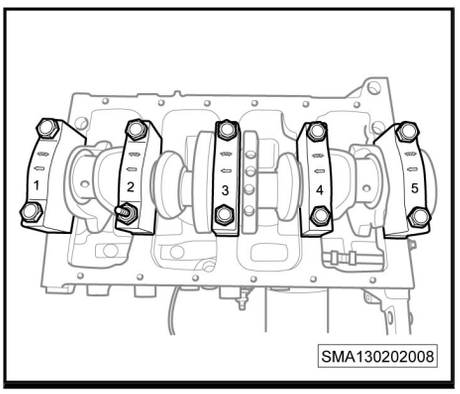
2. Then tighten them in the order from (-1-) to (-10-) for several times.

- Tightening torque for fixing bolts of the crankshaft main bearing cap: 95±5 N•m



6.3 Assembling relationship of the crankshaft main bearing cap

1. As shown in the figure, letters (-1-2-3-4-5-) and an arrow are cast on the crankshaft main bearing cap.When assembling, start from the side of the timing belt and install it in order with the arrow pointing to the crankshaft pulley.

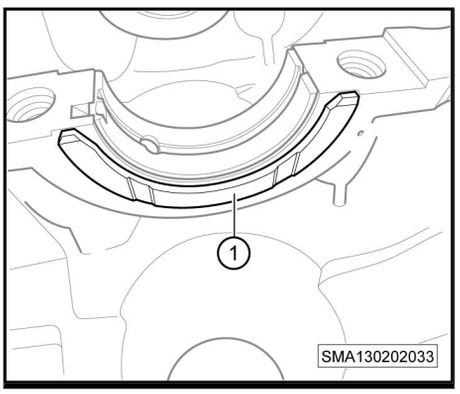


6.4 Selecting method of crankshaft main bearing shell

1. During production, the 477F engine uses a "standard" crankshaft main bearing shell, which are marked with "STD" on the shell back instead of any colour.
2. There are three types of main bearing shells for service. The first one is the mainshaft shell for the main bearing hole with an enlargement of 0.4 mm of the cylinder block and a black mark "0.4" is etched on the back of the main bearing shell. The second one is the crankshaft journal with less than 0.25 mm wear and a green mark "0.25" is etched on the back of the shell. The third one is used to correct the main bearing shell with bearing clearance and a yellow mark "0.02" is etched on the shell back.
3. The crankshaft main bearing shell consists of an upper main bearing shell and a lower main bearing shell.The upper shell has oil channels and oil holes. When assembling, the oil holes in the upper main bearing shell must be aligned with the oil holes in the cylinder block.The lower shell does not have oil holes.

6.5 Installing the thrust washer

1. Before installing, clean the thrust washer and the cylinder face that matches with the thrust washer.
2. As shown in the figure, the surface of the thrust washer (-1 –) with two grooves should face toward outside and the other surface without any groove should stick on the cylinder face.



7 Cylinder Block

7.1 Product specifications

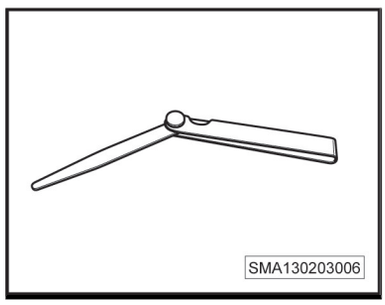
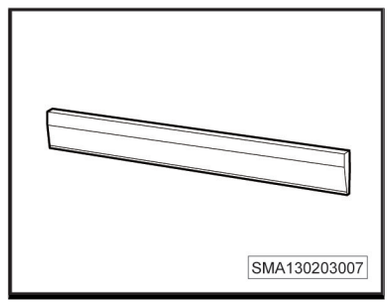
Cylinder block

Item	Standard value (mm)
Upper surface planeness of the cylinder block	0.05
Permissible maximum wear thickness on the cylinder block (wear limit)	0.05
Sum of permissible maximum wear thicknesses for cylinder block and cylinder head (wear limit)	0.20
Cylinder block overall height	206±0.05
Cylinder bore roundness/straightness	0.008/0.01

7.2 Inspection

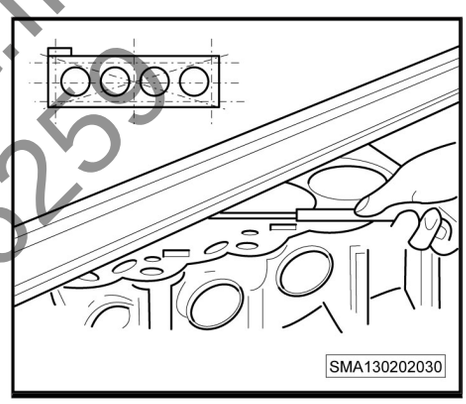
Inspecting the upper surface planeness of the cylinder block

Maintenance tools and common equipment

	
Clearance gauge	Precision ruler

1. Clean the cylinder block upper surface.

2. As shown in the figure， using the precision ruler and the clearance gauge, inspect the upper surface planenes of the cylinder block.
3. Permissible maximum wear thickness on the cylinder block (wear limit) is 0.05 mm. The sum of maximum wear thicknesses for cylinder block and cylinder head (wear limit) is 0.20 mm.

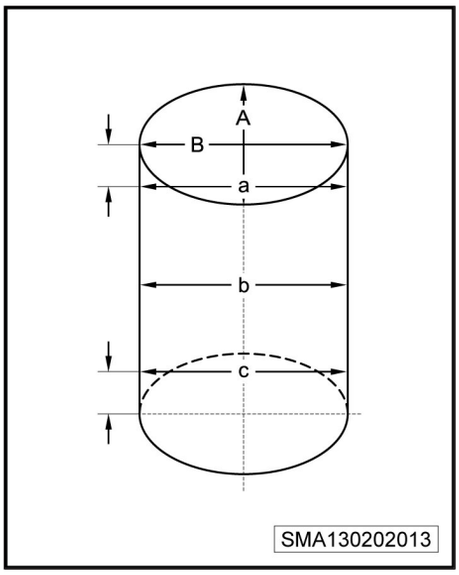


Item	Standard value (mm)
Upper surface planeness	0.05

Inspecting the cylinder internal diameter roundness

1. Check the cylinder wall for scratches. If scratches are present, inspect or replace the cylinder block.

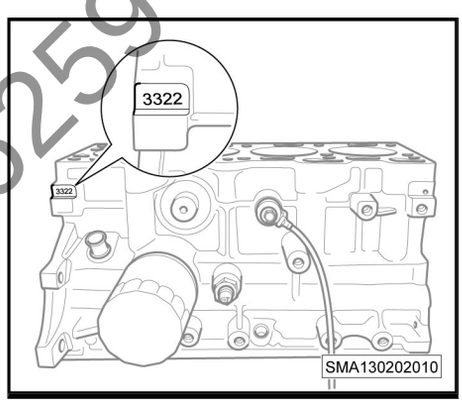
2. Using the an internal diameter dial indicator, measure the internal diameters of the cylinder bores at three different heights (plane a, b and c, see the figure for the heights) on the cylinder block and take the maximum and minimum values.Roundness =(Maximum diameter - Minimum diameter)/2.The standard roundness of the cylinder internal diameter should be less than 0.008 mm.



Standard diameter and service dimension of the cylinder bore

1. In normal operation, the cylinder diameter tolerance should be 0.04 mm and falls into four groups.

2. As shown in the figure, the group marks of cylinder bores are printed on the small rough datum plane on the back end surface of the cylinder intake side and labelled with Arabic numerals, impressing the cylinder bore class numbers (-4-3-2-1-) from left to right.



3. It is permissible to enlarge the cylinder bore diameter to rework in special cases.The cylinder bore diameter tolerance for production and service is 0.03mm and falls into three groups.
4. When a cylinder bore is reworked to the service dimension, other three cylinder bores should be machined to the dimension for production and service.

Production situation	Group No.	Cylinder	Cylinder bore diameter (mm)
Normal production	1	4th cylinder	77.36～77.37
	2	3rd cylinder	77.37～77.38
	3	2nd cylinder	77.38～77.39
	4	1st cylinder	77.39～77.4
Production and service	A	77.63～77.64	
	B	77.64～77.65	

Production situation	Group No.	Cylinder	Cylinder bore diameter (mm)
	C	77.65～77.66	

0203 Valve Train

1 General Information

1.1 Overview

1. Depending on engine operation, the valve train opens and closes the intake and exhaust valves of all cylinders in the order of ignition at regular intervals, allowing the entry of flammable gas mixture into the cylinder and the discharge of exhaust gases.
2. When the valve is opened for air exchange during the operation of cylinder, the crankshaft drives the camshaft to rotate via the timing belt, causing the lobes on the camshaft to push one end of the rocker upwards, which makes the other end press the valve downwards and open it to further compress the spring. When the dead center of the lobes does not reach the rocker, the thrust force on the rocker will gradually decrease. The opening of the valve will become gradually narrower and finally closed under the spring tension. The valve would therefore be tightly closed during the compressing and working stroke.
3. The valve train consists of the following components:

   a. Valve
   b. Valve guide
   c. Valve seat
   d. Valve spring
   e. Valve oil seal
   f. Spring seat
   g. Lock plate
   h. Rocker
   i. Rocker shaft
   j. Camshaft
   k. Cylinder head

1.2 Product specifications

Torque specifications

Component	Value
Fixing bolt of the cylinder head	42.5±2.5 N•m＋90°＋90°
Fixing bolt of the rocker shaft	30±1.5 N•m
Fixing bolt of the camshaft timing gear	95±5 N•m
Fixing bolt of the camshaft cap 1	9.5±1 N•m
Fixing bolt of the cylinder head cover	7±1 N•m
Fixing bolt of the thermostat seat	9.5±1.5 N•m
Fixing bolt of the camshaft position sensor	8±0.5 N•m

Cylinder head

Item	Value (mm)
Overall height	97
Lower surface warpage degree	0.055±0.025
Surface warpage degree of the intake manifold side	0.04
Surface warpage degree of the exhaust manifold side	0.04

Camshaft

Item	Value (mm)
Intake camshaft lifting	5.09
Exhaust camshaft lifting	5.34
Camshaft diameter	25.974±0.007
Crankshaft axial clearance	0.124±0.029

Valve spring

Item	Value
Free height	47.7 mm
Pretension	260±11 N
Installation height	41 mm

Valve

Valve head edge thickness	Intake valve	0.6 mm
	Exhaust valve	0.4 mm
Valve stem diameter	Intake valve	5.98±0.008 mm
	Exhaust valve	5.96±0.008 mm
Seal width	Intake valve	2.83 mm
	Exhaust valve	2.86 mm
Clearance between the valve stem and the valve guide	Intake valve	0.027±0.015 mm
	Exhaust valve	0.047±0.015 mm

Tilt angle	Intake valve	68°
	Exhaust valve	70°
Height	Intake valve	107.998 mm
	Exhaust valve	117.41 mm

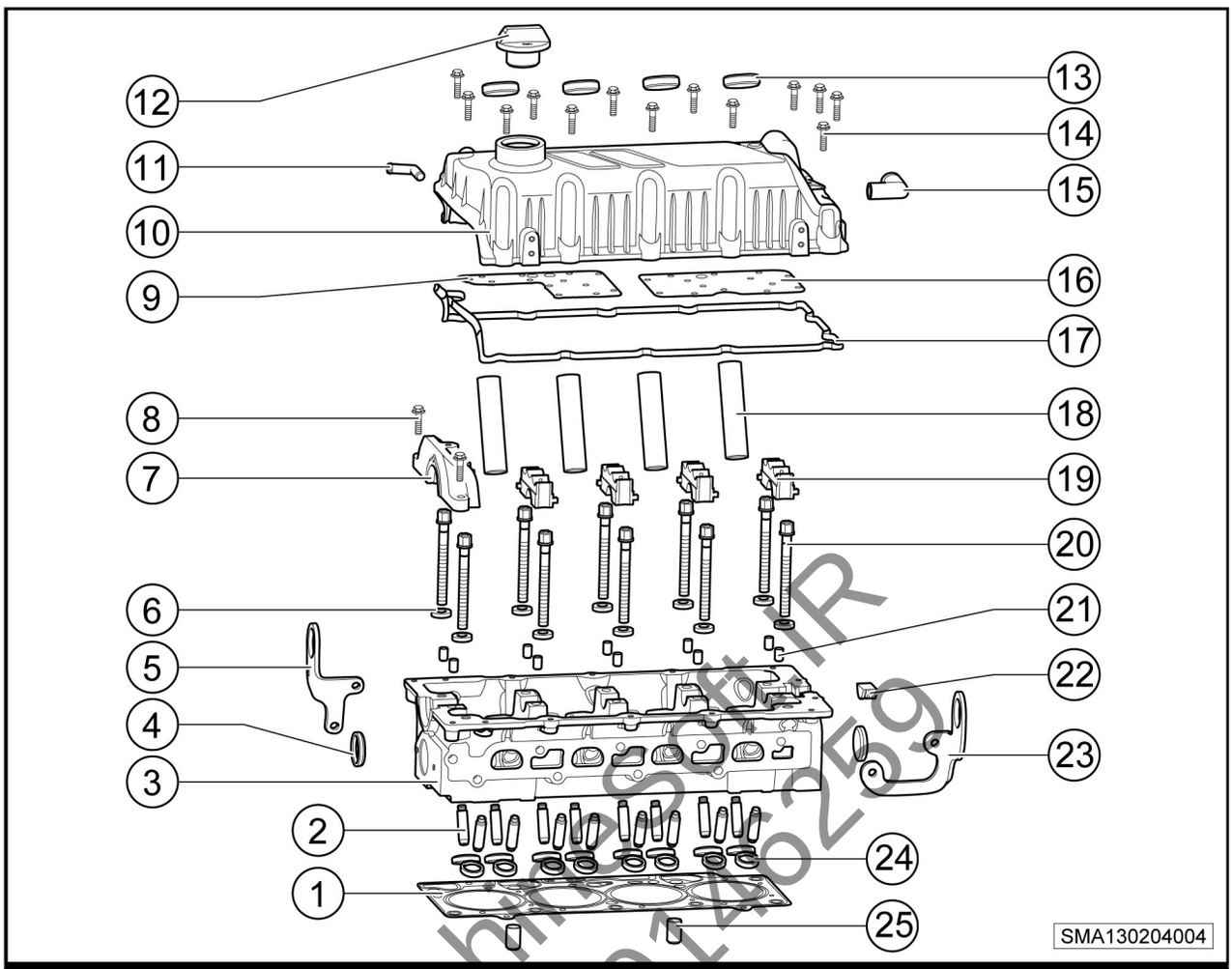
Valve guide

Item	Value (mm)
Valve guide length	42±0.25
Inner diameter	6.007±0.007
Outer diameter	11.045±0.005
Press-in height	12.5±0.2

Valve opening angle

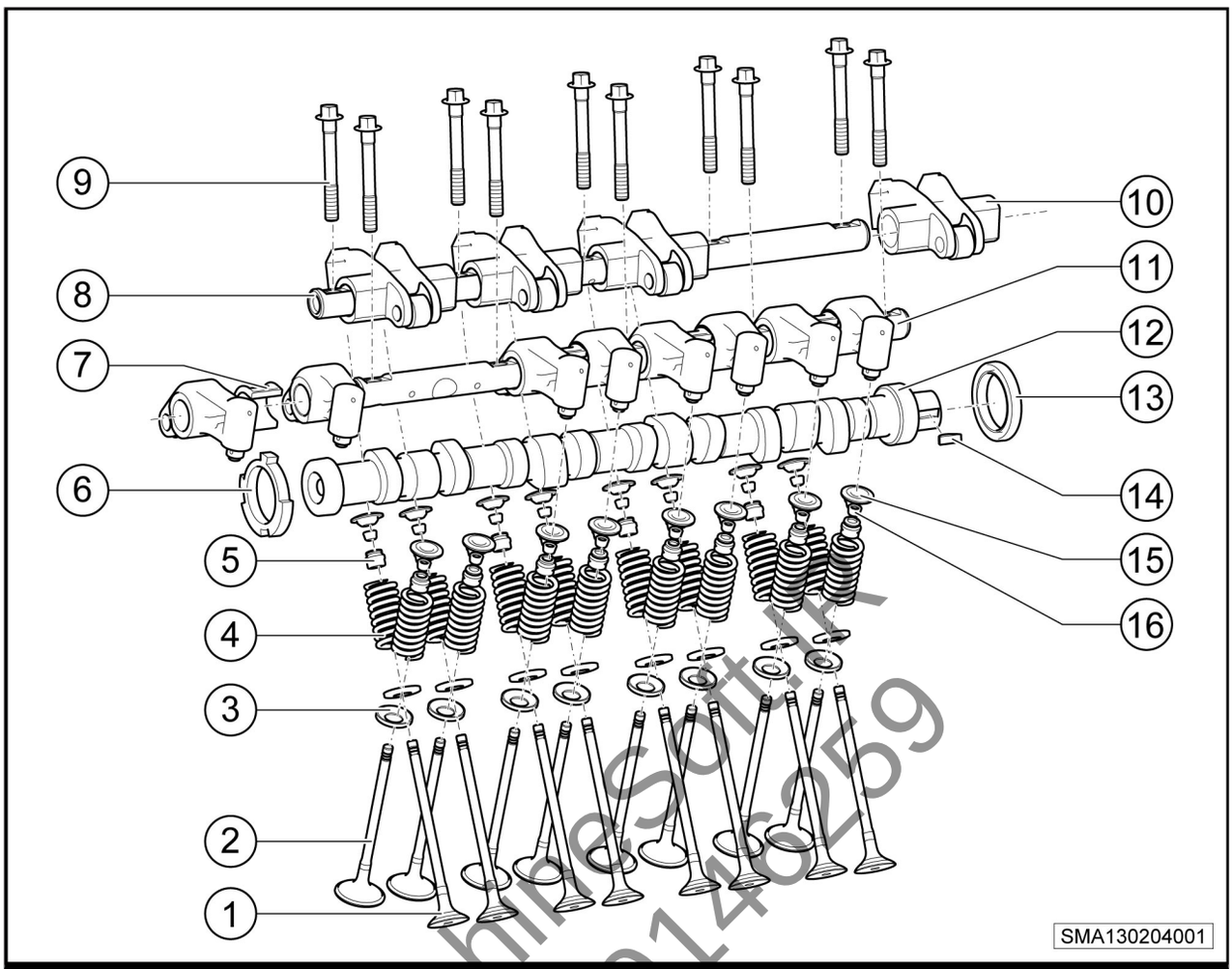
Item	Value (°)
Crankshaft angle as the intake valve is open (before TDC)	15
Crankshaft angle as the intake valve is closed (after BDC)	61
Crankshaft angle as the exhaust valve is open (before BDC)	17
Crankshaft angle as the exhaust valve is closed (after TDC)	35

1.3 The valve train assembly drawing



1. Cylinder gasket	2. Valve guide
3. Cylinder head	4. Water block
5. Lug	6. Washer
7. Camshaft cap 1	8. Bolt
9. Plate	10. Cylinder head cover
11. Elbow	12. Oil filler cap
13. Seal ring	14. Bolt
15. Square elbow	16. Plate
17. Gasket	18. Spark plug socket
19. Camshaft cap	20. Cylinder head bolt
21. Dowel pin	22. Semi-circular rubber block
23. Lug	24. Valve seat ring
25. Locating sleeve	

1.4 The crankshaft assembly drawing



1. Exhaust valve	2. Intake valve
3. Lower valve spring seat	4. Valve spring
5. Valve oil seal	6. Camshaft phase ring
7. Rocker spacer sleeve	8. Exhaust rocker shaft
9. Rocker shaft bolt	10. Exhaust rocker
11. Intake rocker shaft	12. Camshaft
13. Oil seal	14. Woodruff key
15. Upper valve spring seat	16. Valve cotter

2 Valve Train Troubleshooting

2.1 The valve train fault list

Symptoms	Possible causes	Maintenance recommendations
Abnormal noise of the crankshaft	Excessive camshaft axial clearance causing shift back and forth	Check the camshaft axial clearance and replace the worn parts if necessary
	Camshaft distortion	Replace the camshaft
	Excessive camshaft radial clearance	Check the camshaft radial clearance and replace the cyclinder head if necessary
Abnormal noise of the valve seat ring	Improper installation of the valve oil seal	Replace the valve oil seal and reinstall it
	Upside-down installation of the valve seat ring	Replace the cylinder head
	Valve seat ring distortion	Replace the valve seat ring
	Improper installation depth of the valve guide	Adjust the installation depth of the valve guide
	Improper installation angle of the valve guide	Replace the valve guide and the cylinder head
Abnormal noise of the rocker	Damage to the rocker retainer	Replace the rocker
	Damage to the tappet ball joint	

3 Cylinder Head

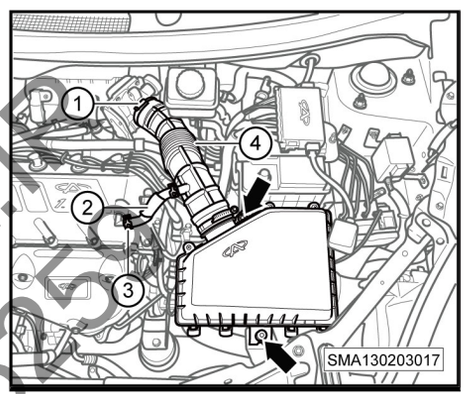
3.1 Removing and installing the cylinder head

Removal

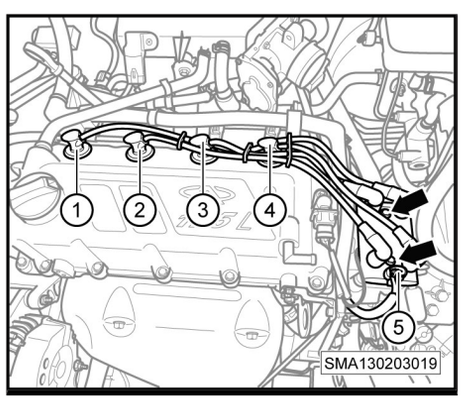
02

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Discharge the coolant.=> refer to page 177
4. Discharge the oil. => refer to page 31

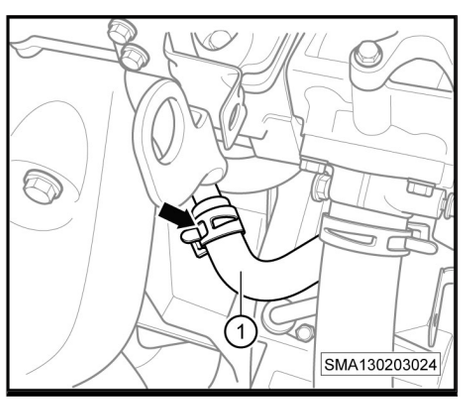
5. Unscrew the fixing bolts (-arrow-) and the worm clamp bolt (-1-), loosen the clamp (-3-), pull out the hose (-2-) and (-4-), and remove the air filter assembly.



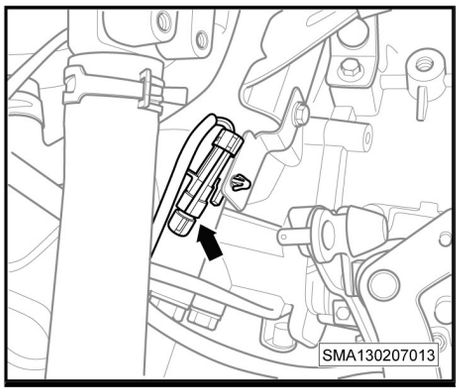
6. Disconnect the ignition coil connector (-5-), pull out the ignition cables from (-1-) to (-4-), unscrew the fixing bolts (-arrow-), and remove the ignition coil and the ignition cables.



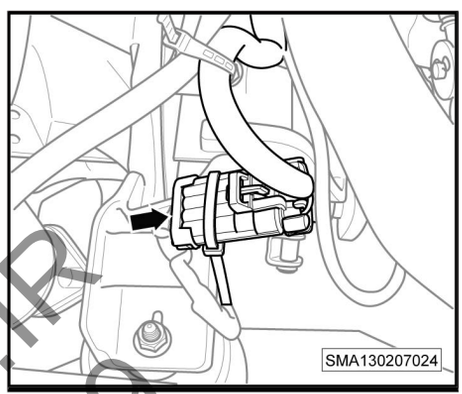
7. Release the clamp (-arrow-) and pull out the coolant hose (-1-).



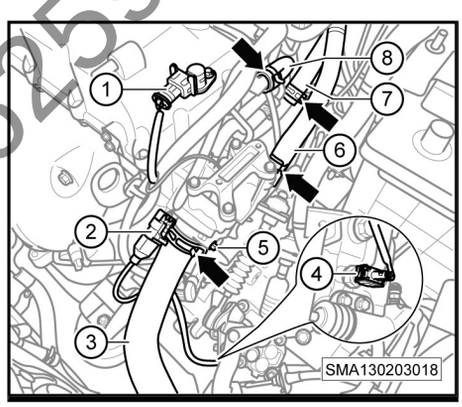
8. Disconnect the front oxygen sensor connector (-arrow-).



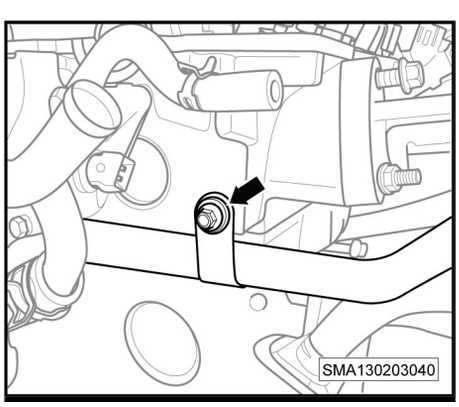
9. Disconnect the rear oxygen sensor connector (-arrow-).



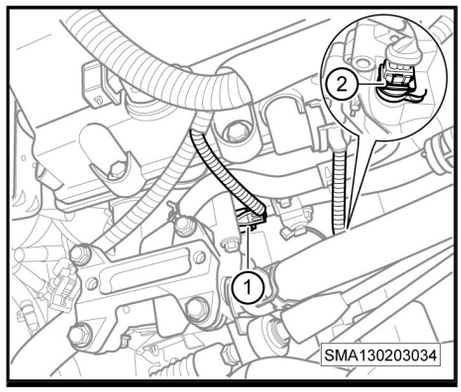
10. Disconnect the camshaft position sensor connector (-1-), the crankshaft position sensor connector (-2-) and the reverse gear switch connector (-4-); disengage the fixing clamps (-arrow-), the radiator inlet hose (-3-), the heater tank inlet hose (-6-), the heater tank outlet hose (-7-) and the crankcase ventilation hose (-8-); and unscrew the earth wire bolt (-5-) and release the earth wire.



11. Unscrew the fixing bolt (-arrow-) and disconnect the coolant pipe assembly from the cylinder head.

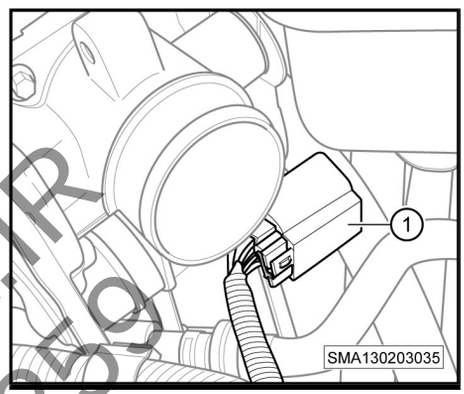


12. Disconnect the coolant temperature sensor connector (-1-) and the speed sensor connector (-2-).

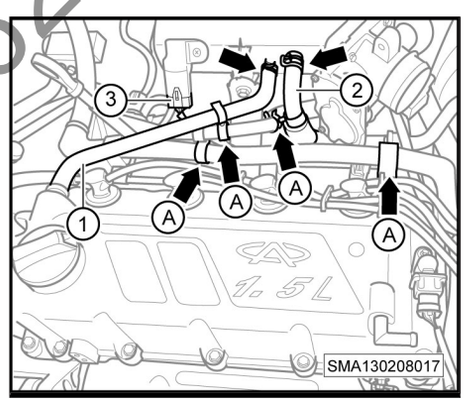


The following steps 13 and 14 are applied to vehicles equipped with electronic throttles

13. Disconnect the electronic throttle connector (-1-).

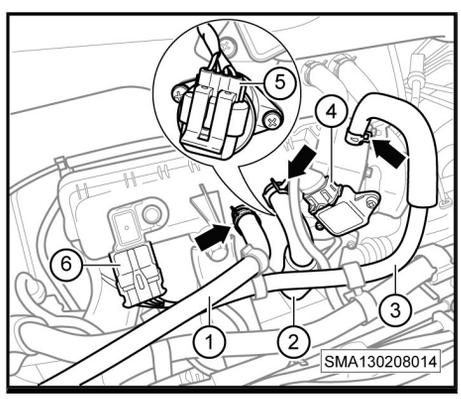


14. Loosen the clamps (-arrow-) and clips (-arrow A-), pull out the crankcase ventilation hose (-1-) and the vacuum booster hose (-2-), and then disconnect the intake air pressure/temperature sensor connector (-3-).



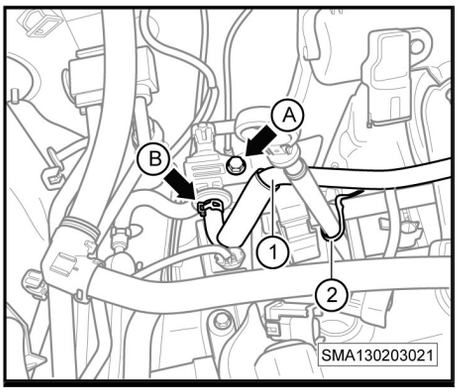
The following step 15 is applied to vehicles equipped with mechanical throttles

15. Loosen the clamps (-arrow-); pull out the crankcase ventilation hose (-1-), the vacuum booster hose (-2-) and the activated carbon canister hose (-3-); and disconnect the throttle position sensor connector (-4-), the idling stepper motor connector (-5-) and the intake air pressure/temperature sensor connector (-6-).

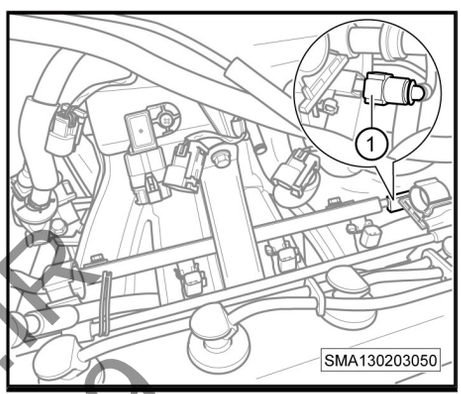


The following steps 16 to 23 are applied to all vehicles

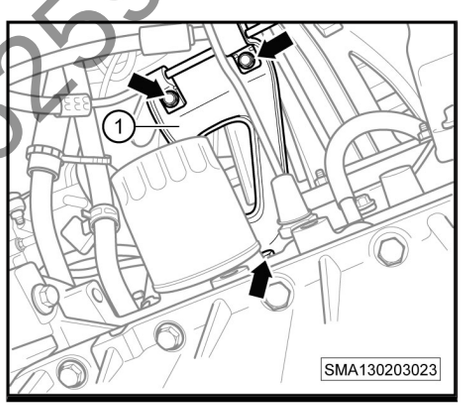
16. Unscrew the fixing bolt (-1-), disconnect the activated carbon canister solenoid valve from the intake manifold, loosen the clamp (-2-), pull out the hose (-4-), disconnect the knock sensor connector (-3-) and the oil dipstick tube retainer (-5-), and pull out the oil dipstick (-arrow-).



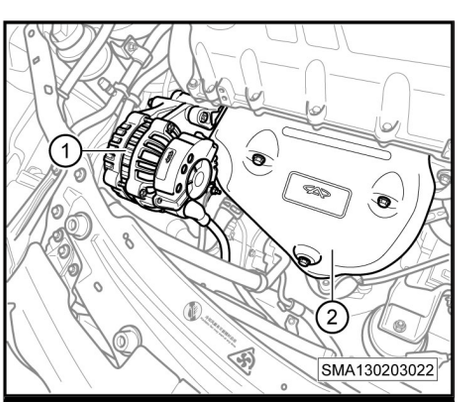
17. As shown in the figure, press the lock pin of pipeline connector (-1-) and pull out the fuel pipe.



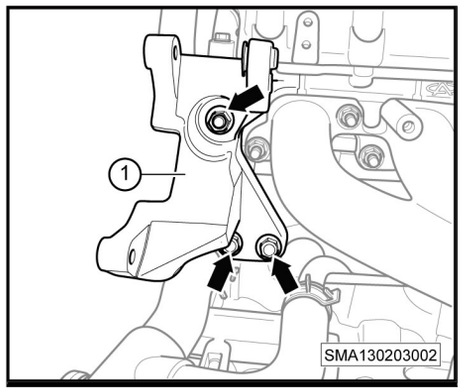
18. Unscrew the fixing bolts (-arrow-) and remove the lower intake manifold bracket (-1-).



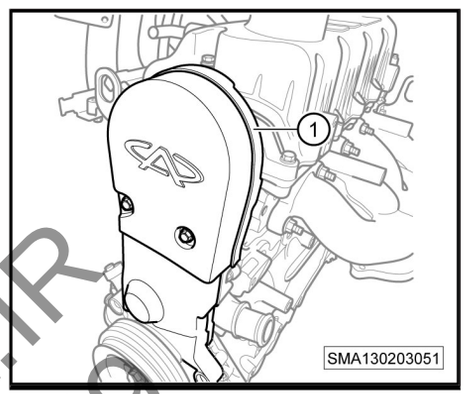
19. Remove the generator (-1-) and the exhaust manifold (-2-) .=> refer to page 983 => refer to page 221



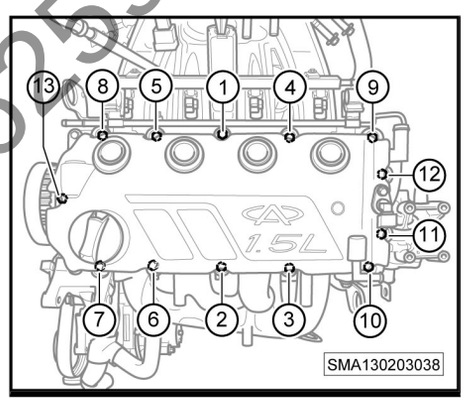
20. Unscrew the fixing bolts (-arrow-) and remove the engine accessory bracket (-1-).



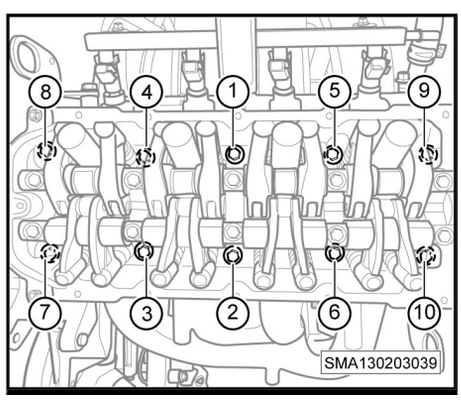
21. Remove the timing belt housing (-1-) and the timing belt. => refer to page 88



22. Unscrew the fixing bolts in the sequence from (-13-) to (-1-), and remove the cylinder head cover and the gasket.



23. Unscrew the fixing bolts in the sequence from (-10-) to (-1-), and remove the cylinder head and the cylinder gasket. Cover the cylinder block with a glabrous cloth to prevent the entry of dust and foreign matters.



Installation

Note

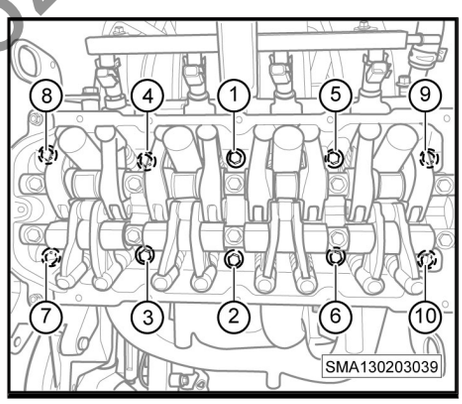
- Remove the sealant residue on the cylinder head and block.
- The cylinder head bolts are disposable and must be replaced in every removal.
- Replace the O-rings, the seals, the cylinder head gasket, the self-locking nuts and other disposable parts.
- Check the cylinder head gasket that shall be clean and smooth and free of bumps or scratches. The side with the part number shall be placed upwards.
- Install the cylinder gasket on the surface of the cylinder block with dowel pins.
- Align the oil hole of the cylinder head gasket with that of the cylinder block.
- Install two dowel pins on the surface of the cylinder block. The dowel pins located in the 2nd and 4th threaded holes on the left side (seen from the front) are elastic dowel pins. The assembly of the dowel pin and the cylinder block is interference fit, while the assembly of the dowel pin and the cylinder head is transition fit.
- Wipe the joint surface of the combustion chamber and the cylinder head, and the surface and the threaded holes of the cylinder block. The threaded holes shall be free of oil.
- Install the washers to 10 cylinder head bolts respectively with their bevel upwards.
- The piston shall not be placed at the TDC of the cylinder head during installation to avoid the conflict between the opened valve and the piston during rocker installation.

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

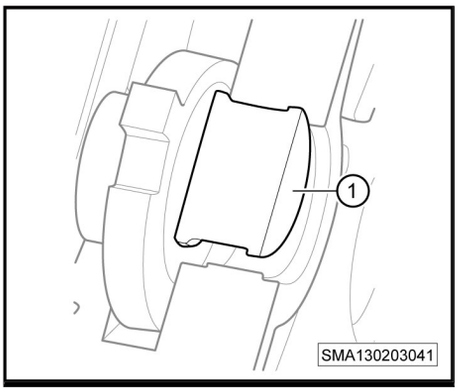
1. Check the surface warpage degree of the cylinder block and head .

2. As shown in the figure, tighten the bolts in the sequence from (-1-) to (-10-) according to the following procedures:

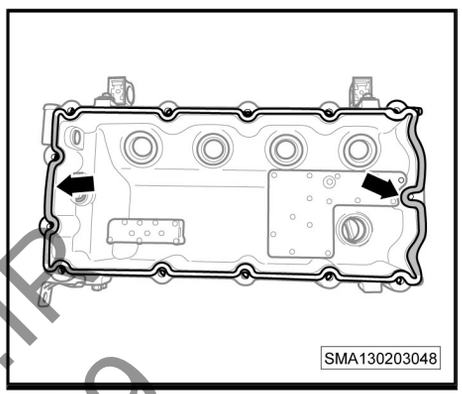
a. First install the cylinder head bolts and manually tighten them.
b. Tighten the cylinder head bolts in the tightening order with the common tool.
c. Tighten the cylinder head fixing bolts in the tightening order by a torque wrench with the torque of 22.5±2.5 N•m.
d. Tighten the cylinder head fixing bolts again in the tightening order with the torque of 42.5±2.5 N•m.
e. Then turn the cylinder head fixing bolts by 90 degrees in the tightening order.
f. Finally, turn the cylinder head fixing bolts again by 90 degrees in the tightening order.



3. Apply sealant on the contact surface between the semi-circular rubber block (-1-) and the cylinder head, and then install the block on the cylinder head. When installing, align the limit groove of the semi-circular rubber block with the top dead center of the cylinder head and press it down.

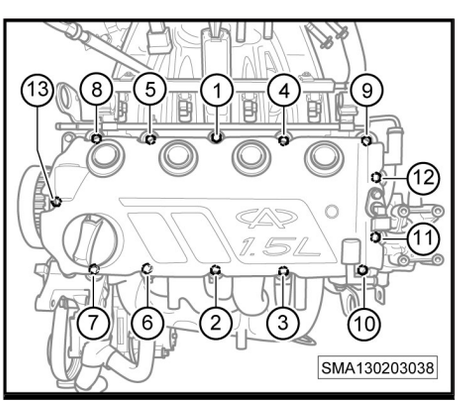


4. Install the cylinder head cover gasket into the groove of the cylinder head cover, and then apply sealant on the connection area between the front end of the cylinder head cover and the bearing cap and the area between the two rear bolts, i.e. the grey part of the gasket (-arrow-).



5. Hold the cylinder head cover with both hands; align and install it on the cylinder cover, making the spark plug sleeve pass through the gasket; then press it down to match the cylinder head cover with the bolt hole. Install carefully to prevent the cylinder head cover gasket from separation. Make sure the gasket is installed in place at a time to avoid it from dislocation.

6. As shown in the figure, tighten the bolts in the sequence from (-1-) to (-13-) according to the following procedures:
   - **a.** Screw in all of the cylinder head cover fixing bolts.
   - **b.** Tighten the cylinder head cover fixing bolts with a torque of 4±1 N•m in the tightening order.
   - **c.** Tighten the cylinder head cover fixing bolts again with a torque of 7±1 N•m in the tightening order.



7. Other installation shall follow the reverse sequence of the removal procedure.

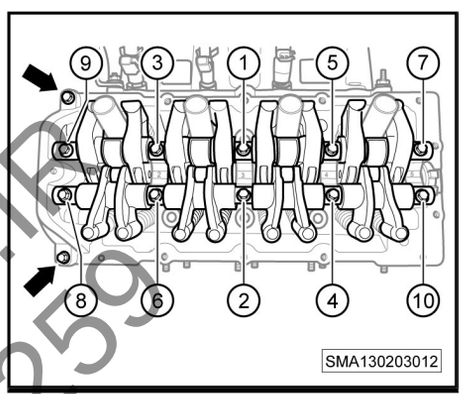
4 Camshaft and Rocker Shaft

4.1 Removing and installing the rocker shaft and camshaft

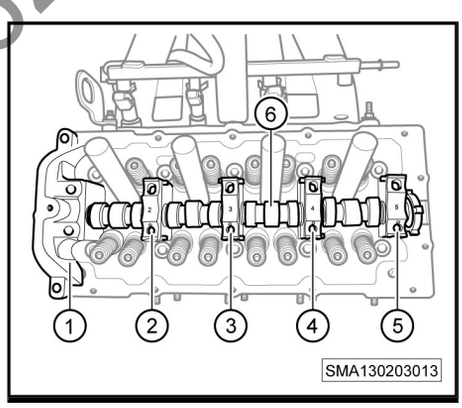
Removal

1. Remove the cylinder head cover.

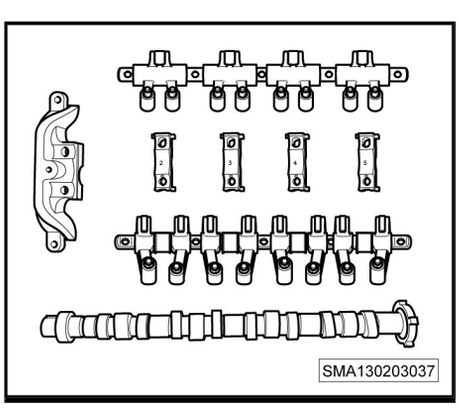
2. As shown in the figure, unscrew the fixing bolts respectively in the sequence from (-10-) to (-1-) and unscrew the fixing bolts of the camshaft cap 1 (-arrow-). Remove the intake and exhaust rockers and rocker shafts.



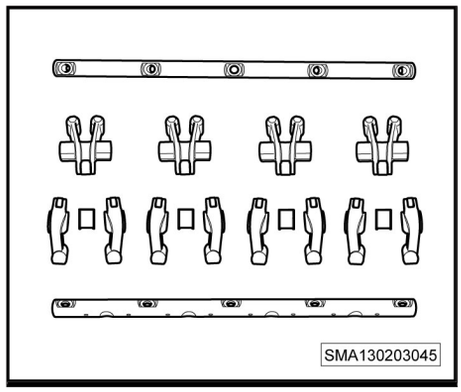
3. Remove the camshaft caps in the sequence from (-1-) to (-5-) and the camshaft (-6-).



4. As shown in the figure, place the removed parts neatly on the workbench.



5. As shown in the figure, place the disassembled intake and exhaust rockers and rocker shafts neatly on the workbench.

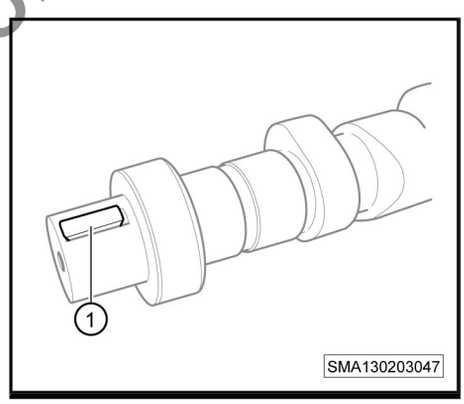


Installation

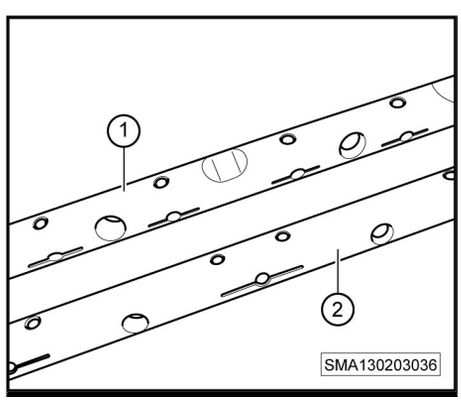
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Check the valve rockers and the camshaft.
2. Check the camshaft bearing shell holes and the cam surface for scratches.
3. Check the camshaft caps for blisters, cracks, etc..
4. Clean the intake and exhaust rocker shafts, camshafts, camshaft bearing shells, etc. with detergent.
5. Remember to replace the lubricant inside the valve rocker tappet when installing the valve rocker.

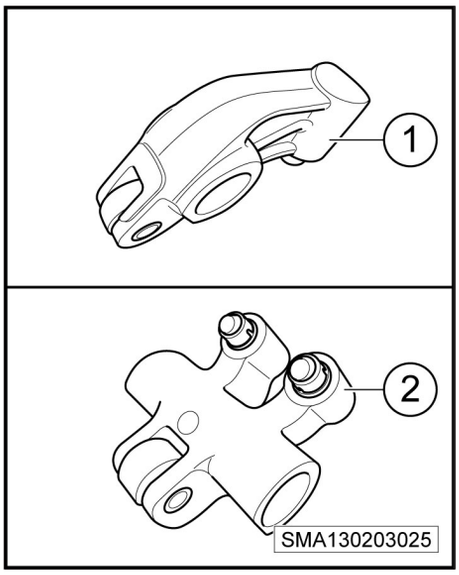
6. Check if the assembly of camshaft woodruff key (-1-) and the camshaft key slot is transition fit widthwise. After inserting the woodruff key, check if the projection height is 1.875±0.235 mm.



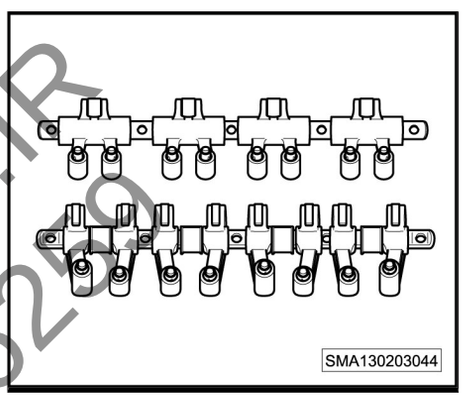
7. Check the oil holes and the oil grooves of the rocker shaft and make sure there are no residues or foreign matters. Check the intake and exhaust rocker shafts. (-1-) is the intake rocker shaft with four grooves (to keep away from the spark plug sleeve). And (-2-) is the exhaust rocker shaft.



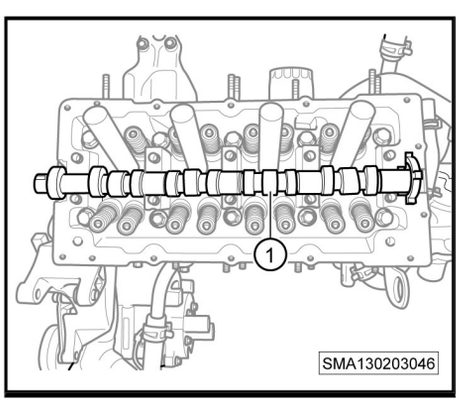
8. Check the ball joints and retainers of the intake and exhaust rockers, and apply engine oil on the rocker shafts.



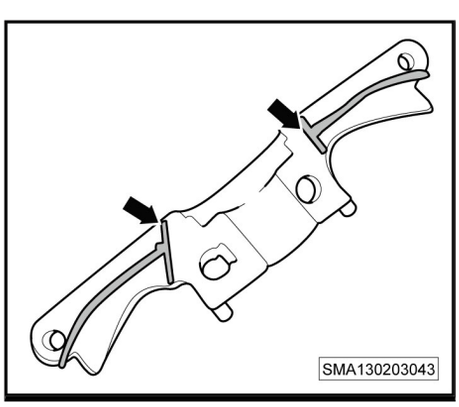
9. As shown in the figure, install the rockers to the rocker shafts.



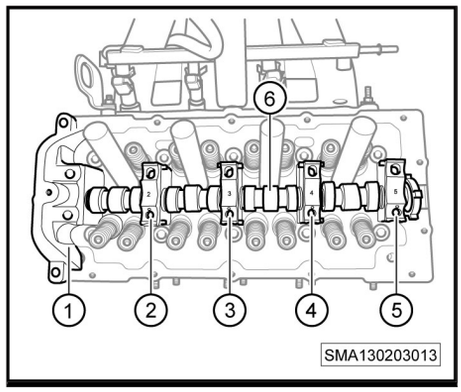
10. Apply engine oil on the contact surface of the camshaft (-1-) and then install the camshaft.



11. Clean all of the camshaft caps. As shown in the figure, apply sealant on the grey part of the camshaft cap 1 (-arrow-).



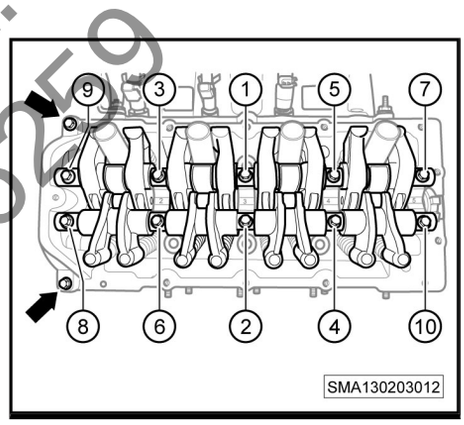
12. Apply a small amount of engine oil on the surfaces of the cams and the journals of the camshaft, and then install the camshaft caps in the sequence from (-1-) to (-5-). The installation of dowel pins of the camshaft caps and the cylinder head is clearance fit. Manually position the camshaft cap upright before installing, and then knock it gently with a rubber hammer till it fits properly. Turn the camshaft (-6-) manually to feel the engagement.



13. Install the intake rocker shaft assembly. Adjust the position of each rocker. Turn the camshaft slightly if necessary to make the rocker shaft contact the camshaft caps. Never press or pull with brute force. Check the intake rockers for engagement.
14. Install the exhaust rocker shaft assembly. Adjust the position of each rocker without turning the camshaft. Make the rocker shaft contact the camshaft caps and make sure no exhaust rockers interfering with the bearing seat or the intake rocker.

15. Install the rocker shaft bolts. As shown in the figure, tighten the rocker shaft fixing bolts in the sequence from (-1-) to (-10-) according to the following procedures:

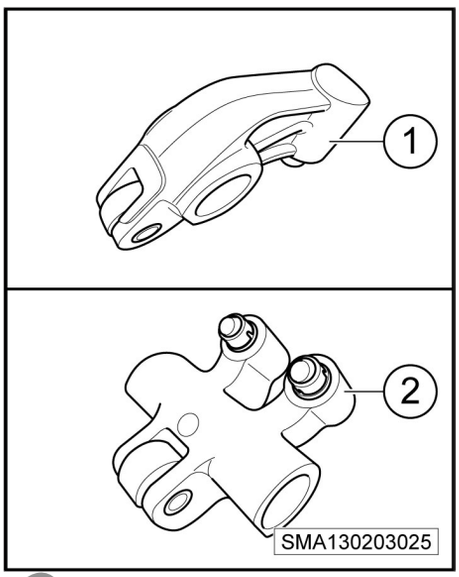
    a. First, mannualy screw the bolts into the cylinder head.
    b. Tighten the rocker shaft fixing bolts by a torque wrench with the torque of 15±2N•m in the tightening order.
    c. Tighten the rocker shaft fixing bolts again by a torque wrench with the torque of 30±1.5 N•m in the tightening order.



16. Tighten the camshaft cap 1 fixing bolts (-arrow-) by a torque wrench with the torque of 9.5±1 N•m.

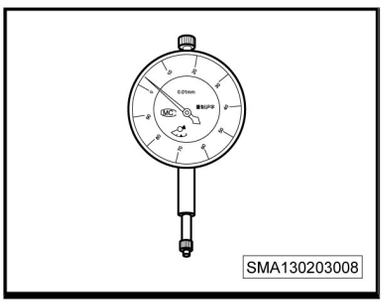
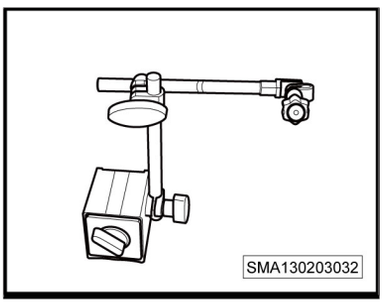
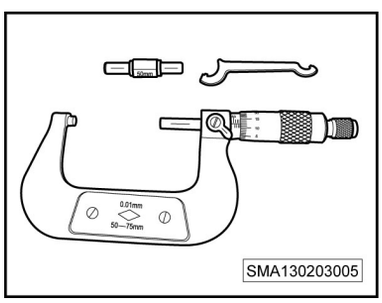
4.2 Checking the valve rocker

1. Check the rocker retainer for damage and if the rocker tappet ball joint falls off. Replace the rocker if necessary.
2. Check if the roller rotates smoothly. Replace the valve rocker if it becomes loose or rotates unsmoothly.
3. Check the inner diameter of the valve rocker hole and replace the rocker if there is any damage or blockage.



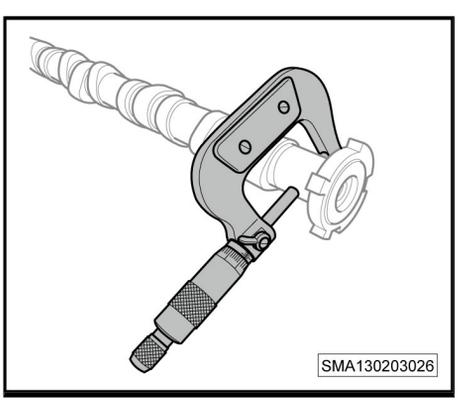
4.3 Checking the camshaft

Maintenance tools and common equipment

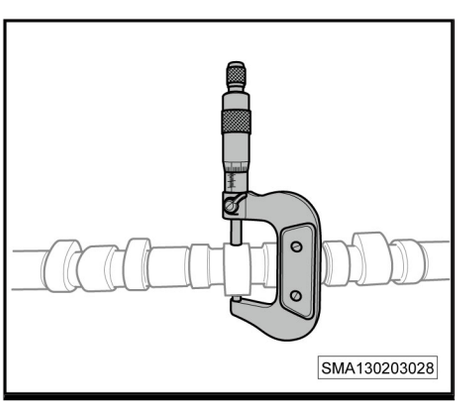
	
Dial indicator	Bracket
	
Outer diameter micrometer	

Inspection

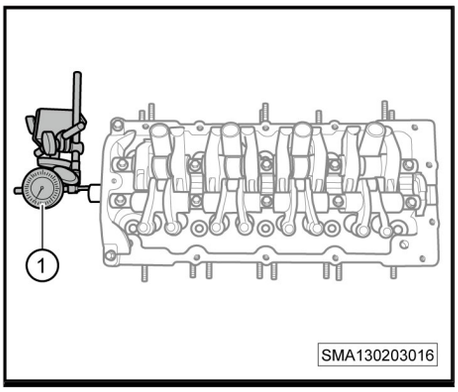
1. As shown in the figure, measure the camshaft radial diameter with an outer diameter micrometer. The measured value shall be 25.974±0.007 mm.



2. As shown in the figure, measure the camshaft lifting height with an outer diameter micrometer. The measured lifting heights of the intake and exhaust camshafts shall be 5.09 mm and 5.34 mm respectively.

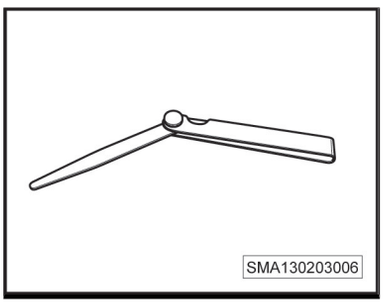
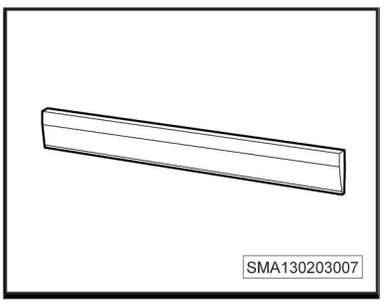


3. As shown in the figure, measure the axial clearance of the camshaft. Hold the dial indicator bracket against the front end of the camshaft, and reset the dial indicator to zero. Push the camshaft back and forth (without turning it) and read out the axial clearance value. The measured value shall be 0.124±0.029 mm.



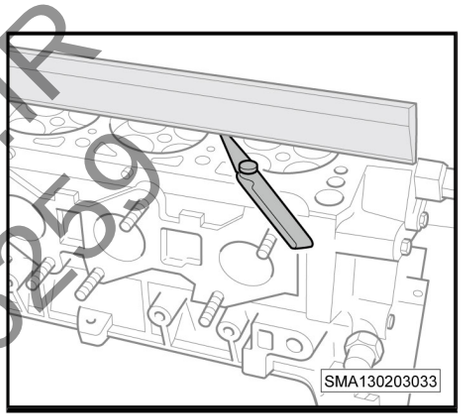
4.4 Checking the cylinder head

Maintenance tools and common equipment

 SMA130203006	 SMA130203007
Clearance gauge	Precision ruler

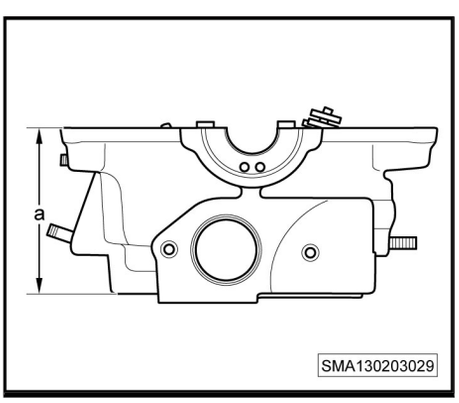
Checking the lower surface warpage degree of the cylinder head

1. As shown in the figure, measure the warpage degree of the cylinder head with a precision ruler and a clearance gauge. The measured value shall be 0.055±0.025 mm. You shall repair the surface if the value fails to meet the standard.


SMA130203033

Checking the cylinder head height

1. As shown in the figure, the measured value of the cylinder head height (-a-) shall be 97 mm.

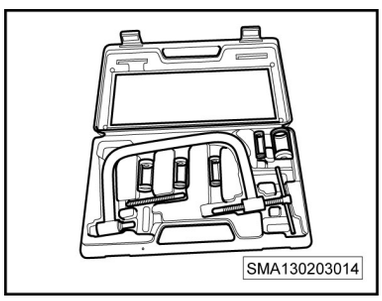


SMA130203029

5 Valve and Valve Spring

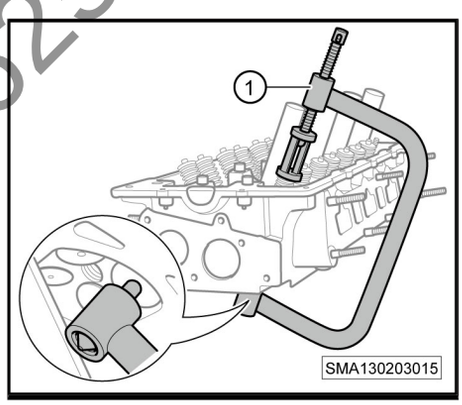
5.1 Removing and installing the valve and valve spring

Maintenance tools and common equipment

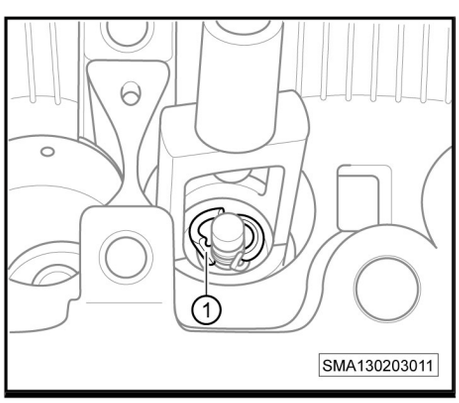
	
Tools for removing and installing valve springs	

Removal

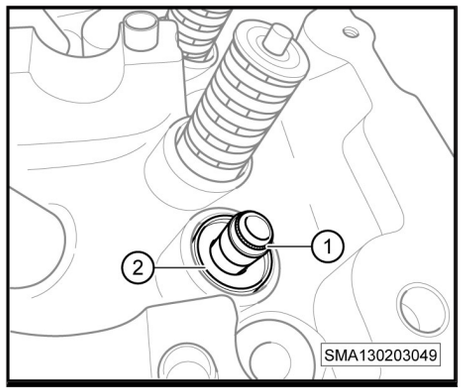
1. As shown in the figure, install the tool (-1-) on the valve spring, turn the compression screw of the tool to compress the valve spring.



2. As shown in the figure, remove the valve cotter (-1-) from the valve with a plier or a magnetic bar. Remove the tool and take off the upper valve spring seat, the valve spring and the valve.



3. Remove the valve oil seal (-1-) and take out the lower valve spring seat (-2-).



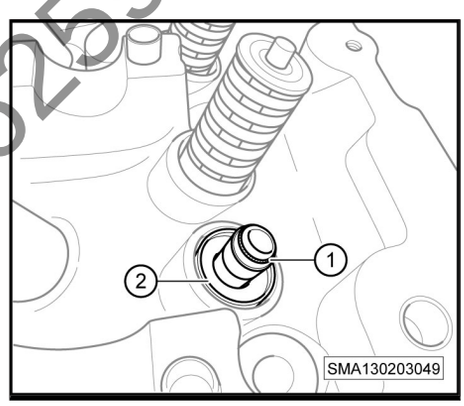
Note

- Soak the new oil seal in engine oil for several minutes before installing.
- Check if the lower valve spring seat has been properly installed before installing the valve spring.
- The valve spring is the variable pitch spring, whose painted end must face the lower valve spring seat.

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

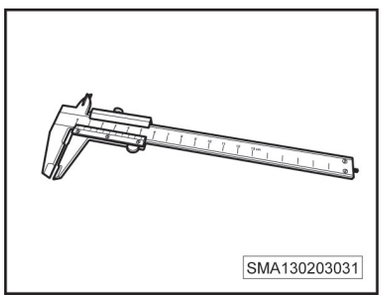
1. As shown in the figure, slide the lower valve spring seat (-2-) (with the bottom facing the cylinder head) into the valve guide. The bottom surface of the lower valve spring seat shall be fit to the processing surface of the lower valve spring seat of the cylinder head. Then apply engine oil on the lip of the valve oil seal (-1-), install the valve oil seal on the valve guide with a pressing sleeve, and check if the valve oil seal fits well with the valve guide.



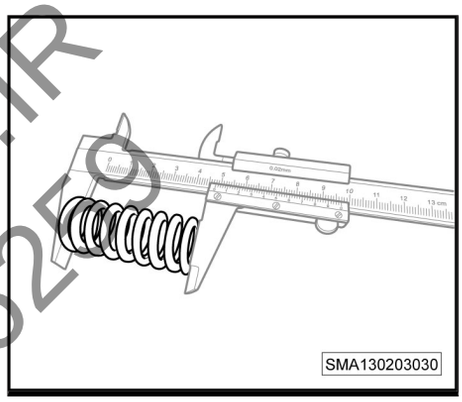
5.2 Inspection

Checking the valve spring

Maintenance tools and common equipment

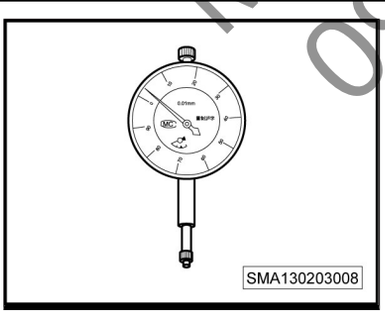
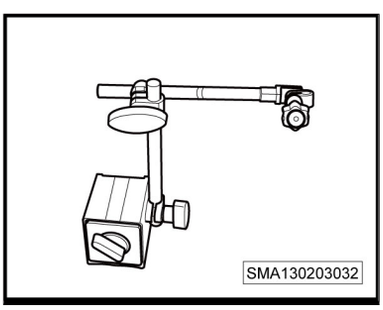
 SMA130203031	
Vernier	

1. As shown in the figure, measure the free height and the pretension height of the valve spring with a vernier. The measured value of free height shall be 47.7 mm, and the installation height shall be 41 mm under the pretension of 260±11 N.

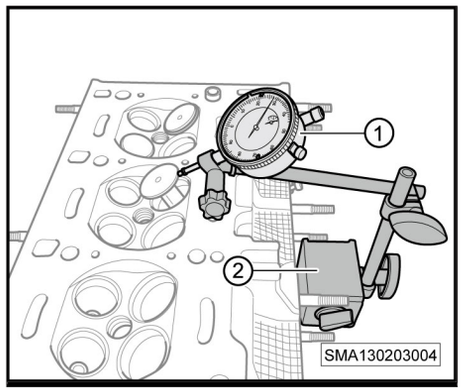

SMA130203030

Checking the clearance between the valve and the valve guide

Maintenance tools and common equipment

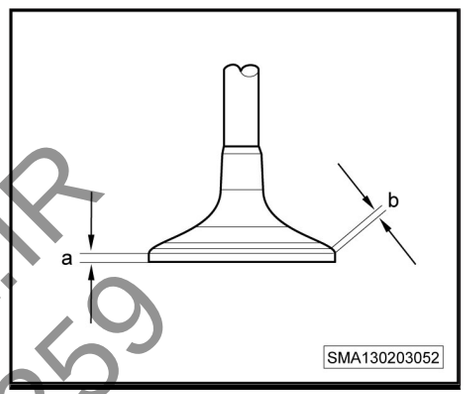
 SMA130203008	 SMA130203032
Dial indicator	Bracket

1. As shown in the figure, install the dial indicator (-1-) on the (magnetic) bracket (-2-), and install the intake or exhaust valve into the valve guide to be inspected.
2. Pull the valve out of the cylinder head for about 10 mm, rock the valve gently, and measure the clearance between the valve and the valve guide. The standard clearance between the intake valve and the valve guide shall be 0.027±0.015 mm. The standard clearance between the exhaust valve and the valve guide shall be 0.047±0.015 mm.



Checking the valve dimensions

Item	Standard value (mm)
Intake valve head thickness	0.6
Exhaust valve head thickness	0.4
Intake valve seal width	2.83
Exhaust valve seal width	2.26



0204 Lubrication System

1 General Information

1.1 Overview

- The lubrication system is used to supply lubricant to the surfaces of the parts that are in relative motion to realize liquid friction and reduce the friction resistance and wear of parts, and to clean and cool the parts surface.
- When the gas mixture starts burning in the engine combustion chamber, the fuel energy is converted to pressure that operates the crankshaft. However, not all energy is used to operate the engine, because the friction between operating engine parts could consume the energy produced by the engine which is then converted to heat. In order to reduce frictions and protect the engine, the lubrication system is a must to lubricate the engine.
- Most of the engine oil is reserved in the oil pan. When the engine is operating, the crankshaft drives the oil pump that sucks oil out of the oil pan. The oil sucked out is then filtered by the oil filter, flows via the engine oil passage to lubricate or cool different parts of the engine, and finally returns to the oil pan.
- The lubrication system consists of following components:

  a. Engine oil pump
  b. Engine oil strainer
  c. Engine oil pressure switch
  d. Engine oil filter
  e. Oil pan

Caution

- The used oil potentially contains harmful substances; thus, contacting with the oil for a long time may cause the skin dry and painful.
- When replacing the engine oil, you shall take effective measures to protect your skin, e.g. wearing protective clothing or gloves.
- After replacing the engine oil, please immediately use soap or soap solution to wash your hands thoroughly. Do not use chemical solvents like gasoline or diluting agents to wash your hands.
- Dispose the waste oil according to the local regulations.

1.2 Product specifications

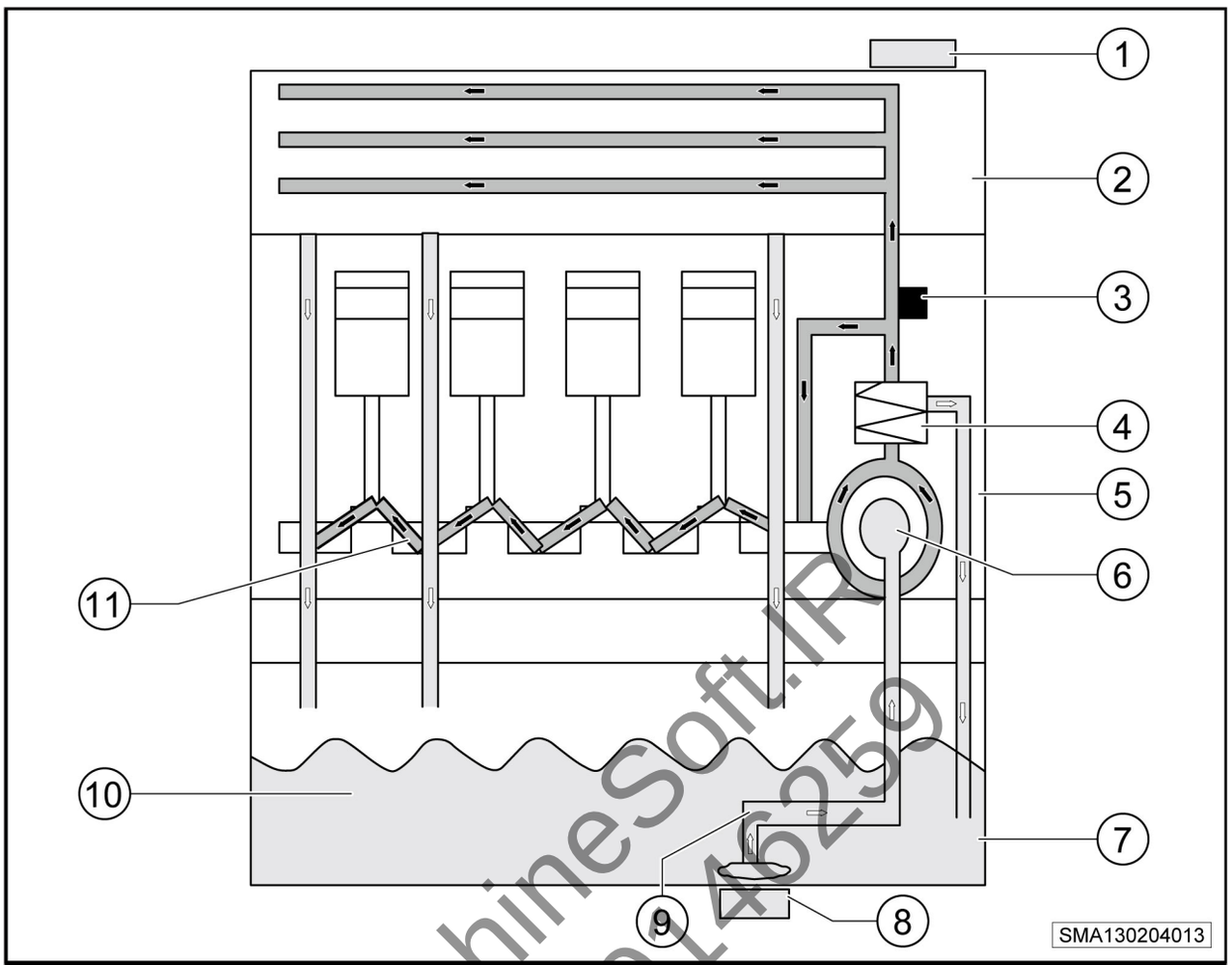
System pressure

Condition	Value (bar)
Idling speed (rev 800±50 r/min) (oil temperature 90℃)	＞1.5
High speed (rev 4000 r/min) (oil temperature 100℃)	＞3.5

Engine oil specifications

Condition	Value
Summer	Lubricant with the viscosity of SAE 10W-40 (SL or above)
Winter	Lubricant with viscosity of SAE 5W-40 (SL or above)
Filling capacity	3.9 L

1.3 Lubrication system flow chart

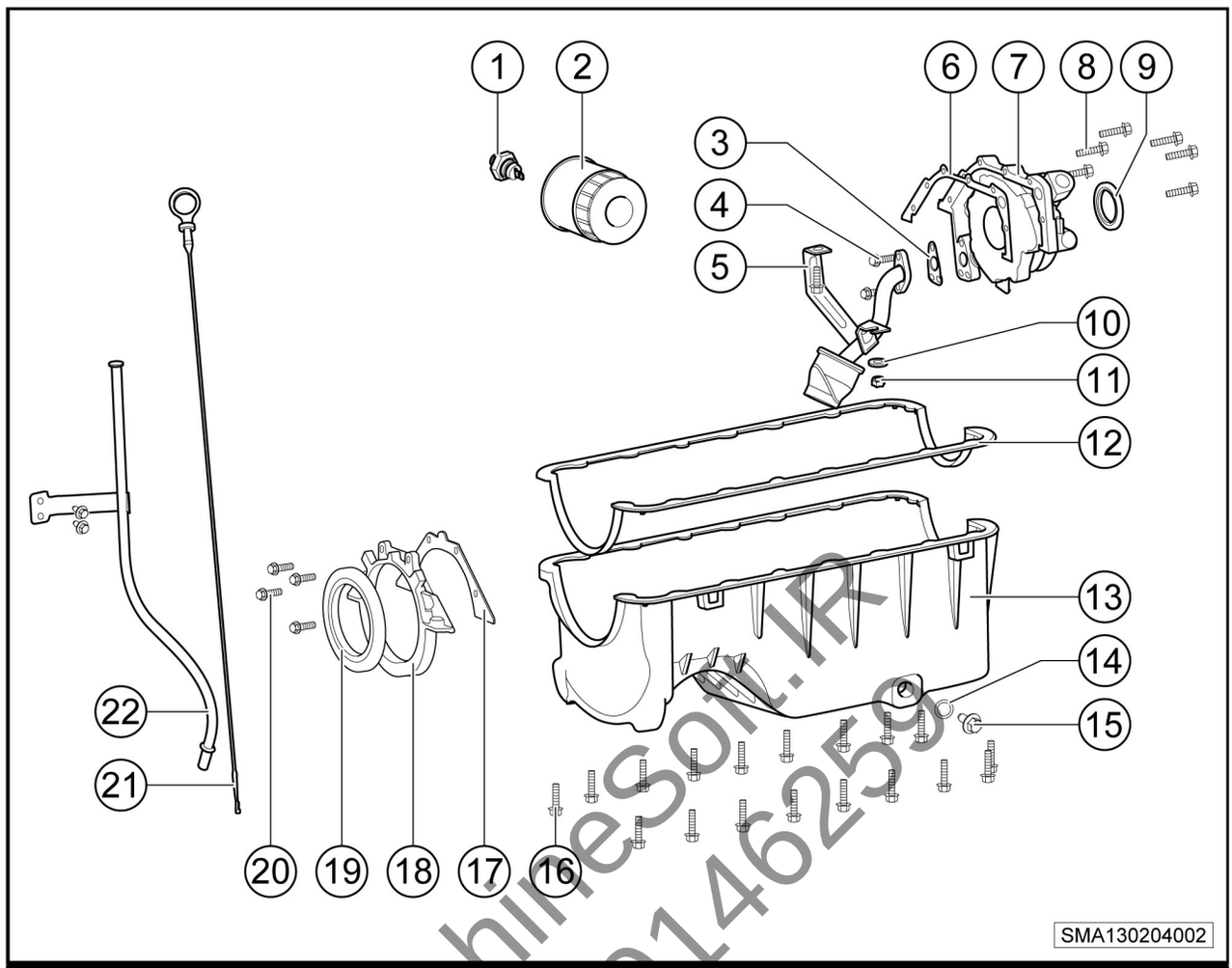


1. Oil filler cap	2. Cylinder head
3. Engine oil pressure switch	4. Engine oil filter
5. Cylinder block	6. Engine oil pump
7. Oil pan	8. Oil drain bolt
9. Engine oil strainer	10. Engine oil
11. Crankshaft	

Illustrations:

1. Solid arrow: indicates the flow of high-pressure lubricant.
2. Hollow arrow: indicates the flow of low-pressure lubricant.
3. Dark area: indicates the high-pressure lubricant.
4. Light area: indicates the low-pressure lubricant.

1.4 The lubrication system assembly drawing



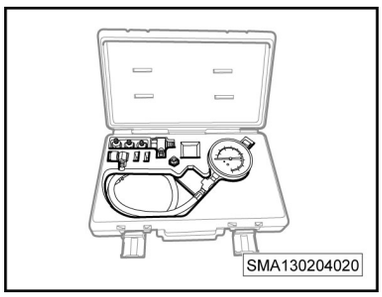
1. Engine oil pressure switch	2. Engine oil filter
3. Engine oil strainer gasket	4. Fixing bolt
5. Engine oil strainer	6. Engine oil pump gasket
7. Engine oil pump	8. Bolt
9. Front crankshaft oil seal	10. Gasket
11. Nut	12. Oil pan gasket
13. Oil pan	14. Copper gasket
15. Oil drain bolt	16. Oil pan fixing bolt
17. Rear crankshaft oil seal gasket	18. Rear oil seal bracket
19. Rear crankshaft oil seal	20. Fixing bolt
21. Oil dipstick	22. Oil dipstick tube

2 Diagnosis and Inspection

2.1 The lubrication system fault list

Symptoms	Possible causes	Maintenance recommendations
Inadequate engine oil pressure	Low engine oil level	Add oil to the standard scale
	Blockage of the engine oil strainer screen	Clean the engine oil strainer screen
	Loosening of the engine oil strainer bolts	Replace the gasket and tighten the bolts
	Failure of the engine oil pump seal	Replace the engine oil pump
	Damage to the engine oil pump	
	Excessive bearing shell clearance	Check the engine bearing shell and the crankshaft and replace worn parts if necessary.
	Failure of the engine oil pressure switch	Replace the engine oil pressure switch
	Thin engine oil viscosity	Replace the engine oil
Inadequate engine oil	Leakage of front and rear crankshaft oil seal, camshaft oil seal, engine oil pressure switch, oil filter, oil drain bolt and oil pan, etc.	Inspect the leak parts
	Engine oil burning resulting in high oil consumption	Inspect the cylinder pressure and the valve oil seal, repair the engine if necessary.

2.2 Testing the lubrication system pressure

	
Engine oil pressure tester	

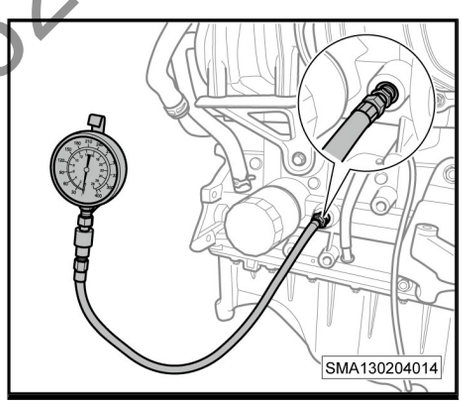
Preconditions:

1. The engine oil level is normal.
2. The engine oil filter is used within 5000 Km.
3. The engine reaches the normal operating temperature.

Inspection

1. Disconnect the engine oil pressure switch connector and unscrew the engine oil pressure switch .=> refer to page 165

2. As shown in the figure, screw the engine oil pressure tester into the engine oil pressure switch threaded hole.
3. Start the engine. When the engine meets the inspection condition, read the engine oil pressure value at idling speed and high speed respectively. If the lubrication system pressure is low, please clean the oil pan and the engine oil strainer screen, and then test again. If the lubrication system pressure is still low, there must be a fault in the engine oil pump.
   - Idling speed (800±50 r/min) Engine oil pressure: ＞1.5 bar
   - High speed (4000 r/min) Engine oil pressure: ＞ 3.5 bar



3 Oil Pan

3.1 Removing and installing the oil pan

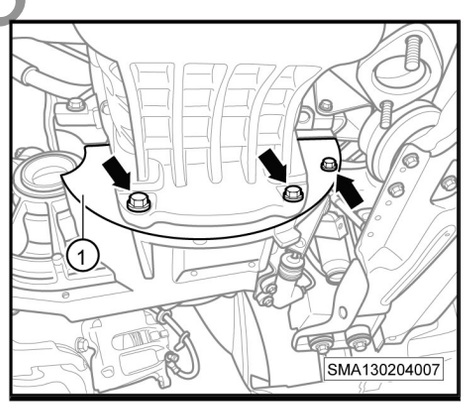
Note

- Check the sealant type and validity of when applying sealant.
- The sealant shall not be applied too thick; otherwise, the sealant will overflow into the oil pan due to squeezing, and thus block the engine oil strainer.
- Install the oil pan within the specified time after applying the sealant according to the instructions.
- After installing the oil pan, do not add engine oil until the sealant becomes dry.

Removal

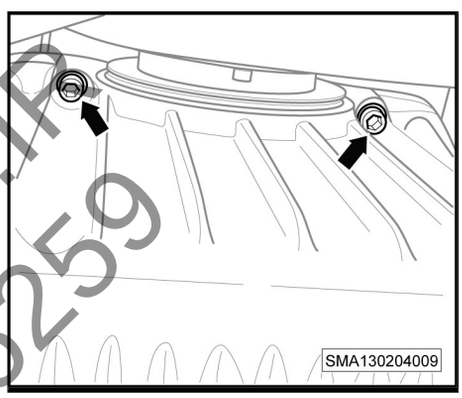
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the main three-way catalytic converter . => refer to page 231
3. Discharge the oil . => refer to page 31
4. Loosen but do not unscrew the fixing bolts between the engine and the transaxle to allow a small gap between them.

5. Unscrew the fixing bolts (-arrow-) and remove the clutch clapboard (-1-).

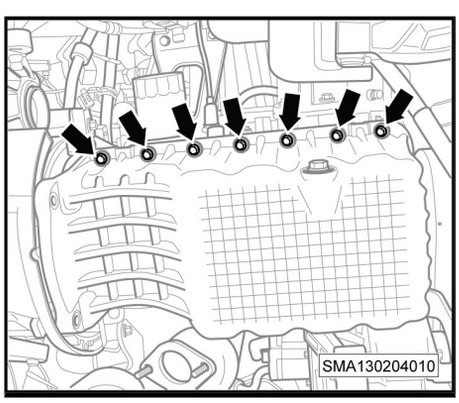


6. Unscrew the transaxle side oil pan fixing bolts (-arrow-).

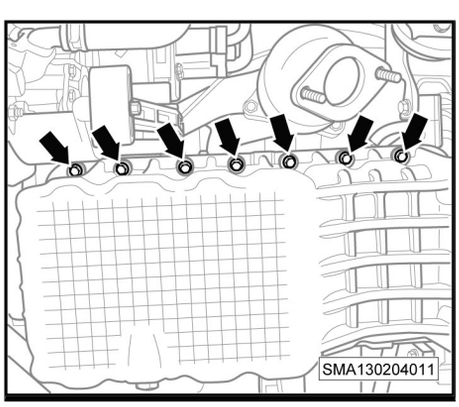
7. Unscrew the timing belt side oil pan fixing bolts (-arrow-).



8. Unscrew the intake pipe side oil pan fixing bolts (-arrow-).



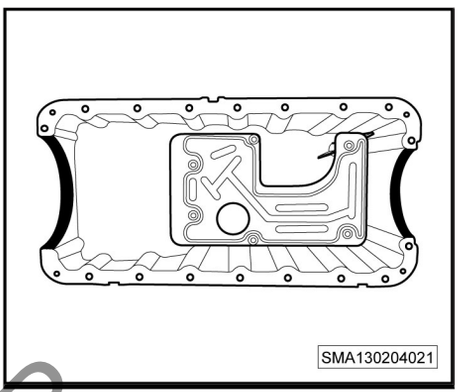
9. Unscrew the exhaust pipe side oil pan fixing bolts (-arrow-), and remove the oil pan and oil pan gasket.



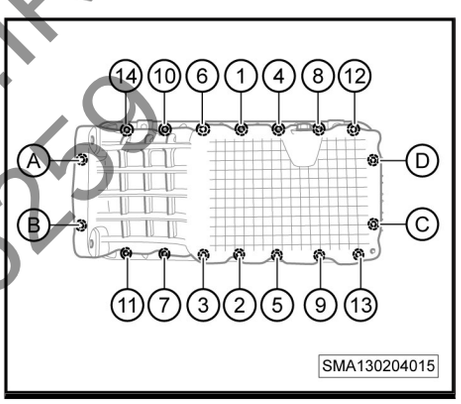
Installation

1. Clean the engine oil strainer screen.
2. Remove the impurities, iron chips and residual sealant in the oil pan.
3. Remove the residual sealant on the cylinder block with a flat scraper.
4. Remove the oil stain and residual sealant on the threaded hole of the cylinder block oil pan.

5. As shown in the figure, apply sealant on the semicycle interface between the oil pan gasket and the oil pan (the black part) and replace with a new gasket.



6. As shown in the figure, when installing the oil pan, tighten the bolts in the sequence from 1 to 14, and then tighten the four inner hexagonal bolts in the sequence of A, B, C and D.
   - Tightening torque of the oil pan fixing bolt: 7±1 N•m



7. Other installation shall follow the reverse sequence of the removal procedure.

4 Engine Oil Pump and Engine Oil Strainer

4.1 Removing and installing the engine oil pump and strainer

⚠ Warning

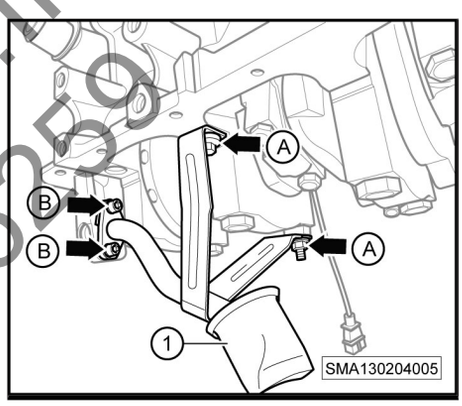
- After cleaning or replacing the engine oil pump, you shall add engine oil via the oil inlet, and rotate the pump rotor until the oil flows out of the outlet; otherwise, no vacuum can be rapidly produced between the inner and outer pump rotors and the pump body to pump out the engine oil, which may damage the bearings and bearing shells.

02

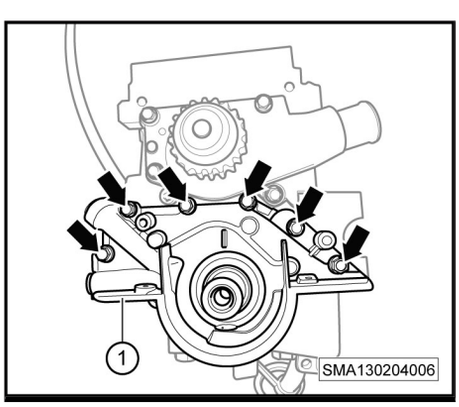
Removal

1. Discharge the oil . => refer to page 31
2. Remove the oil pan .=> refer to page 160

3. Unscrew the engine oil strainer bracket fixing bolts and nuts (-arrow A-), the engine oil strainer flange bolts (-arrow B-), and remove the engine oil strainer (-1-) and its gasket.
   - Tightening torque of the engine oil strainer bracket fixing bolts and nuts: 20±3 N•m
   - Tightening torque of the engine oil strainer flange fixing bolts: 10±2 N•m



4. Unscrew the engine oil pump fixing bolts (-arrow-) and remove the engine oil pump (-1-) and its gasket.
   - Tightening torque of the oil pump fixing bolts: 10±2 N•m



Installation

1. Clean the gaskets and residual sealant on the surface of the cylinder bolck and the engine oil pump.
2. Remove the residual sealant in the oil pan and the engine oil strainer.
3. Add oil via the inlet and rotate the pump rotor until the oil is pumped out from the outlet.

4. Replace the engine oil pump gasket, apply sealant on the pump bottom and the cylinder bottom, and install the engine oil pump.
5. Replace the engine oil strainer gasket and install the engine oil strainer.
6. Replace the oil pan gasket and install the oil pan .
7. Other installation shall follow the reverse sequence of the removal procedure.

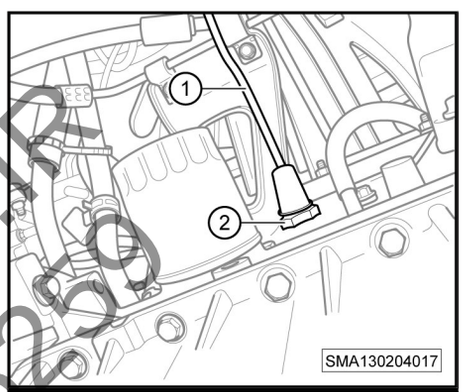
5 Engine Oil Pressure Switch

5.1 Removing and installing the engine oil pressure switch

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal and wait until the engine cools down.

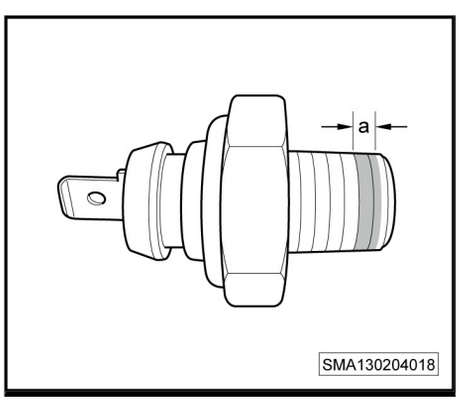
3. Disconnect the engine oil pressure switch connector (-1-) and unscrew the engine oil pressure switch (-2-).



Installation

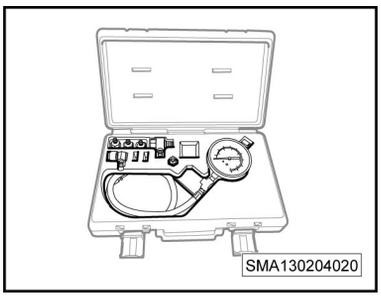
1. Remove the oil and impurities on the engine oil pressure switch and its threaded hole.

2. As shown in the figure, apply a few sealant within the scope of thread "a" when installing the engine oil pressure switch.
   - Tightening torque of the engine oil pressure switch: 27±2 N•m
   - Width of a: about 3 mm



5.2 Inspecting the engine oil pressure switch

Maintenance tools and common equipment

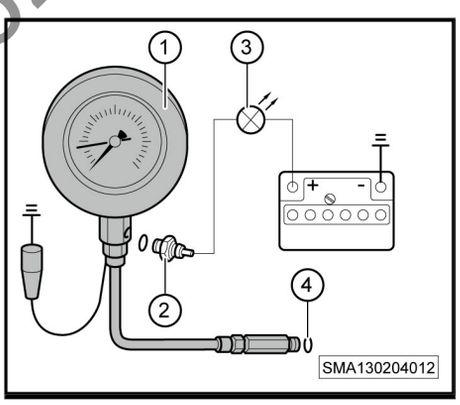
	
Engine oil pressure tester	

Note

- Before inspecting the engine oil pressure switch, please make sure that the engine oil level is normal, the coolant temperature reaches above 90℃, the oil filter is used within 5000 Km and the electric fan stops operating.

1. Remove the engine oil pressure switch . => refer to page 165

2. As shown in the figure, screw the engine oil pressure tester into the engine oil pressure switch threaded hole (-4-).
3. Install the engine oil pressure switch (-2-) on the tester (-1-) and insert the engine oil pressure switch connector into the engine oil pressure switch.
4. Earth the engine oil pressure tester to the vehicle body.
5. Start the engine to observe the tester pressure readout. The engine oil pressure warning light (-3-) lights up.When the engine oil pressure is lower than 75 Kpa, the warning light will light up; otherwise, you shall replace the engine oil pressure switch.



0205 Cooling System

1 General Information

1.1 Overview

- The cooling system is used to keep the engine running within an appropriate range in all operation conditions.
- The engine cooling system is a forced circulation system, which increases the system pressure by the coolant pump and forces the coolant to circulate in the engine.
- The main purpose of the cooling system is, in all circumstances, to timely distribute some heat from the heated parts, ensuring the engine to operate under proper temperature. The coolant is used as a cooling medium to take away the heat of the high-temperature parts and then radiate it to the air in certain ways.
- The cooling system consists of following components:

  a. Radiator
  b. Coolant
  c. Water pump
  d. Cooling fan
  e. Thermostat
  f. Expansion tank
  g. Hose and clamp
  h. Coolant temperature sensor

1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Fixing bolt of the water pump	9±1
Fixing bolt of the thermostat seat cap	9±1
Fixing bolt of the thermostat seat	9±1
Fixing bolt of the coolant pipe (to the cylinder block)	40±4
Fixing bolt of the coolant pipe (to the cylinder head)	8±1

Coolant concentration

Glycol	Soft water
50%	50%

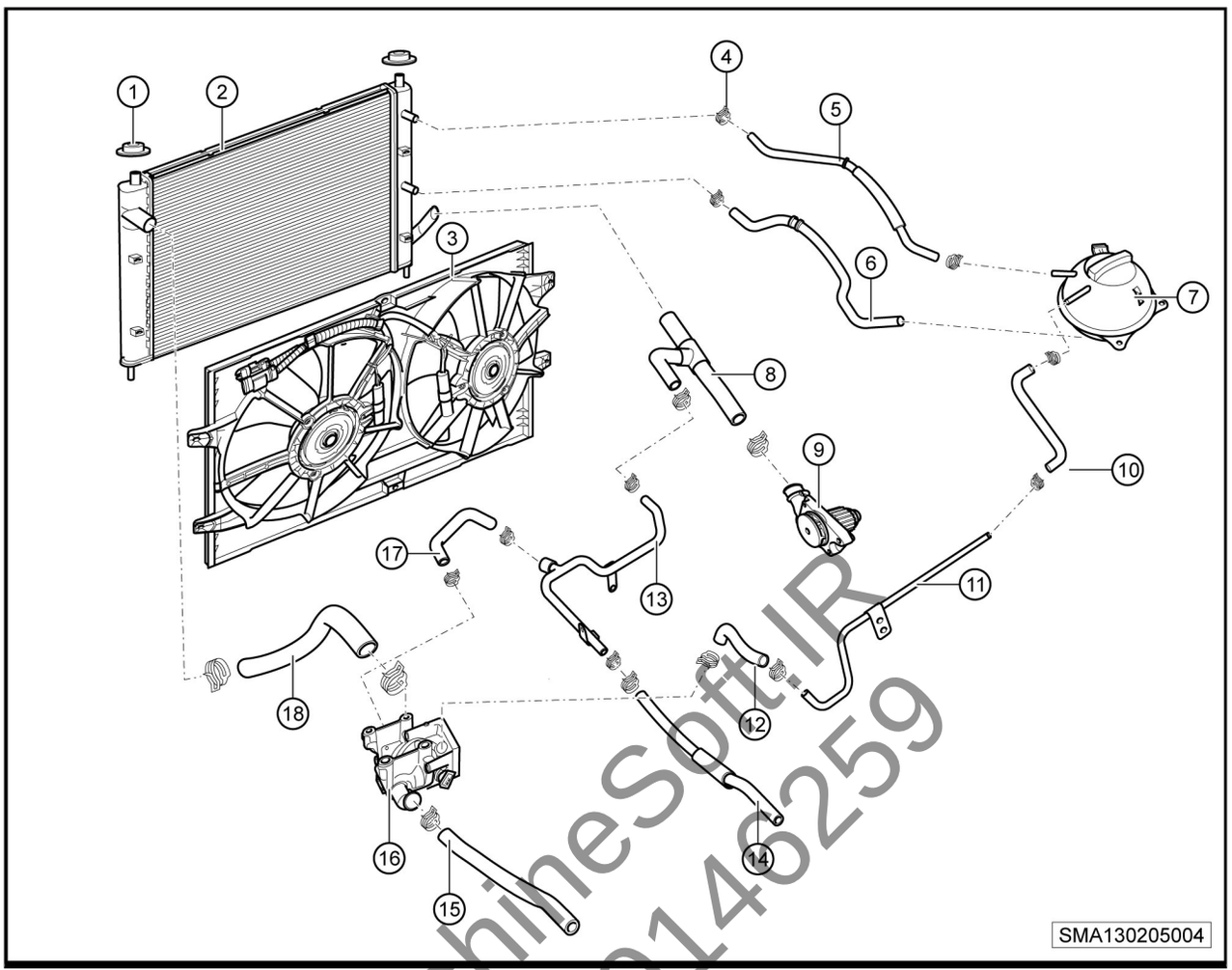
Coolant filling amount

Item	Capacity (L)
Cooling system	7

Pressure of the cooling system

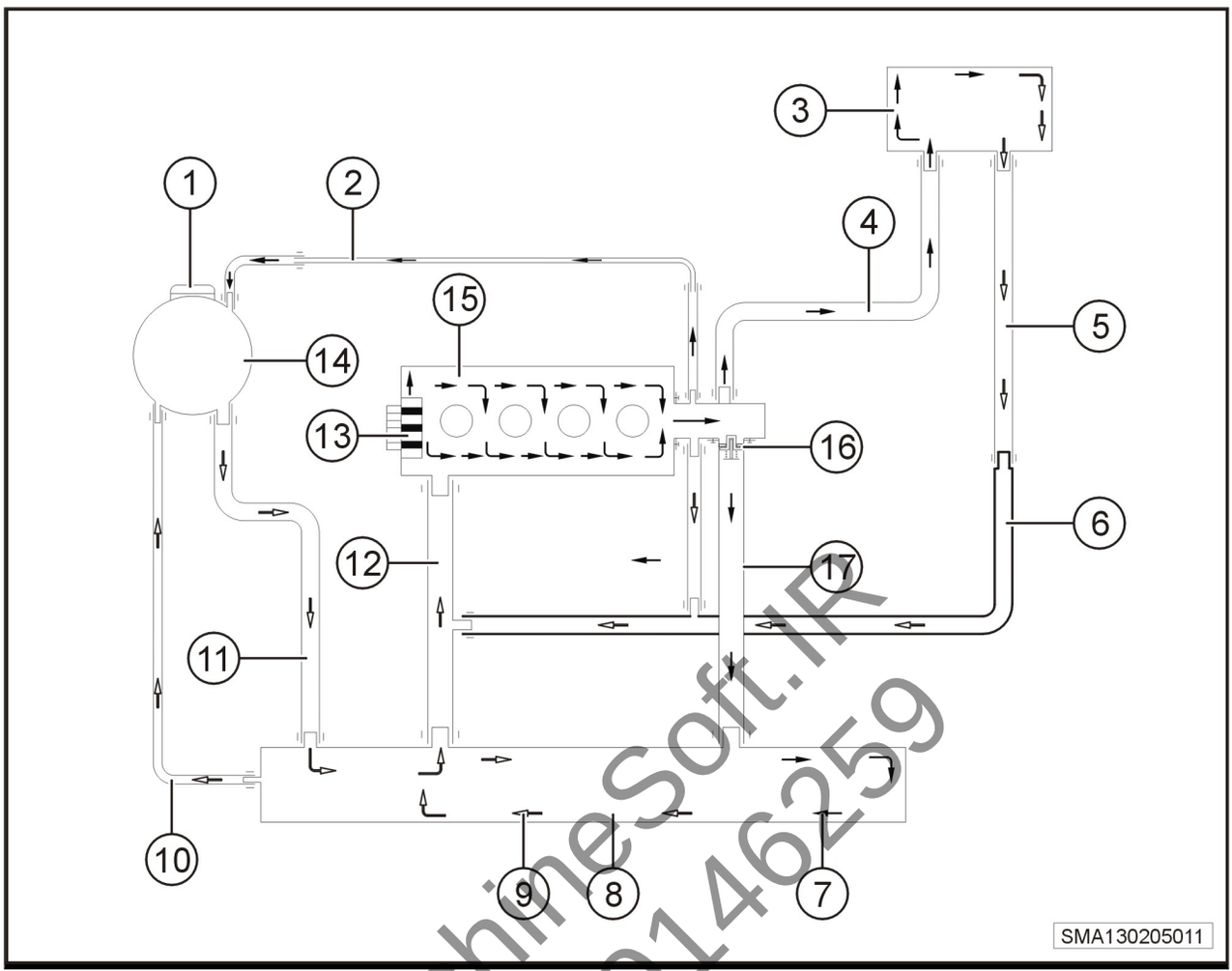
Item		Value (bar)
Cooling system (test pressure)		1.3±0.2
Pressure of the expansion tank cap	Dropping valve (releasing pressure to the outside)	1.5±0.1
	Vacuum valve (introducing air into the tank)	-0.06±0.04

1.3 The breakdown drawing of the cooling system



1. Radiator gasket	2. Radiator
3. Cooling fan	4. Clamp
5. Radiator exhaust hose	6. Coolant filling hose
7. Expansion tank	8. Radiator outlet hose
9. Water pump	10. Exhaust hose
11. Exhaust hard pipe	12. Exhaust hose
13. Water return hard pipe	14. Heater outlet pipe
15. Heater inlet pipe	16. Thermostat seat
17. Hose	18. Radiator inlet hose

1.4 The connection layout of the cooling system pipeline



1. Expansion tank cap	2. Exhaust hard pipe
3. Heater tank	4. Heater tank inlet hose
5. Heater tank outlet hose	6. Water return hard pipe
7. Black solid arrow (indicating high-temperature coolant)	8. Radiator
9. Hollow arrow (indicating low-temperature coolant)	10. Radiator exhaust hose
11. Coolant filling hose	12. Radiator outlet hose
13. Water pump	14. Expansion tank
15. Engine	16. Thermostat
17. Radiator inlet hose	

2 Diagnosis and Testing

2.1 Testing the pressure of the cooling system

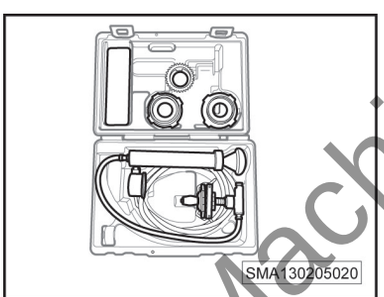
Caution

- When testing the cooling system, please pressurize the system with the specified pressure; otherwise, it may damage its components.
- Before inspecting the cooling system, you shall not operate until the coolant temperature drops to normal and shall take precautions; otherwise, there is a risk of scald.

Note

- When the expansion tank cap is opened, the vapor inside will overflow. For this reason, you may cover the cap with a cloth and unscrew it slowly.

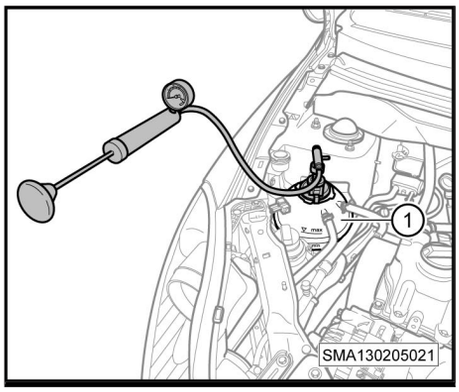
Maintenance tools and common equipment

	
Pressure tester for the cooling system	

Procedures

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Check if the coolant level is within the specified scale, and add coolant if necessary.
3. Cover the expansion tank cap with a cloth and unscrew it slowly. Then connect the pressure tester to the expansion tank (-1-).

4. As shown in the figure， pressurize the cooling system to 1.3±0.2 bar with the pressure tester and then observe the pressure variation. If the system pressure does not drop within two minutes, it indicates the system is good in leak tightness; if the pressure considerably varies, it indicates the system has leaks. In that case, please find the leak point and have the fault rectified.

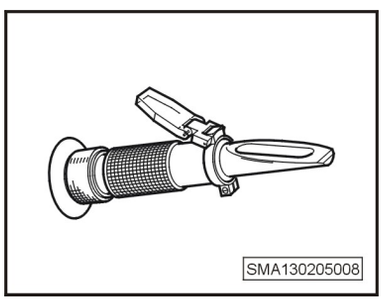


2.2 Testing the coolant concentration

Caution

- Mixture of different coolants is not allowed.
- Only use the coolant approved by Chery Automobile Co., Ltd..
- In the tropics or in summer, please use the coolant with a higher boiling point.

Special tools and equipment required

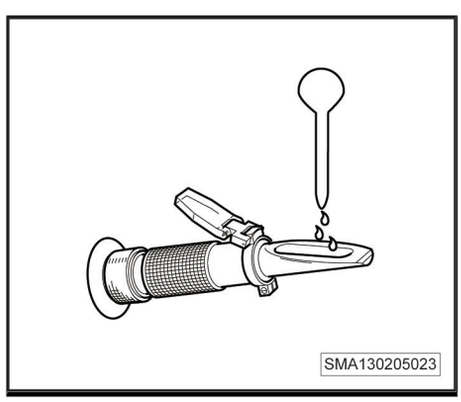
	
Refractometer	

Methods

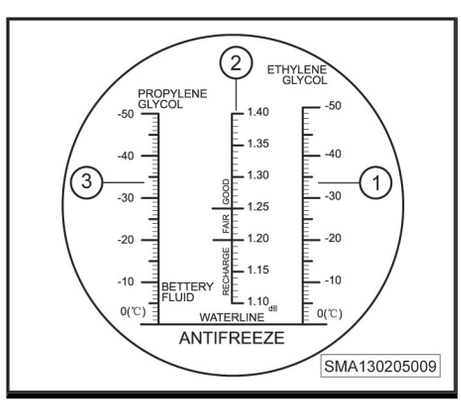
Note

- Please read the test value at the dividing line of light-and-shade. In order to distinguish the dividing line more clearly, drip a drop of water on the refractometer glass through a pipette; then the light-and-shade dividing line can be clearly distinguished via a "waterline".

1. As shown in the figure， drip the coolant on the refractometer glass through a pipette, and observe the freezing point value of coolant.



2. As shown in the figure， the right side of the refractometer dial (-1-) is used to measure glycol coolant, the left side (-3-) to measure propylene glycol coolant and the middle (-2-) to measure battery electrolytes.
3. When measuring the glycol coolant applied in the vehicle, you should observe the right side (-1-) of the dial.



4. The freezing point value of coolant must be kept below -35°C (or it may vary with the area, climate or freezing point).
5. If the freezing point is beyond the specified value, replace the coolant.

2.3 Cooling system fault list

Symptoms	Possible causes	Maintenance recommendations
Coolant shortage	Aging and leakage of the coolant pipe	Replace the coolant pipe
	Loosening and leakage of the water pump bearing	Replace the water pump
	Damage to the expansion tank cap	Replace the expansion tank cap
	Damage to the engine cylinder gasket	Replace the engine cylinder gasket
	Leakage of the water block in the engine cylinder block	Replace the water block
	Leakage of the water block in the engine cylinder head	Replace the water block
	Leakage of the radiator	Repair or replace the radiator
	Leakage of the heater tank	Repair or replace the heater tank
Engine overheating	Low coolant level	Add coolant
	Air resistance in the pipe	Discharge the air in the cooling system
	Damage to the expansion tank cap	Replace the expansion tank cap
	Blockage of the condenser	Clean or replace the condenser
	Inner blockage of the radiator	Clean or replace the radiator
	Failure of the thermostat	Replace the thermostat
	Failure of the cooling fan	Inspect the cooling fan and circuit
	Inner leakage of the engine	Inspect the leak point
Unable to reach the normal engine temperature	Constant operation of the cooling fan	Inspect the cooling fan and circuit
	Failure of the thermostat	Replace the thermostat
Non-operation of the cooling fan	Short circuit of the fuses	Replace the fuses and inspect relative circuits
	Failure of the relay	Replace the relay and inspect relative circuits
	Failure of the coolant temperature sensor	Replace the coolant temperature sensor
	Failure of the ECM (engine control module)	Inspect relative circuits and replace the ECM if necessary
Abnormal speed of the cooling fan	Circuit failure	Inspect relative circuits and repair the failure point

3 Discharging and Adding the Coolant

3.1 Discharging the coolant

Caution

- Before inspecting the cooling system, you shall not operate until the coolant temperature drops to normal and shall take precautions; otherwise, there is a risk of scald.

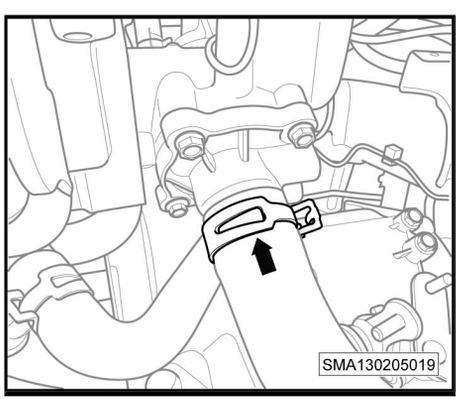
Note

- When the expansion tank cap is opened, the vapor inside will overflow. For this reason, you may cover the cap with a cloth and unscrew it slowly.

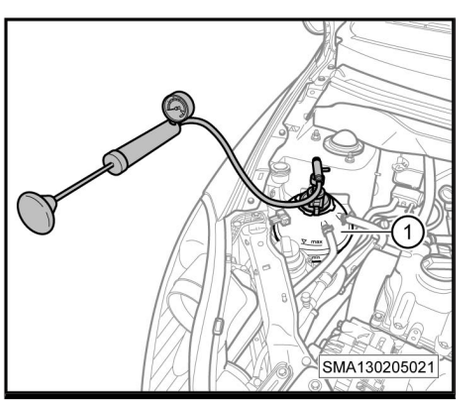
Procedures

1. Switch off all electrical equipment and the ignition switch, and pull out the key. Wait until the engine cools down.
2. Unscrew the expansion tank cap.
3. Lift the vehicle.
4. Place the collection vessel at the position where the discharged coolant could be collected.

5. Loosen the clamp (-arrow-) and pull out the hose.



6. Connect the pressure tester of the cooling system to the expansion tank (-1-), apply pressure until the coolant is drained.



7. After draining the coolant, install the hose and tighten the clamp.

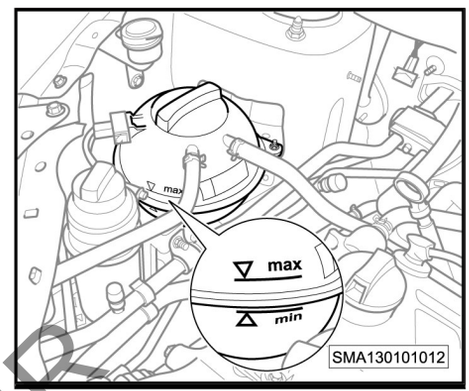
3.2 Adding the coolant

⚠ Warning

- If air enters the pipeline while adding coolant, it will cause engine overheated or even damaged.

Procedures

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Add coolant to the expansion tank slowly, and make sure the coolant flow is not too heavy so as to avoid air entering. Add the coolant to the upper -MAX- mark of the expansion tank.
3. Tighten the expansion tank cap.
4. Start the engine, increase the engine speed to 2000 rpm gradually and then keep the speed. When the cooling fan begins running, observe the coolant level and add coolant if necessary.



4 Thermostat

4.1 Overview

- The thermostat is installed at the rear of the engine cylinder head and connected to the radiator inlet pipeline. It is used to adjust the coolant flow and flow direction, change the coolant cycle range and regulate the heat dissipation capacity of the cooling system according to engine's operating temperature, to ensure the engine operating at a proper temperature.
- The thermostat must be kept in good work condition; otherwise, the normal operating temperature of the engine will be severely affected. Late opening of the thermostat's main valve will make the engine overheated, while early opening of the main valve will prolong the preheating time and make the engine temperature too low.
- When the engine is just started, the coolant temperature is low. In order to make the engine reach the normal operating temperature quickly, the thermostat shall be in inactive state, and the coolant flows in small circulation; when the coolant temperature reaches about 87℃, the thermostat is in slightly-active state, and the coolant flows mainly in small circulation and supportively in big circulation; when the coolant temperature is between 87℃ and 102℃, the thermostat is in half-active state, the coolant flows in small circulation and big circulation simultaneously; when the coolant temperature reaches about 102℃, the thermostat is in full-active state, and the coolant flows in big circulation.

4.2 Removing and installing the thermostat

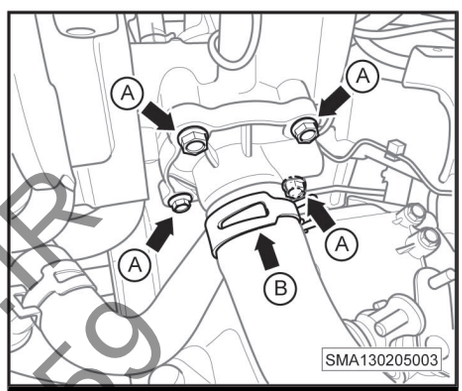
Caution

- Before inspecting the cooling system, you shall not operate until the coolant temperature drops to normal and shall take precautions; otherwise, there is a risk of scald.

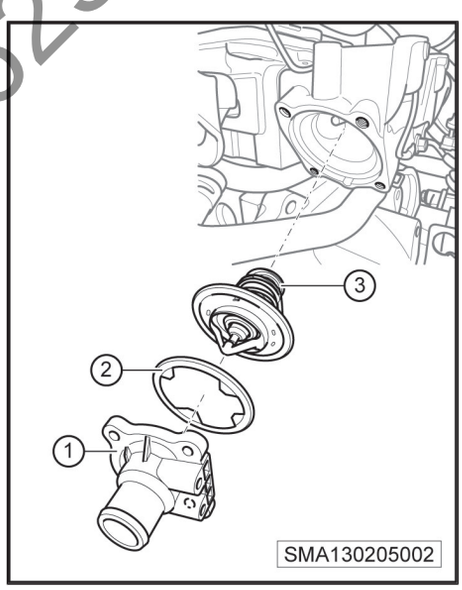
Removal

1. Discharge the coolant.=> refer to page 177
2. Place the coolant collection vessel under the vehicle.

3. Loosen the clamp (-arrow B-)， pull out the hose and unscrew the fixing bolts (-arrow A-).
   - Tightening torque of the fixing bolt of the thermostat seat cap: 9±1 N•m

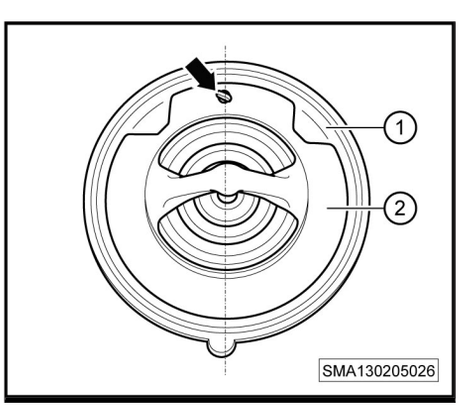


4. Remove the thermostat seat cap (-1-), the thermostat O-ring (-2-) and the thermostat (-3-).



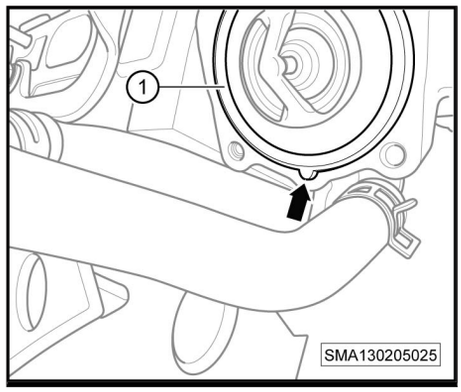
Installation

1. The thermostat O-ring must be replaced in every removal and installation.
2. Soak the new O-ring with coolant.
3. As shown in the figure, install the convex plate on the O-ring (-1-) and the check vavle (-arrow-) on the thermostat (-2-) in an angle of 180°.



4. Install the thermostat components. Please pay attention to the installation position (-arrow-) of the O-ring (-1-) and the thermostat seat.

5. Other installation shall follow the reverse sequence of the removal procedure.

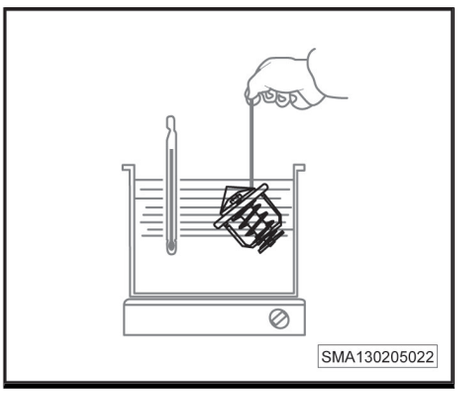


4.3 Testing the thermostat

Procedures

1. Place the thermostat in the container with water and put a thermometer in the container, and then warm up the container.
2. Observe the thermostat temperature under slightly-active and full-active state.

   - When the starting temperature is about 87°C.
   - When the temperature under full-active state is about 102°C.
   - The travel from the inactive state to full-active state shall be larger than or equal to 8 mm.



5 Cooling Fan

5.1 Overview

- The cooling fan is used to increase the airflow on the radiator fin surface through forced air supplement made by the cooling fan to cool down the radiator and the condenser.
- The cooling fan is a kind of double-motor-driven fan which consists of two driving motors, two five-blade fans, a fairing, leads and connectors.
- The engine control module (ECM) controls the operation of the cooling fan via the cooling fan relay according to the signals from the coolant temperature sensor, the air conditioner and the A/C pressure switch.
- The cooling fan works under the following conditions:

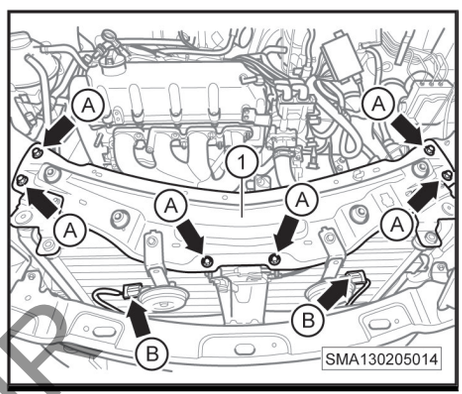
  a. When the coolant temperature is higher than 95°C, the cooling fan begins to operate at a low speed.
  b. When the coolant temperature is higher than 99°C, the cooling fan begins to operate at a high speed.
  c. When the coolant temperature is lower than 95°C, the cooling fan stops operating at a high speed.
  d. When the coolant temperature is lower than 90°C, the cooling fan stops operating at a low speed.
  e. When the air conditioner is switched on, the A/C fan starts operating.

5.2 Removing and installing the cooling fan

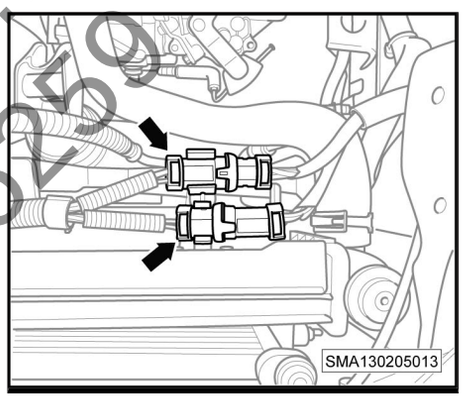
Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the air intake grid .=> refer to page 838

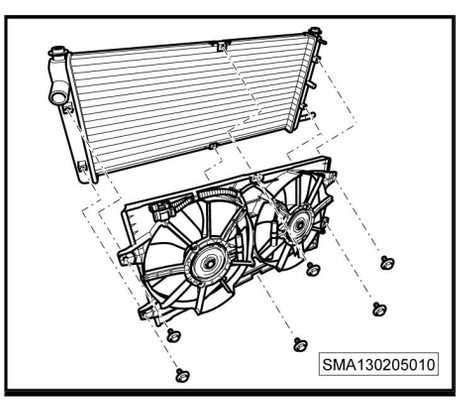
4. Unscrew the fixing bolts (-arrow A-), pull out the horn connectors (-arrow B-) and remove the front cross member (-1-).



5. Disconnect the cooling fan connectors (-arrow-).



6. Unscrew the bolt and remove the cooling fan.



Installation

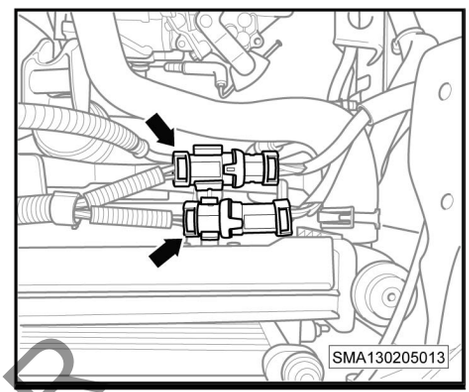
Installation shall follow the reverse sequence of the removal procedure.

5.3 Checking the cooling fan

Procedures:

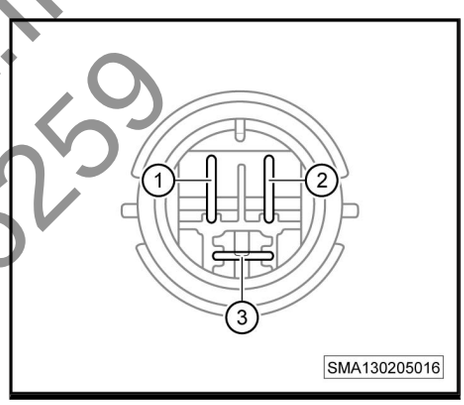
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.

3. Disconnect the cooling fan connectors (-arrow-).



4. As shown in the figure， measure with a multimeter. Terminal 1 is grounding, terminal 2 is high speed and terminal 3 is low speed.

- Set the multimeter to Ohms to measure terminal 1 and terminal 2. The measured value shall be about 0.55 Ohms. Replace the cooling fan if there are discrepancies.
- Set the multimeter to Ohms to measure terminal 1 and terminal 3. The measured value shall be about 0.8 Ohms. Replace the cooling fan if there are discrepancies.



6 Radiator

6.1 Overview

- Actually, the radiator is a heat exchanger which functions to absorb the heat of the coolant flowing into the radiator and then radiate it to the air via the radiator fin.

6.2 Removing and installing the radiator

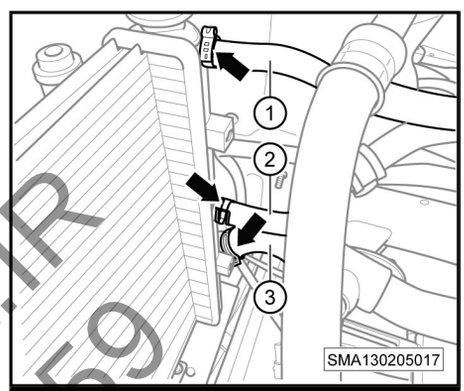
Caution

- Before inspecting the cooling system, you shall not operate until the coolant temperature drops to normal and shall take precautions; otherwise, there is a risk of scald.

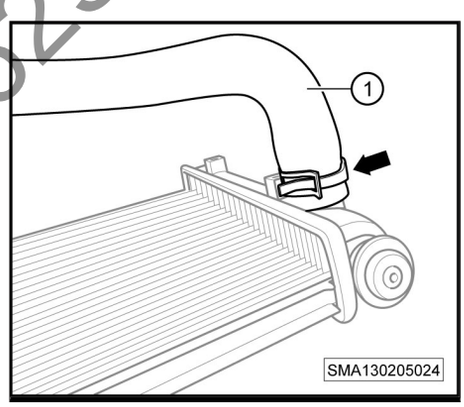
Removal

1. Discharge the coolant .=> refer to page 177
2. Remove the cooling fan .=> refer to page 185

3. Loosen the clamps (-arrow-)， and pull out the radiator vapor hose (-1-), the coolant filling hose (-2-) and radiator outlet hose (-3-).



4. Loosen the clamp (-arrow-)， pull out the hose (-1-) and remove the radiator.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the disposable clamp.
2. Connect the hose and reset the clamp.
3. After installation, add coolant .
4. Finally, test the pressure of the system so as to ensure it is good in leak tightness.

7 Water Pump

7.1 Removing and installing the water pump

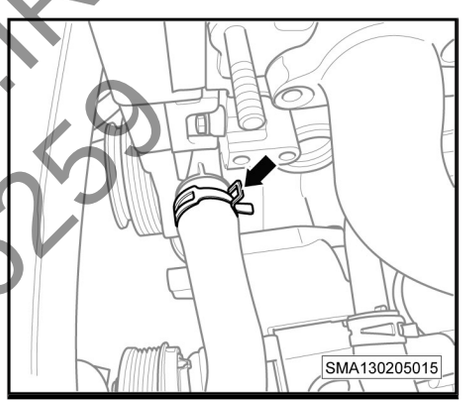
Caution

- If the water pump is damaged, it must be replaced instead of repaired.

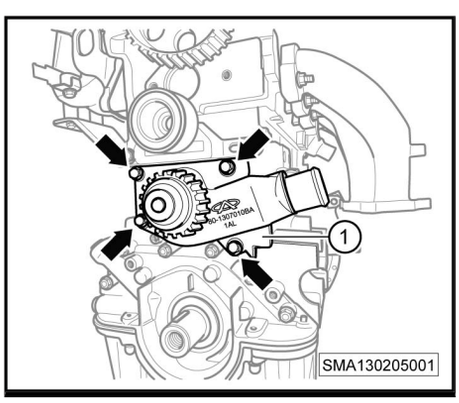
Removal

1. Discharge the coolant .=> refer to page 177
2. Remove the timing belt .=> refer to page 88
3. Remove the accessory bracket .=> refer to page 74

4. Loosen the clamp (-arrow-) and pull out the hose (-1-).



5. Unscrew the fixing bolts (-arrow-) and remove the water pump (-1-).
   - Tightening torque of the fixing bolt of the water pump: 9±1 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Clean the installation contact surface and replace the water pump gasket.
2. Install the hose and tighten the clamp in place.
3. After installation, add coolant .

4. Test the pressure of the cooling system to ensure it is good in leak tightness.

7.2 Checking the water pump

1. Visually check whether the contact surface between the water pump and the cylinder block is smooth.
2. Sway the cooling wheel to check the bearing for looseness.
3. Turn the cooling wheel to check the water pump for smooth rotation.
4. Be sure to replace the water pump out of specification.

0206 Fuel System

1 General Information

1.1 Overview

- The fuel stytem is used to provide fuel smoothly from the fuel tank to the engine at a certain amount of pressure.
- When the ignition is turned on, the engine control module activates the fuel pump relay to work for several seconds. Then the fuel pump starts to work and builds up a starting oil pressure for the fuel system. When receiving the anti-theft control module signal and the crankshaft position sensor signal, the engine control module will keep the fuel pump relay working.
- The fuel system consists of the following components:

  a. Fuel tank
  b. Fuel pump assembly
  c. Fuel filter
  d. Fuel rail
  e. Injector
  f. Fuel pipes

⚠ Warning

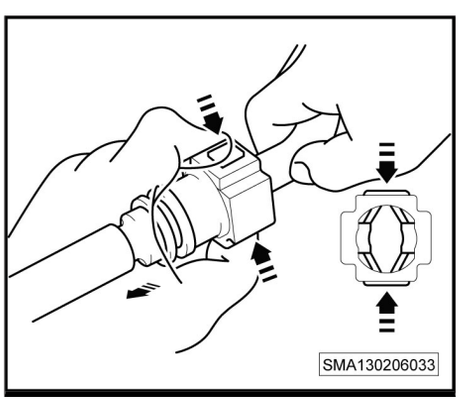
- When operating the fuel system, please keep the fire sources and open flames away from the working area, which should be equipped with extinguishers.
- Before operating the fuel system, please touch the vehicle body to discharge the static electricity; otherwise, it will cause fire and even explosion.
- When operating the fuel system, please keep good ventilation in the working area.
- Before removing and installing the fuel pipes, depressurize the fuel system.

Notes

When removing the fuel pipe connector, first press the projecting part of the fuel pipe connector with force in the (-arrow-) direction, and then pull out the fuel pipe connector.

Make sure that you have heard a "click" in the installation process. Then pull the fuel hose and its connector with force to make sure it is fixed.

Start the engine to make sure that there is no fuel leakage in the fuel connector after installation.



1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Fixing bolt of the fuel rail	9±1
Fixing bolt of the fuel tank fixing strap	30±3
Fixing nut of the filling guide	7±1
Fixing bolt of the filling pipe	10±1

Fuel system pressure

Condition	Value (Kpa)
Idle speed (800±50 r/min)	>350
Engine speed (2500 r/min)	>350

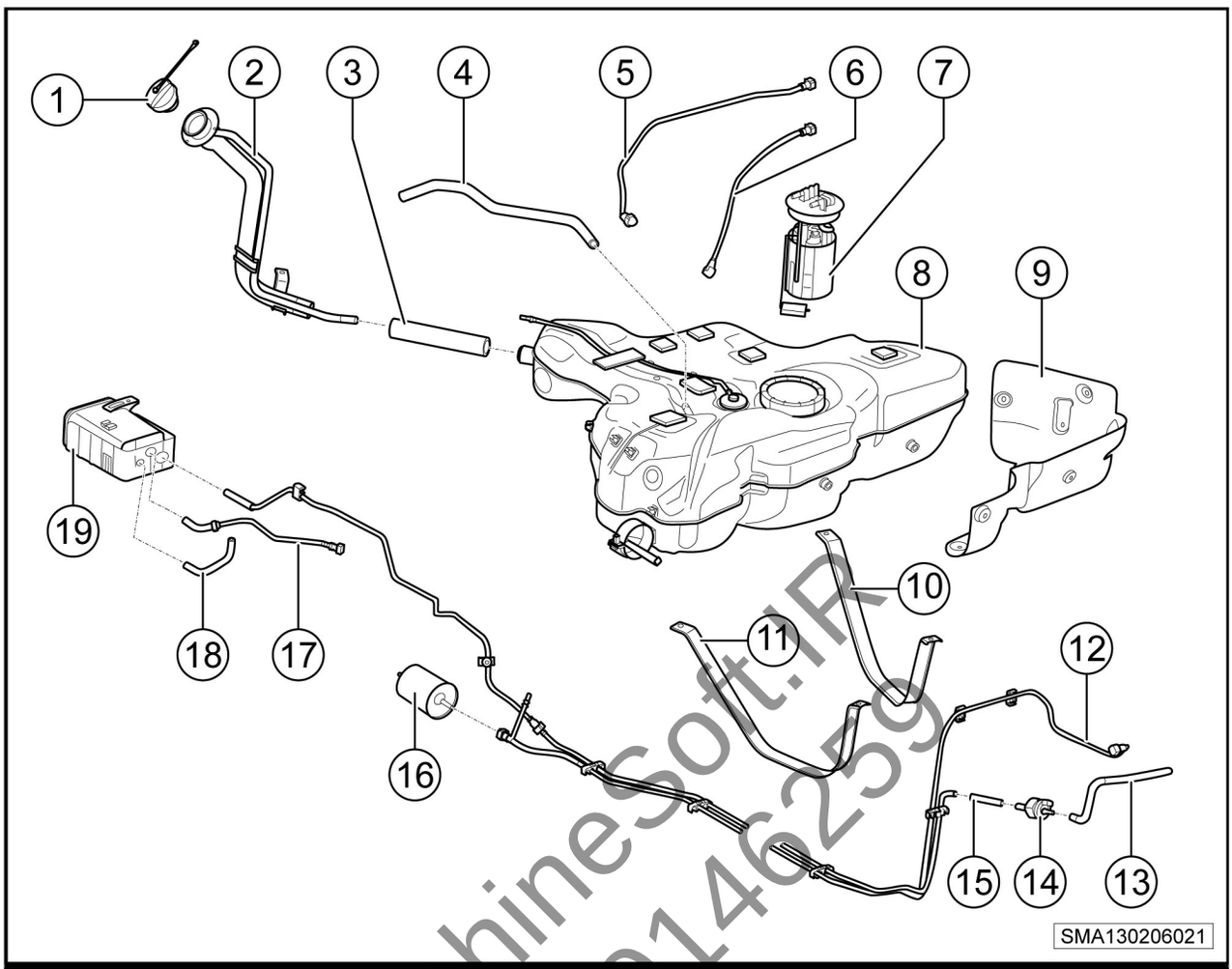
Fuel pump motor

Item	Ohm (Ω)
Resistance	0.5

Injector

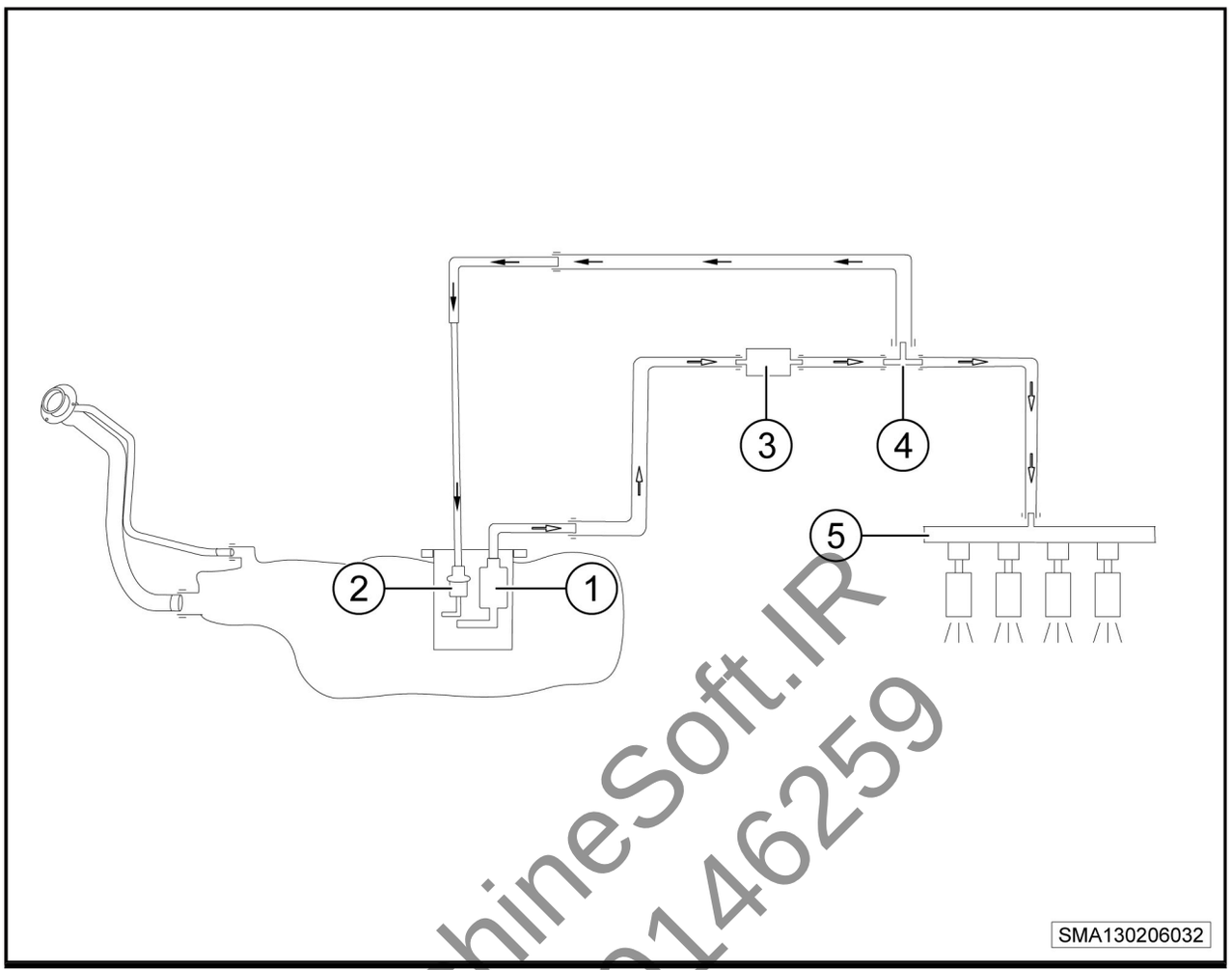
Item	Value
Standard resistance	12±0.4 Ω
Normal operating voltage	12.5 V

1.3 The fuel sytem assembly drawing



1. Fuel filler cap	2. Fuel filler pipe assembly
3. Hose	4. Fuel vapor hose
5. Fuel pump return pipe	6. Fuel pump outlet pipe
7. Fuel pump assembly	8. Fuel tank
9. Fuel tank heat shield	10. Fuel tank fixing strap
11. Fuel tank fixing strap	12. Oil feed pipe
13. Hose	14. Activated carbon canister solenoid valve
15. Hose	16. Fuel filter
17. Hose	18. Activated carbon canister intake pipe
19. Activated carbon canister assembly	

1.4 The connection layout of the fuel system pipeline



When the engine works properly, the fuel pump (-1-) pumps fuel from the fuel tank to filter through the fuel filter (-3-) and then reaches the T pipe (-4-). Then part of the fuel goes to the fuel rail (-5-) to supply fuel to the injector, and part flows directly to the fuel pump pressure regulating valve (-2-). When the fuel system pressure is high, the pressure jacks up the diaphragm spring inside the regulating valve, and then the valve opens and fuel lets out from the regulating valve. When the pressure reaches a normal level, the regulating valve shuts off and then fuel stops letting out. Consequently, the system pressure is stable.

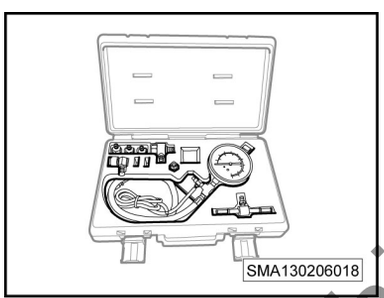
2 Diagnosis and Testing

⚠ Warning

- When operating the fuel system, please keep the fire sources and open flames away from the working area, which should be equipped with extinguishers.
- Before operating the fuel system, please touch the vehicle body to discharge the static electricity; otherwise, it will cause fire and even explosion.
- When operating the fuel system, please keep good ventilation in the working area.
- Before removing and installing the fuel pipes, depressurize the fuel system.

2.1 Testing the fuel system pressure

Maintenance tools and common equipment

	
Fuel system pressure tester	

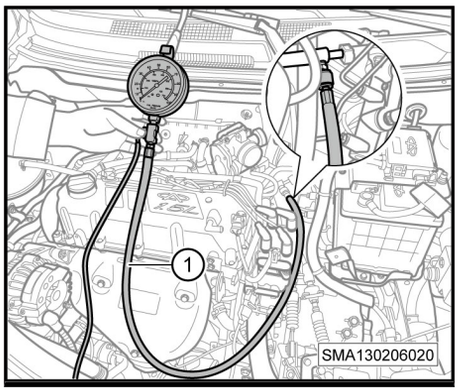
Preconditions

1. The battery voltage should be at least about 11.5 V.
2. The fuel should be at least 25% of the fuel tank volume.
3. The fuel filter mileage should be within 5,000 Km.
4. The fuel system pipe should abstain from leakage.

Testing

1. Switch off all electrical equipment and the ignition switch, and disconnect the fuel pump relay.

2. As shown in the figure, disconnect the oil feed hose connector and connect the fuel system pressure tester (-1-) between the oil feed hose and the fuel rail.



3. Start the engine， run it at idle speed and read the pressure tester value.

- The standard pressure at idle speed should be over 350 Kpa.
- If the measured pressure value is lower than 350 Kpa, please check the fuel filter for blockage. Replace the fuel filter if necessary.
- If the measured pressure value is lower than 350 Kpa and the fuel filter functions properly, please check the fuel pump and replace it if necessary.
- If the measured pressure value is too high, it may be caused by the injector blockage or fuel pump pressure regulating valve fault. Check the injector and the pressure regulating valve, replace them if necessary.

4. Switch off the engine and read the pressure tester value minutes later.

- The standard dwell pressure of the fuel system should be 24 Kpa.
- If the measured pressure value is lower than 24 Kpa, please check the fuel system pipe for leakage. If there is leakage, repair the pipe.
- If the measured pressure value is lower than 24 Kpa and the fuel system pipe does not leak, replace it with a new fuel pump and test again. If the measured pressure value becomes normal after the replacement, it indicates a fuel pump failure. Please replace the fuel pump. If the measured pressure value is still under 24 Kpa, please check the injector and replace it in case of failure.

2.2 Fuel system fault list

Fuel system fault diagnosis list

Symptoms	Possible causes	Maintenance recommendations
Normal starter operation, engine start failure	Anti-theft system failure	Eliminate the failure with the diagnostic tester
	Fuel pump failure	Check the fuel pump, repalce it if necessary
	Fuel pump relay failure	Check the fuel pump relay, replace it if necessary
	Fuel system pipe leakage	Repair or replace the leaky pipe
	Fuel filter blockage	Replace the fuel filter, clean the fuel tank and replace the fuel
	Fuel pump filter blockage	Replace the fuel and fuel pump, and clean the fuel tank
	Complete failure of the fuel pump pressure regulating valve	Replace the fuel pump
	Massive blockage in the injector	Clean or replace the injector
Extended time for engine start	Injector leakage	Clean or replace the injector
	Failure of the fuel pump internal check valve	Replace the fuel pump
	Fuel pump pressure regulating valve failure	Replace the fuel pump
	Fuel system pipe leakage	Repair or replace the leaky pipe
Frequent blockage in the injector	Poor fuel quality	Replace the fuel and clean the fuel tank
	Excessive impurities in the fuel tank	Replace the fuel and clean the fuel tank
	Dirty fuel filter	Replace the fuel and fuel filter, and clean the fuel tank

Fuel pump failure elimination

Symptoms	Possible causes	Maintenance recommendations
Loud operating noise	Low oil level for a long time or fuel pump damage	Replace the fuel pump, and keep the fuel level at over 25%
Powerless running		
Extended operation for fuel pump		

Injector failure elimination

Symptoms	Possible causes	Maintenance recommendations
Injector leakage	The injector blockage caused by excessive impurities in the fuel	Clean the fuel system, clean or replace the injector
Poor atomization of the injector	Excessive impurities in the fuel or injector failure	Replace the fuel and the injector
Injection hole blockage	Excessive impurities in the fuel	Clean the injector
Non-operation of the injector	Short circuit in the injector coil	Replace the injector

3 Fuel Tank

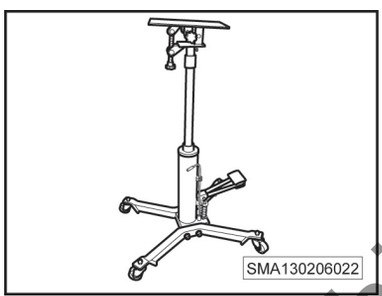
⚠ Warning

- When operating the fuel system, please keep the fire sources and open flames away from the working area, which should be equipped with extinguishers.
- Before operating the fuel system, please touch the vehicle body to discharge the static electricity; otherwise, it will cause fire and even explosion.
- When operating the fuel system, please keep good ventilation in the working area.
- Before removing and installing the fuel pipes, depressurize the fuel system.

02

3.1 Removing and installing the fuel tank

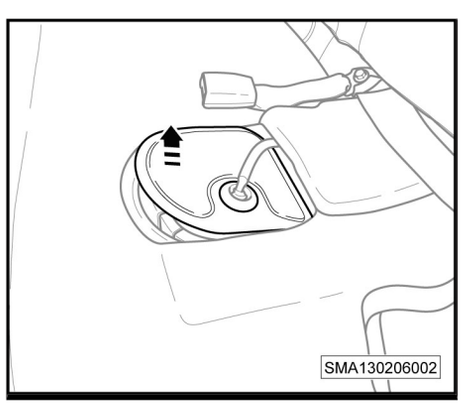
Maintenance tools and common equipment

 SMA130206022	
Hydraulic jack	

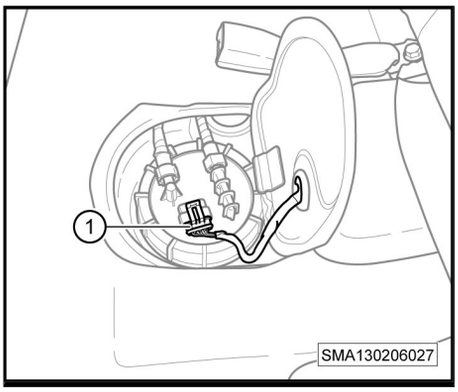
Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the fuel pump relay.
2. Start the engine and wait until its natural flameout.
3. Disconnect the battery negative terminal.

4. Lift the rear seat and pry off the cover with a screwdriver in the (-arrow-) direction.


SMA130206002

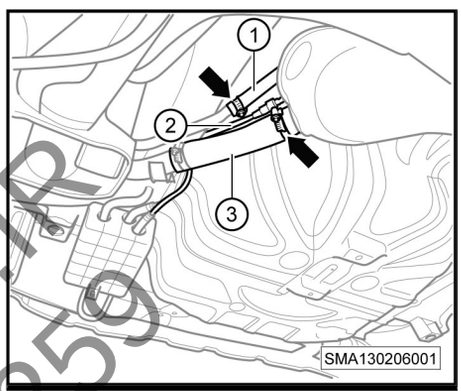
5. Disconnect the fuel pump connector (-1-).



6. Place a collection vessel under the fuel filler hose.

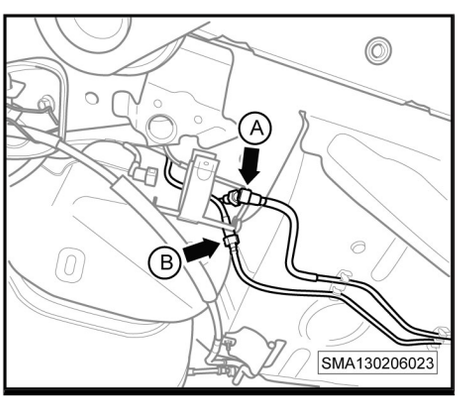
7. Press the lock pin of the pipe connector (-2-) and pull out the fuel vapor hose. Loosen the clamps (-arrow-) and pull out the hoses (-1-) and (-3-).

8. Unscrew the fixing nuts of the stabilizer bar link (-arrow-).

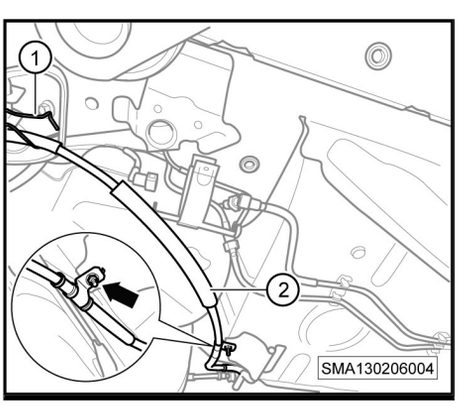


9. Remove the fuel filter .=> refer to page 211

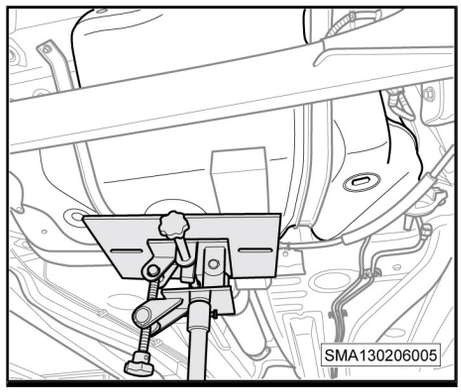
10. Press the lock pins of the pipe connectors (-arrow A-) and (-arrow B-), and pull out the fuel filter return pipe and the fuel vapor hose.



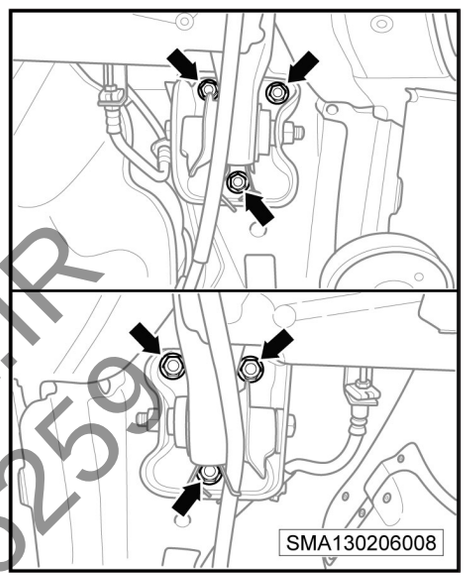
11. Unscrew the fixing bolt (-arrow-), disengage the holder (-1-) and move away the parking brake cable (-2-).



12. As shown in the figure， use a hydraulic jack to prop the fuel tank. A proper spacer block is used at the fuel tank support point so as to avoid fuel tank damage.

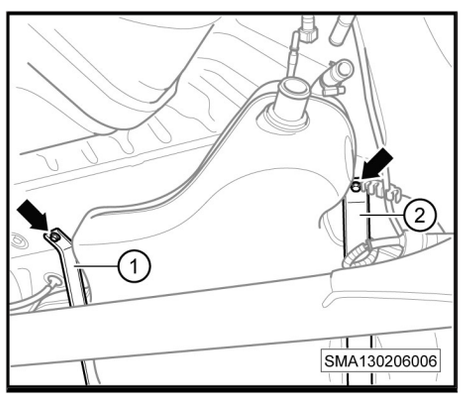


13. Unscrew the fixing bolts of the rear suspension (-arrow-) and lower the rear supspension slowly to a proper position.



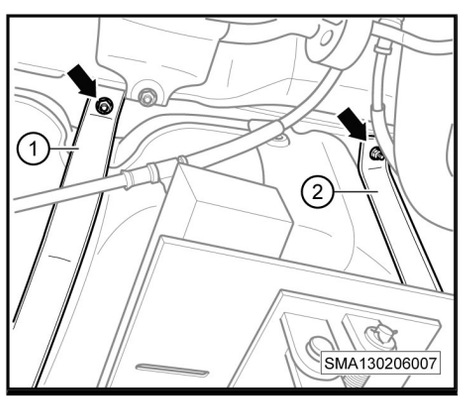
14. Unscrew the fixing bolts (-arrow-) and disengage the fixing straps (-1-) and (-2-).

- Tightening torque of the fixing strap fixing bolt: 22±2 N•m



15. Unscrew the fixing bolts (-arrow-) and remove the fixing straps (-1-) and (-2-). Lower the jack slowly to remove the fuel tank.

- Tightening torque of the fixing strap fixing bolt: 22±2 N•m



Installation

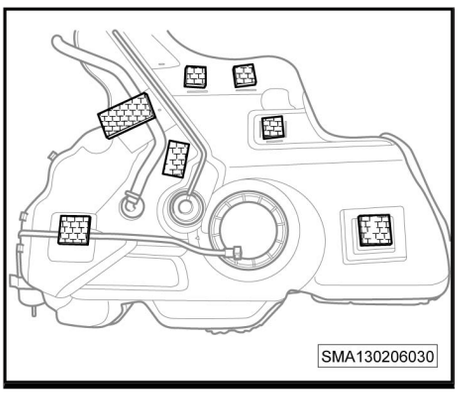
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. The fuel pipe and the ventilation pipe of the fuel tank must be restored to their original position. Otherwise, the friction caused by the body vibrations will damage the fuel pipe and subsequently leads to fuel leakage.
2. Check whether the pipe is firmly connected after installation of the fuel tank.
3. Be sure to keep enough space between the fuel pipe and the exhaust pipe heat shield.
4. Check the toe-in and camber of the rear wheel, and adjust it if necessary.

3.2 Fuel tank accessory instructions

Installation position of the fuel tank spacer blocks

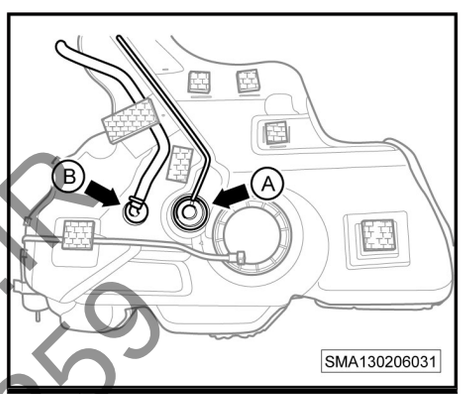
As shown in the figure， be sure to properly install the spacer blocks. Improper installation can lead to friction between the fuel tank and the body shell, which will damage the fuel tank or the fuel pipes.



Fuel steam valve and vent pipe

The function of the fuel steam valve (-arrow A-): When fuel in the fuel tank produces oil vapor, the vapor is then absorbed from the fuel steam valve to the activated carbon canister. When the fuel tank is fully filled, fuel buoyancy will help jack up the fuel steam valve to prevent fuel being absorbed from the fuel steam valve to the activated carbon canister.

The function of the vent pipe (-arrow B-): When filled into the fuel tank via the filler, the fuel squeezes air out of the fuel tank.



4 Fuel Pump Assembly

4.1 Overview

1. The fuel pump is used to absorb the fuel from the tank and and then deliver pressurized fuel to the oil feed pipe, which then works with the fuel pump pressure regulating valve to stabilize the fuel pressure.
2. When the ignition is turned on, the engine control module activates the fuel pump relay to work for several seconds. Then the fuel pump starts to work and builds up a starting oil pressure for the fuel system. When receiving the anti-theft control module signal and the crankshaft position sensor signal, the engine control module will keep the fuel pump relay working.
3. The fuel pump consists of the following components:

   a. Fuel pump motor
   b. Fuel filter screen
   c. Oil level sensor
   d. Fuel pump pressure regulating valve
   e. Fuel pipes

Warning

- When operating the fuel system, please keep the fire sources and open flames away from the working area, which should be equipped with extinguishers.
- Before operating the fuel system, please touch the vehicle body to discharge the static electricity; otherwise, it will cause fire and even explosion.
- When operating the fuel system, please keep good ventilation in the working area.
- Before removing and installing the fuel pipes, depressurize the fuel system.

Caution

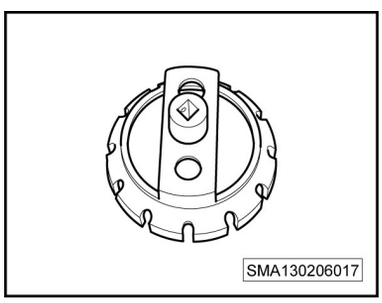
- Only use parts approved by Chery Automobile Co., Ltd. to replace the fuel pump assembly.
- As the fuel pump assembly radiates through fuel, low fuel level in the fuel tank will directly shorten the service life of the fuel pump.
- Be sure to keep the fuel pump assembly and the working area clean when replacing the fuel pump assembly; otherwise, the fuel pump screen will be blocked.

4.2 Removing and installing the fuel pump assembly

Caution

- Protective gloves must be worn in removing the fuel pump assembly.
- Be sure not to damage the harness and the fuel hose, nor to bend the float arm of the level sensor when removing the fuel pump assembly.

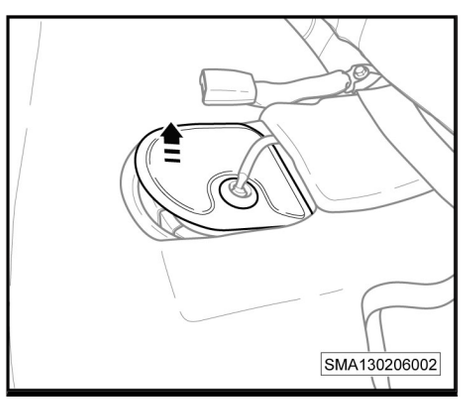
Maintenance tools and common equipment

	
Fuel pump cover remover	

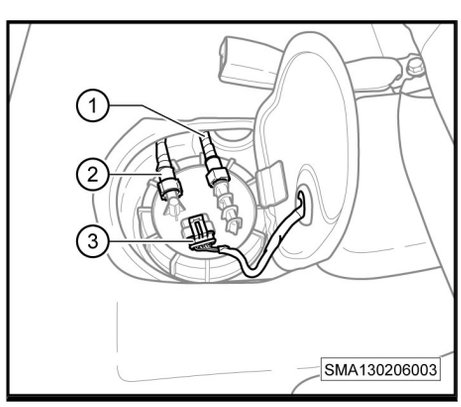
Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the fuel pump relay.
2. Start the engine and wait until its natural flameout.
3. Disconnect the battery negative terminal.

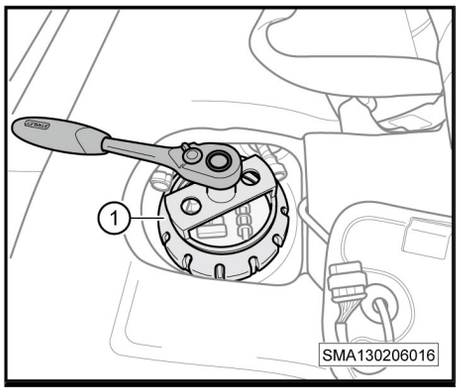
4. Lift the rear seat and pry off the cover with a screwdriver in the (-arrow-) direction.



5. Disconnect the fuel pump connector (-3-), press the lock pins of the pipe connectors (-1-) and (-2-) and pull out the oil return hose and oil outlet hose.



6. As shown in the figure， unscrew the fixing cover with the special tool (-1-) and remove the fuel pump assembly and the fuel pump seal ring.

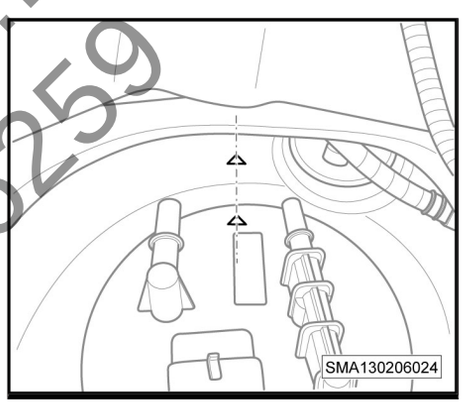


Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Check if the fuel pump package is complete before installing a new fuel pump.

2. Keep an eye on the installation position of the fuel pump. As shown in the figure，the mark ARROW on the fuel pump housing and that on the fuel tank must point toward the same direction before installing the fuel pump.



3. After installation, turn on the ignition switch repeatedly (without starting the engine) to build up a pressure for the fuel system. Also check the fuel pump connector for leakage.
4. Start the engine, check the fuel pump inlet and outlet pipe for leakage.

4.3 Testing the fuel pump

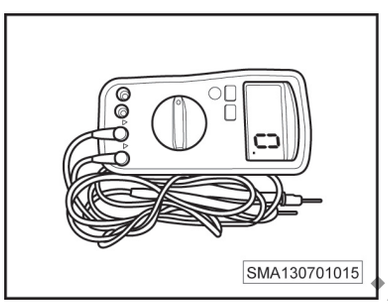
Warning

- When operating the fuel system, please keep the fire sources and open flames away from the working area, which should be equipped with extinguishers.
- Before operating the fuel system, please touch the vehicle body to discharge the static electricity; otherwise, it will cause fire and even explosion.
- When operating the fuel system, please keep good ventilation in the working area.
- Before removing and installing the fuel pipes, depressurize the fuel system.

Caution

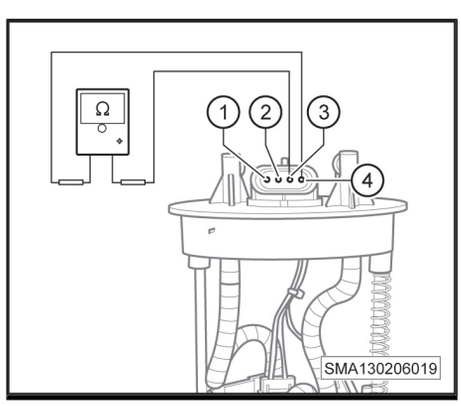
- The fuel pump must be removed from the fuel tank when checking the fuel pump.
- The current on time must not exceed 10 seconds to avoid coil burning when testing the fuel pump.

Maintenance tools and common equipment

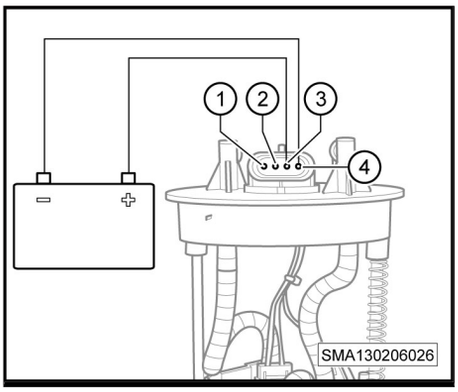
	
Digital multimeter	

Testing the fuel pump resistance

1. Connect the digital multimeter with fuel pump pins (-3-) and (-4-) respectively to test the fuel pump resistance. The resistance under normal temperature 20℃ is about 0.5 Ω. Replace the fuel pump if the resistance is too high.



Testing the fuel pump motor running state



1. Use a jumper to connect the fuel pump connector (-3-) with the battery positive terminal, and connect the fuel pump connector (-4-) with the battery negative terminal to check if the fuel pump runs properly. Replace the fuel pump in case of any abnormal conditions. The starting voltage of the fuel pump motor is 8 V and the maximum voltage is 16 V.

5 Fuel Filter

5.1 Overview

- The fuel filter is used to filter impurities in the fuel to avoid blockage in the fuel system (especially in the injector). Additionally, it will reduce mechanical wear and keep the engine running properly.

⚠ Warning

- When operating the fuel system, please keep the fire sources and open flames away from the working area, which should be equipped with extinguishers.
- Before operating the fuel system, please touch the vehicle body to discharge the static electricity; otherwise, it will cause fire and even explosion.
- When operating the fuel system, please keep good ventilation in the working area.
- Before removing and installing the fuel pipes, depressurize the fuel system.

i Note

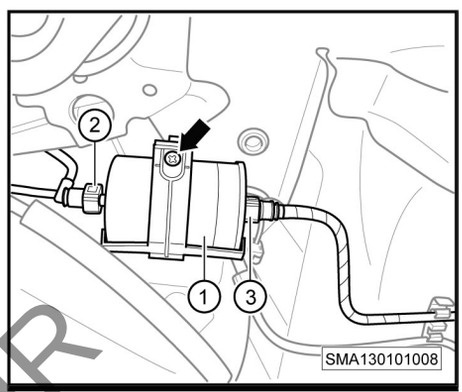
- Frequent injector blockage or poor atomization after replacement of the fuel filter are mostly caused by improper installation direction of the fuel filter.

5.2 Removing and installing the fuel filter

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the fuel pump relay.
2. Start the engine and wait until its natural flameout.
3. Place a collection vessel under the fuel filter.

4. Unscrew the fixing screw (-arrow-), press the lock pins of pipe connectors (-2-) and (-3-), and pull out the oil inlet and outlet pipes.
5. Remove the fuel filter (-1-) from the bracket.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Check the filter package for completeness.
2. During installation, the ARROW direction on the fuel filter housing must point to the vehicle's driving direction.
3. When starting the engine, please turn on the ignition switch repeatedly to build up a starting oil pressure for the fuel system. And meanwhile check the fuel filter connector for leakage.
4. Start the engine and check the fuel filter for leakage.

6 Injection Unit

6.1 Overview

- The injection unit is used to inject a certain amount of fuel into the intake manifold at a proper time according to the command of the engine control module, and produce flammable gas mixture with the air inside.
- The injector is a precision part of considerably high machining accuracy, which requires a large range of dynamic flow, sound clog-free and anti-contamination performance, and good atomization.
- The engine control module controls the power-on and power-off of the injector. The engine control module outputs control current to the injector in the form of electric pulse. When the electric pulse rises from zero, the injector will open because of power-on. When the electric pulse drops to zero, the injector will close because of power-off. The duration from electric pulse rise to drop is defined as pulse width. The shorter the pulse width output by the engine control module, the shorter the injection duration and the smaller rate of injection; and vice versa.
- The injection unit, installed on the intake manifold, consists of four injectors and one common fuel rail.

⚠ Warning

- When operating the fuel system, please keep the fire sources and open flames away from the working area, which should be equipped with extinguishers.
- Before operating the fuel system, please touch the vehicle body to discharge the static electricity; otherwise, it will cause fire and even explosion.
- When operating the fuel system, please keep good ventilation in the working area.
- Before removing and installing the fuel pipes, depressurize the fuel system.

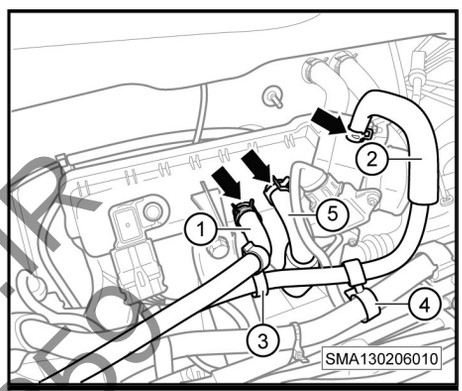
6.2 Removing and installing the injector

Removal

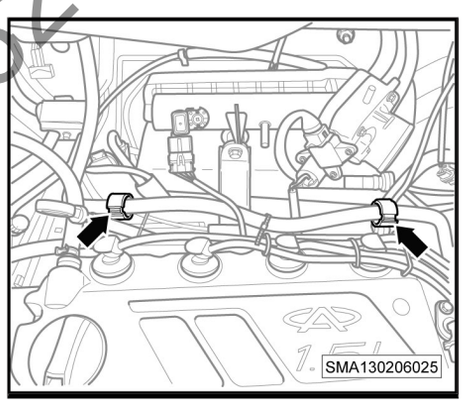
1. Switch off all electrical equipment and the ignition switch, and disconnect the fuel pump relay.
2. Start the engine, wait until its natural flameout, and pull out the key.
3. Disconnect the battery negative terminal.
4. Remove the air filter assembly . => refer to page 34

The following steps 5 to 6 are applied to vehicles equipped with mechanical throttles

5. Loosen the clamps (-arrow-), pull out the hoses (-1-), (-2-) and (-5-) and disengage the hose clips (-3-) and (-4-).

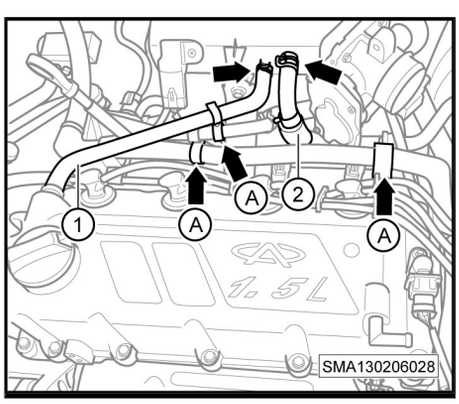


6. Release the harness from the fixing clips (-arrow-).



The following steps 7 and 8 are applied to vehicles equipped with electronic throttles

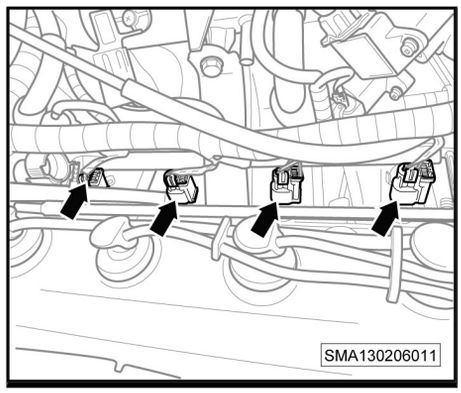
7. Release the clips (-arrow A-) and the clamps (-arrow-), and pull out the hoses (-1-) and (-2-).



8. Remove the electric throttle .=> refer to page 240

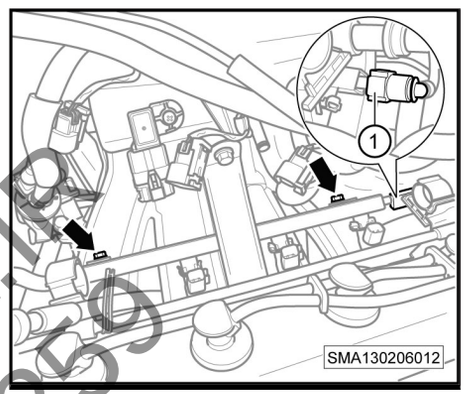
The following steps 9 to 11 are applied to all vehicles

9. Disconnect the fuel injector connectors (-arrow-).

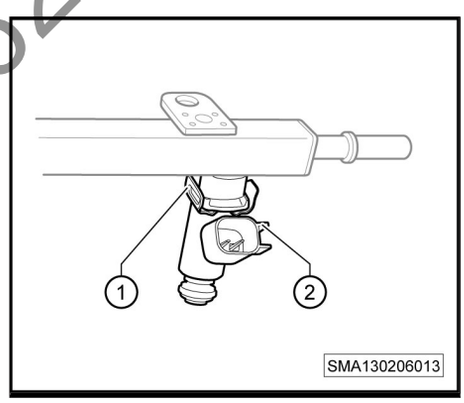


10. Press the lock pin of the pipe connector (-1-) and pull out the oil feed hose connector. Then unscrew the fixing bolts of the fuel rail (-arrow-) and pull out the injector together with the fuel rail. Seal the installation hole with a glabrous cloth to fend off foreign materials.

- Tightening torque of the fixing bolt of the fuel rail：9±1 N•m



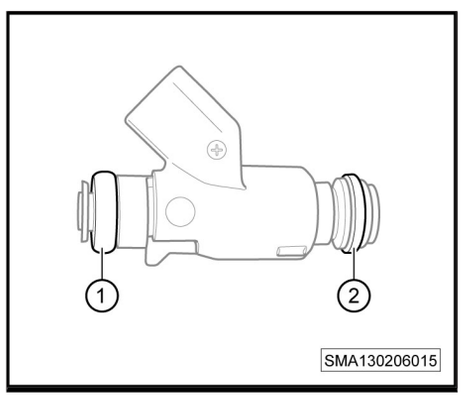
11. Loosen the holder (-1-) and pull out the injector (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

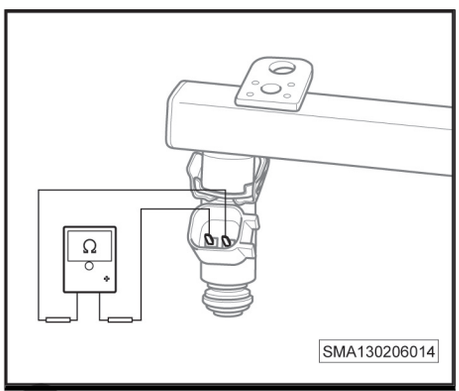
1. Replace the seal rings (-1-) and (-2-).
2. Apply a little lubricant on the injector O-ring to prevent the O-ring from being damaged in installing the injector.
3. Be sure to properly install the fuel rail and the injector. The injector connector must point to the vehicle's driving direction.



6.3 Testing the injector

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the fuel injector connectors.

4. Use a multimeter to measure the resistance between the two injector pins. The standard resistance under normal temperature 20℃ is 12±0.4 Ω.



0207 Exhaust

1 General Information

1.1 Overview

- The exhaust system is used to discharge engine exhaust, reducing vehicle emissions with the three-way catalytic converter, and eliminating exhaust noise with the silencer.
- When the exhaust system discharges exhaust gases, the oxygen sensor monitors the oxygen content in exhaust gases, with which the engine control module adjusts the air-fuel ratio of the flammable gas mixture to control vehicle emissions and fuel economy to the utmost.
- The exhaust system consists of the following components:

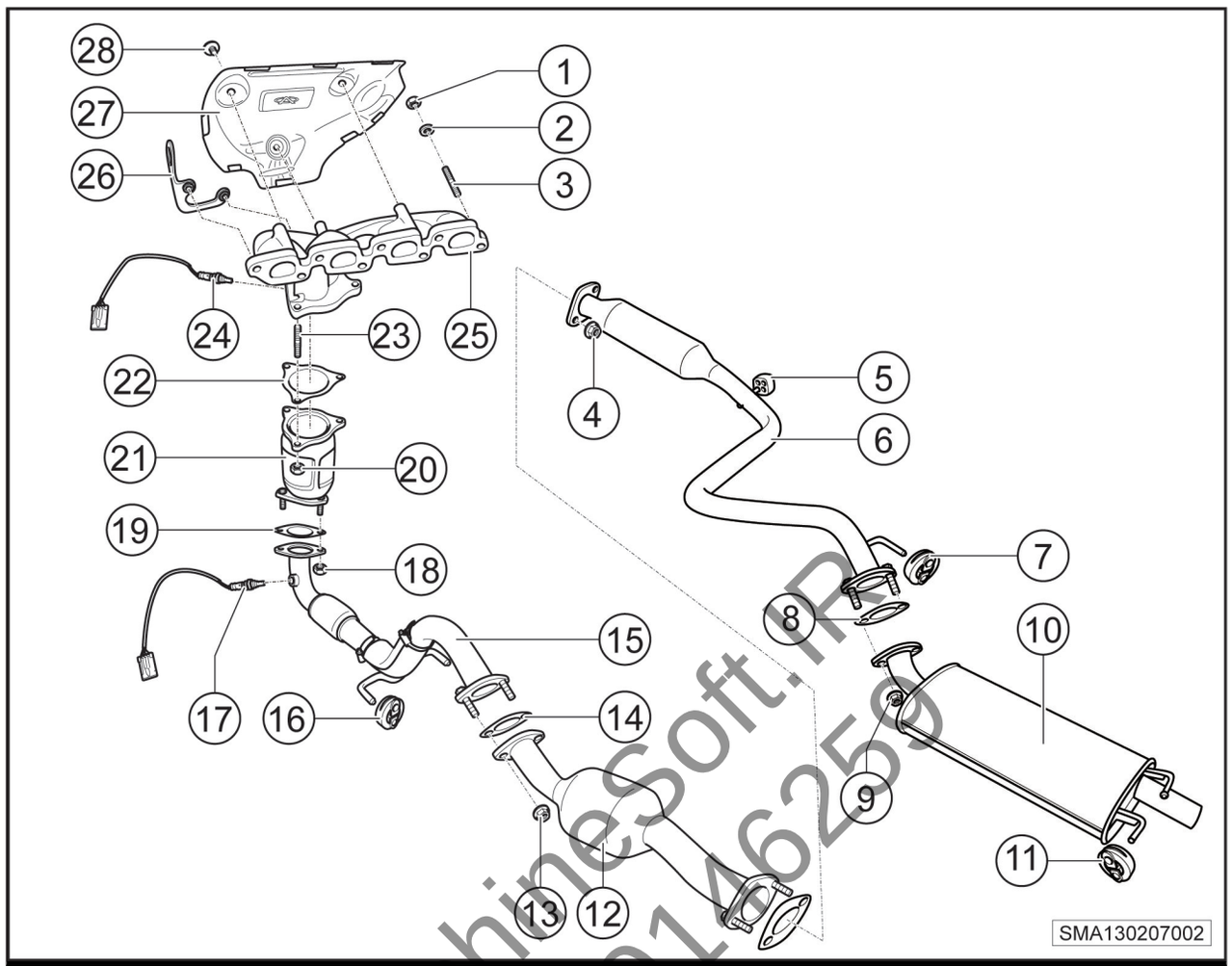
  a. Exhaust manifold
  b. Three-way catalytic converter
  c. Oxygen sensor
  d. Front exhaust pipe
  e. Silencer
  f. Exhaust manifold heat shield
  g. Gasket
  h. Bolts and nuts
  i. Hanger

1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Exhaust manifold stud	10±2
Exhaust manifold fixing nut	22±2
Front oxygen sensor	45±5
Fixing nut from three-way catalytic preconverter to exhaust manifold	45±5
Fixing nut from front exhaust pipe to three-way catalytic preconverter	45±5
Rear oxygen sensor	45±5
Fixing nut from main three-way catalytic converter to front exhaust pipe	45±5
Fixing nut from front silencer to main three-way catalytic converter	50±5
Fixing nut from main silencer to front silencer	50±5

1.3 The exhaust system assembly drawing



1. Nut	2. Gasket
3. Stud	4. Nut
5. Hanger	6. Front silencer
7. Hanger	8. Gasket
9. Nut	10. Main silencer
11. Hanger	12. Main three-way catalytic converter
13. Nut	14. Gasket
15. Front exhaust pipe	16. Hanger
17. Rear oxygen sensor	18. Nut
19. Gasket	20. Nut
21. Three-way catalytic preconverter	22. Gasket
23. Stud	24. Front oxygen sensor
25. Exhaust manifold	26. Hanger
27. Exhaust manifold heat shield	28. Nut

2 Diagnosis and Inspection

2.1 Exhaust system fault list

Symptoms	Possible causes	Maintenance recommendations
Excessive exhaust noise	Damage or leakage of the main silencer	Replace the main silencer
	Damage or leakage of the front silencer	Replace the front silencer
	Damage or leakage of the front exhaust pipe	Replace the front exhaust pipe
	Breakage or leakage of the exhaust manifold	Replace the exhaust manifold gasket or the exhaust manifold
Excessive exhaust temperature	Blockage of the three-way catalytic converter	Replace the three-way catalytic converter
	Incorrect ignition timing	Eliminate the ignition system failure or the valve timing fault
	Inadequate gas mixture combustion	Check the ignition coil or the ignition cable and spark plugs
Blockage of the exhaust pipe	Poor quality fuel resulting in blockage of the three-way catalytic converter	Clean the fuel system and replace the three-way catalytic converter
	Engine oil burning resulting in blockage of the three-way catalytic converter	Eliminate the fault causes to repair and replace the three-way catalytic converter
Leakage of the exhaust pipe	Damage of the exhaust pipe connector gasket	Replace the gasket and tighten the bolts as specified
	Warpage of the exhaust pipe connector surface	Check and replace if necessary
	Damage of the exhaust pipe	Replace the exhaust pipe

3 Exhaust Manifold

3.1 Removing and installing the exhaust manifold

Warning

- The temperature of the exhaust system is very high when the engine is running. Before removal and installation, you must make sure that the engine has stopped running and cooled down; otherwise, there is a risk of scald.

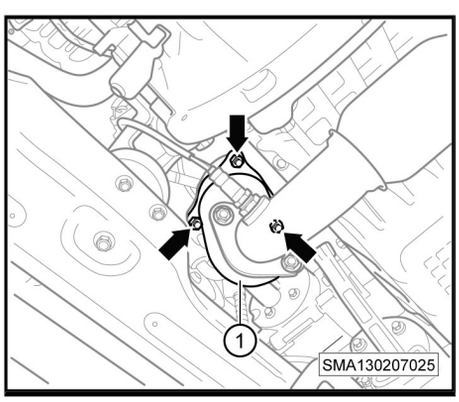
Note

- The corresponding gasket must be replaced during the removal and installation of the exhaust system.
- During installation, please note that do not fix the exhaust device too tight; keep an adequate distance to the vehicle body; and the suspension is evenly loaded.

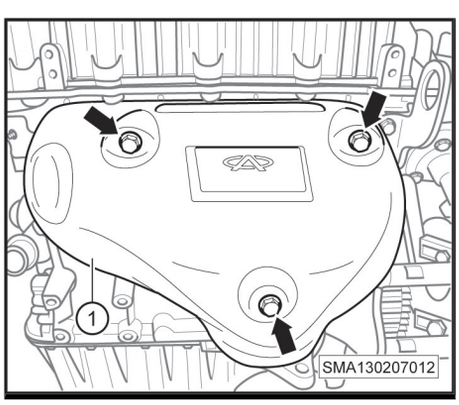
Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.

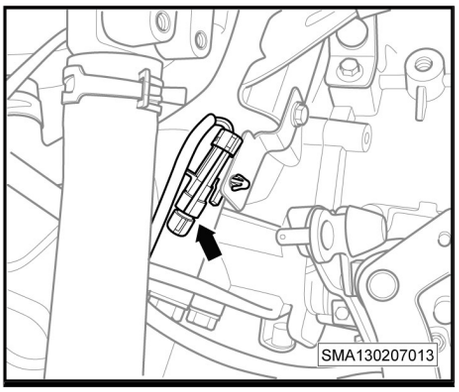
3. Unscrew the bolt (-arrow-), disengage the connection between the exhaust manifold and the three-way catalytic preconverter (-1-).



4. Unscrew the bolt (-arrow-), remove the exhaust manifold heat shield (-1-).
   - Tightening torque of the exhaust manifold heat shield fixing bolt: 22±2 N•m

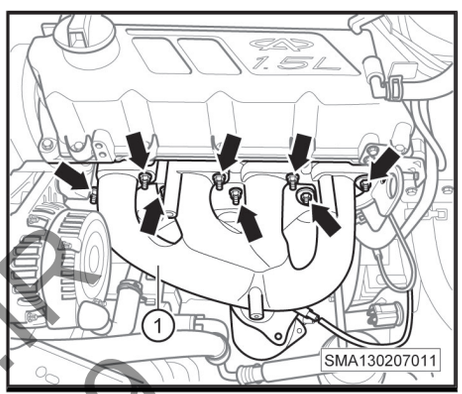


5. Disconnect the front oxygen sensor connector (-arrow-).



6. Unscrew the nut (-arrow-), remove the exhaust manifold (-1-) and the gasket.

- Tightening torque of the exhaust manifold fixing nut: 22±2 N•m



02

Installation

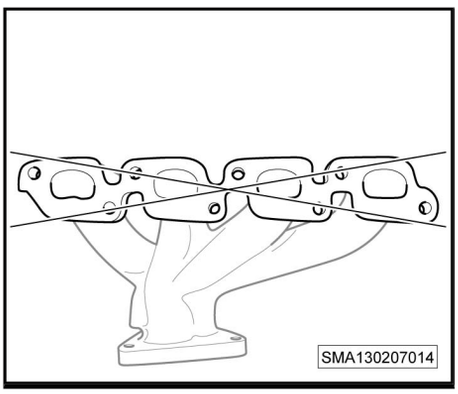
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the gasket.
2. Remove the impurities and rust on the joints and the threads.
3. Tighten the nuts with the specified torque.
4. Apply the treadlocker on the stud head before tightening the exhaust manifold stud.
5. Replace the damaged parts in case of cracks or leakages.

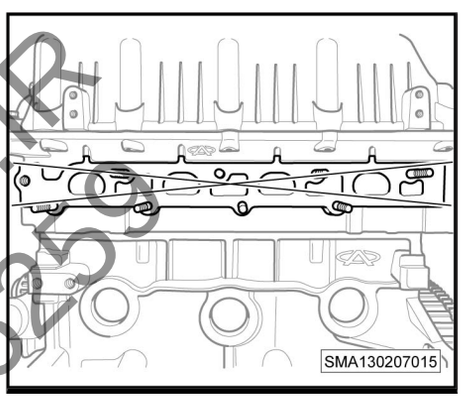
3.2 Checking the surface warpage degree of the exhaust manifold and the cylinder head exhaust side

Methods

1. As shown in the figure, measure the surface warpage degree of the exhaust manifold. Replace it if the surface warpage degree is more than 0.5 mm.



2. As shown in the figure, measure the surface warpage degree of the cylinder head exhaust side. Replace it if the surface warpage degree is more than 0.04 mm.



4 Front Exhaust Pipe

4.1 Removing and installing the front exhaust pipe

Warning

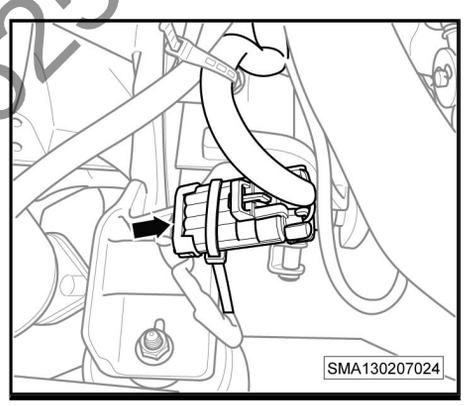
- The temperature of the exhaust system is very high when the engine is running. Before removal and installation, you must make sure that the engine has stopped running and cooled down; otherwise, there is a risk of scald.

Note

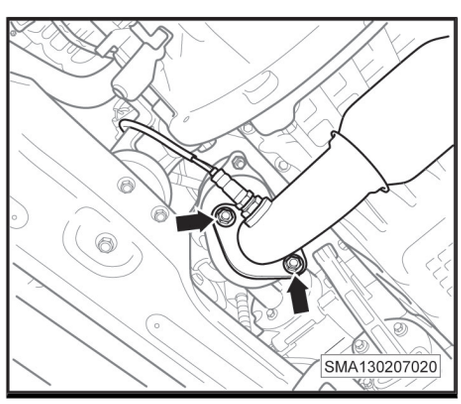
- Gaskets must be replaced during the removal and installation of the exhaust system.
- During installation, please note that do not fix the exhaust device too tight; keep an adequate distance to the vehicle body; and the suspension is evenly loaded.
- Please lubricate the joints with lubricants first to facilitate disengaging the connection between the front exhaust pipe and the hanger.

Removal

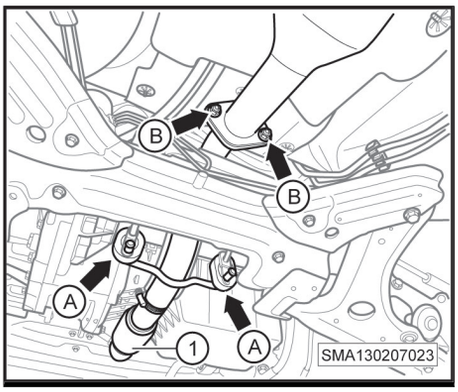
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the rear oxygen sensor connector (-arrow-).



4. Unscrew the fixing nut (-arrow-), and disengage the connection to the three-way catalytic preconverter.
   - Tightening torque of the nut: 45±5 N•m



5. Unscrew the nut (-arrow B-), and disengage the connection to the front silencer. Disengage the hanger (-arrow A-), and remove the front exhaust pipe (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the gasket, and remove the impurities on the joints and the threads.

2. Tighten the fixing nuts with the specified torque.

3. Replace the damaged parts in case of cracks or leakages.

5 Silencer

5.1 Removing and installing the main silencer

Warning

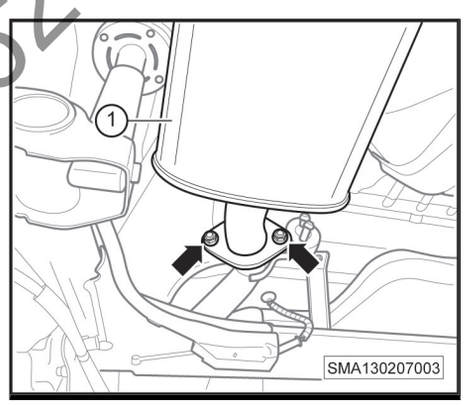
- The temperature of the exhaust system is very high when the engine is running. Before removal and installation, you must make sure that the engine has stopped running and cooled down; otherwise, there is a risk of scald.

Note

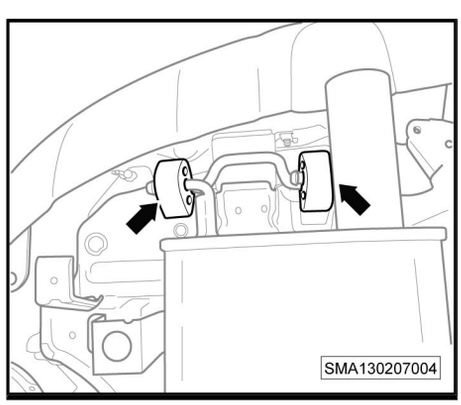
- Gaskets must be replaced during the removal and installation of the exhaust system.
- During installation, please note that do not fix the exhaust device too tight; keep an adequate distance to the vehicle body; and the suspension is evenly loaded.
- Please lubricate the joints with lubricants first to facilitate disengaging the connection between the front exhaust pipe and the hanger.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Unscrew the nut (-arrow-), disengage the connection between the main silencer (-1-) and the front silencer, and remove the gasket.
   - Tightening torque of the fixing nut: 50±5 N•m



3. Disengage the hanger (-arrow-), and remove the main silencer.



Installation

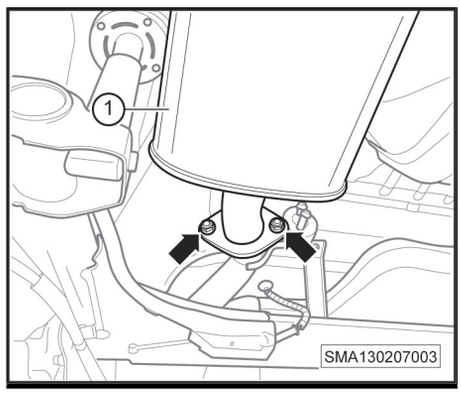
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the gasket, and remove the impurities on the joints and the threads.
2. Tighten the nuts with the specified torque.
3. Replace the damaged parts in case of cracks or leakages.

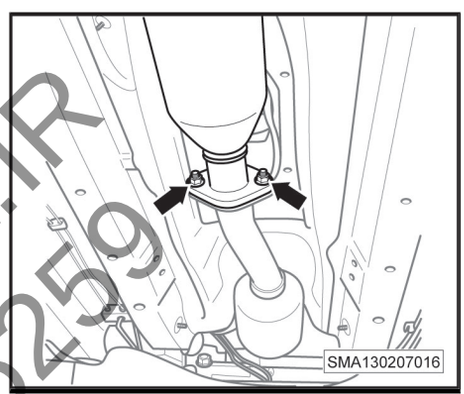
5.2 Removing and installing the front silencer

Removal

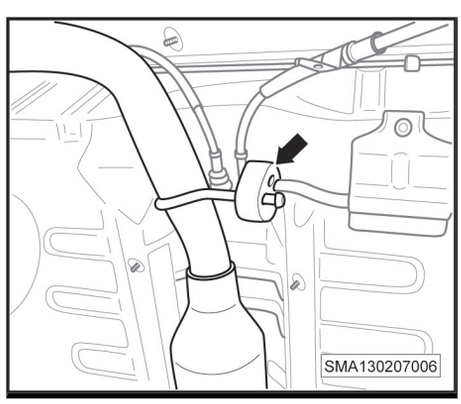
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Unscrew the fixing nut (-arrow-), disengage the connection between the main silencer (-1-) and the front silencer, and remove the gasket.
   - Tightening torque of the fixing nut: 50±5 N•m



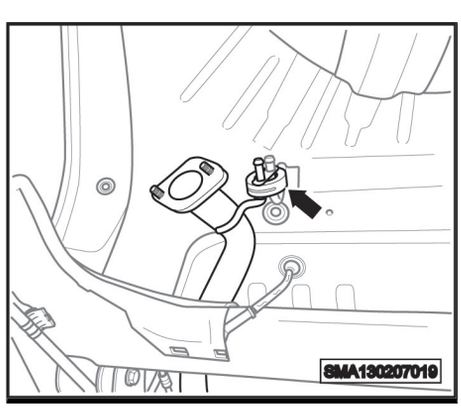
3. Unscrew the nut (-arrow-), disengage the connection between the front silencer and the main three-way catalytic converter, and remove the gasket.
   - Tightening torque of the nut: 50±5 N•m



4. Disengage the hanger (-arrow-).



5. Disengage the hanger (-arrow-), and remove the front silencer.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the gasket, and remove the impurities on the joints and the threads.
2. Tighten the nuts with the specified torque.
3. Replace the damaged parts in case of cracks or leakages.

6 Three-way Catalytic Converter

6.1 Overview

- The three-way catalytic converter is used to convert vehicle emissions like CO, HC, NOx and other harmful gases to harmless carbon dioxide, water and nitrogen through oxidation and reduction.
- When the high-temperature vehicle emissions go through the three-way catalytic converter, the purificant in the catalytic converter will increase the activity of CO, HC and NOx, resulting in some oxidation-reduction reaction, in which CO is oxidated into colorless, non-toxic carbon dioxide, HC into water and carbon dioxide, and NOx into nitrogen and oxygen.The three types of harmful gases are then converted into harmless gases, making the exhaust purified.

⚠ Warning

- The temperature of the exhaust system is very high when the engine is running. Before removal and installation, you must make sure that the engine has stopped running and cooled down; otherwise, there is a risk of scald.

i Note

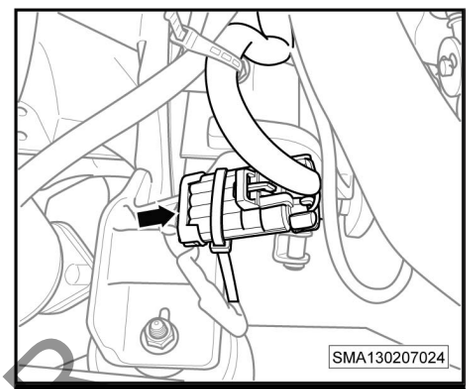
- Gaskets must be replaced during the removal and installation of the exhaust system.
- During installation, please note that do not fix the exhaust device too tight; keep an adequate distance to the vehicle body; and the suspension is evenly loaded.
- Please lubricate the joints with lubricants first to facilitate disengaging the connection between the front exhaust pipe and the hanger.

6.2 Removing and installing the three-way catalytic preconverter

Removal

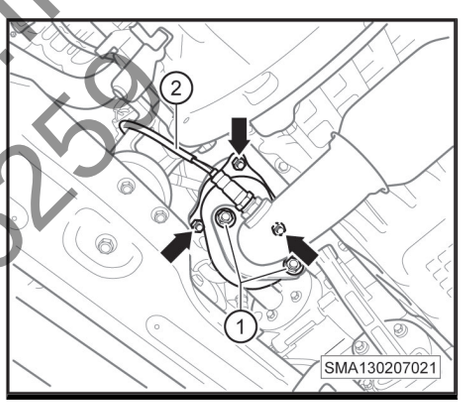
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.

3. Disconnect the rear oxygen sensor connector (-arrow-).



4. Unscrew the nut (-1-), disengage the connection to the front exhaust pipe, and remove the gasket.
   - Tightening torque of the fixing nut: 45±5 N•m

5. Unscrew the nut (-arrow-), rock the upper part of the front exhaust pipe to one side. Be careful not to rupture the rear oxygen sensor harness (-2-). Then disengage the connection to the exhaust mainfold and remove the three-way catalytic preconverter.
   - Tightening torque of the nut: 45±5 N•m



Installation

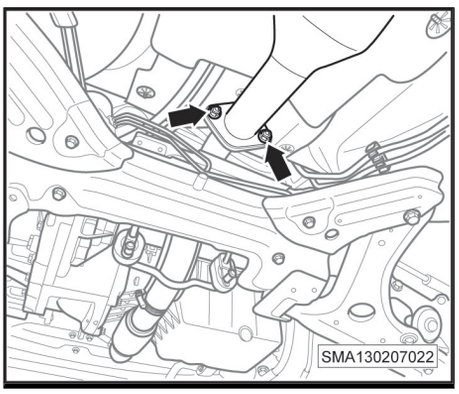
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the gasket, and remove the impurities on the joints and the threads.
2. Tighten the fixing nuts with the specified torque.
3. Replace the damaged parts in case of cracks or leakages.

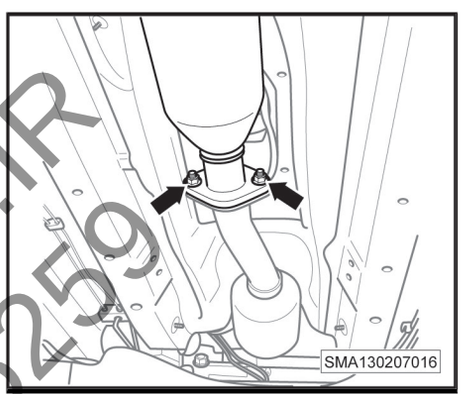
6.3 Removing and installing the main three-way catalytic converter

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Unscrew the nut (-arrow-), disengage the connection to the front exhaust pipe and remove the gasket.
   - Tightening torque of the nut: 45±5 N•m



3. Unscrew the nut (-arrow-), disengage the connection to the front silencer, remove the gasket and the main three-way catalytic converter.
   - Tightening torque of the nut: 50±5 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the gasket, and remove the impurities on the joints and the threads.
2. Tighten the fixing nuts with the specified torque.
3. Replace the damaged parts in case of cracks or leakages.

0208 Air Intake System

1 General Information

1.1 Overview

- The air intake system is used to filter air, change the engine's air input and supply flammable gas mixture evenly to all cylinders to coordinate with the control of engine operation.
- After filtered through the air filter, the air flows into the resonant cavity through the throttle and mixes with the fuel in the intake manifold to form a flammable gas mixture, which finally flows into the cylinder through the intake valve.

Applied to vehicles equipped with mechanical throttles

- When driving, the driver presses the accelerator pedal and directly controls the opening of the throttle through the cable to change the engine's air input.
- When the whole vehicle is operating at idling speed, the main valve plate of the mechanical throttle body is closed, and the air flows into the intake manifold through the air bypass of the throttle body. The engine control module controls the position of the stepper motor adjuster in the air bypass via controlling its moving steps, and thus controls the engine's air input.
- The air intake system consists of the following components:

  a. Intake manifold
  b. Throttle
  c. Throttle position sensor
  d. Intake air pressure/temperature sensor
  e. Stepper motor
  f. Air filter
  g. Intake hose

Applied to vehicles equipped with electronic throttles

- The engine control module controls the opening of the main valve plate of the electronic throttle body according to signals from the accelerator pedal position sensor and other input signals, calculating the engine output required for the vehicle at this moment and state to control the volume of engine fuel supply (injection), and modifying control parameters based on feedback signals to ensure the engine operates in an optimal control state.
- The electronic throttle valve body is supplemented with components such as the drive motor, the gear-driven mechanism and the throttle position sensor with enhanced functions and reliability.
- The air intake system consists of the following components:

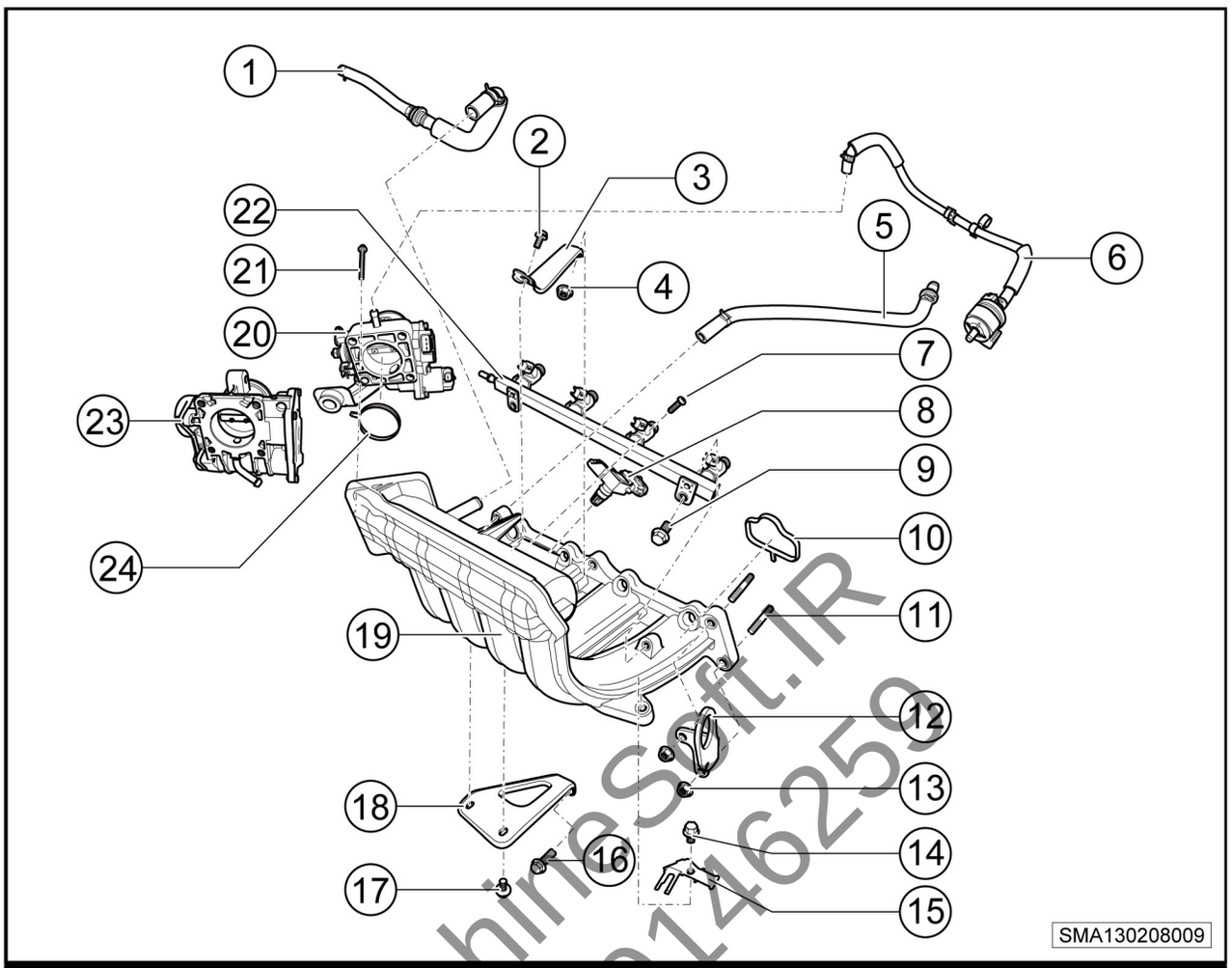
  a. Intake manifold
  b. Intake air pressure/temperature sensor
  c. Electronic throttle
  d. Accelerator pedal position sensor
  e. Air filter
  f. Intake hose

1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Fixing bolt of the air filter housing	10±1
Fixing bolt of the fuel rail	9±1
Fixing nut of the intake manifold	10±2
Fixing screw of the intake air pressure/temperature sensor	6±1
Fixing bolt of the activated carbon canister solenoid valve bracket	18±2
Fixing bolt and nut of the upper intake manifold bracket	18±2
Fixing bolt of the lower intake manifold bracket (upper)	18±2
Fixing bolt of the lower intake manifold bracket (lower)	27±2

1.3 The air intake system assembly drawing



1. Vacuum booster hose	2. Upper bracket fixing bolt
3. Upper intake manifold bracket	4. Upper bracket fixing nut
5. Crankcase ventilation hose	6. Activated carbon canister hose and solenoid valve
7. Fixing bolt of the intake air pressure/temperature sensor	8. Intake air pressure/temperature sensor
9. Fixing bolt of the fuel rail	10. Intake manifold seal ring
11. Stud	12. Shackle
13. Nut	14. Bracket bolt
15. Activated carbon canister solenoid valve bracket	16. Lower bracket fixing bolt (lower)
17. Lower bracket fixing bolt (upper)	18. Lower bracket
19. Intake manifold	20. Throttle (mechanical)
21. Throttle fixing bolt	22. Fuel rail
23. Throttle (electronic)	24. Throttle seal ring

2 Diagnosis and Inspection

2.1 The air intake system fault list

Applied to vehicles equipped with mechanical throttles

Symptoms	Possible causes	Maintenance recommendations
Unstable idling speed of the engine (fluctuations in speed)	Blokage of the idling stepper motor	Clean the idling stepper motor, replace it if necessary
	Dirty throttle	Clean the throttle
	Leakage of the throttle connection	Replace the throttle gasket or the throttle body
	Leakage of the intake manifold	Replace the intake manifold gasket or the intake manifold
	Constant opening of the activated carbon canister solenoid valve	Replace the activated carbon canister solenoid valve
	Blockage of the crankcase ventilation check valve	Replace the crankcase ventilation check valve
	Improper installation of the fuel injector, causing poor sealing effect of the fuel injector seal ring	Replace the fuel injector seal ring and reinstall the fuel rail

Applied to vehicles equipped with electronic throttles

Symptoms	Possible causes	Maintenance recommendations
	Dirty electronic throttle	Clean the throttle
	Leakage of the throttle connection	Replace the throttle gasket or the throttle body
	Leakage of the intake manifold	Replace the intake manifold gasket or the intake manifold
	Constant opening of the activated carbon canister solenoid valve	Replace the activated carbon canister solenoid valve
	Blockage of the crankcase ventilation check valve	Replace the crankcase ventilation check valve
	Improper installation of the fuel injector, causing poor sealing effect of the fuel injector seal ring	Replace the fuel injector seal ring and reinstall the fuel rail

3 Air Filter

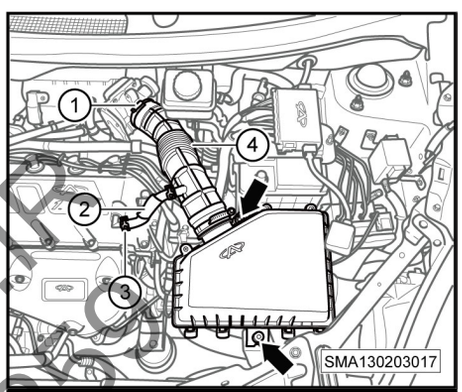
3.1 Removing and installing the air filter assembly

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.

2. Unscrew the fixing bolt (-arrow-) and the worm clamp bolt (-1-), loosen the clamp (-3-), pull out the hose (-2-) and (-4-), and remove the air filter assembly.

- Tightening torque of the air filter housing fixing bolts: 10±1 N•m



Installation

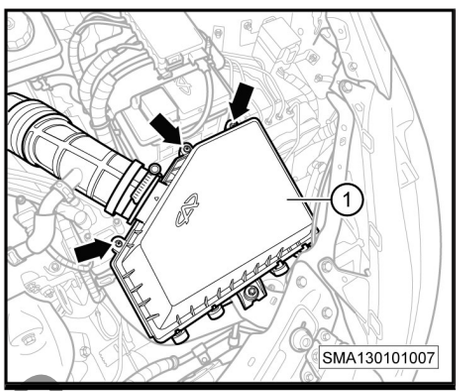
Installation shall follow the reverse sequence of the removal procedure.

3.2 Replacing the air filter element

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.

2. Unscrew the fixing screws (-arrow-).
3. Take off the upper housing (-1-) and remove the air filter element.



Installation

1. Clean the air filter assembly and install a new air filter element.
2. Other installation shall follow the reverse sequence of the removal procedure.

4 Throttle Body

⚠ Warning

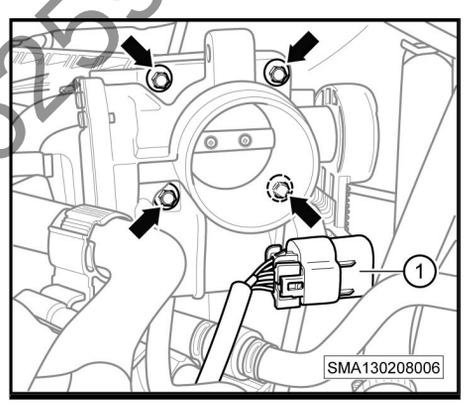
- The detergent is a kind of flammable and corrosive fluid. Please observe accident prevention and safety regulations and tips to take precautions and avoid it contacting with your skin.

4.1 Removing and installing the electronic throttle body

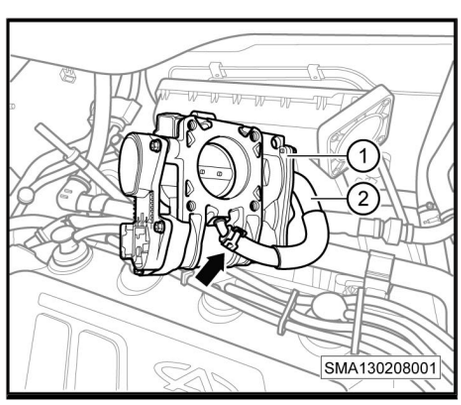
Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the air filter assembly .=> refer to page 239

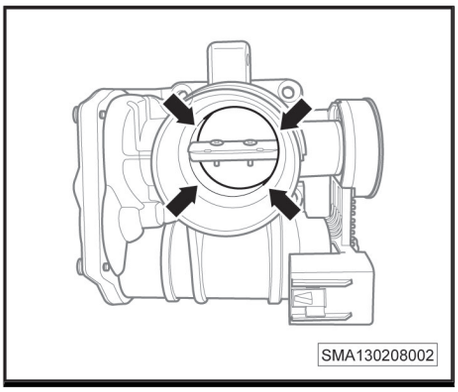
4. Disconnect the electronic throttle connector (-1-), and unscrew the fixing bolts (-arrow-).



5. Loosen the clamp (-arrow-), pull out the hose (-2-) and remove the electronic throttle (-1-).



6. As shown in the figure, manually fully open the throttle and keep its status by an appropriate object. Then carefully clean the throttle, especially the closed throttle area (-arrow-), with detergent and a clean brush. Dry the throttle with a glabrous cloth, and install the electronic throttle after the detergent is fully evaporated.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

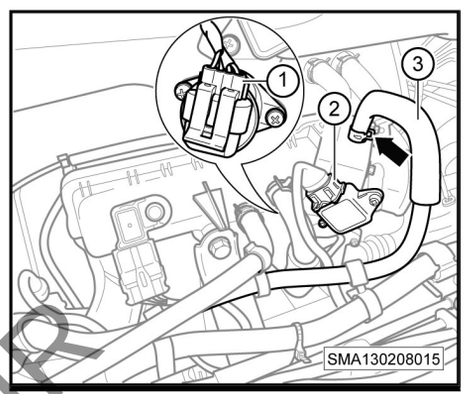
1. Replace the throttle seal ring.
2. When replacing the electronic throttle or the engine control module, you must adapt the electronic throttle to the engine control module.

4.2 Removing and installing the mechanical throttle body

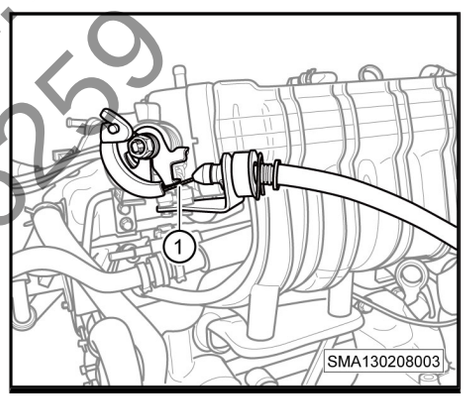
Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the air filter assembly . => refer to page 239

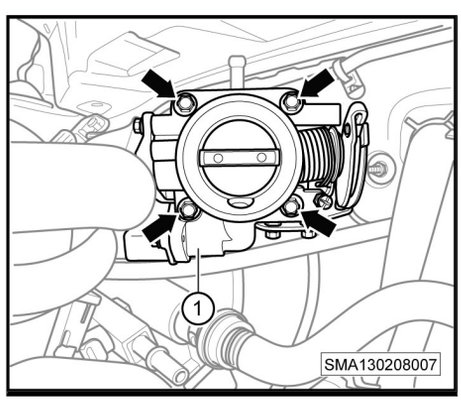
4. Disconnect the idling stepper motor connector (-1-) and the throttle position sensor connector (-2-), loosen the clamp (-arrow-) and remove the hose (-3-).



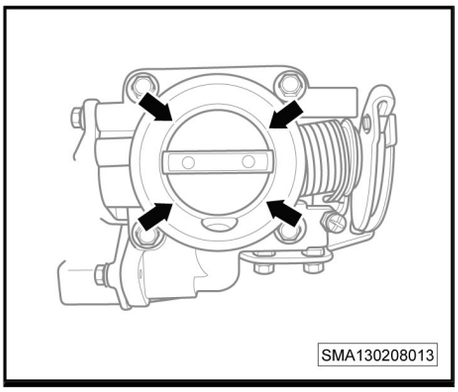
5. Loosen the mechanical throttle cable (-1-) and disconnect the cable from the bracket.



6. Unscrew the fixing bolts (-arrow-) and remove the mechanical throttle (-1-).



7. As shown in the figure, carefully clean the throttle, especially the closed throttle area (-arrow-), with detergent and a clean brush. Dry the throttle with a glabrous cloth, and install the mechanical throttle after the detergent is fully evaporated.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the throttle seal ring.
2. Do not adjust the idling adjustment bolt on the mechanical throttle during inspection.

4.3 Removing and installing the idling stepper motor

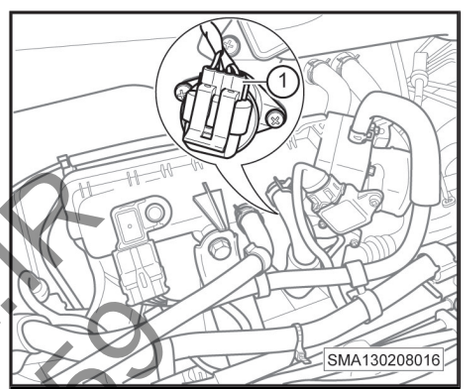
Caution

- Do not push and pull the idling stepper motor valve when cleaning the idling stepper motor.

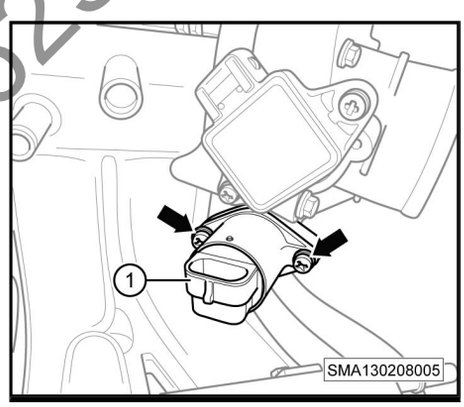
Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.

3. Disconnect the idling stepper motor connector (-1-).



4. Unscrew the fixing bolts (-arrow-) and remove the idling stepper motor （-1-）.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the throttle seal ring. Remove the dust on the working surface of the idling stepper motor and the carbon deposit on the throttle seat.
2. Replace the O-ring of the idling stepper motor.
3. After cleaning the idling stepper motor, you shall take the adaptation and learning procedure.

4.4 Removing and installing the accelerator pedal position sensor

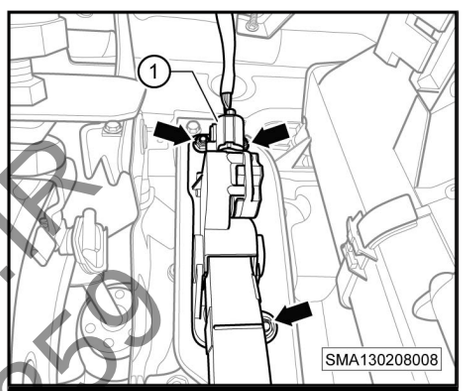
Note

- The accelerator pedal position sensor is integrated into the accelerator pedal, which cannot be individually disassembled.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.

3. Disconnect the accelerator pedal position sensor connector (-1-).
4. Unscrew the fixing bolts (-arrow-) and remove the accelerator pedal and the accelerator pedal position sensor.



Installation

Installation shall follow the reverse sequence of the removal procedure.

5 Intake Manifold

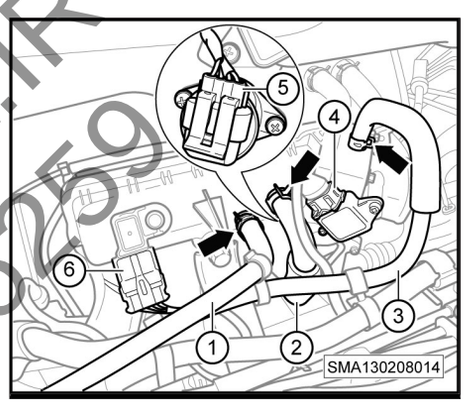
5.1 Removing and installing the intake manifold

Removal

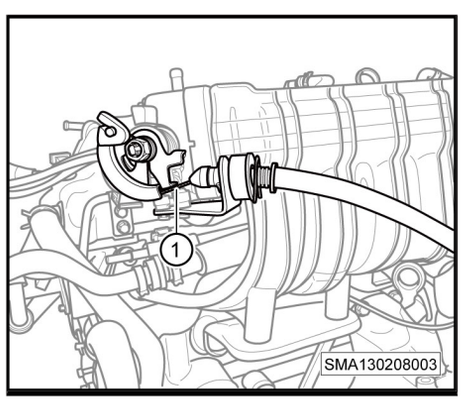
1. Switch off all electrical equipment and the ignition switch, and disconnect the fuel pump relay.
2. Start the engine, wait until its natural flameout, and pull out the key.
3. Disconnect the battery negative terminal.
4. Remove the air filter assembly .=> refer to page 239

The following steps 5 to 7 are applied to vehicles equipped with mechanical throttles

5. Loosen the clamp (-arrow-) and remove the crankcase ventilation hose (-1-), the vacuum booster hose (-2-) and the activated carbon canister hose (-3-). Disconnect the throttle position sensor connector (-4-), the idling stepper motor connector (-5-) and the intake air pressure/temperature sensor connector (-6-).

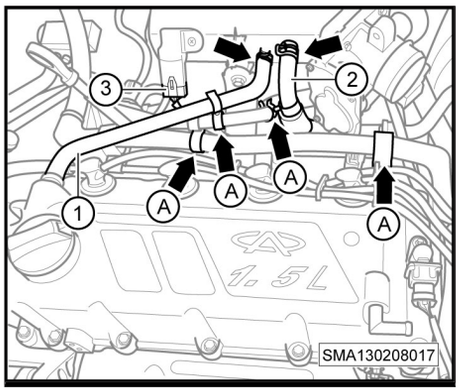


6. Loosen the mechanical throttle cable (-1-) and disconnect the cable from the bracket.

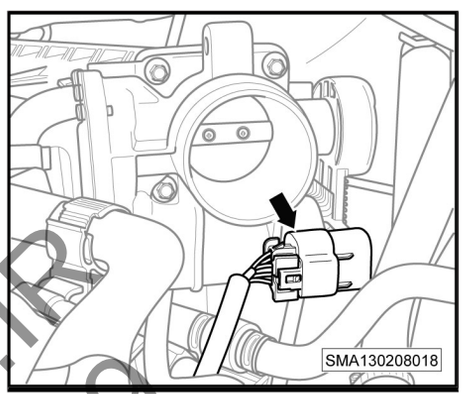


The following steps 7 and 8 are applied to vehicles equipped with electronic throttles

7. Loosen the clamps (-arrow-) and clips (-arrow A-), pull out the crankcase ventilation hose (-1-) and the vacuum booster hose (-2-), and then disconnect the intake air pressure/temperature sensor connector (-3-).

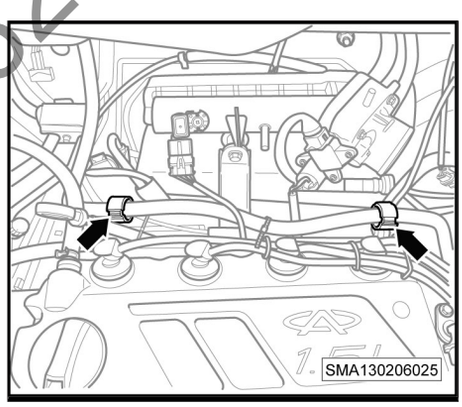


8. Disconnect the electronic throttle connector (-arrow-).

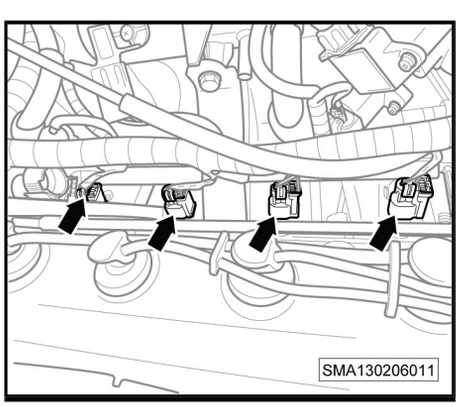


The following steps 9 to 15 are applied to all vehicles

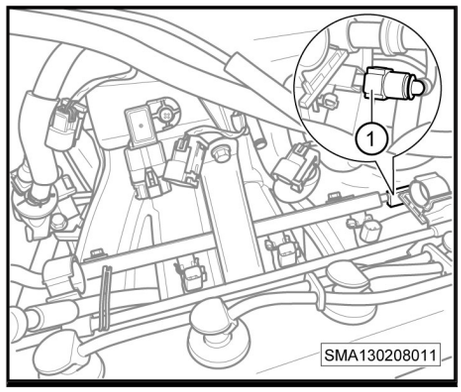
9. Release the engine harness from the clips (-arrow-).



10. Disconnect the fuel injector connectors (-arrow-).

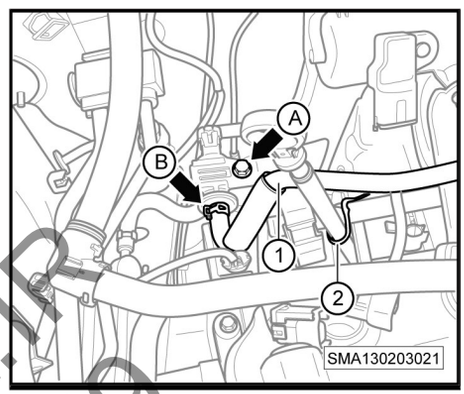


11. Press the lock pin of the pipe connector (-1-) and pull out the oil feed hose.



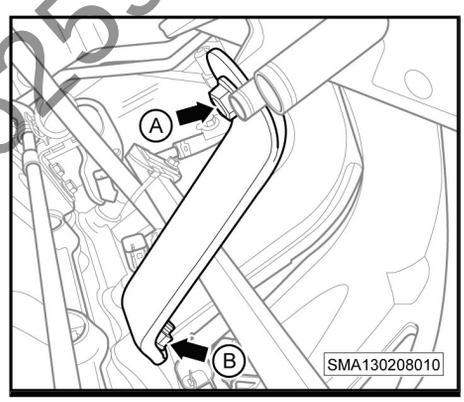
12. Unscrew the fixing bolt (-arrow A-), loosen the clamp (-arrow B-), pull out the hose (-1-) and disconnect the tie (-2-).

- Tightening torque of the activated carbon canister solenoid valve bracket fixing screw: 18±2 N•m



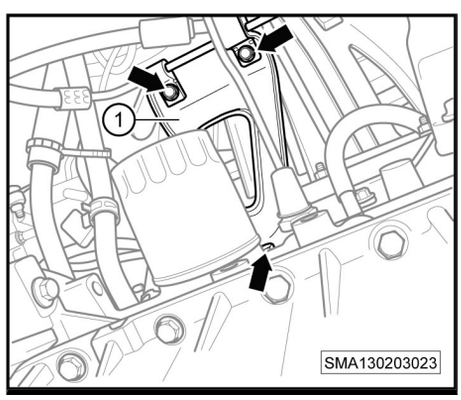
13. Unscrew the fixing bolt (-arrow A-) and the nut (-arrow B-), and remove the upper intake manifold bracket.

- Tightening torque of the upper bracket fixing bolt and nut: 18±2 N•m



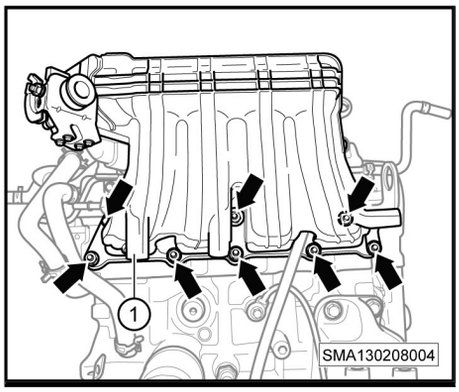
14. Unscrew the fixing bolts (-arrow-) and remove the intake manifold bracket (-1-).

- Tightening torque of the lower bracket fixing bolt (upper): 18±2 N•m
- Tightening torque of the lower bracket fixing bolt (lower): 27±2 N•m



15. Unscrew the fixing nuts (-arrow-), remove the intake manifold (-1-) and place the intake manifold opening downwards to prevent foreign matters from getting in.

    - Tightening torque of the intake manifold fixing nut: 10±2 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Apply treadlocker on the stud head during installation.
2. Replace the intake manifold seal ring.

0301 Delphi Engine Electronic Control System

1 General Information

1.1 Overview

Engine SQR477F applies the Delphi MT80 engine management system to control the closed-loop control unit, the sequential fuel injection, the distributorless group direct ignition and the three-way catalytic converter aftertreatment.

The MT80 engine management system mainly consists of three parts: electronic control module (ECM), sensor and actuator. The sensor is used to detect the physical signals (temperature, pressure, speed, etc.) of the vehicle, convert them to voltage signals and send them to the ECM. The ECM calculates and analyzes the electric signal data input by the sensor according to the preset program after receiving them, and then sends the corresponding control command to the power drive circuit. The power drive circuit will drive each actuator to perform according to the command, thus enabling the engine to run efficiently and smoothly.

The fault diagnosis system of the engine electronic control module (ECM) is used to monitor every sensor and controller in the system randomly. If detecting and confirming a fault signal, it will store the relevant fault code and activate the "Limp Home" function to run the engine. If detecting that the fault has been eliminated, it will reactivate the normal engine function.

Functions of the engine management system

Intake air pressure/temperature sensor control:

1. Engine torque output control
2. Overall vehicle main power relay control
3. Sequential fuel injection closed-loop control
4. Fuel pump operation control
5. Knock control
6. Electronic throttle control
7. A/C control
8. Cooling fan control
9. Carbon canister solenoid valve control
10. System self-diagnosis
11. ECM anti-theft control
12. Built-in ignition drive module of ECM, distributorless group direct ignition

Features of ECM in the engine management system

1. ECM developed by the high-end market
2. Latest electronic hardware technology
3. High performance 32-bit microprocessor (CPU) is applied
4. High performance-cost ratio

5. I/O input/output port is flexibly customized
6. Meeting the Euro IV emission standards and the EOBD (European On-Board Diagnostics) technology

1.2 System functions

Calculation of air flow by engine aerothermodynamics

The ECM calculates the air flow and air mass entering the cylinder via signals of the intake air pressure/temperature sensor, and then corrects the injection volume to make the air-fuel ratio meet the requirements of various conditions.

Torque control

The ECM estimates the current torque output required by the engine according to signals of the accelerator pedal position sensor, and controls the engine torque output via sensor information.

Measurement of crankshaft position and engine speed

The ECM determines the crankshaft position and the engine speed according to signals from the 58X ring gear, and accurately controls the engine ignition and the injection timing.

Determination of working sequence of engine cylinders

The ECM recognizes the top dead center of one cylinder via the camshaft position sensor, so as to determine the working sequence of engine cylinders.

Fuel control

There are two modes of fuel control: closed-loop fuel control and open-loop fuel control. The closed-loop fuel control can accurately regulate engine's air-fuel ratio, thus effectively controlling emissions. The open-loop fuel control is applied when the engine is starting or warming up or the oxygen sensor is malfunctioning.

Ignition control

The ignition control system of the engine applies group control.

Knock control

When a knocking is detected by the knock sensor, the system will calculate the ignition advance angle that needs to be delayed or advanced according to the current condition and knock intensity, and adjusts it to the proper ignition angle, thus avoiding or reducing knocking.

Emission control

The three-way catalytic converter can convert the engine exhaust into harmless gas and discharge it to the air. When the engine reaches the normal temperature after warming up, the ECM will activate the closed-loop fuel control to correct the air-fuel ratio, thus realizing the optimum conversion efficiency of the three-way catalytic converter.

Three-way catalytic converter protection

The engine management system has the function to protect the three-way catalytic converter. The ECM estimates the temperature of the three-way catalytic converter according to engine's operation. When it is estimated that the exhaust temperature will exceed converter's maximum permissible temperature for a long time, the ECM will automatically activate the function of three-way catalytic converter protection to keep it at a normal temperature.

System voltage protection

When the charging system malfunction causes an excessive system voltage, the engine electronic control system will activate the protection program to limit the engine speed, thus avoiding damage to ECM and battery.

1.3 System control logic

Fuel pump control logic

Fuel pump operation logic:

When the ignition switch is turned on, the fuel pump will operate for 2 seconds. If no valid crankshaft position sensor signal is detected, the fuel pump will stop. Once the valid crankshaft position sensor signal is detected by the ECM, the fuel pump will start to operate.

Fuel pump cut-off logic:

When the crankshaft position sensor signal is lost after 0.6 second or the fuel pump is required to stop by the anti-theft control, the fuel pump will stop operating.

Start-up pilot injection

Start-up pilot injection enables the injectors to spray fuel once when starting the engine and it occurs when:

The engine starts to run (valid 58X signal detected).

The fuel pump relay is operating.

The operating time of fuel pump exceeds the delay time of accumulator.

Start-up pilot injection has not occurred yet.

Once the above conditions are met, the start-up pilot injection will enable the injectors in all the cylinders to inject fuel one time.

Protective fuel cut-off

When one of the following conditions is met, the system will stop the fuel injection:

- The fuel is cut off when the engine speed is higher than 6400 rpm and supplied again when the engine speed is lower than 6000 rpm.
- The fuel is cut off when the system detects the ignition system has a malfunction.
- When the system voltage is higher than 16 V, it enters the electronic throttle function limitation mode (compulsory idling mode).

Ignition coil magnetizing control

The magnetizing time of ignition coil determines the ignition energy of spark plugs. If the magnetizing time is too long, the ignition coil or ignition coil driver will be damaged. If the magnetizing time is too short, the misfire will be caused.

Start-up mode

In the start-up mode, the system uses a fixed ignition angle to ensure the gas mixture in the cylinders is ignited. After the engine runs normally, the start-up mode is exited.

Ignition advance angle

Main ignition advance angle:

- The main ignition angle is the minimum ignition angle or knocking critical point (KBL) at the optimal torque point (MBT).

Ignition advance angle correction:

- Water temperature correction
- Intake air correction
- Altitude compensation correction
- Idling speed correction
- Acceleration correction
- Power rich correction
- Deceleration fuel cut-off correction
- A/C control correction

Idling control

Basic target idling speed

Setting the basic target idling speed:

Coolant temperature ℃	Target idling speed rpm	Coolant temperature ℃	Target idling speed rpm	Coolant temperature ℃	Target idling speed rpm	Coolant temperature ℃	Target idling speed rpm
＜-20	1175	20	1150	60	850	100	750
-10	1200	30	1150	70	800	110	750
0	1200	40	1000	80	750	＞120	800
10	1150	50	900	90	750		

Knocking control logic

The operation conditions of knocking control are:

- The engine running time should exceed 2 seconds.
- The engine coolant temperature is higher than 70℃.
- The engine speed is higher than 800 rpm.

When the system detects the engine knocking, it quickly delays the ignition advance angle for 3 to 5 degrees depending on different engine speeds, and restores to the normal control within the subsequent 2 to 3 seconds.

Carbon canister solenoid valve control logic

The following conditions must be met before the carbon canister solenoid valve is switched on:

- The system voltage is less than 18 V and more than 8 V.
- The engine coolant temperature is higher than 0℃.
- The engine intake air temperature is higher than 0℃.
- There is no relevant system fault.

The opening angle of carbon canister solenoid valve is determined by the ECM according to engine duty ratio signals.

Cooling fan control logic

The way and conditions in which the cooling fan operates are:

- When the coolant temperature is higher than 95℃, the cooling fan starts operating at low speed.
- When the coolant temperature is higher than 99℃, the cooling fan starts operating at high speed.
- When the coolant temperature is lower than 95℃, the cooling fan stops operating at high speed.
- When the coolant temperature is lower than 90℃, the cooling fan stops operating at low speed.
- When the air conditioner is switched on, the cooling fan starts operating.

Control strategy of the accelerator pedal position sensor

When the ignition switch is in ON position, the system starts self check. If the fault code of accelerator pedal position sensor is not stored in the ECM, the engine malfunction indicator in the dashboard will go out in several seconds after the engine starts. If the system detects that the accelerator pedal position sensor fails, the fault code generated will be stored in the ECM, and the engine MIL will light up permanently.

Operating conditions of the A/C

The A/C system will operate when the following conditions are met:

- The engine running time exceeds 7 seconds.
- The A/C switch is switched on.
- The engine coolant temperature is normal.
- The A/C pressure switch is connected when in medium pressure.

A/C off mode

1. The A/C off mode when the engine speed is excessive:
   - The A/C compressor is allowed to activate only when the engine speed is less than 4900 rpm while A/C switch is switched off.
   - The A/C compressor will stop operating when the engine speed is more than 5100 rpm while A/C switch is switched on.
2. The A/C off mode when the engine coolant temperature is excessive:
   - The A/C compressor is allowed to activate only when the coolant temperature is less than 106℃ while A/C switch is switched off.
   - The A/C compressor will stop operating when the coolant temperature is more than 108℃ while A/C switch is switched on.
3. The disconnect mode of the evaporation tank temperature control:
   - When the A/C evaporator temperture is lower than 3℃, the A/C compressor will be disconnected; and when the A/C evaporator temperture is higher than 4℃, the A/C compressor will restart.
   - If the A/C evaporator temperture sensor fails, the A/C compressor will be disconnected.
4. The disconnect mode of the A/C pressure switch control:
   - When the A/C system pipe pressure is 0.12 Mpa, the A/C compressor will be disconnected.

- When the A/C system pipe pressure is 3.2 Mpa, the A/C compressor will be disconnected.

1.4 Product specifications

Torque specifications

Item	Value (N.m)
Crankshaft position sensor	8±2
Camshaft position sensor	8±2
Knock sensor	20±3
Intake air pressure/temperature sensor	6±1
Electronic throttle	10±1
Coolant temperature sensor	22±2
Accelerator pedal assembly	10±2
Oxygen sensor	45±5
Ignition coil	6±1

1.5 Failures of the engine management system input and output devices

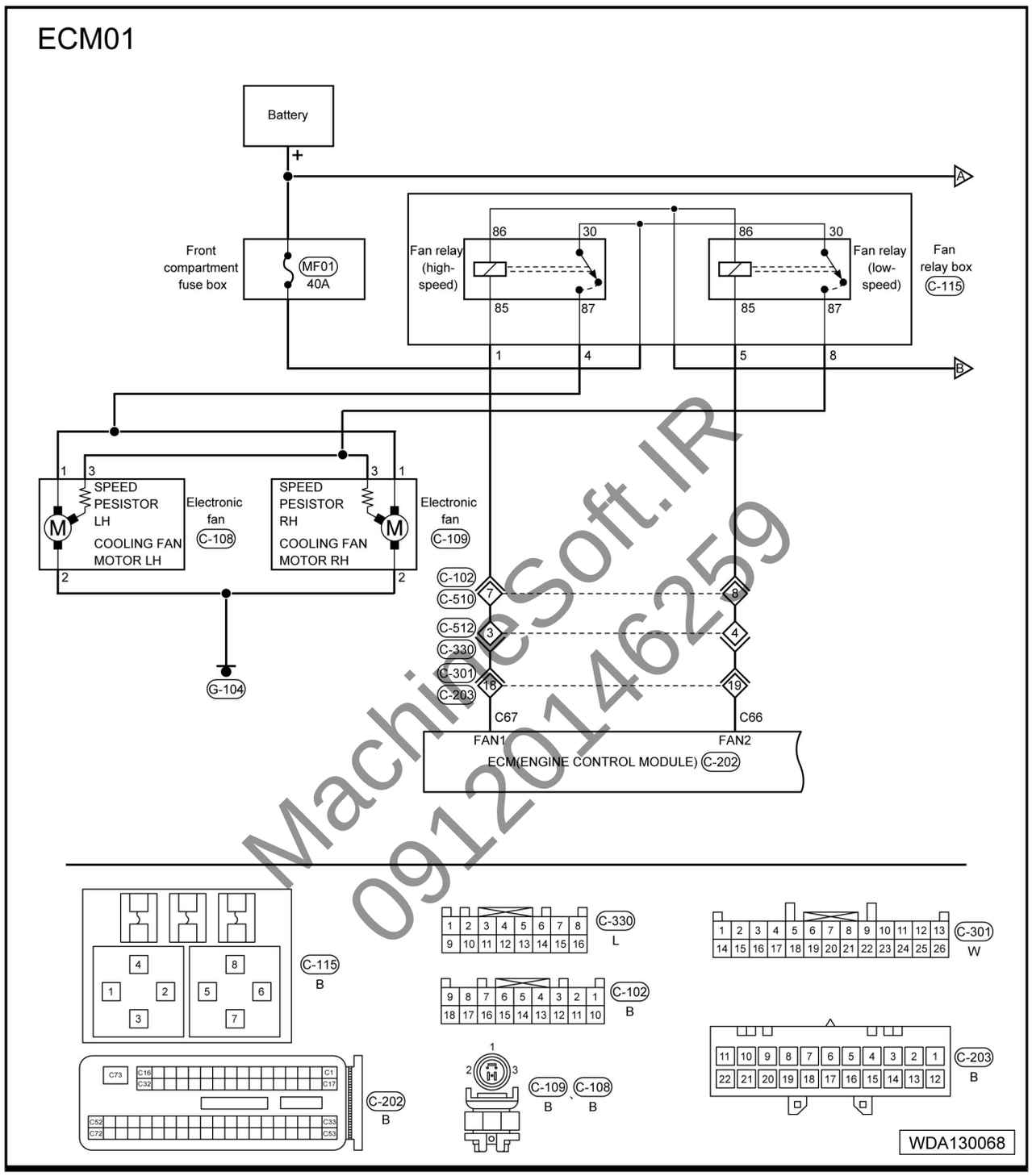
No.	Component name	Symptoms	Maintenance recommendations
1	Crankshaft position sensor	• Engine start failure • Frequent engine flameout • Sporadic flameout • Maximum engine speed of less than 3800 rpm	Replace the crankshaft position sensor
2	Camshaft position sensor	• Engine start failure • Maximum engine speed of less than 4000 rpm • Increased fuel consumption	Replace the camshaft position sensor
3	Knock sensor	• Knocking when accelerating • Incorrect ignition timing • Increased fuel consumption • Inadequate engine power	Replace the knock sensor
4	Intake air pressure/temperature sensor	• High fuel consumption • Frequent engine flameout • Rough idling • Rich gas mixture • Inadequate engine power	Replace the intake air pressure/temperature sensor
5	Electronic throttle	• Engine start failure • No idling speed • Frequent engine flameout • Poor engine operation • Poor engine acceleration performance • Frequent engine flameout	Replace or clean the electronic throttle
6	Coolant temperature sensor	• Engine start difficulty • Rough idling • Disabled cooling fan • Poor engine performance • Incorrect ignition timing	Replace the coolant temperature sensor
7	Oxygen sensor	• Improper air-fuel ratio and high exhaust emission	Replace the oxygen sensor

No.	Component name	Symptoms	Maintenance recommendations
		• High fuel consumption	
8	A/C pressure switch	• The cooling fan operating at low speed with the A/C turned on • Poor cooling effect with the A/C turned on • The electromagnetic clutch relay out of work with the A/C turned on	Replace the A/C pressure switch
9	Power steering switch	• Engine vibration when turning the steering wheel at idling • The engine cannot be compensated and is easily shut down when idling	Replace the power steering switch
10	Brake switch	• Unsmooth fueling • Abnormal driving	Replace the brake switch
11	Accelerator pedal position sensor	• Limited engine speed • Delayed engine output response • Limited engine output torque	Replace the accelerator pedal position sensor
12	Ignition coil	• Engine start failure • Inadequate engine power and disabled acceleration • Incomplete combustion • Unstable engine operation	Replace the ignition coil
13	Carbon canister solenoid valve	• Unstable engine operation • Poor idling • Incorrect air-fuel ratio	Replace the carbon canister solenoid valve
14	Fuel injector	• Engine start failure or difficulty • Unstable engine operation and vibration • Frequent engine flameout • Black smoke in emissions	Replace the fuel injector
15	Fuel pump	• Engine start failure • Inadequate engine power and disabled acceleration • Engine start difficulty	Replace the fuel pump

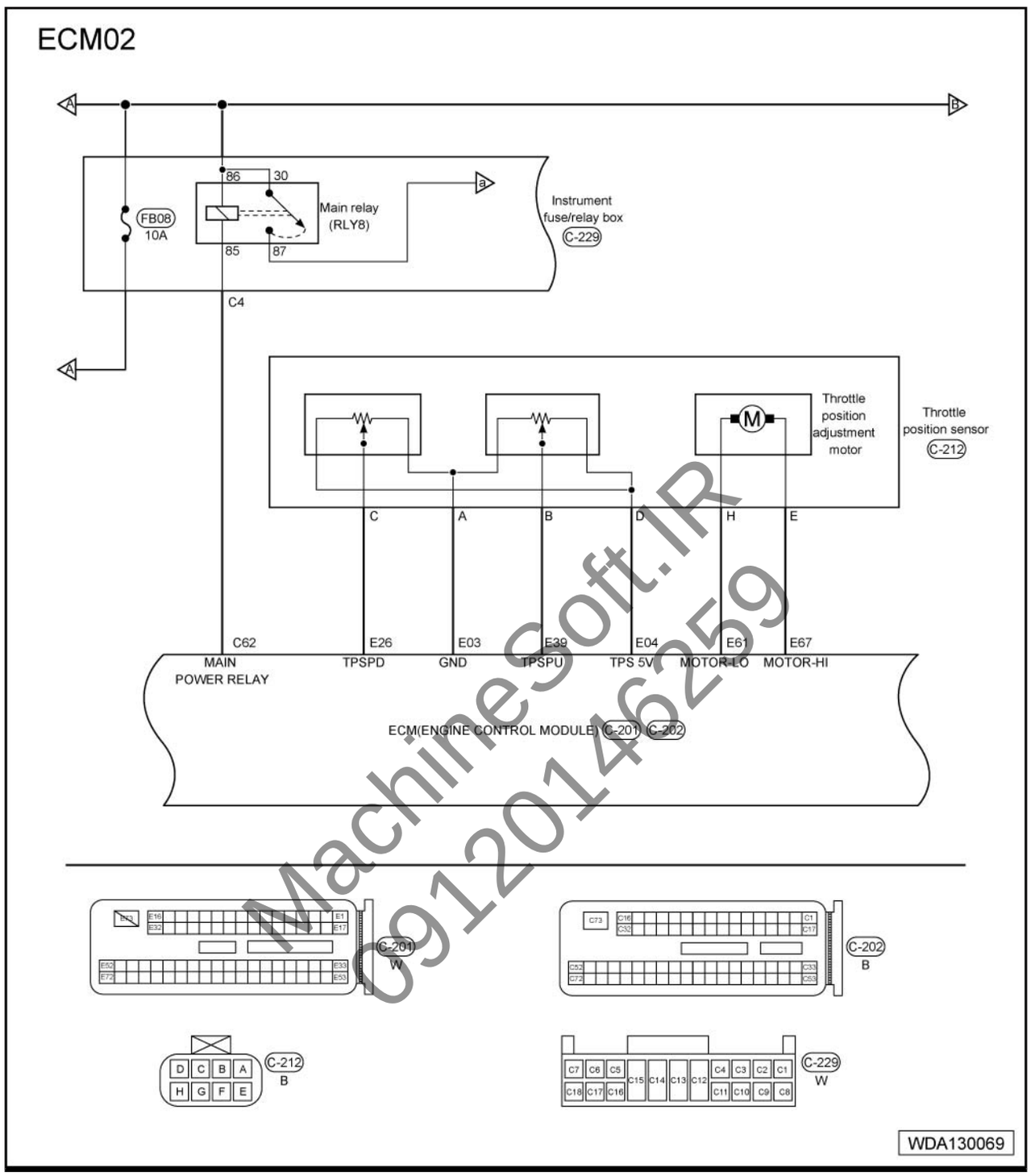
No.	Component name	Symptoms	Maintenance recommendations
		• Poor acceleration performance	
16	Cooling fan	• Excessive engine coolant temperature • Intermittent operation of the air conditioner • Low engine coolant temperature	Replace the cooling fan

1.6 Delphi engine electronic control system circuit diagrams

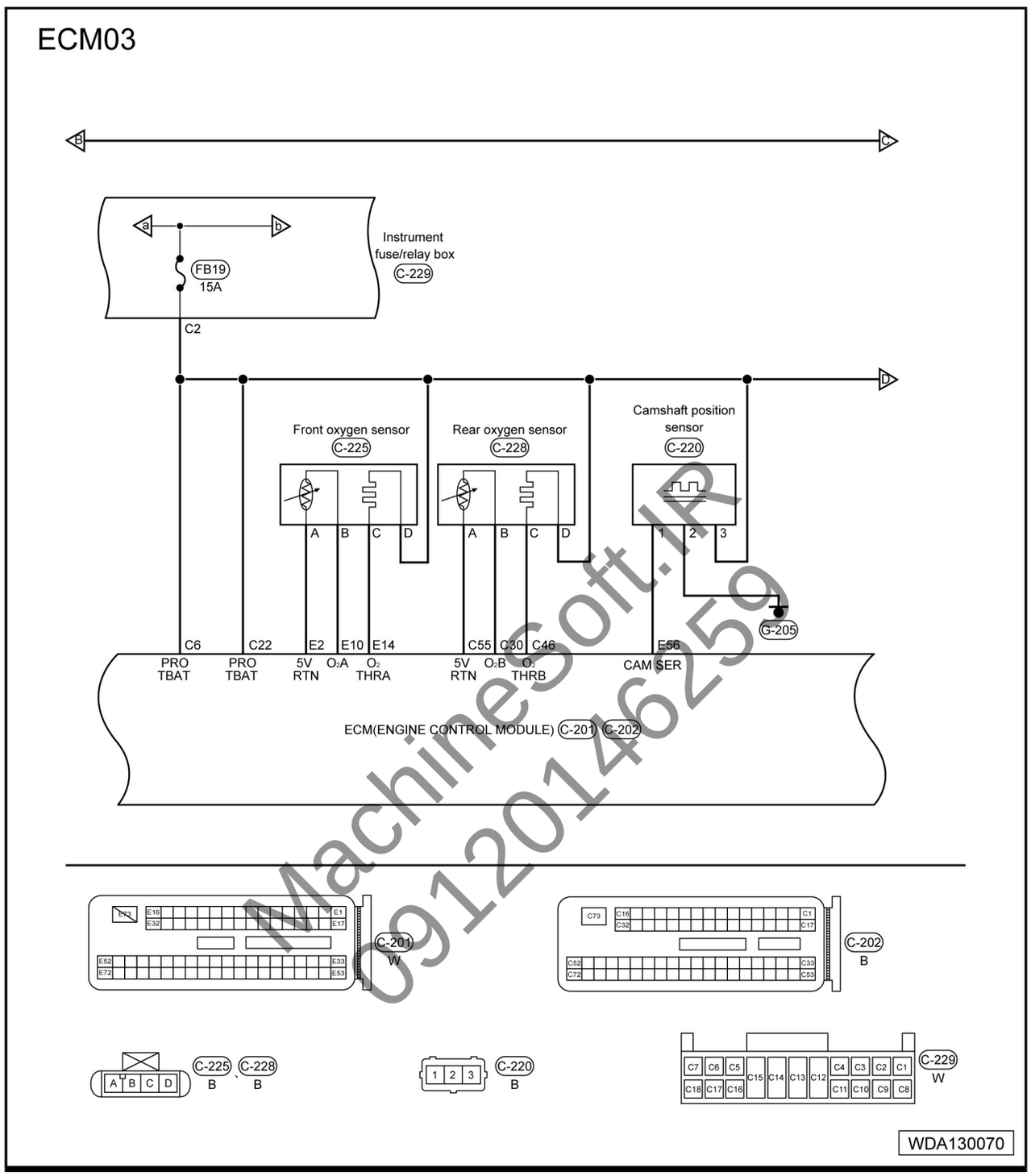
Engine circuit diagram (page 1)



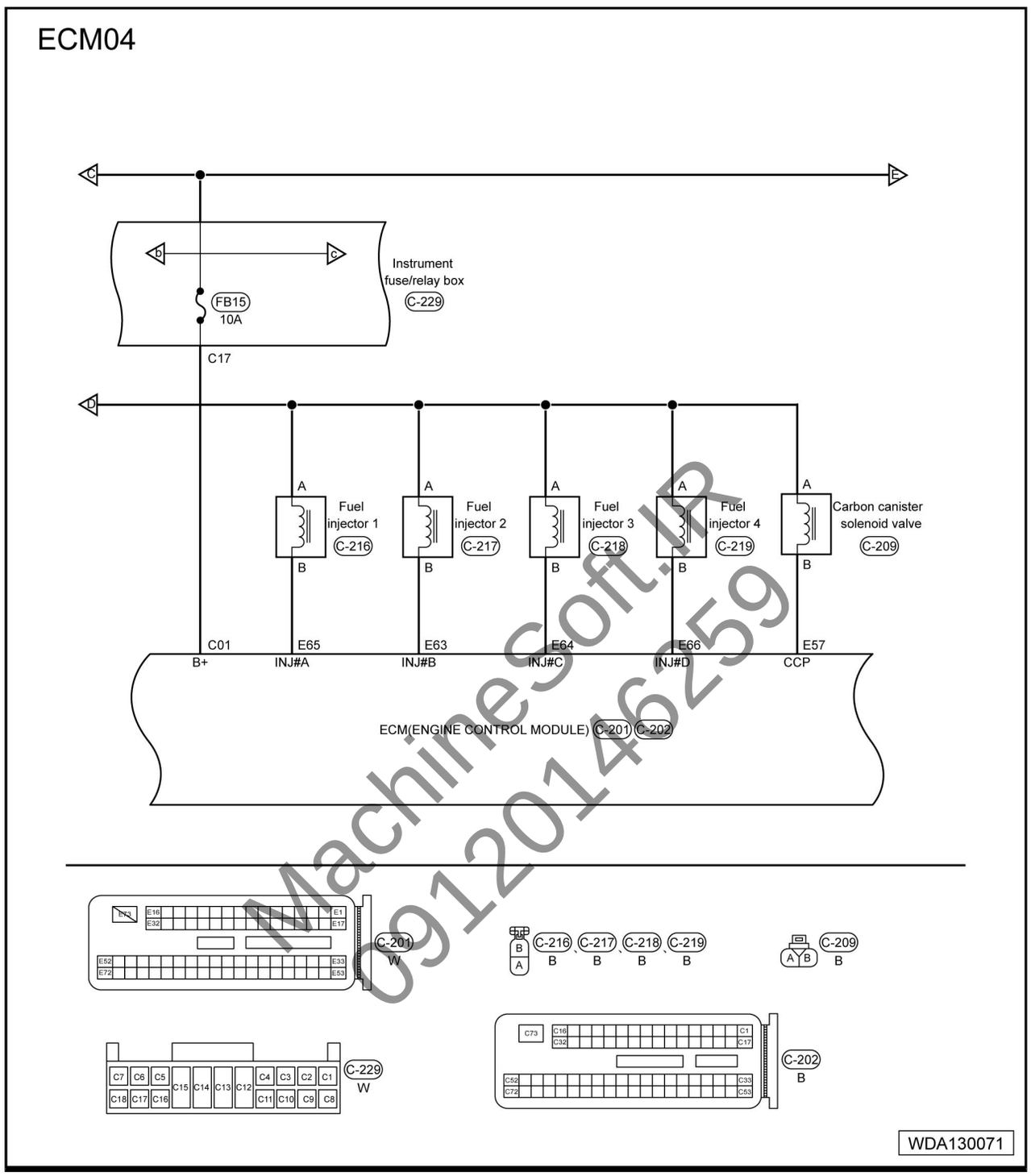
Engine circuit diagram (page 2)



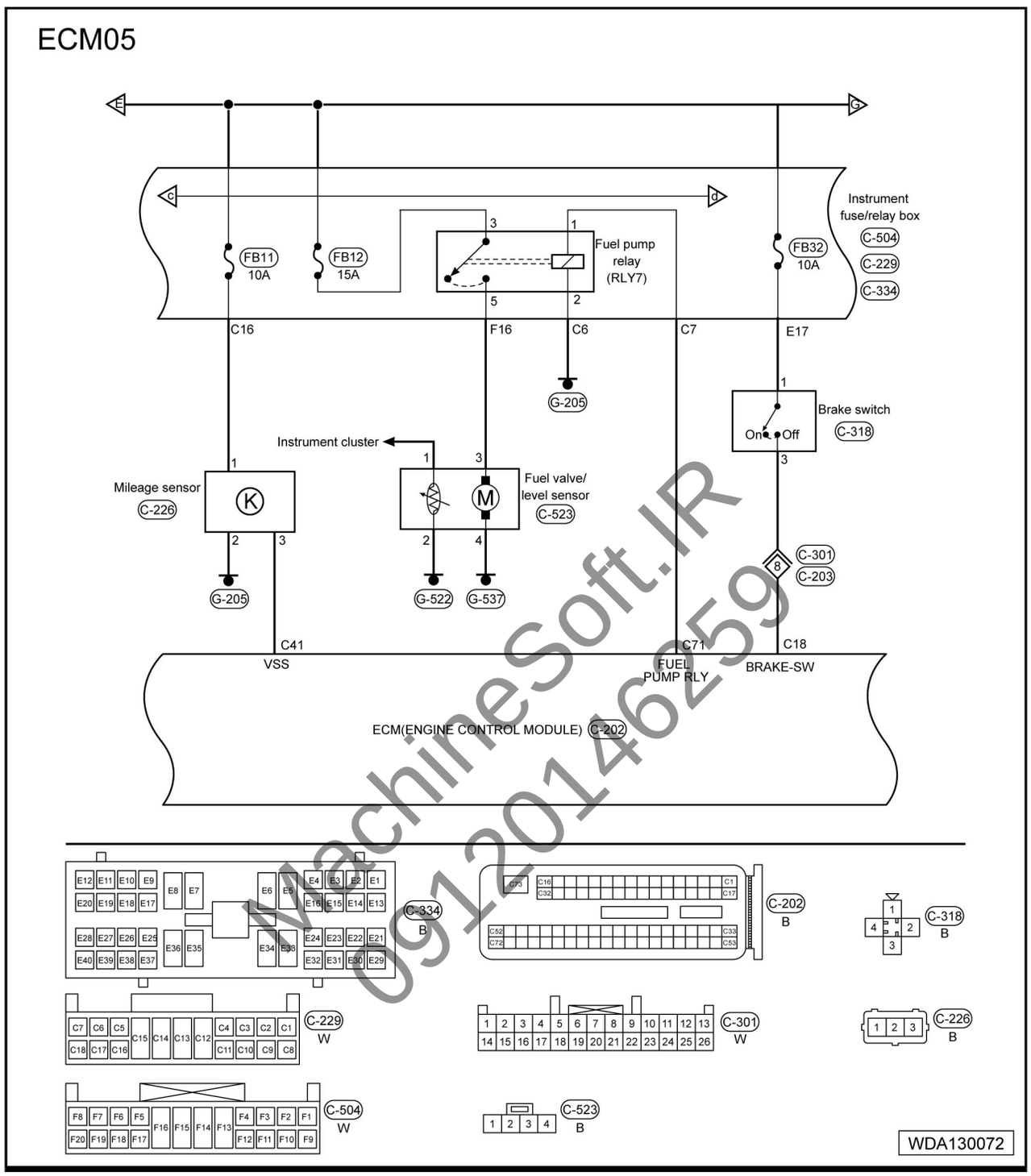
Engine circuit diagram (page 3)



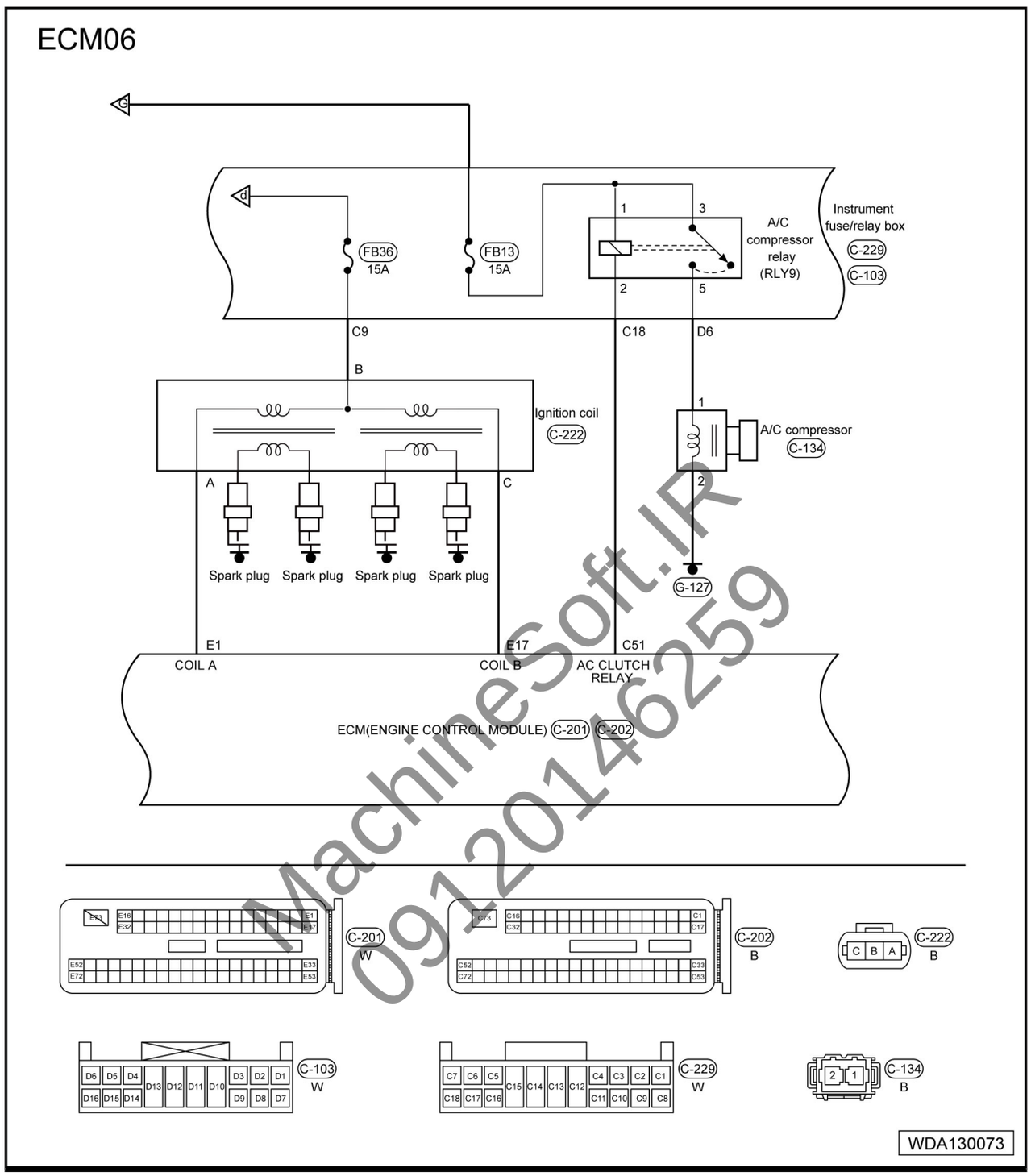
Engine circuit diagram (page 4)



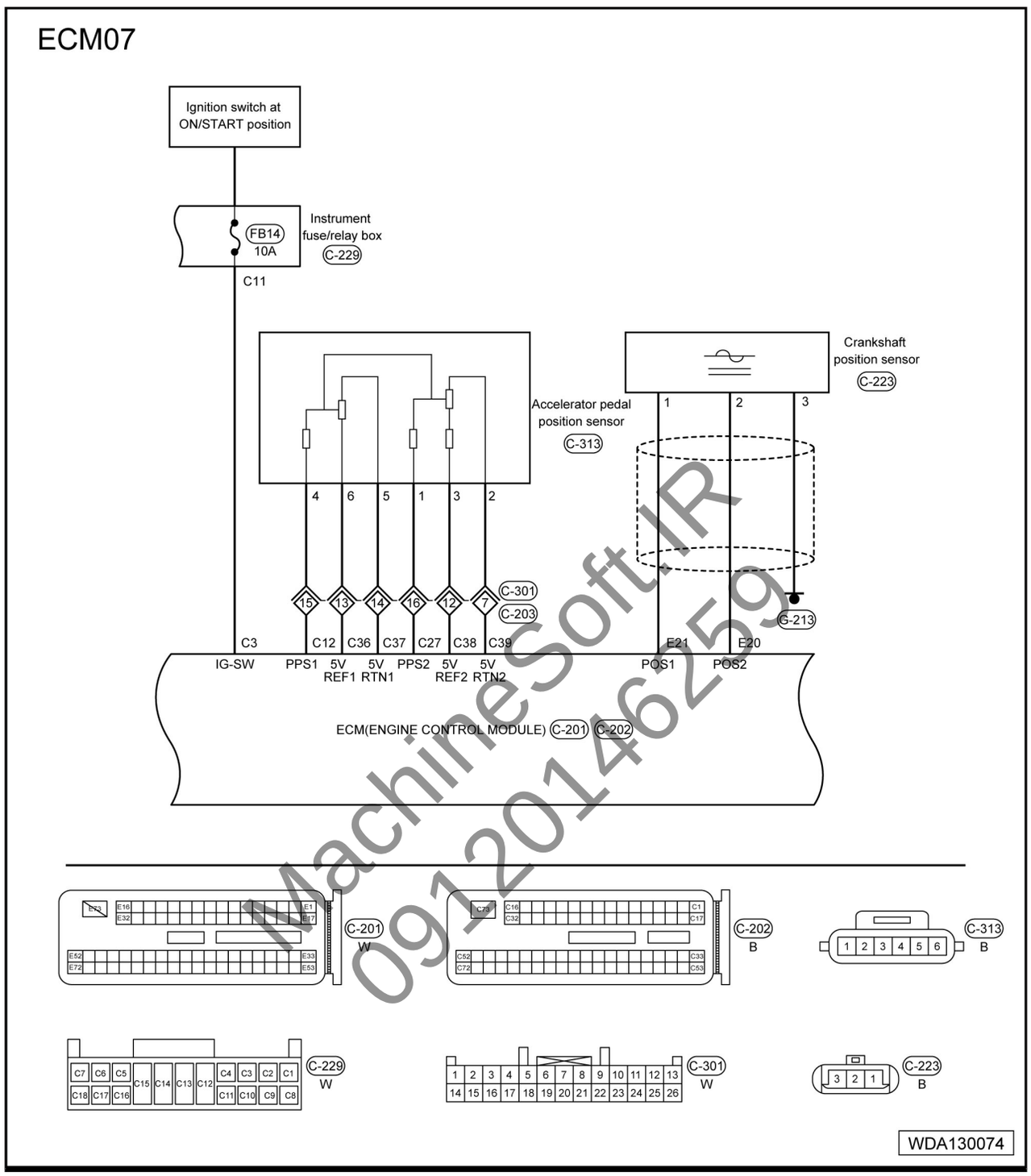
Engine circuit diagram (page 5)



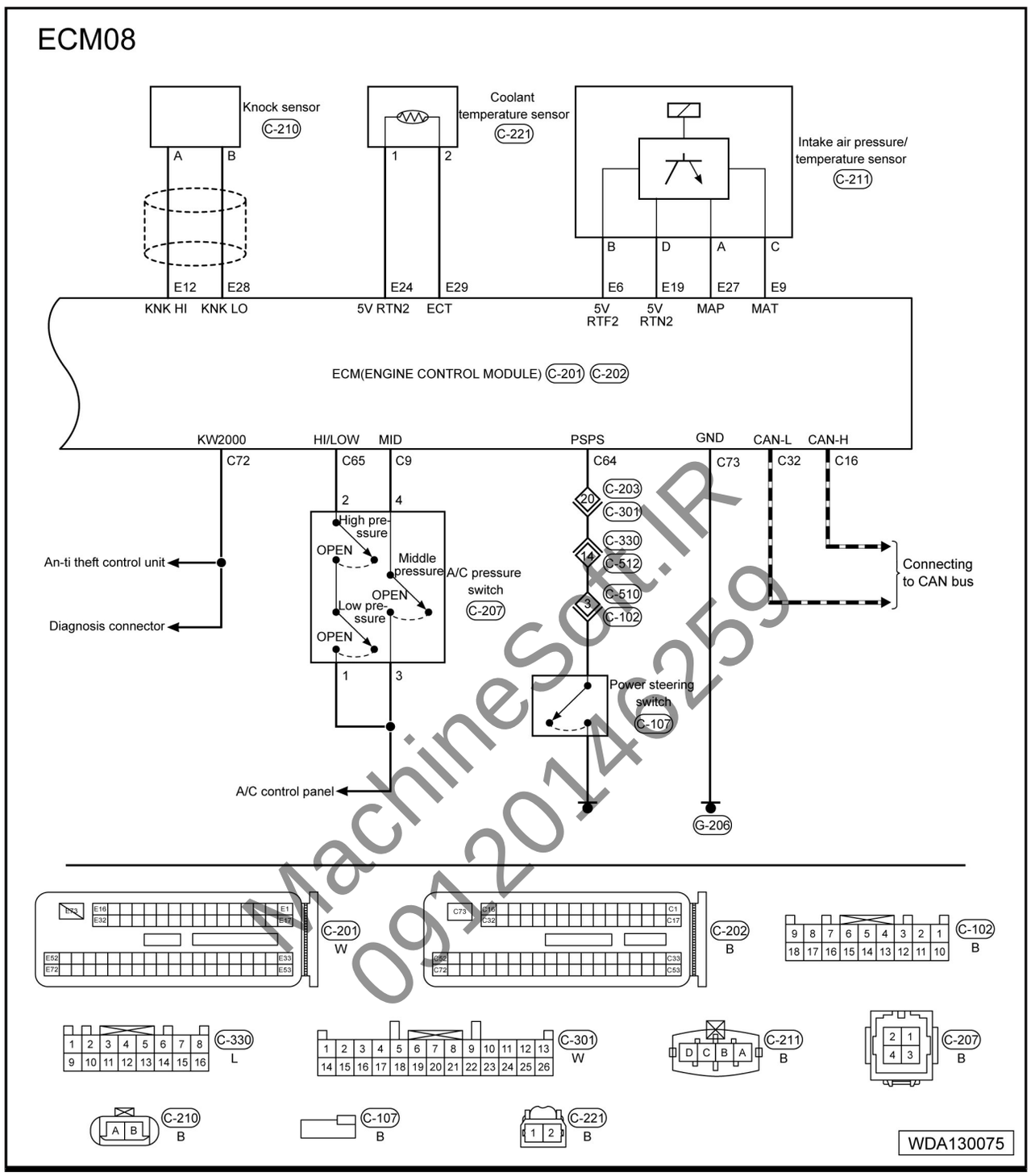
Engine circuit diagram (page 6)



Engine circuit diagram (page 7)



Engine circuit diagram (page 8)



2 Diagnosis and Inspection

2.1 Diagnosis and troubleshooting of sporadic faults

Diagnosis and inspection for sporadic DTC

If the sporadic DTC faults occur, please check the following items:

- Check if the connector of the DTC-related actuator or sensor is properly installed.
- Check the connector pins of the actuator or sensor for leakage and corrosion.
- Check the leads for bending or squeezing.
- Check the sensor for dirt or damage.
- Check if the routing of wiring harness is correct and proper.

2.2 Checking earth connection

A good earth connection is prerequisite for ensuring the normal operation of the circuit. If the earth terminal of the circuit is always exposed to the wet and dusty environment, the metal of the earth terminal will corrode and affect the circuit smoothness, thus causing various electrical system malfunctions. As the control circuit is very sensitive, the loosened or corroded wires may significantly affect the transmission of various signals in the electronic control circuit. Therefore, please note the followings when inspecting:

- Replace the earth bolts or nuts.
- Check the earth terminal and coil for corrosion.
- Clean and polish the earth terminal and coil when necessary to ensure good contact.
- Check if there is any accessory interfering with the earth circuit.

2.3 Learning process of the electronic throttle main control

If the following occurs, please perform learning on the electronic throttle main control:

- Replace the engine control module.
- Connect the engine control module again after disconnecting it.
- Replace the accelerator pedal.
- Replace or clean the electronic throttle.

Self-learning process of the electronic throttle actuator:

Learning conditions:

- The battery voltage is within the normal range.
- The cooling fan stops after operating.
- The engine stops running.
- The engine has no fault and fault code.
- The accelerator pedal is fully released.
- The engine performance is normal.

Self-learning operation steps:

Perform the following steps to activate the self-learning function:

- Turn on the ignition switch for 10 seconds.
- Turn off the ignition switch.

2.4 DTC fault diagnosis list

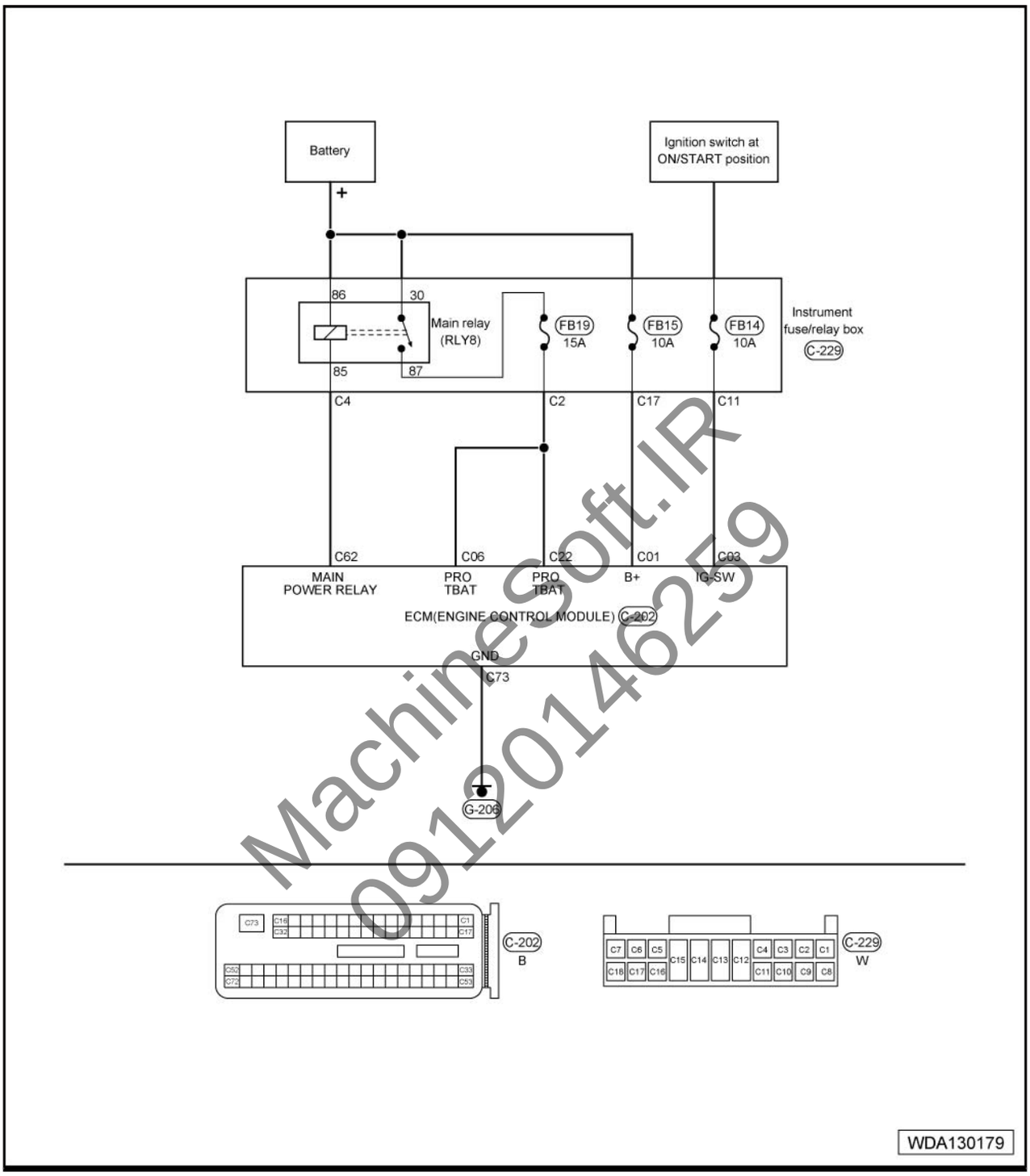
P 0068	Incorrect electronic throttle air flow
P 0106	Rationality failure of the intake air pressure/accelerator pedal position
P 0107	Intake air pressure sensor circuit low voltage or open circuit
P 0108	Intake air pressure sensor circuit high voltage
P 0112	Intake air temperature sensor circuit low voltage
P 0113	Intake air temperature sensor circuit high voltage or open circuit
P 0117	Coolant temperature sensor circuit low voltage
P 0118	Coolant temperature sensor circuit high voltage or open circuit
P 0122	Electronic throttle position sensor circuit 1 low voltage
P 0123	Electronic throttle position sensor circuit 1 high voltage
P 0131	Front oxygen sensor short to low voltage
P 0132	Front oxygen sensor short to high voltage
P 0133	Slow response of front oxygen sensor
P 0134	Front oxygen sensor open circuit
P 0135	Failure of the front oxygen sensor heater
P 0137	Rear oxygen sensor short to low voltage
P 0138	Rear oxygen sensor short to high voltage
P 0140	Rear oxygen sensor open circuit
P 0141	Failure of the rear oxygen sensor heater
P 0171	Fuel system too lean
P 0172	Fuel system too rich
P 0222	Electronic throttle position sensor circuit 2 low voltage
P 0223	Electronic throttle position sensor circuit 2 high voltage
P 0230	Failure of the fuel pump relay
P 0261	Fuel injector 1 circuit low voltage
P 0262	Fuel injector 1 circuit high voltage
P 0264	Fuel injector 2 circuit low voltage
P 0265	Fuel injector 2 circuit high voltage
P 0267	Fuel injector 3 circuit low voltage
P 0268	Fuel injector 3 circuit high voltage
P 0270	Fuel injector 4 circuit low voltage
P 0271	Fuel injector 4 circuit high voltage
P 0300	Misfire of the single cylinder or multiple cylinders
P 0324	Failure of the knock control system
P 0325	Failure of the knock sensor
P 0335	No signal in the crankshaft position sensor circuit

P 0336	Signal interference in the crankshaft position sensor circuit
P 0340	No signal in the camshaft position sensor circuit
P 0341	Rationality failure of the camshaft position sensor circuit
P 0351	Failure of the ignition coil 1
P 0352	Failure of the ignition coil 2
P 0420	Low catalytic converter efficiency
P 0458	Carbon canister solenoid valve circuit short to low voltage or open circuit
P 0459	Carbon canister solenoid valve circuit short to high voltage
P 0462	Accelerator pedal position sensor circuit short to low voltage
P 0463	Accelerator pedal position sensor circuit short to high voltage
P 0480	Failure of the low speed cooling fan
P 0481	Failure of the high speed cooling fan
P 0502	No signal in the vehicle speed sensor
P 0504	Correlation failure of the brake switch
P 0537	A/C evaporator temperature sensor circuit short to low voltage
P 0538	A/C evaporator temperature sensor circuit short to high voltage or open circuit
P 0551	Failure of the power steering switch circuit voltage range/performance
P 0552	Power steering switch circuit short to low voltage
P 0553	Power steering switch circuit short to high voltage
P 0562	System voltage low
P 0563	System voltage high
P 0571	No change in the brake lamp switch during braking
P 0601	ROM error
P 0602	Failure of the ECM processor
P 0604	RAM error
P 0606	Failure of the ECM processor
P 060A	Failure of the ECM programming
P 0633	Anti-theft control not learned
P 0641	ETC reference voltage amplitude value A error
P 0646	A/C clutch relay circuit short to low voltage or open circuit
P 0647	A/C clutch relay circuit short to high voltage
P 0650	Failure of the failure indicator
P 0651	ETC reference voltage amplitude value B error
P 0685	Failure of the main relay

P 1167	Front oxygen too rich when decelerating and cutting off fuel
P 1171	Front oxygen too lean when accelerating and becoming rich
P 1336	58-tooth gear tolerance not learned
P 1397	No signal in the wheel speed sensor
P 1516	ETC driver two-phase diagnosis error
P 2101	ETC driver stable state diagnosis error
P 2104	Engine compulsory idling
P 2105	Engine compulsory stopping
P 2106	Engine performance limitation
P 2110	Engine power management
P 2119	Return failure of the electronic throttle
P 2122	Electronic accelerator pedal position sensor circuit 1 low voltage
P 2123	Electronic accelerator pedal position sensor circuit 1 high voltage
P 2127	Electronic accelerator pedal position sensor circuit 2 low voltage
P 2128	Electronic accelerator pedal position sensor circuit 2 high voltage
P 2135	Correlation failure of the electronic throttle position sensor circuit 1 and 2
P 2138	Correlation failure of the electronic accelerator pedal position sensor circuit 1 and 2
P 2610	Failure of LPC
P 2610	Reset failure of LPC
U 0167	No response in the anti-theft control
U 0426	Failure of the anti-theft control authentication

2.5 Testing the ECM power and ground circuit

2.5.1 Testing the ECM power circuit



Values of the ECM power supply line

ECM pin No.	Function	Condition	Value (DC voltage range)
C1	Providing power constantly	The ignition switch in the LOCK, ON or START position	Battery voltage
C3	ECM energized	The ignition switch in the ON position	Battery voltage

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

1. Check if the ECM power supply fuses FB14 (10A)and FB15 (10A) are normal.

- If yes, go to step 2.
- If not, replace the failed fuse. ■

2. Check if the lead between the battery positive terminal and the FB15 (10A) fuse pin has short or open circuit.

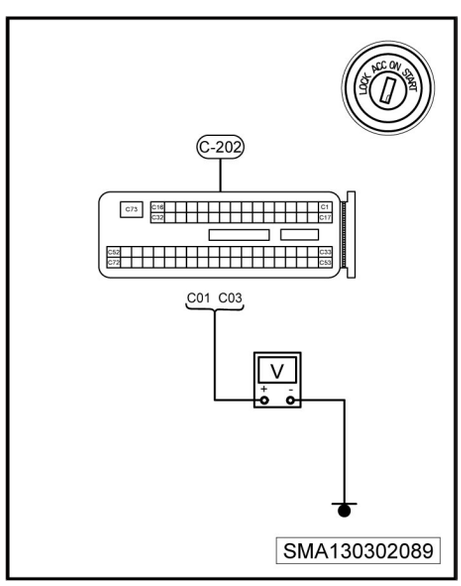
- If yes, repair the defective lead. ■
- If not, go to step 3.

3. Check if the lead between the ignition switch and the FB14 (10A) fuse pin has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.

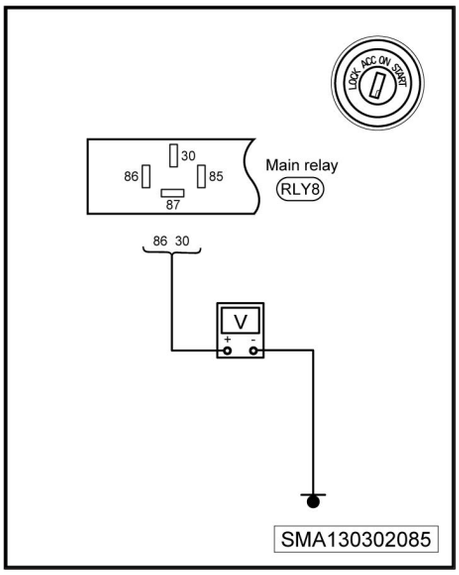
4. Turn the ignition switch to the ON position, disconnect the ECM connector C-202 and check if the voltage between the pins C1 and C3 of C-202 is battery voltage.

- If yes, go to step 5.
- If not, the lead between the ECM connector and the fuse/relay box fails and please repair the defective lead. ■



5. Pull out the main relay (RLY8), and check if the voltage between the pins 86 and 30 of the relay is battery voltage.

- If yes, go to step 6.
- If not, the lead between the fuse/relay box and the battery positive terminal fails or the fuse/relay box fails. ■

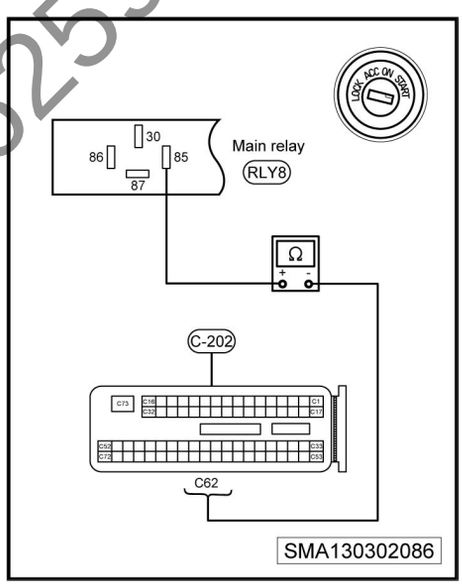


6. Check if the relay is normal.

- If yes, go to step 7.
- If not, the main relay fails and please replace it. ■

7. Check if the lead between the pin 85 of the main relay and the pin C62 of the ECM C-202 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 8.



8. Check if the ECM power supply fuse FB19 (15A) is normal.

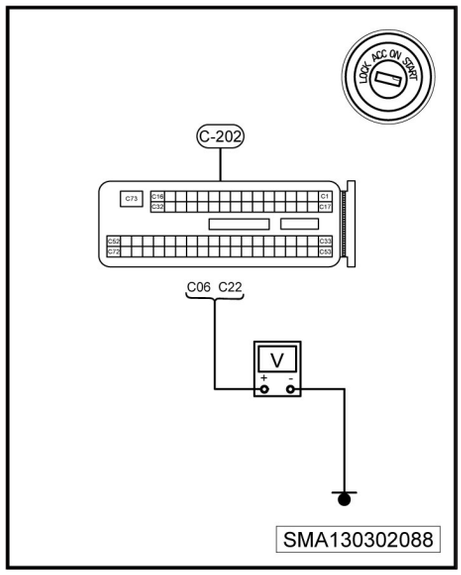
- If yes, go to step 9.
- If not, replace the fuse FB19. ■

9. Pull out the main relay (RLY8) and the fuse FB19 (15A) and check if the circuit between the main relay and the fuse pin FB19 is conducted.

- If yes, go to step 10.
- If not, the fuse/relay box fails. ■

10. Disconnect the ECM connectors C-201 and C-202, and pull out the main relay (RLY8). Short-circuit the main relay pins 30 and 87 with the short connector, and check if the voltage between the pins C6 and C22 of C-202 is battery voltage.

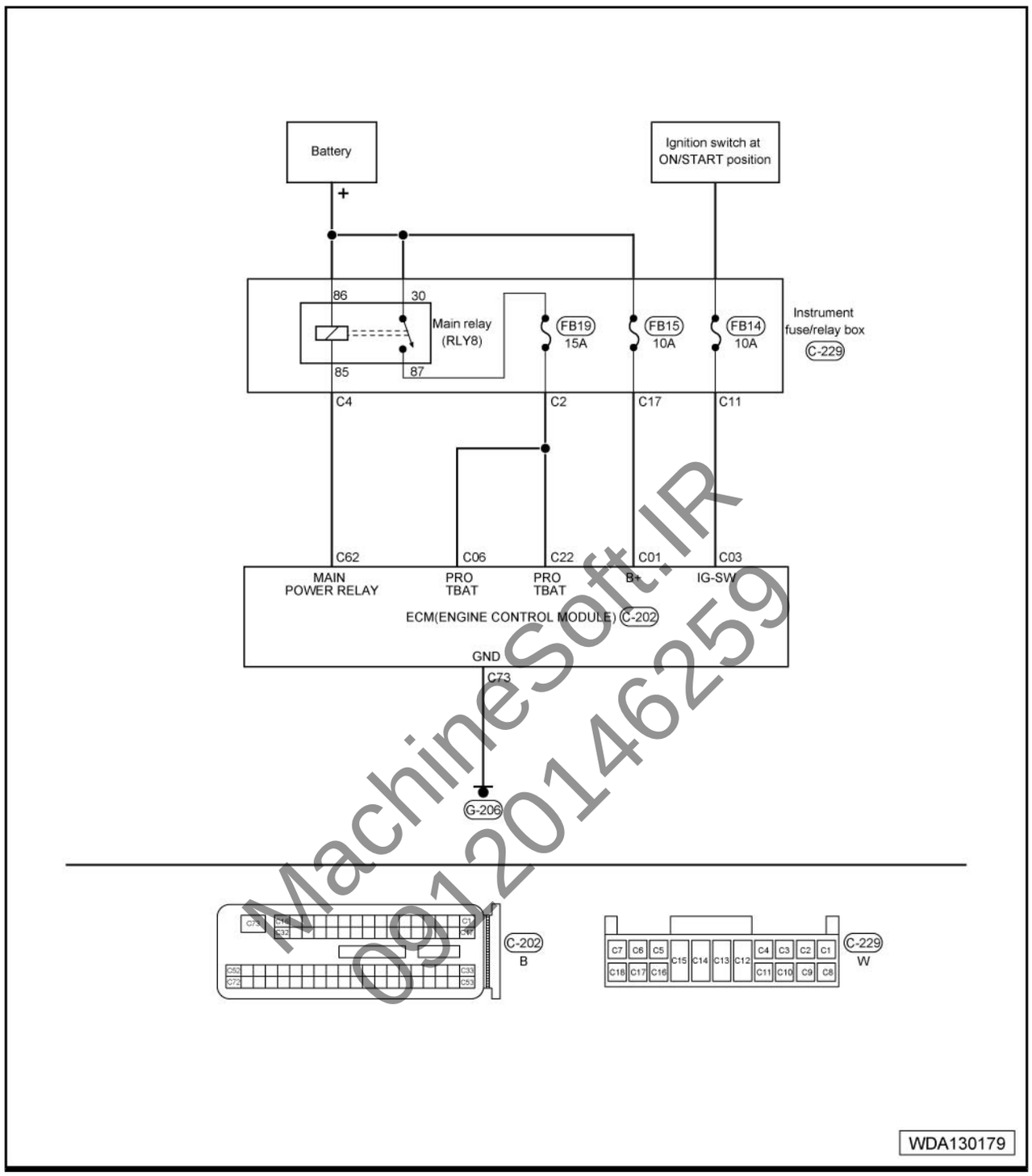
- If yes, go to step 11.
- If not, the lead between the pins C6 and C22 of C-202 and the main relay fails and please repair the defective lead. ■



11. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.5.2 Testing the ECM ground circuit



DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

1. Disconnect the battery negative terminal, and pull out the ECM connectors C-201 and C-202. Check if the circuit between the pin C73 of ECM C-202 and the battery negative terminal is conducted.

- If yes, go to step 4.
- If not, go to step 2.

2. Unscrew the earth terminal G206 from the ECM, and check if the lead between the pin C73 of the ECM C-202 and the earth terminal has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 3.

3. Check if the earth terminal has oxide and corrosion.

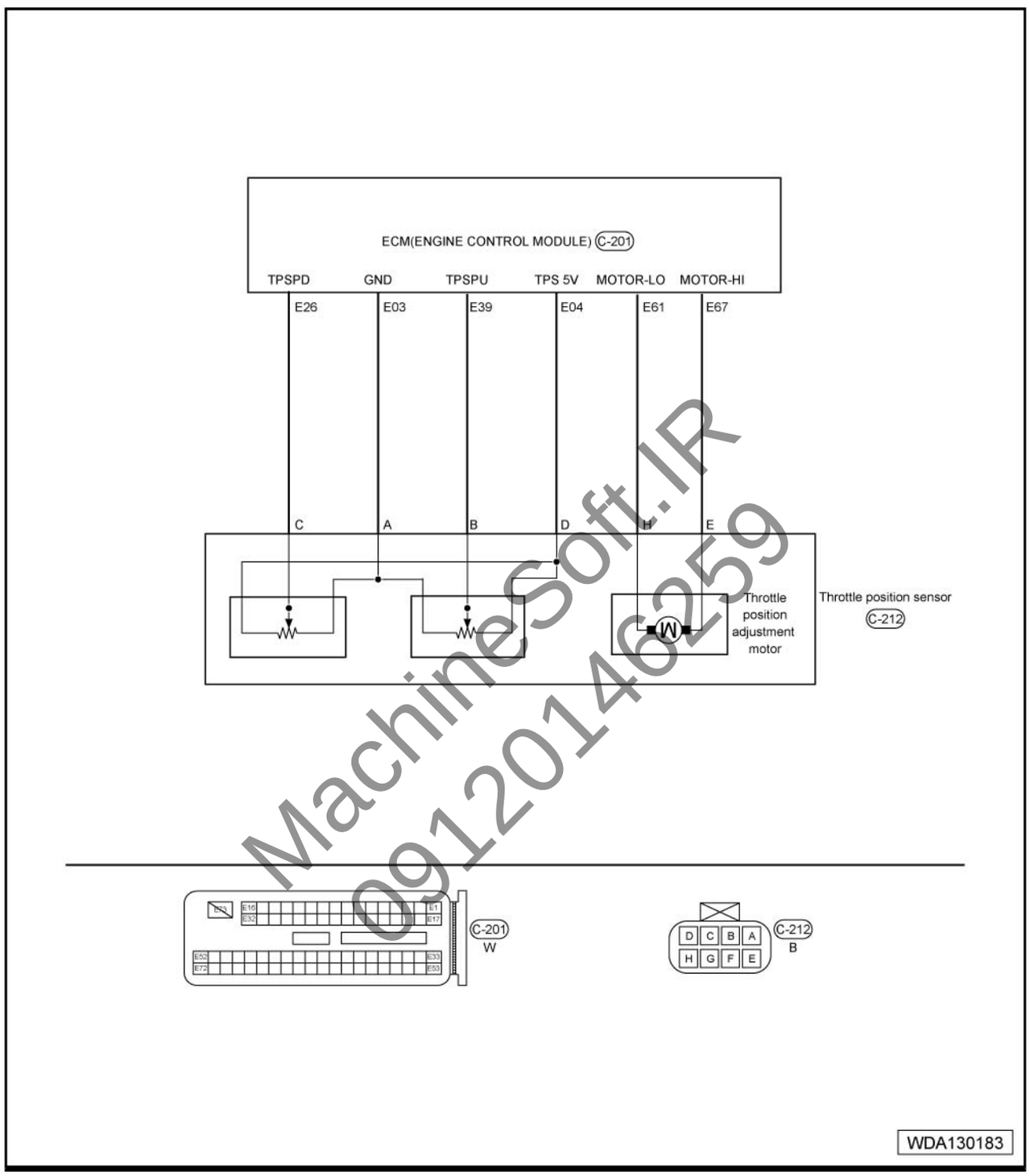
- If yes, clean the earth terminal G206. ■
- If not, go to step 4.

4. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6 DTC diagnosis procedures

2.6.1 P0068 Incorrect electronic throttle air flow



Values between the ECM and the electronic throttle

ECM pin No.	Function	Condition	Value (DC voltage range)
E3	Sensor grounded	The ignition switch in the ON position	0 V
E4	Sensor power supply	The ignition switch in the ON position	5 V

ECM pin No.	Function	Condition	Value (DC voltage range)
E26	"1" sensor signal	The ignition switch in the ON position	0 V
E39	"2" sensor signal	The ignition switch in the ON position	0 V
E61	Throttle position adjustment motor	The ignition switch in the ON position	0.5 V
E67	Throttle position adjustment motor	The ignition switch in the ON position	5 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0068	Incorrect electronic throttle air flow	Start the engine and there is no failure of intake air pressure/temperature sensor	There is deviation between the air flow calculated by a speed-density method and the predicted electronic throttle position air flow	• Failure of the electronic throttle • Intake system leakage • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

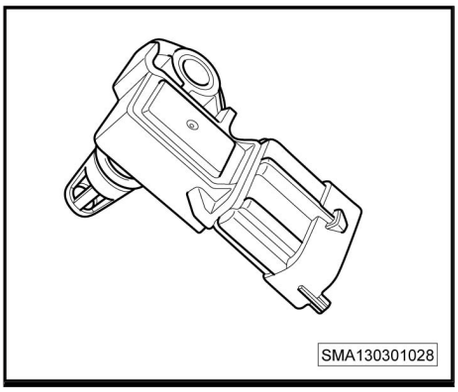
Diagnosis procedures:

Note

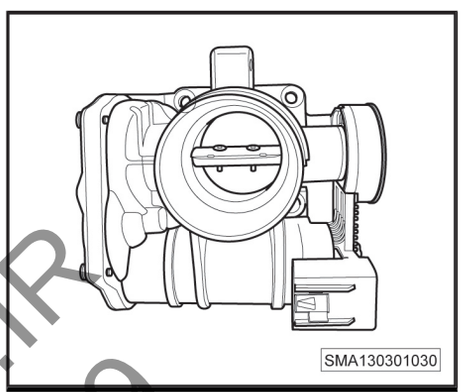
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check for leakage of the intake systems such as the vacuum booster pump hose, crankcase ventilation hose and activated carbon canister intake hose.
   - If yes, the intake system fails and please repair the leak point. ■
   - If not, go to step 2.

2. Remove the intake air pressure/temperature sensor and check if the sensor has any dust or other foreign matters on it.
   - If yes, clean or replace the intake air pressure/temperature sensor. ■
   - If not, go to step 3.



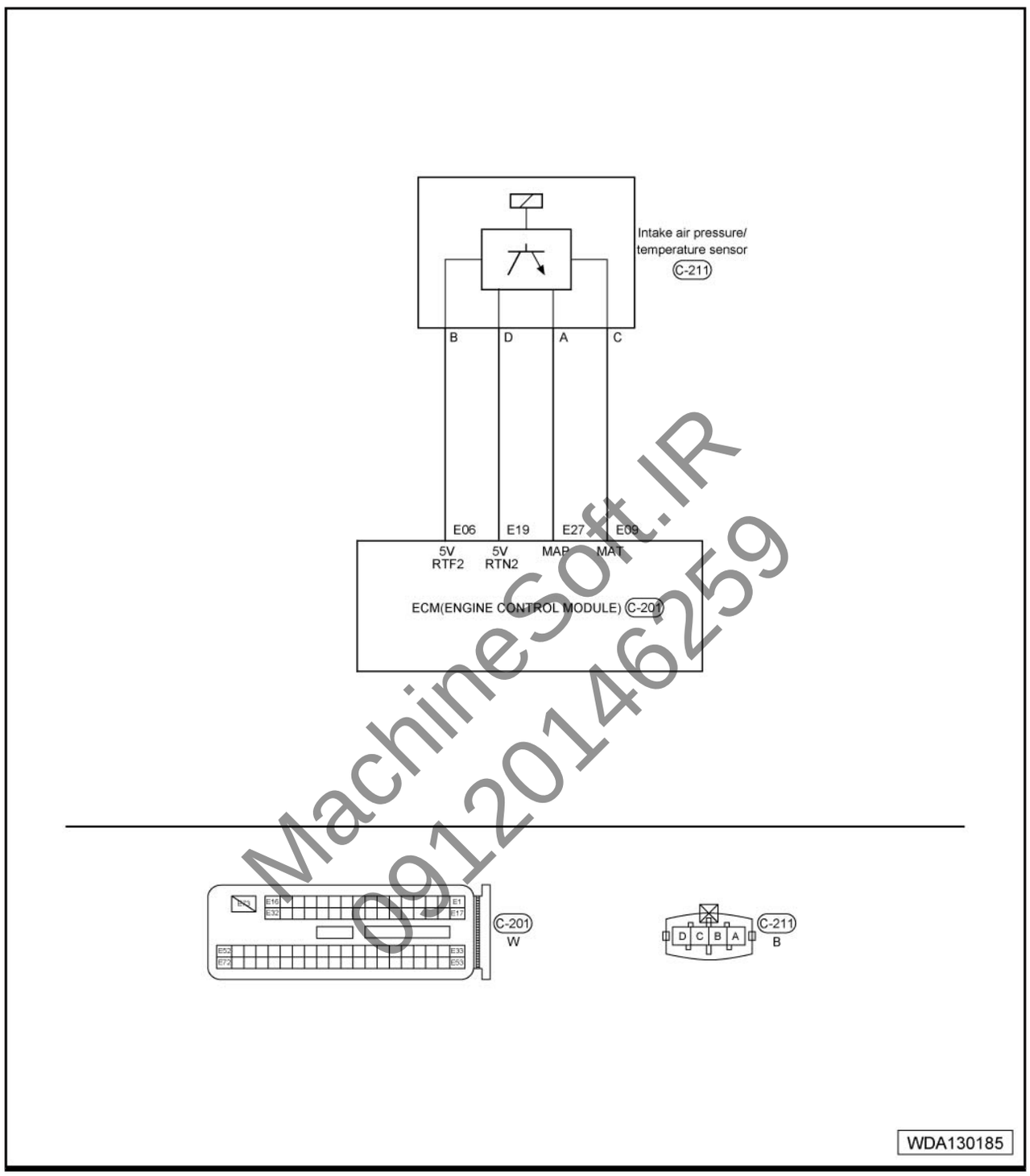
3. Remove the air filter assembly and check if the electronic throttle plate has carbon deposit or dust.
   - If yes, clean the electronic throttle. ■
   - If not, go to step 4.



4. Restore the vehicle to its normal state, connect the diagnostic device and check if the reading of the "electronic throttle related data flow" is normal.
   - If yes, go to step 5.
   - If not, refer to the information related to the electronic throttle failure and eliminate the electronic throttle failure. ■

5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

2.6.2 P0107 Intake air pressure sensor circuit low voltage or open circuit
P0108 Intake air pressure sensor circuit high voltage



Values between the ECM and the intake air pressure/temperature sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E6	Sensor power supply	The ignition switch in the ON position	5 V
E9	Intake air temperature sensor signal	The ignition switch in the ON position	0 V

ECM pin No.	Function	Condition	Value (DC voltage range)
E19	Sensor grounded	The ignition switch in the ON position	5 V
E27	Intake air pressure sensor signal	The ignition switch in the ON position	0 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0107	Intake air pressure sensor circuit low voltage or open circuit	Under the idling condition	Intake air pressure sensor circuit low voltage or open circuit	• Failure of the intake air pressure sensor • Failure of the intake air pressure sensor circuit • Failure of the engine control module
P0108	Intake air pressure sensor circuit high voltage	Under the idling condition	Intake air pressure sensor circuit high voltage	• Failure of the intake air pressure sensor • Failure of the intake air pressure sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

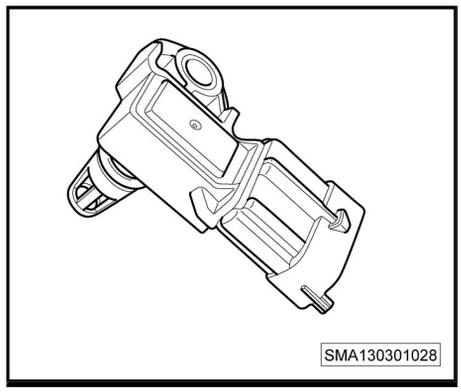
- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

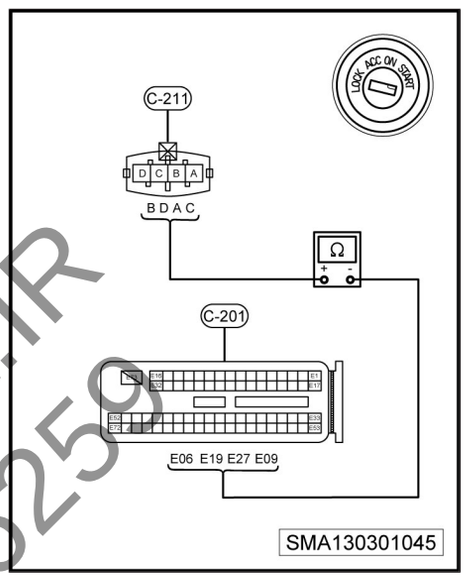
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Remove the intake air pressure/temperature sensor and check if the sensor has any dust, oil stains or other foreign matters on it.
   - If yes, clean or replace the intake air pressure/temperature sensor. ■
   - If not, go to step 2.



2. Disconnect the battery negative terminal, disconnect the ECM connector C-201 and intake air pressure/temperature sensor connector C-211 and check if the leads between the pins of E6, E19, E27, E9 of C-201 and the pins of B, D, A, C of C-211 have short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 3.



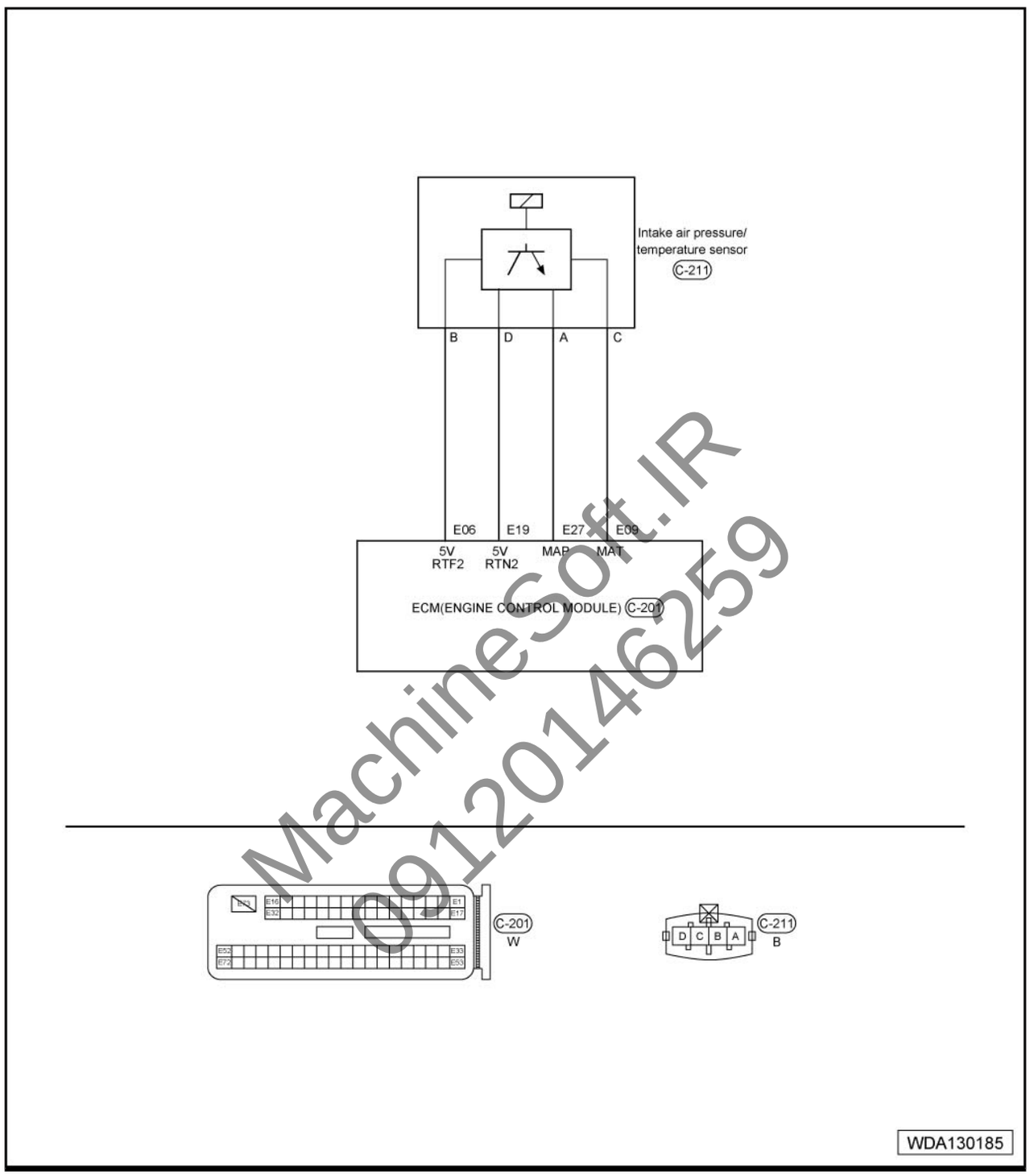
3. Connect the diagnostic device and check if the reading of "intake air pressure sensor data flow" is normal.
   - If yes, go to step 4.
   - If not, replace the intake air pressure/temperature sensor. ■

Intake air pressure sensor				
Pressure (KPa)	15	40	94	102
Output voltage (V)	0.12～0.38	1.52～1.68	4.44～4.60	4.86～5.04

4. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

2.6.3 P0112 Intake air temperature sensor circuit low voltage

P0113 Intake air temperature sensor circuit high voltage or open circuit



Values between the ECM and the intake air pressure/temperature sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E6	Sensor power supply	The ignition switch in the ON position	5 V
E9	Intake air temperature sensor signal	The ignition switch in the ON position	0 V

ECM pin No.	Function	Condition	Value (DC voltage range)
E19	Sensor grounded	The ignition switch in the ON position	5 V
E27	Intake air pressure sensor signal	The ignition switch in the ON position	0 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0112	Intake air temperature sensor circuit low voltage	Vehicle speed more than 50 km/h	Intake air temperature sensor circuit low voltage	• Failure of the intake air pressure sensor • Failure of the intake air temperature sensor circuit • Failure of the engine control module
P0113	Intake air temperature sensor circuit high voltage or open circuit	Vehicle speed less than 25 km/h	Intake air temperature sensor circuit high voltage or open circuit	• Failure of the intake air pressure sensor • Failure of the intake air temperature sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

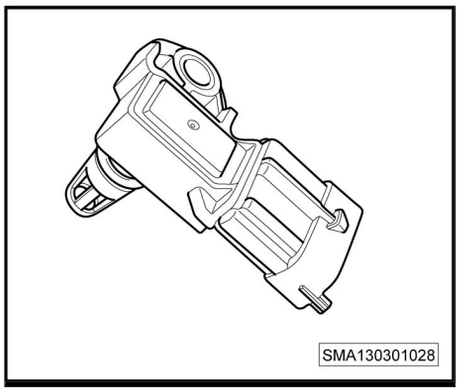
- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

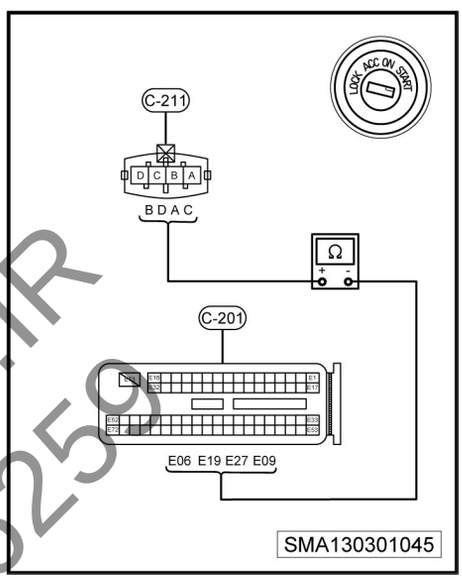
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Remove the intake air pressure/temperature sensor and check if the sensor has any dust, oil stains or other foreign matters on it.
   - If yes, clean or replace the intake air pressure/temperature sensor. ■
   - If not, go to step 2.



2. Disconnect the battery negative terminal, disconnect the ECM connector C-201 and intake air pressure/temperature sensor connector C-211 and check if the leads between the pins of E6, E19, E27, E9 of C-201 and the pins of B, D, A, C of C-211 have short or open circuit.
   - If yes, go to step 3.
   - If not, repair the defective lead. ■

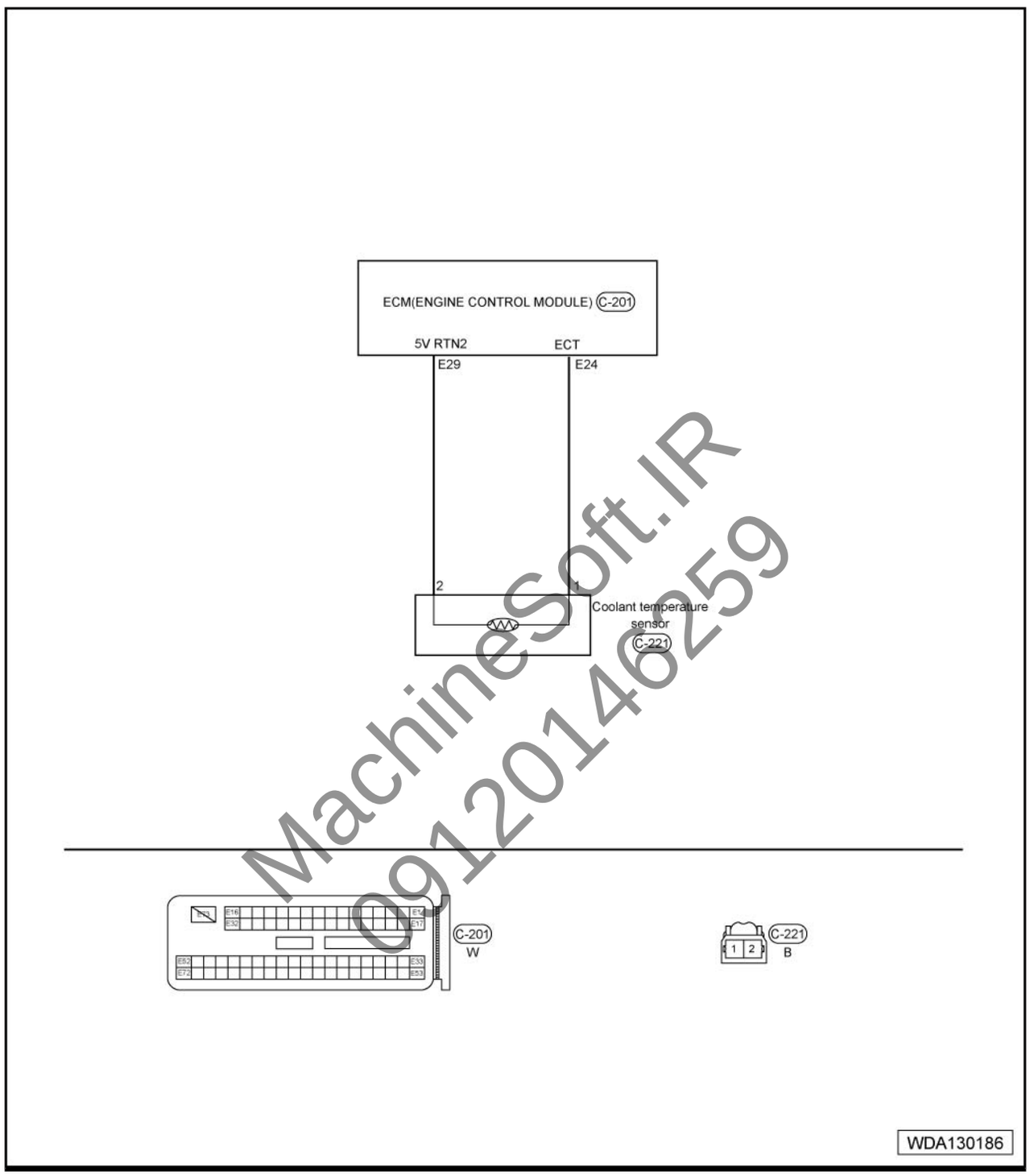


3. Disconnect the intake air pressure/temperature sensor connector and measure if the resistance value of intake air temperature sensor is normal.
   - If yes, go to step 4.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

Intake air temperature sensor				
Temperature (℃)	15	20	30	40
Resistance value (KΩ)	5.65	3.51	2.24	1.46

4. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

2.6.4 P0117 Coolant temperature sensor circuit low voltage
P0118 Coolant temperature sensor circuit high voltage or open circuit



Values between the ECM and the coolant temperature sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E24	Coolant temperature sensor signal	The ignition switch in the ON position	5 V
E29	Coolant temperature sensor signal	The ignition switch in the ON position	3.6 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0117	Coolant temperature sensor circuit low voltage	Under the idling condition	Coolant temperature sensor signal wire short to ground	• Failure of the coolant temperature sensor • Failure of the coolant temperature sensor circuit • Failure of the engine control module
P0118	Coolant temperature sensor circuit high voltage or open circuit	Under the idling condition	Coolant temperature sensor circuit high voltage or open circuit	• Failure of the coolant temperature sensor • Failure of the coolant temperature sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

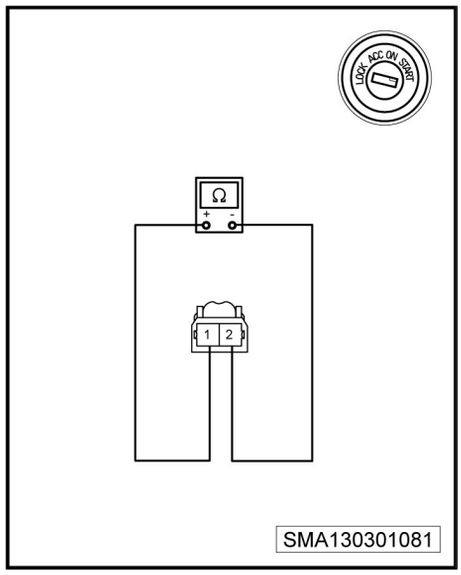
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Connect the diagnostic device, start the engine and check if the reading of "coolant temperature sensor data flow" is normal under the operating conditions.
   - If yes, go to step 3.
   - If not, go to step 2.

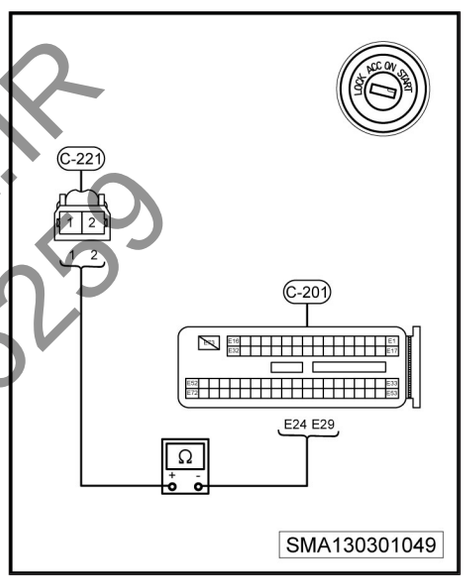
2. Remove the coolant temperature sensor and measure if the resistance value between both terminals of the coolant temperature sensor is normal. (The rated resistance is 2.5 kΩ±5% at 20℃)

- If yes, go to step 3.
- If not, the coolant temperature sensor fails and please replace it. ■



3. Disconnect the coolant temperature sensor connector C-221 and ECM connector C-201, and check if the leads between the pins E24, E29 of C-201 and the pins 1, 2 of C-221 have short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.

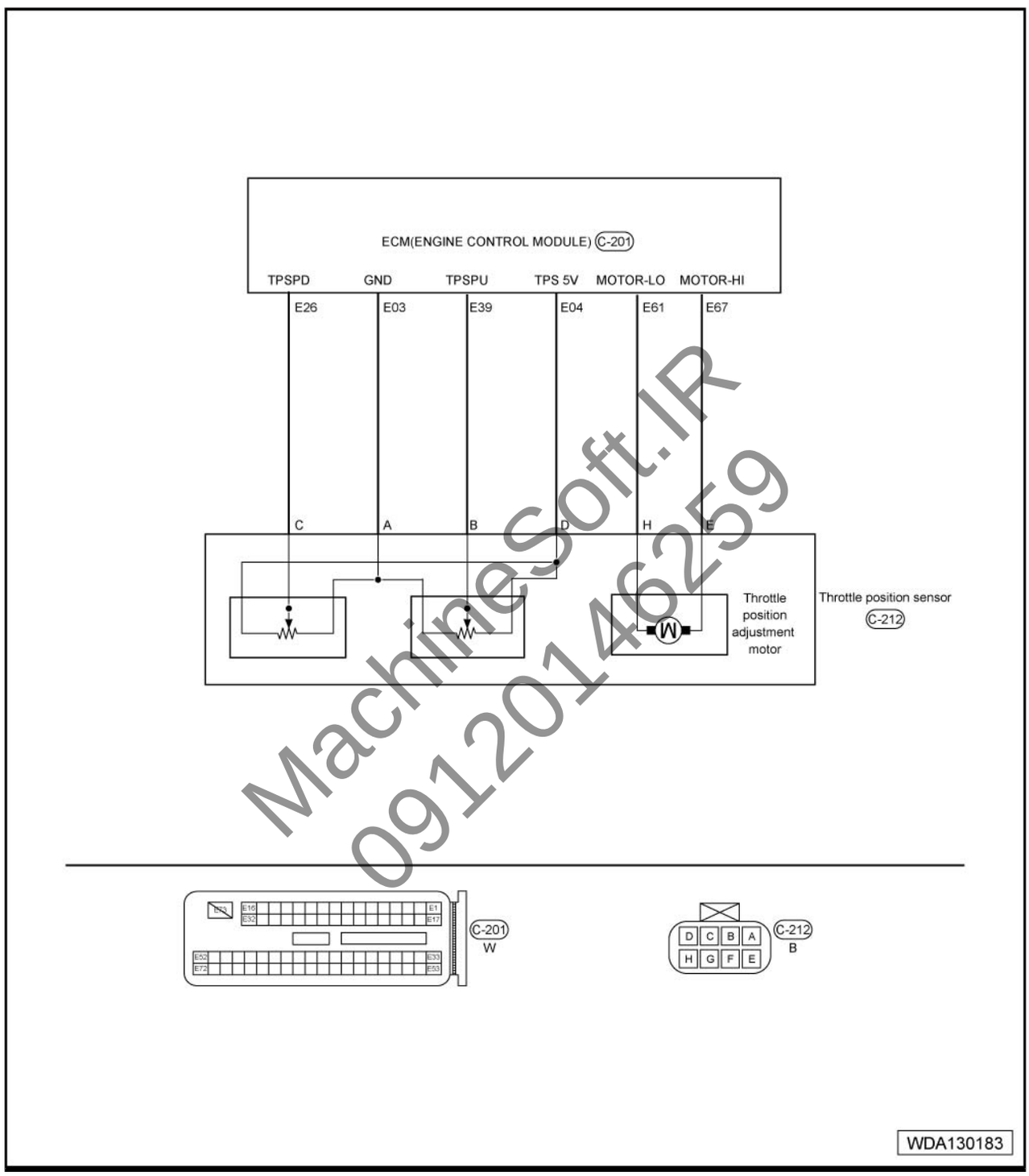


4. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.5 P0122 Electronic throttle position sensor circuit 1 low voltage

P0123 Electronic throttle position sensor circuit 1 high voltage
P0222 Electronic throttle position sensor circuit 2 low voltage
P0223 Electronic throttle position sensor circuit 2 high voltage



Values between the ECM and the electronic throttle position sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E3	Sensor grounded	The ignition switch in the ON position	0 V

ECM pin No.	Function	Condition	Value (DC voltage range)
E4	Sensor power supply	The ignition switch in the ON position	5 V
E26	"1" sensor signal	The ignition switch in the ON position	0 V
E39	"2" sensor signal	The ignition switch in the ON position	5 V
E61	Throttle position adjustment motor	The ignition switch in the ON position	0.5 V
E67	Throttle position adjustment motor	The ignition switch in the ON position	5 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0122	Electronic throttle position sensor circuit 1 low voltage	Engine running conditions depending on the ETC modes	Electronic throttle position sensor circuit 1 grounded or open circuit	• Failure of the electronic throttle position sensor • Failure of the electronic throttle position sensor circuit • Failure of the engine control module
P0123	Electronic throttle position sensor circuit 1 high voltage	Engine running conditions depending on the ETC modes	Electronic throttle position sensor circuit 1 short to the sensor power supply line	• Failure of the electronic throttle position sensor • Failure of the electronic throttle position sensor circuit • Failure of the engine control module
P0222	Electronic throttle position sensor circuit 2 low voltage	Engine running conditions depending on the ETC modes	Electronic throttle position sensor circuit 2 grounded or open circuit	• Failure of the electronic throttle position sensor • Failure of the electronic throttle position sensor circuit • Failure of the engine control module
P0223	Electronic throttle position sensor circuit 2 high voltage	Engine running conditions depending on the ETC modes	Electronic throttle position sensor circuit 2 short to the sensor power supply line	• Failure of the electronic throttle position sensor • Failure of the electronic throttle

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				position sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

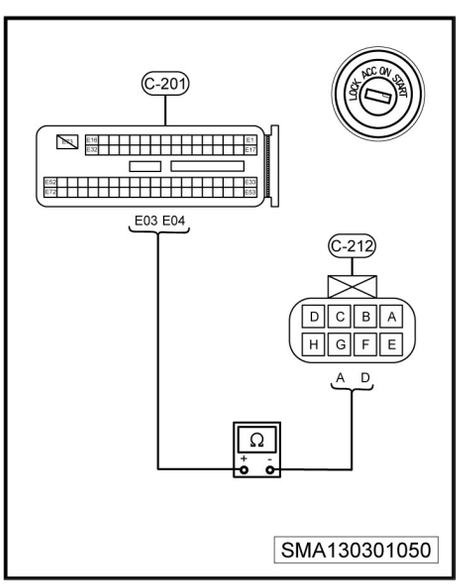
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

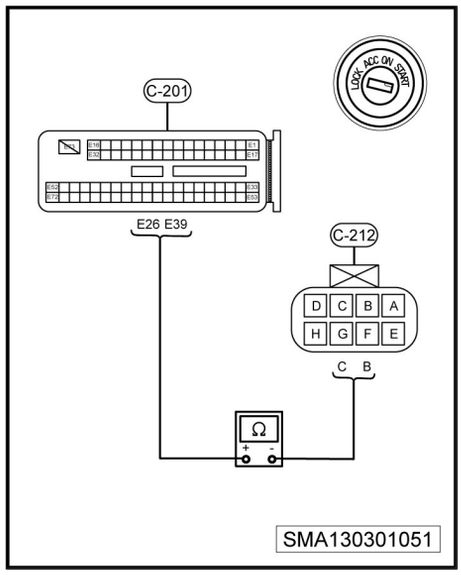
1. Disconnect the battery negative terminal, disconnect the ECM connector C-201 and the electronic throttle control unit connector C-212 and check if the leads between the pins E3, E4 of C-201 and pins A, D of C-212 have short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 2.



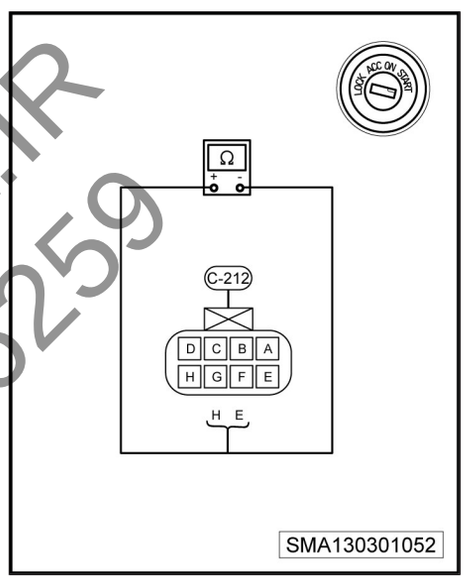
2. Check if the leads between the pins E26, E39 of C-201 and the pins C, B of C-212 have short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 3.



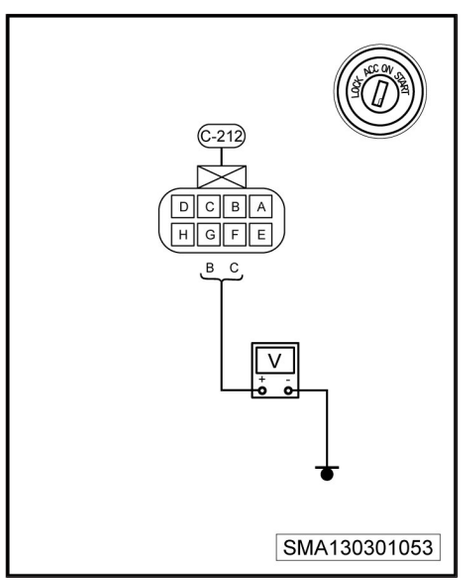
3. Disconnect the electronic throttle connector C-212 and measure if the resistance value between the pins H and E of throttle position adjustment motor is 3.93 Ω.

- If yes, go to step 4.
- If not, the electronic throttle position adjustment motor fails and please replace the electronic throttle. ■



4. Restore the vehicle to its normal state, start the engine and check if the signals of throttle position sensor signal wires B and C are normal without disconnecting the throttle position sensor connector.

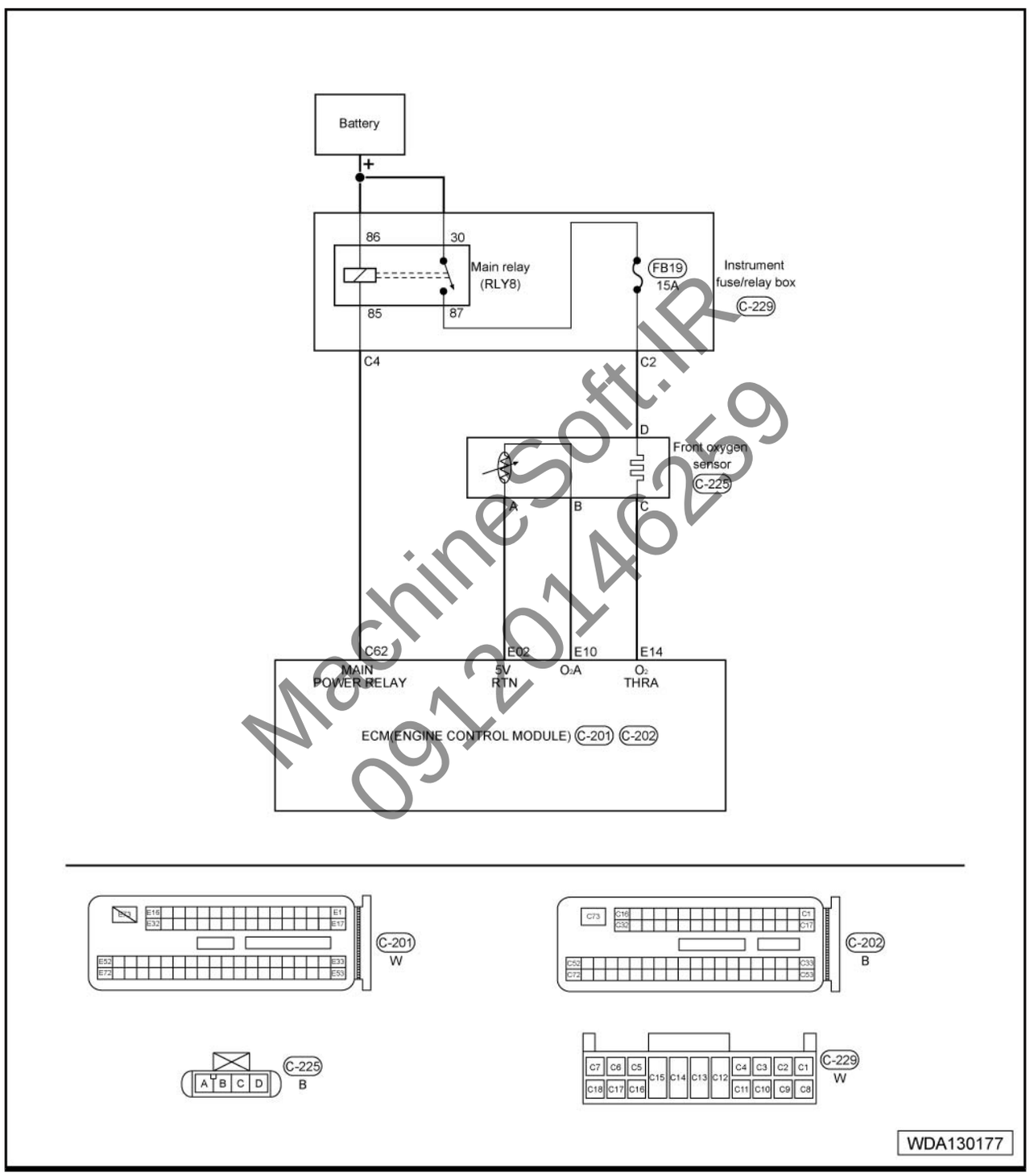
- If yes, go to step 5.
- If not, the electronic throttle position sensor fails and please replace the electronic throttle. ■



5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.6 P0131 Front oxygen sensor short to low voltage
P0132 Front oxygen sensor short to high voltage



Values between the ECM and the front oxygen sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E2	Front oxygen sensor signal	The ignition switch in the ON position	0 V
E10	Front oxygen sensor signal	The ignition switch in the ON position	2.3 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0131	Front oxygen sensor short to low voltage	Engine runs for over 60 seconds and the coolant temperature is below 70℃	The front oxygen sensor signal keeps 0 for over 25 seconds	• Failure of the front oxygen sensor • Failure of the front oxygen sensor circuit • Failure of the engine control module
P0132	Front oxygen sensor short to high voltage	Engine runs for over 60 seconds and the coolant temperature is above 70℃	Front oxygen sensor signal wire short to power	• Failure of the front oxygen sensor • Failure of the front oxygen sensor wiring • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

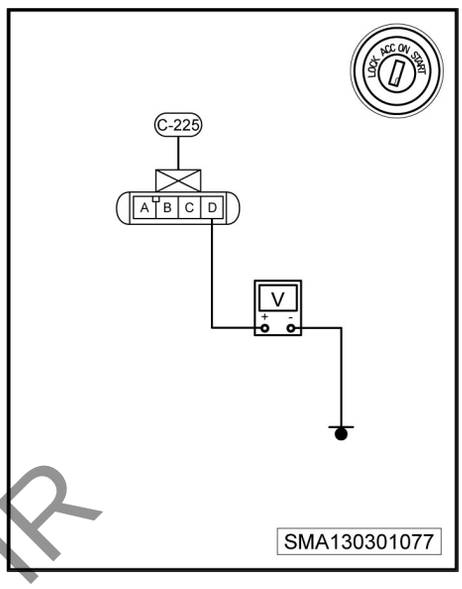
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the heating fuse FB19 (15A) of the front oxygen sensor is normal.

- If yes, go to step 2.
- If not, the fuse fails and please replace the fuse FB19. ■

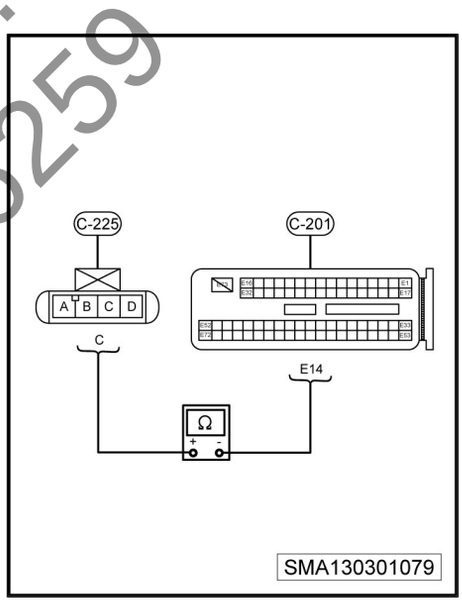
2. Turn the ignition switch to the ON position, disconnect the front oxygen sensor connector C-225 and check if the voltage at the pin D of C-225 is battery voltage.

- If yes, go to step 3.
- If not, the lead between the fuse FB19 and the pin D of C-225 fails and please repair the defective lead. ■



3. Disconnect the battery negative terminal, disconnect the front oxygen sensor connector C-225 and the ECM connector C-201 and check if the lead between the pin C of C-225 and the pin E14 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.

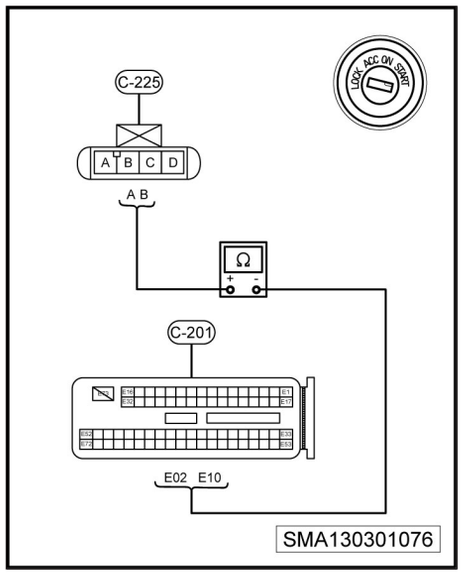


4. Connect the diagnostic device and start the engine. When the engine warms up, check if the voltage of the "front oxygen sensor data flow" fluctuates between 0 V and 0.9 V.

- If yes, go to step 5.
- If not, the front oxygen sensor fails and please replace it. ■

5. Disconnect the battery negative terminal, disconnect the front oxygen sensor connector C-225 and the ECM connector C-201 and check if the leads between the pins A, B of C-225 and the pins E2, E10 of C-201 have short or open circuit.

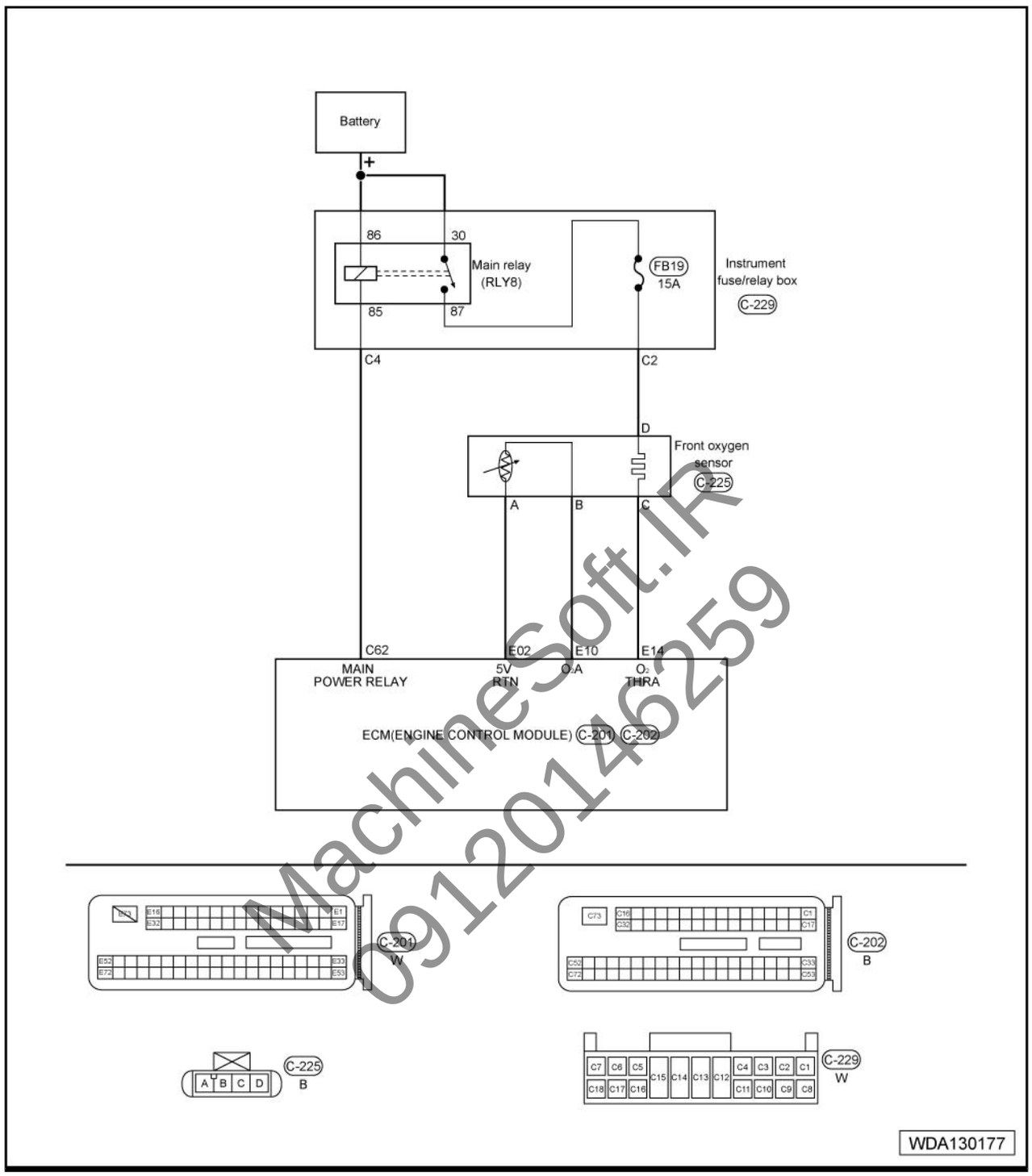
- If yes, repair the defective lead. ■
- If not, go to step 6.



6. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.7 P0133 Slow response of the front oxygen sensor



Values between the ECM and the front oxygen sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E2	Front oxygen sensor signal	The ignition switch in the ON position	5 V
E10	Front oxygen sensor signal	The ignition switch in the ON position	2.3 V
E14	Front oxygen sensor heater control	The ignition switch in the ON position	3.6 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0133	Front oxygen sensor short or open circuit	Engine runs for over 60 seconds and the coolant temperature is above 70℃	Slow response of the oxygen sensor and low system set value when the engine speed is about 2000 rpm	• Failure of the front oxygen sensor • Failure of the front oxygen sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

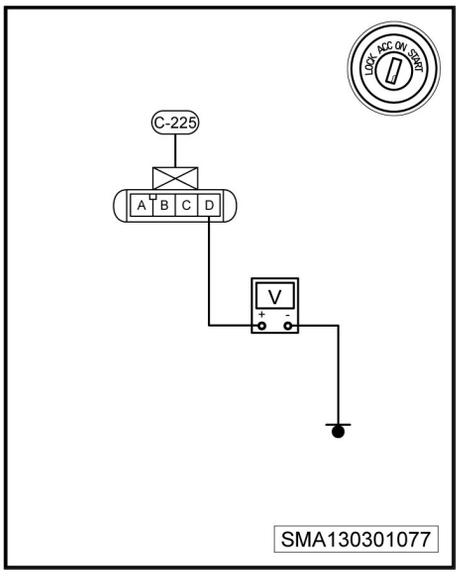
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the heating fuse FB19 (15A) of the front oxygen sensor is normal.
   - If yes, go to step 2.
   - If not, the fuse fails and please replace the fuse FB19. ■

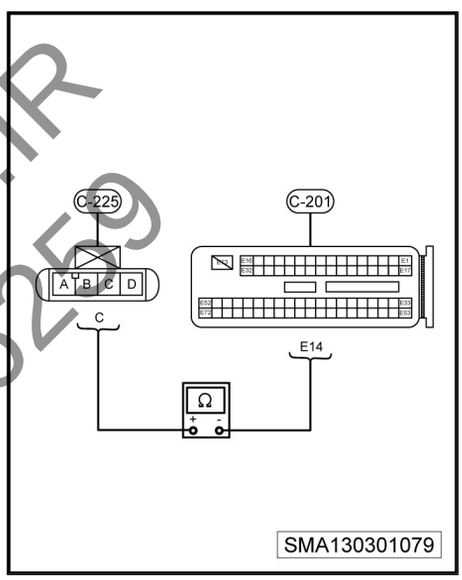
2. Turn the ignition switch to the ON position, disconnect the front oxygen sensor connector C-225 and check if the voltage at the pin D of C-225 is battery voltage.

- If yes, go to step 3.
- If not, the lead between the fuse FB19 and the pin D of C-225 fails and please repair the defective lead. ■



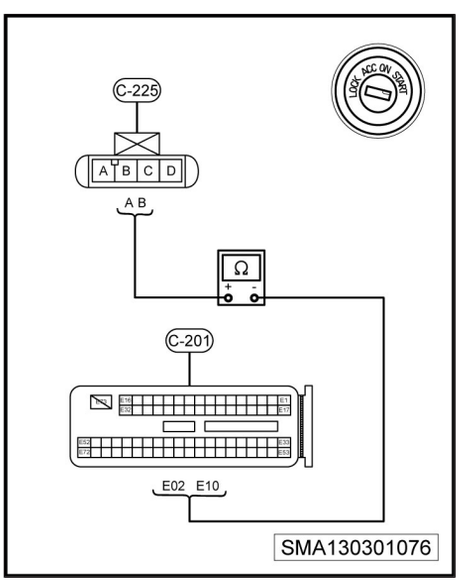
3. Disconnect the battery negative terminal, disconnect the front oxygen sensor connector C-225 and the ECM connector C-201 and check if the lead between the pin C of C-225 and the pin E14 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



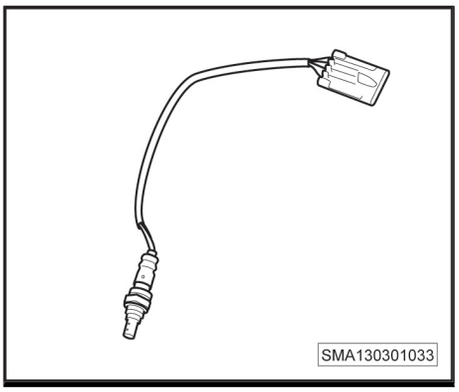
4. Disconnect the battery negative terminal, disconnect the front oxygen sensor connector C-225 and the ECM connector C-201 and check if the leads between the pins A, B of C-225 and the pins E2, E10 of C-201 have short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Disconnect the battery negative terminal, remove the front oxygen sensor and carry out a visual inspection to see if the sensor has carbon deposit or turns white, brown or black.

- If yes, replace the oxygen sensor and fuel, and clean the fuel tank. ■
- If not, go to step 6.



6. Restore the vehicle to its normal state, and start the engine. When the engine warms up, read out "front oxygen sensor data flow" and observe the time of the front oxygen sensor voltage changing from lean to rich and from rich to lean and check if the voltage is normal.

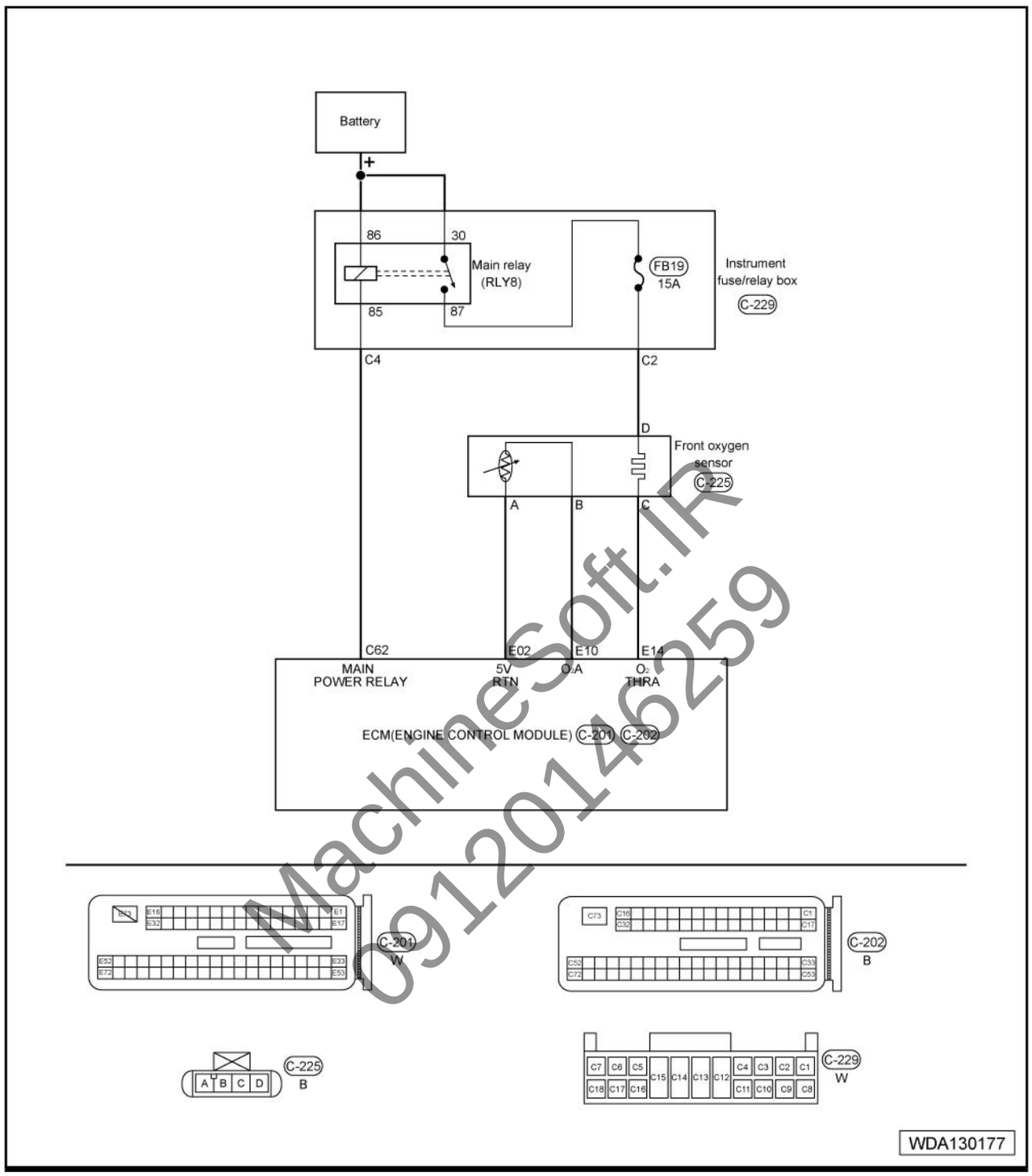
- If yes, go to step 7.
- If not, the front oxygen sensor fails and please replace it. ■

Oxygen sensor			
Temperature	260℃	450℃	595℃
Rich-oxygen output voltage (mV)	＞800	＞800	＞750
Lean-oxygen output voltage (mV)	＜200	＜200	＜150
Response time from lean to rich (mS)	＜75	＜75	＜50
Response time from rich to lean (mS)	＜150	＜125	＜90
Internal resistance (Ω)	＜100 K		

7. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.8 P0135 Failure of the front oxygen sensor heater



Values between the ECM and the front oxygen sensor heater

ECM pin No.	Function	Condition	Value (DC voltage range)
E14	Front oxygen sensor heater control	The ignition switch in the ON position	3.6 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0135	Failure of the front oxygen sensor heater	Engine runs for over 60 seconds at the idling speed and the front oxygen sensor heater is working	The heater control wire of the front oxygen sensor is disconnected within 20 seconds	• Failure of the front oxygen sensor • Failure of the front oxygen sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

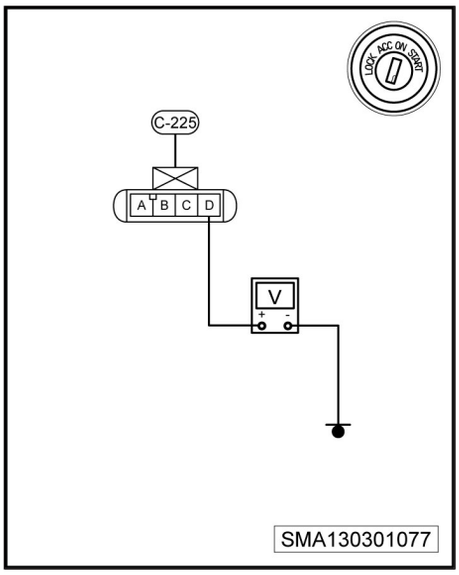
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the heating fuse FB19 (15A) of the front oxygen sensor is normal.

- If yes, go to step 2.
- If not, the fuse fails and please replace the fuse FB19. ■

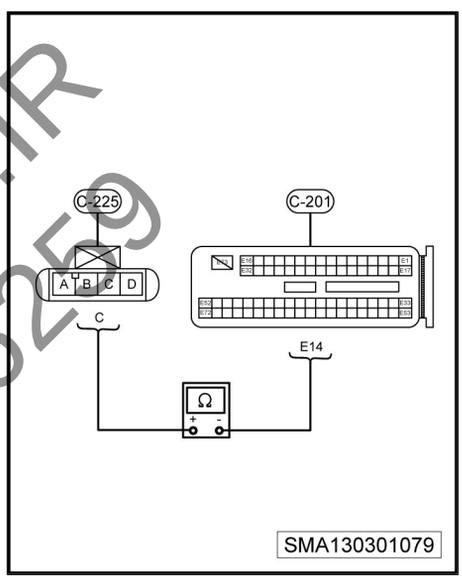
2. Turn the ignition switch to the ON position, disconnect the front oxygen sensor connector C-225 and check if the voltage at the pin D of C-225 is battery voltage.

- If yes, go to step 3.
- If not, the lead between the fuse FB19 and the pin D of C-225 fails and please repair the defective lead. ■



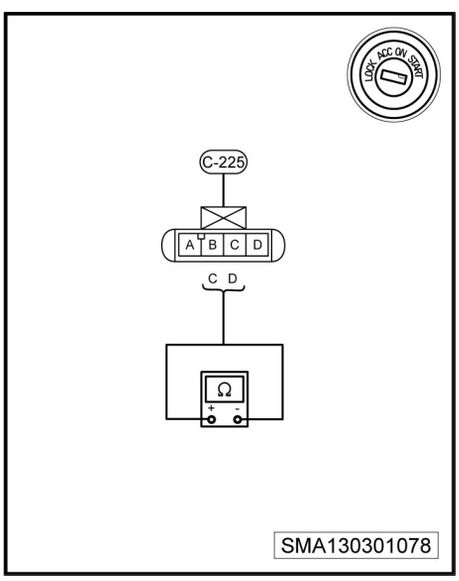
3. Disconnect the battery negative terminal, disconnect the front oxygen sensor connector C-225 and the ECM connector C-201 and check if the lead between the pin C of C-225 and the pin E14 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



4. Disconnect the front oxygen sensor connector C-225 and measure if the heater resistance value between the pin C and the pin D of the front oxygen sensor is normal. The resistance value is 9.2 Ω at normal temperature (actual measured value).

- If yes, go to step 5.
- If not, the front oxygen sensor fails and please replace it. ■

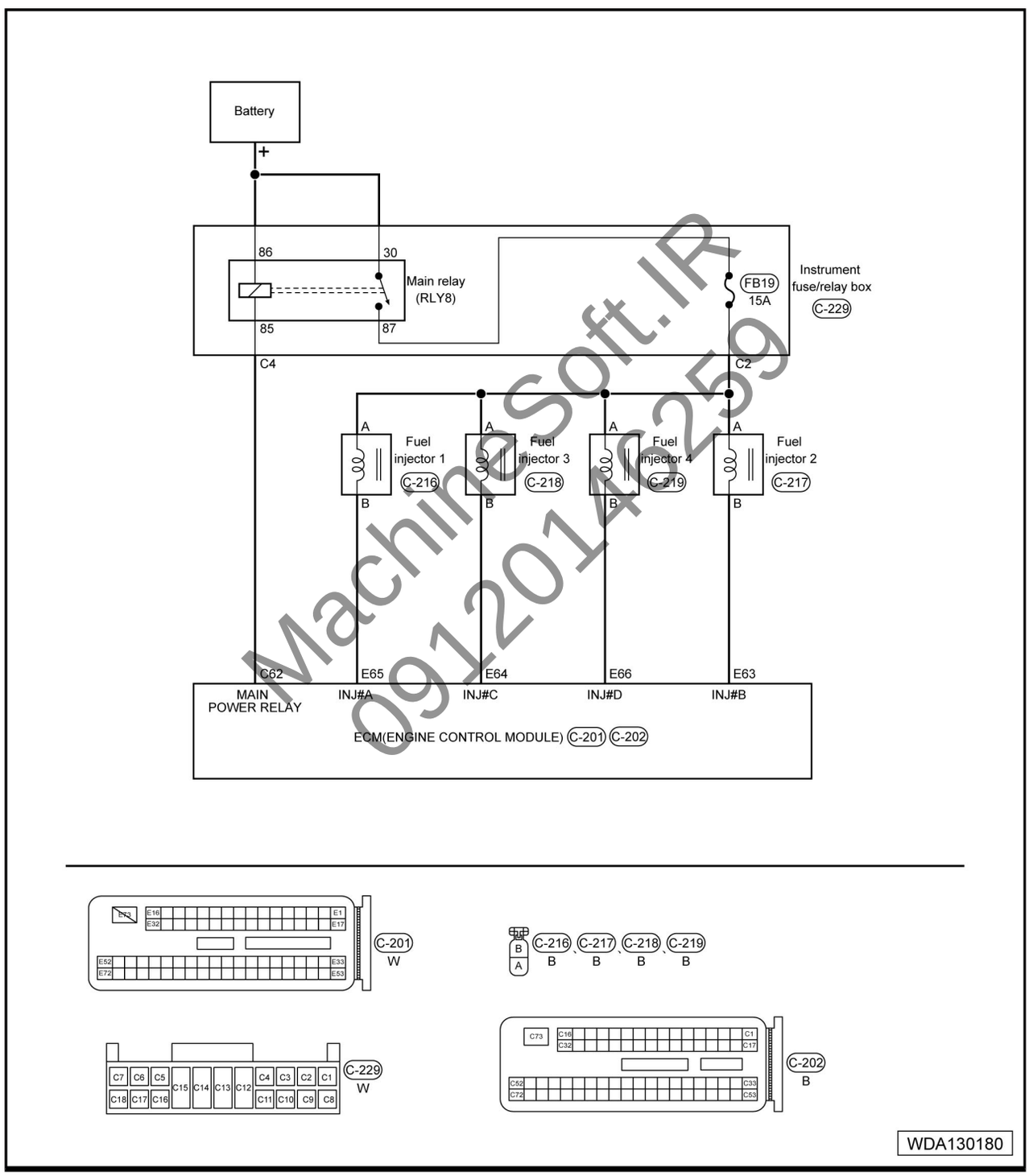


5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.9 P0261 Fuel injector 1 circuit low voltage

P0262 Fuel injector 1 circuit high voltage
P0264 Fuel injector 2 circuit low voltage
P0265 Fuel injector 2 circuit high voltage
P0267 Fuel injector 3 circuit low voltage
P0268 Fuel injector 3 circuit high voltage
P0270 Fuel injector 4 circuit low voltage
P0271 Fuel injector 4 circuit high voltage



Values between the ECM and the fuel injector

ECM pin No.	Function	Condition	Value (DC voltage range)
E63	Fuel injector 2	The ignition switch in the ON position	3.6 V
E64	Fuel injector 3	The ignition switch in the ON position	3.6 V
E65	Fuel injector 1	The ignition switch in the ON position	3.6 V
E66	Fuel injector 4	The ignition switch in the ON position	3.6 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0261	Fuel injector 1 circuit low voltage	Engine idle running	Fuel injector 1 control circuit grounded or open circuit	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module
P0262	Fuel injector 1 circuit high voltage	Engine idle running	Fuel injector 1 control circuit short to power	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module
P0264	Fuel injector 2 circuit low voltage	Engine idle running	Fuel injector 2 control circuit grounded or open circuit	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module
P0265	Fuel injector 2 circuit high voltage	Engine idle running	Fuel injector 2 control circuit short to power	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module
P0267	Fuel injector 3 circuit low voltage	Engine idle running	Fuel injector 3 control circuit grounded or open circuit	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0268	Fuel injector 3 circuit high voltage	Engine idle running	Fuel injector 3 control circuit short to power	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module
P0270	Fuel injector 4 circuit low voltage	Engine idle running	Fuel injector 4 control circuit grounded or open circuit	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module
P0271	Fuel injector 4 circuit high voltage	Engine idle running	Fuel injector 4 control circuit short to power	• Failure of the fuel injector • Failure of the fuel injector circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

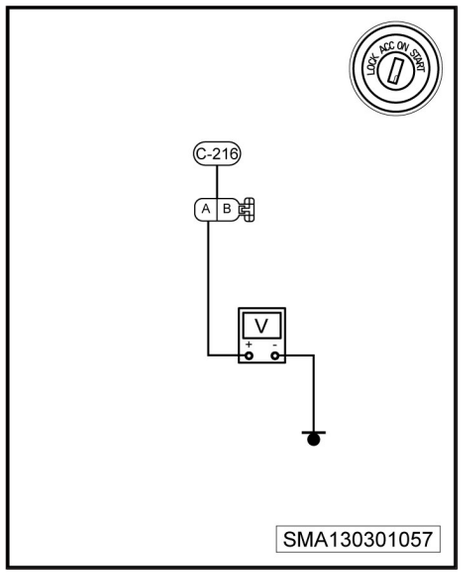
- Please verify again if the DTC and its symptoms are present after fault is rectified.
- The control principles and methods of the four cylinder fuel injectors are the same. The inspection of the fuel injector 1 is taken as an example here.

1. Check if the power supply fuse FB19 (15A) of the fuel injector is normal.

- If yes, go to step 2.
- If not, replace the fuse FB19. ■

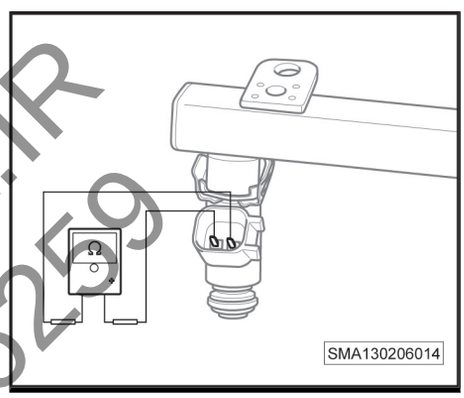
2. Turn the ignition switch to the ON position, disconnect the fuel injector connector C-216 and check if the voltage at the pin A of C-216 is battery voltage.

- If yes, go to step 3.
- If not, the lead between the fuse FB19 and the fuel injector connector C-216 fails and please repair the defective lead. ■



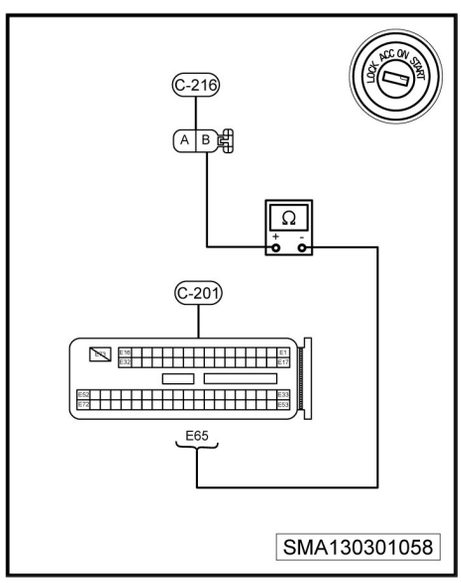
3. Disconnect the fuel injector connector C-216 and measure if the resistance value between two fuel injector pins is normal. The rated resistance is 11-16 Ω at 20℃.

- If yes, go to step 4.
- If not, the fuel injector fails and please replace it. ■



4. Disconnect the fuel injector connector C-216 and the ECM connector C-201 and check if the lead between the pin B of C-216 and the pin E65 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.10 P0300 Misfire of the single cylinder or multiple cylinders

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0300	Misfire of the single cylinder or multiple cylinders	Vehicle driving at a constant speed	ECM monitors that the fluctuation of the crankshaft rotation speed goes beyond the normal range.	• Failure of the ignition coil • Failure of the ignition cable • Failure of the spark plug • Failure of the fuel injector • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the air intake system leaks.

- If yes, rectify the fault. ■
- If not, go to step 2.

2. Check if the fuel injector is normal. (Please refer to the fault diagnosis content related to fuel injectors)

- If yes, go to step 3.
- If not, the fuel injector fails and please replace it. ■

3. Check if the spark plug and the ignition cable are normal.

- If yes, go to step 4.
- If not, the spark plug or the ignition cable fails and please replace the spark plug or the ignition cable. ■

4. Check if the ignition coil is normal. (Please refer to the fault diagnosis content related to ignition coils)

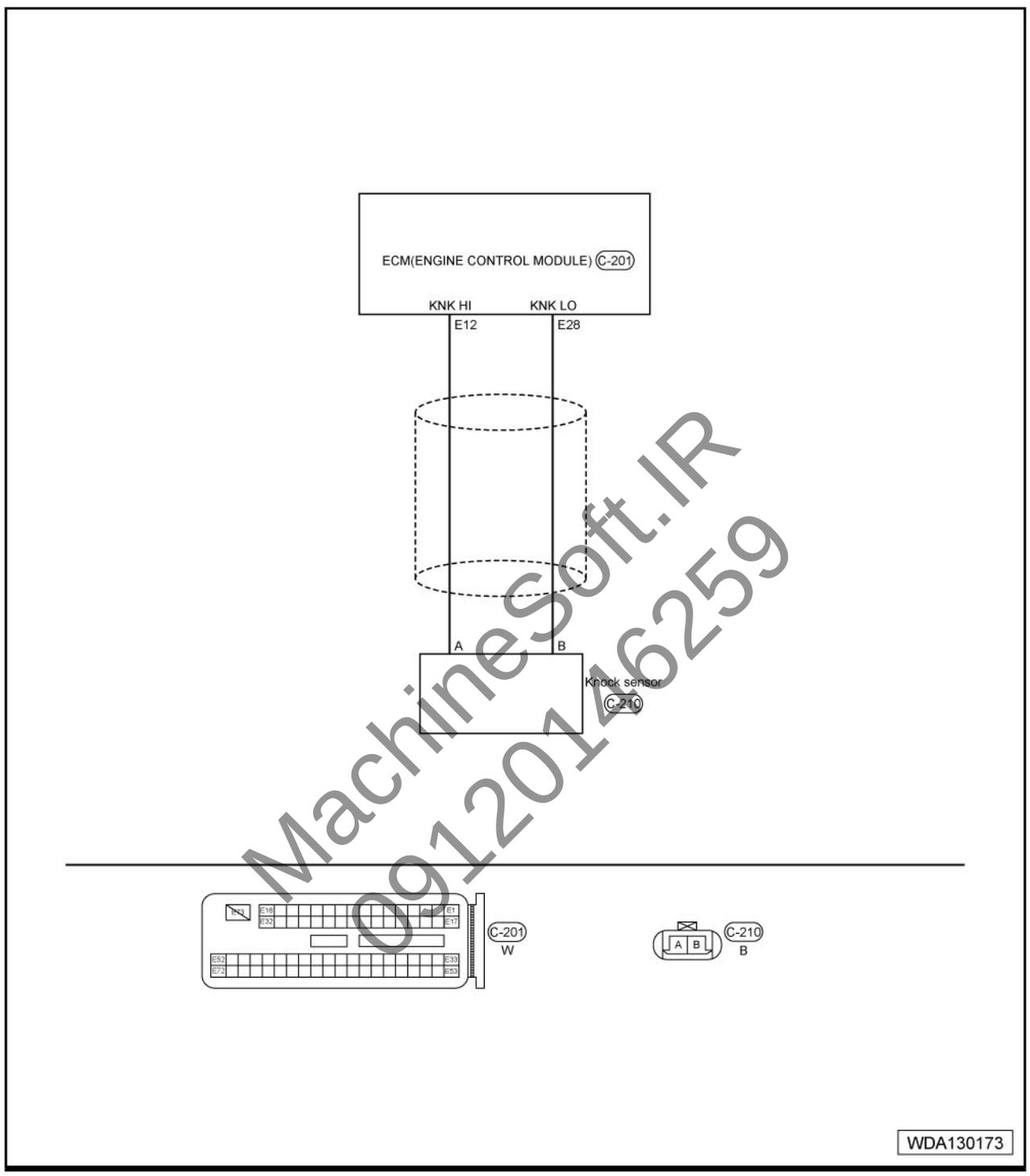
- If yes, go to step 5.
- If not, the ignition coil fails and please replace it. ■

5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.11 P0324 Failure of the knock control system

P0325 Failure of the knock sensor



Values between the ECM and the knock sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E12	Knock sensor signal	The ignition switch in the ON position	1.6 V
E28	Knock sensor signal	The ignition switch in the ON position	1.6 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0324	Failure of the knock control system	The engine reaches a speed of 1600 rpm and is subject to a certain load	A certain signal wire of the knock sensor open circuit	• Failure of the knock sensor • Failure of the knock sensor circuit • Failure of the engine control module
P0325	Failure of the knock sensor	The engine reaches a speed of 1600 rpm and is subject to a certain load	A certain signal wire of the knock sensor grounded	• Failure of the knock sensor • Failure of the knock sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

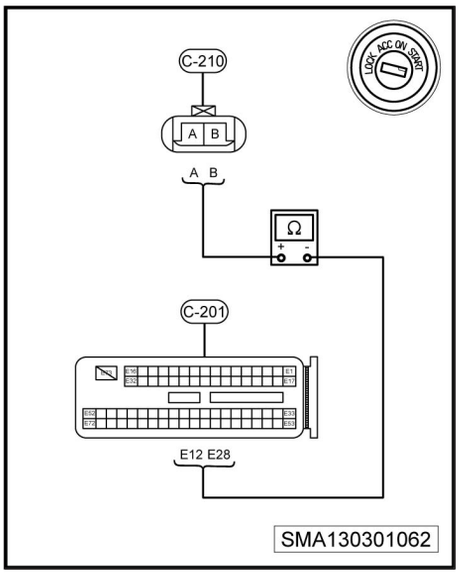
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the knock sensor connector is fixed in the right position.
   - If yes, go to step 2.
   - If not, re-position the knock sensor connector. ■

2. Check if the fixing bolt type and torque of the knock sensor are correct.
   - If yes, go to step 3.
   - If not, replace the bolts and tighten the knock sensor with the specified torque. ■

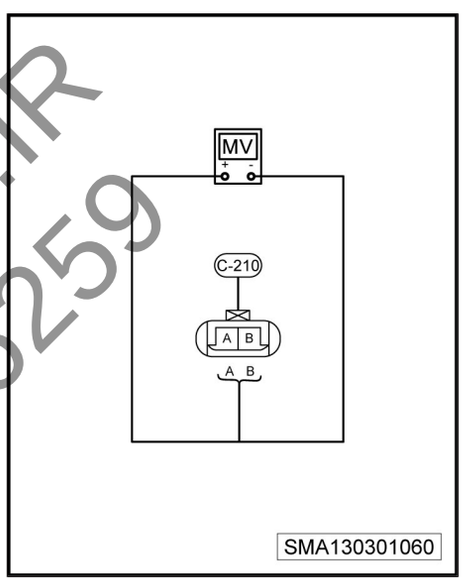
3. Disconnect the battery terminal, disconnect the ECM connector C-201 and the knock sensor connector C-210 and check if the leads between the pins E12, E20 of C-201 and the pins A, B of C-210 have short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



4. Disconnect the knock sensor connector, turn the multimeter to the "mv" position, connect the two probes of the multimeter to the two connectors of the knock sensor and knock the engine cylinder block with a rubber hammer (please note that do not damage the sensor). At this moment, there shall be voltage output in the knock sensor. Check if the sensor has a voltage output.

- If yes, go to step 5.
- If not, the knock sensor fails and please replace it. ■



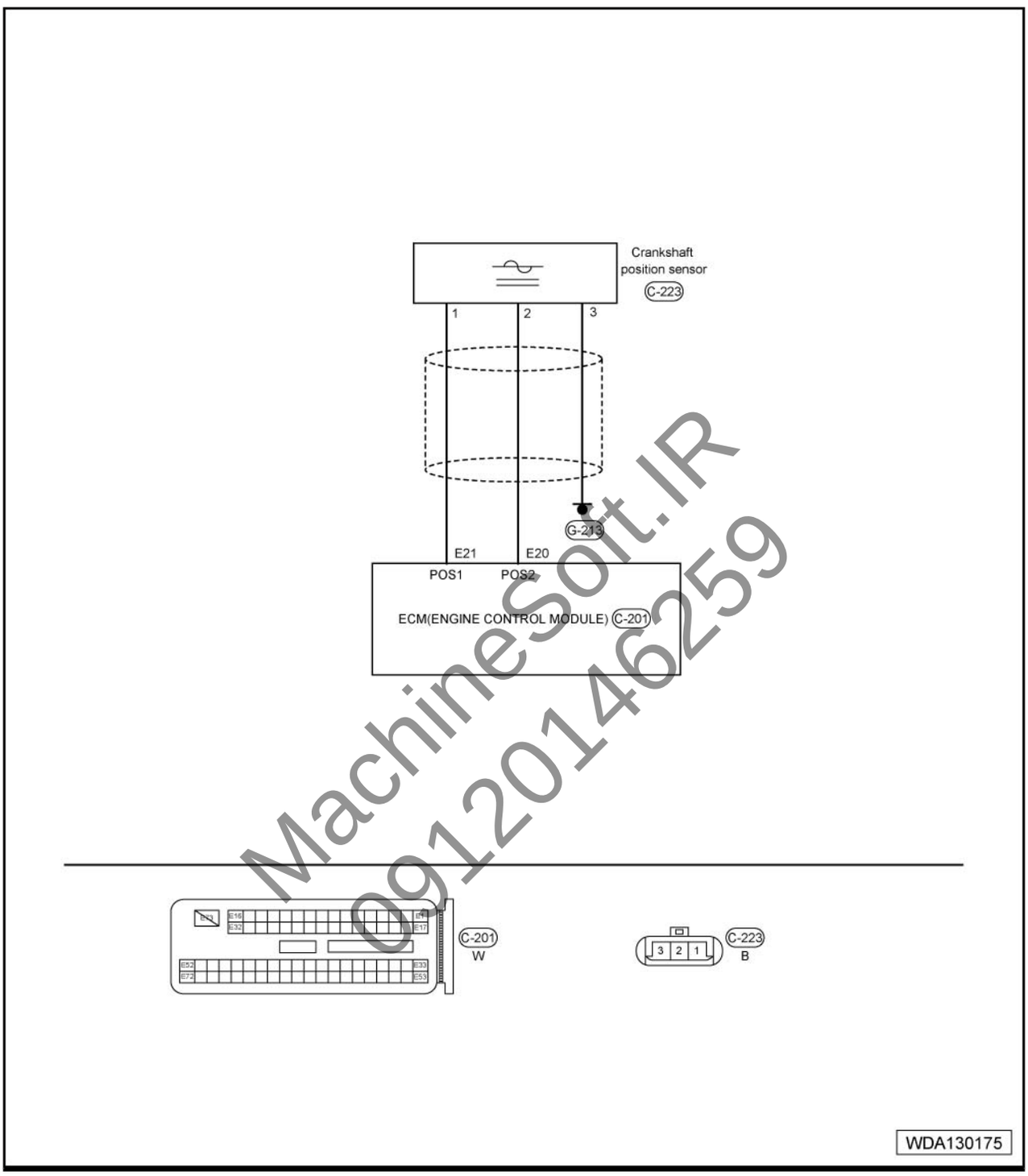
`

5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.12 P0335 No signal in the crankshaft position sensor circuit

P0336 Signal interference in the crankshaft position sensor circuit



Values between the ECM and the crankshaft position sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E20	Crankshaft position sensor signal	The ignition switch in the ON position	2.5 V
E21	Crankshaft position sensor signal	The ignition switch in the ON position	2.5 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0335	No signal in the crankshaft position sensor circuit	During engine start	The sensor short or open circuit	• Failure of the crankshaft position sensor • Failure of the crankshaft position sensor circuit • Failure of the engine control module
P0336	Signal interference in the crankshaft position sensor circuit	Engine running	10% failure rate of crankshaft rotations	• Failure of the crankshaft position sensor • Failure of the crankshaft position sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

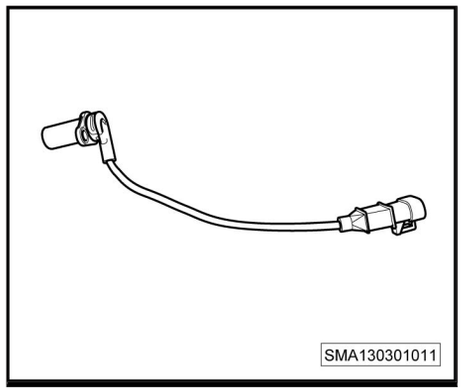
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

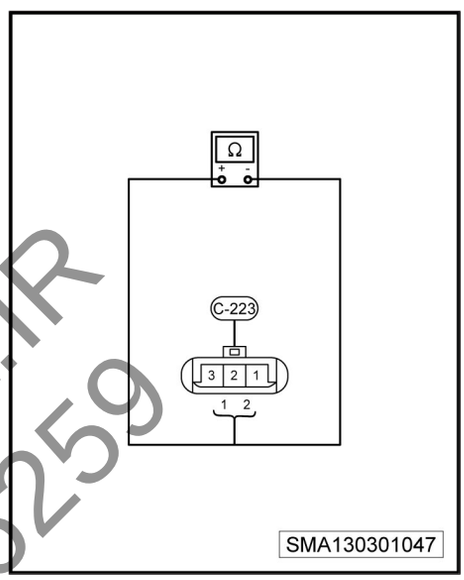
1. Remove the crankshaft position sensor and check if the crankshaft position sensor absorbs the iron chips or is damaged.

- If yes, the sensor fails and please replace or clean the crankshaft position sensor. ■
- If not, go to step 2.



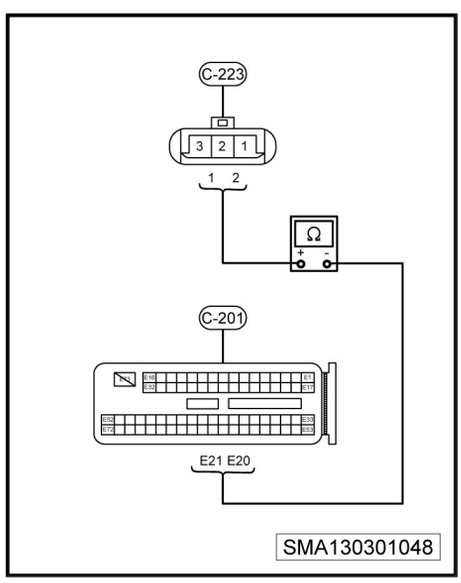
2. Disconnect the crankshaft position sensor connector C-223 and check if the resistance value between the pins 1 and 2 of C-223 is normal. (Coil resistance: 560 Ω±10%)

- If yes, go to step 3.
- If yes, the sensor fails and please replace the crankshaft position sensor. ■



3. Disconnect the battery terminal, disconnect the ECM connector C-201 and the crankshaft position sensor connector C-223 and check if the leads between the pins E21, E20 of C-201 and the pins 1, 2 of C-223 have short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



4. Disconnect the battery terminal, disconnect the crankshaft position sensor connector C-223 and check if the lead between the pin 3 of C-223 and the earth terminal G213 has short or open circuit.

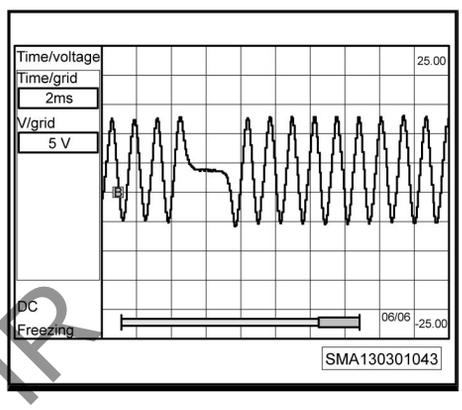
- If yes, repair the defective lead. ■
- If not, go to step 5.

5. Check if the clearance between the crankshaft signal gear ring on the flywheel and the crankshaft position sensor is normal (the clearance shall be 0.3～1.5 mm).

- If yes, go to step 6.
- If not, the flywheel gear ring or the transaxle housing fails and please replace or repair the flywheel gear ring or the transaxle housing. ■

6. Connect the wave analyzer and check if the waveform of the crankshaft position sensor is normal.

- If yes, go to step 7.
- If not, replace the crankshaft position sensor. ■

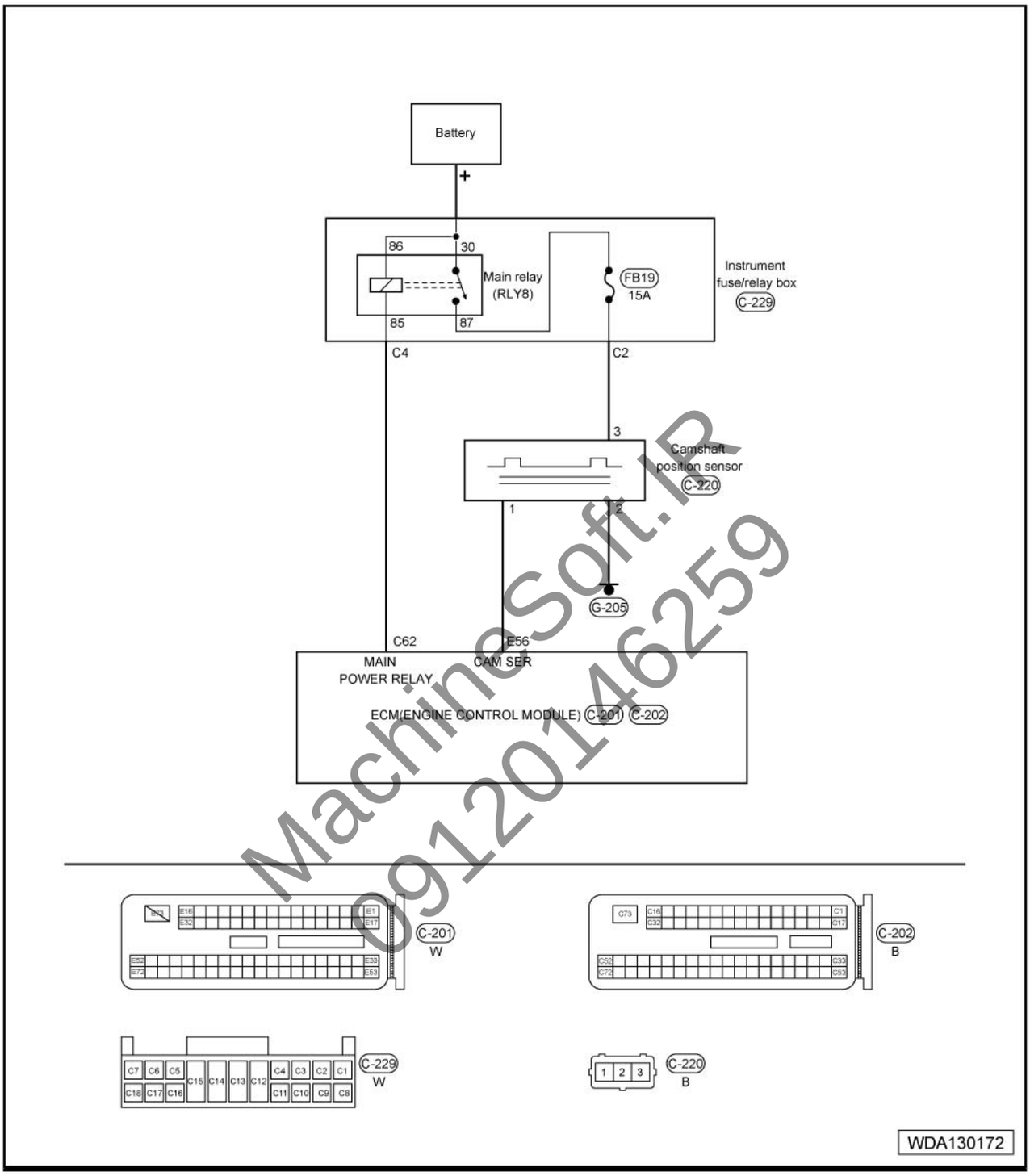


7. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.13 P0335 No signal in the camshaft position sensor circuit

P0336 Signal interference in the camshaft position sensor circuit



Values between the ECM and the camshaft position sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
E56	Camshaft position sensor signal	The ignition switch in the ON position	5 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0340	No signal in the camshaft position sensor circuit	Engine running	The sensor short or open circuit	• Failure of the camshaft position sensor • Failure of the camshaft position sensor circuit • Failure of the engine control module
P0341	Signal interference in the camshaft position sensor circuit	Engine running	The camshaft position sensor signal deviating from the system set range	• Failure of the camshaft position sensor • Failure of the camshaft position sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

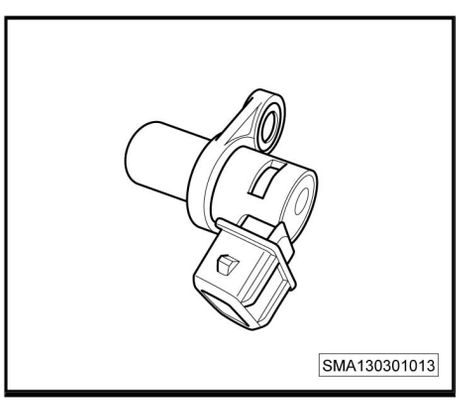
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Remove the camshaft position sensor and check if the camshaft position sensor has iron chips, oil sludge, carbon deposit and cracks.

- If yes, clean or replace the camshaft position sensor. ■
- If not, go to step 2.

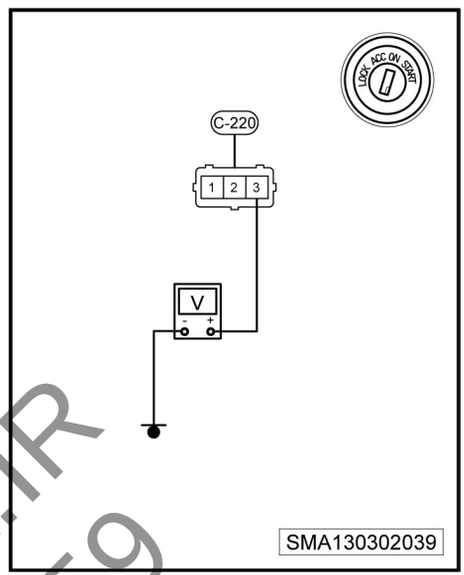


2. Check if the power supply fuse FB19 (15A) of the camshaft position sensor is normal.

- If yes, go to step 3.
- If not, the fuse fails and please replace the fuse FB19. ■

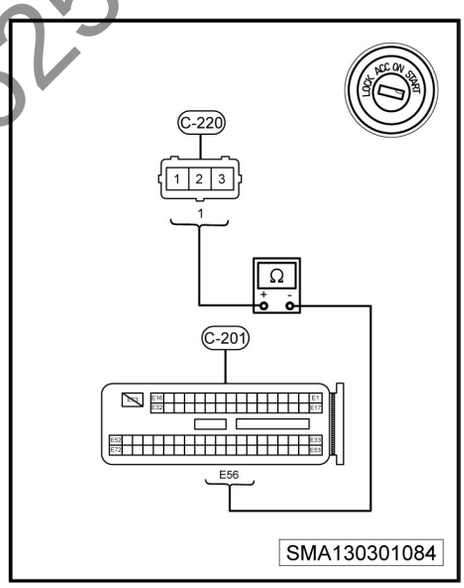
3. Turn the ignition switch to the ON position, disconnect the camshaft position sensor connector C-220 and check if the pin 3 of C-220 is battery voltage.

- If yes, go to step 4.
- If not, the lead between the fuse FB19 and the pin C of C-220 fails and please repair the defective lead. ■



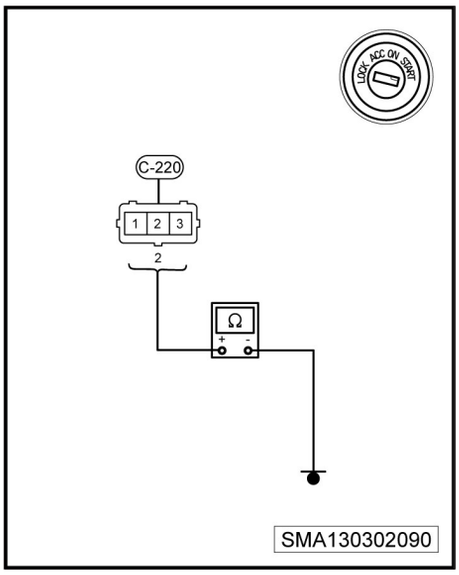
4. Disconnect the battery terminal, disconnect the ECM connector C-201 and the camshaft position sensor connector C-220 and check if the lead between the pin E56 of C-201 and the pin 1 of C-220 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



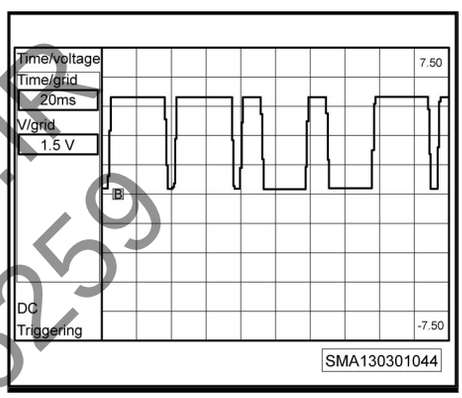
5. Disconnect the battery terminal, disconnect the camshaft position sensor connector C-220 and check if the lead between the pin 2 of C-220 and the earth terminal has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.



6. Connect the oscilloscope and check if the waveform of the camshaft position sensor is normal.

- If yes, go to step 7.
- If not, the camshaft position sensor fails and please replace it. ■

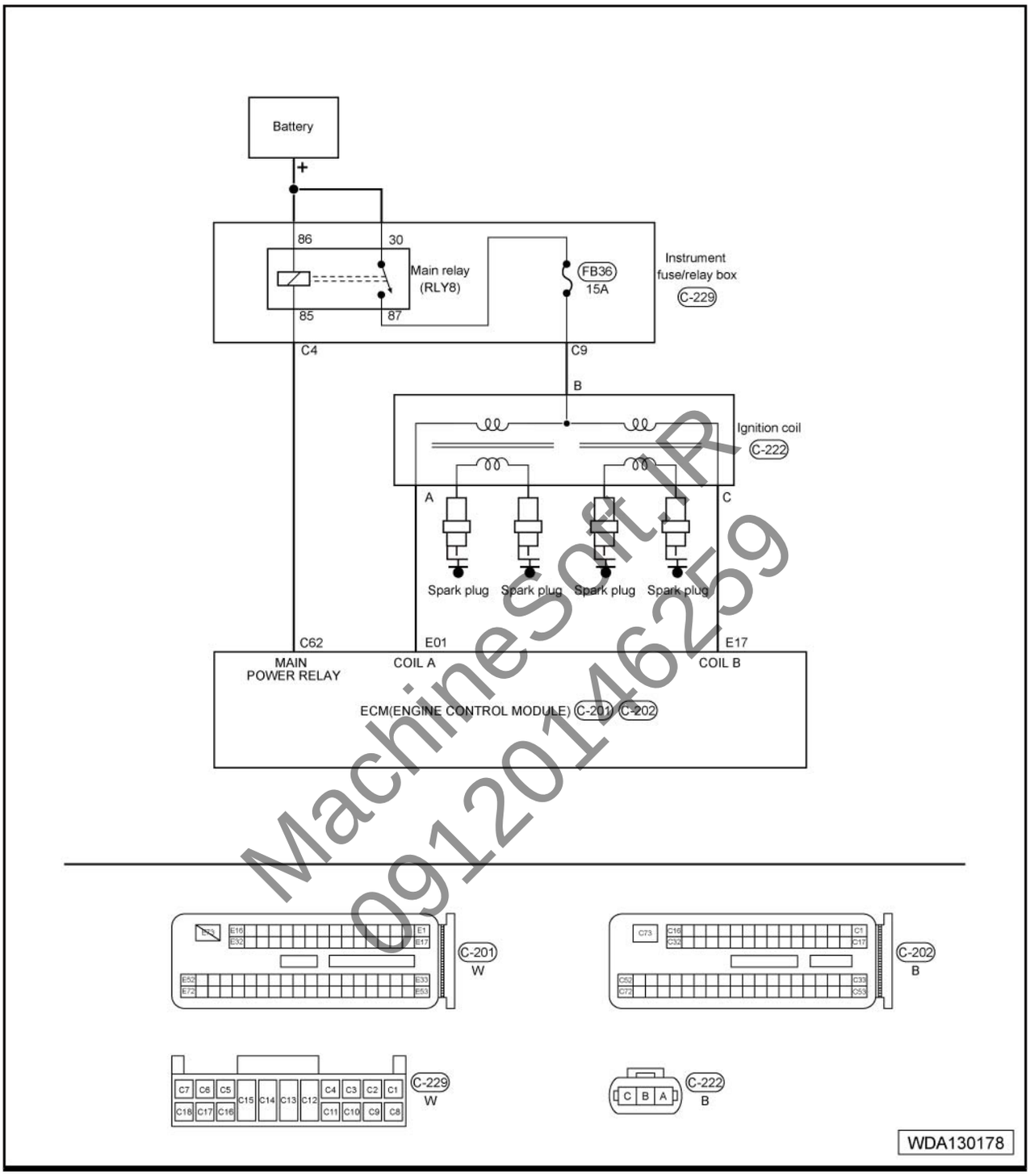


7. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.14 P0351 Failure of the ignition coil 1

P0352 Failure of the ignition coil 2



Values between the ECM and the ignition coils

ECM pin No.	Function	Condition	Value (DC voltage range)
E1	Ignition coil control	The ignition switch in the ON position	3.6 V
E17	Ignition coil control	The ignition switch in the ON position	3.6 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0351	Failure of the ignition coil 1	Engine idle running	The ignition coil control circuit open circuit or short to ground or short to power	• Failure of the ignition coil • Failure of the ignition coil circuit • Failure of the engine control module
P0352	Failure of the ignition coil 2	Engine idle running	The ignition coil control circuit open circuit or short to ground or short to power	• Failure of the ignition coil • Failure of the ignition coil circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

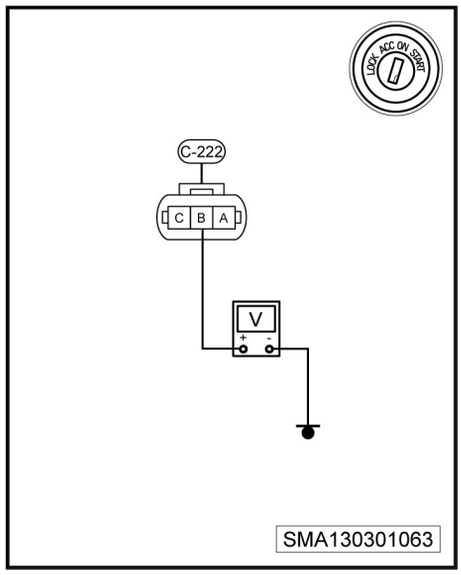
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power supply fuse FB36 (15A) of the ignition coil is normal.

- If yes, go to step 2.
- If not, the fuse fails and please replace the fuse FB36. ■

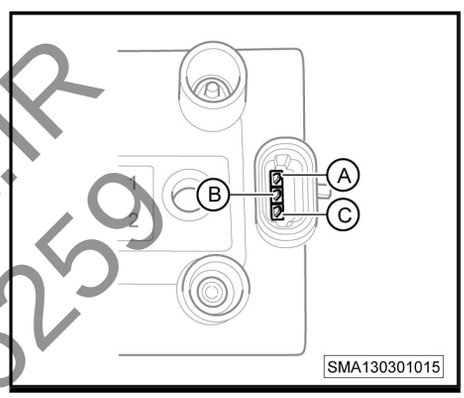
2. Disconnect the ignition coil connector C-222 and check if the pin B of C-222 is battery voltage.

- If not, go to step 3.
- If not, the lead between the fuse FB36 and the pin B of C-222 fails and please repair the defective lead. ■



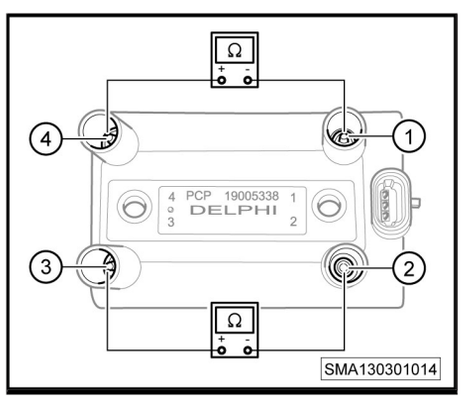
3. Disconnect the ignition coil connector C-222 and measure if the resistance value between the ignition coil primary coils A and B or the ignition coil primary coils B and C is normal. (The resistance value of the primary coils shall be 0.45～0.55 Ω)

- If yes, the ignition coil fails and please replace it. ■
- If not, go to step 4.



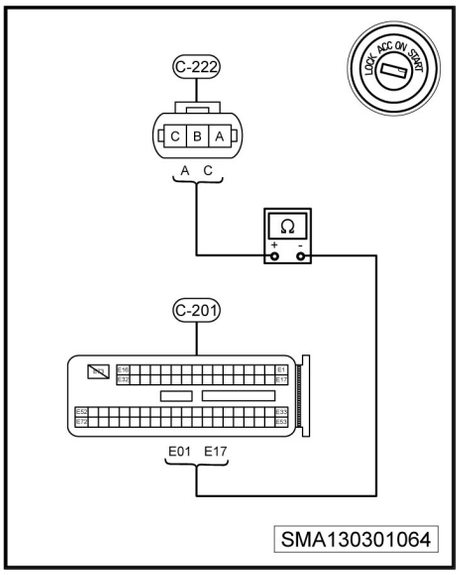
4. Disconnect the ignition coil connector C-222, pull out the ignition cable and measure if the resistance value between the ignition coil secondary coils 1 and 4 or the ignition coil secondary coils 2 and 3 is normal. (The resistance value of the secondary coils shall be 8.8～10.8KΩ)

- If yes, go to step 5.
- If not, the ignition coil fails and please replace it. ■



5. Disconnect the ignition coil connector C-222 and the ECM connector C-201 and check if the leads between the pins A and C of C-222 and the pins E1 and E17 of C-201 have short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.

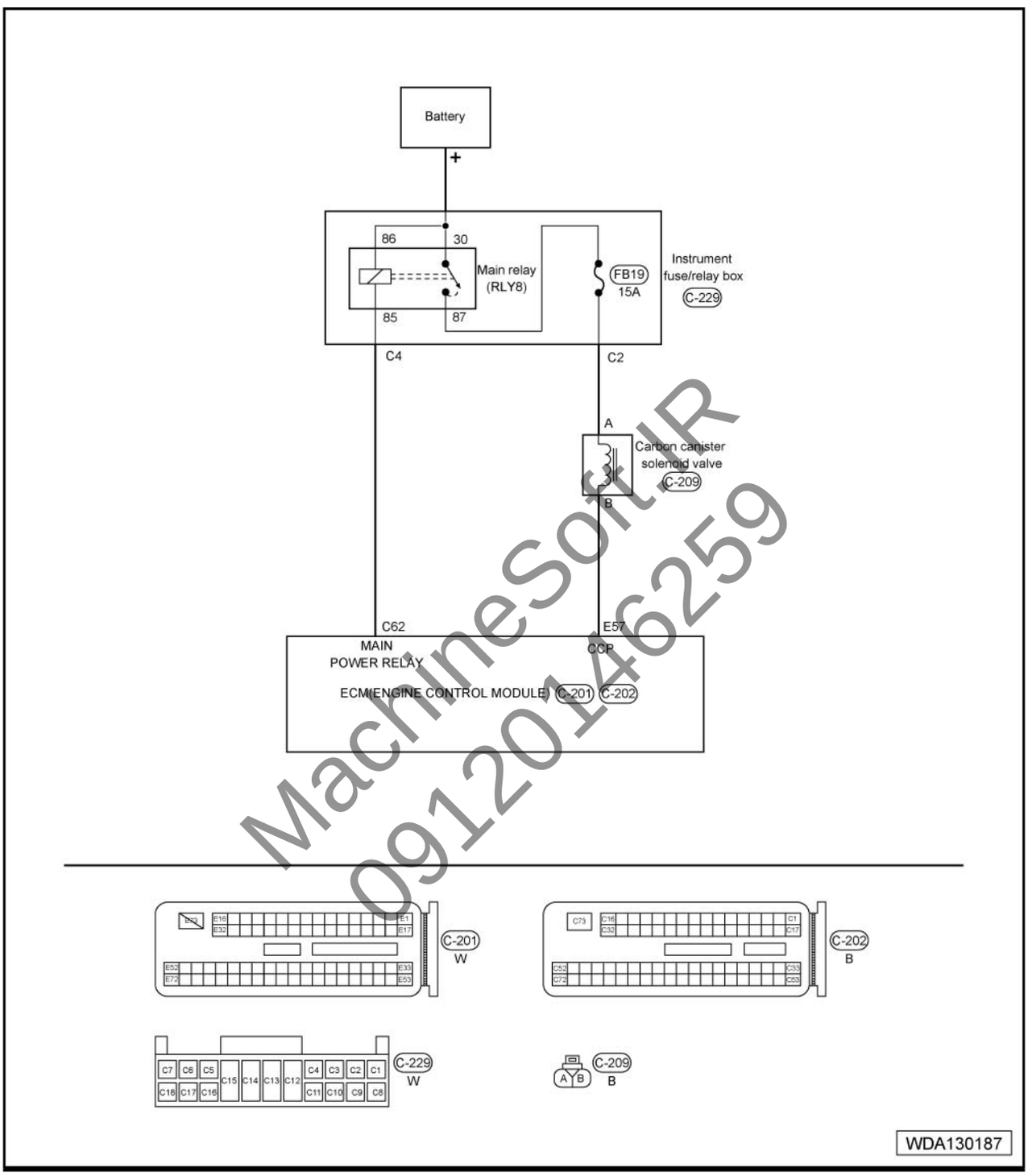


6. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.15 P0458 Carbon canister solenoid valve circuit short to low voltage or open circuit

P0459 Carbon canister solenoid valve circuit short to high voltage



Values between the ECM and the carbon canister solenoid valve

ECM pin No.	Function	Condition	Value (DC voltage range)
E57	Carbon canister solenoid valve control wire	The ignition switch in the ON position	3.6 V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0458	Carbon canister solenoid valve circuit short to low voltage or open circuit	Engine idle running	Carbon canister solenoid valve control terminal grounded or open circuit when the solenoid valve does not work	• Failure of the carbon canister solenoid valve • Failure of the carbon canister solenoid valve circuit • Failure of the engine control module
P0459	Carbon canister solenoid valve circuit short to high voltage	Engine idle running	Carbon canister solenoid valve control terminal short to power when the solenoid valve works	• Failure of the carbon canister solenoid valve • Failure of the carbon canister solenoid valve circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

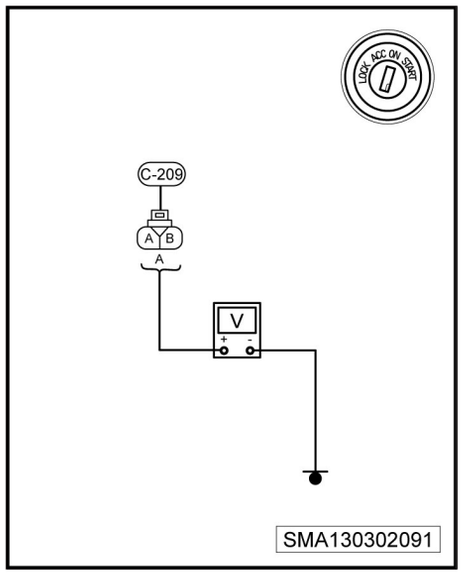
Diagnosis procedures:

Note

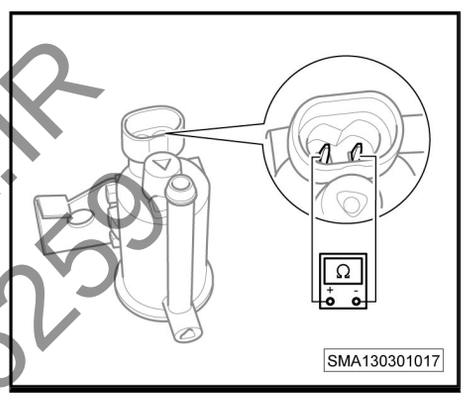
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power supply fuse FB19 (15A) of the carbon canister solenoid valve is normal.
   - If yes, go to step 2.
   - If not, the fuse fails and please replace the fuse FB19. ■

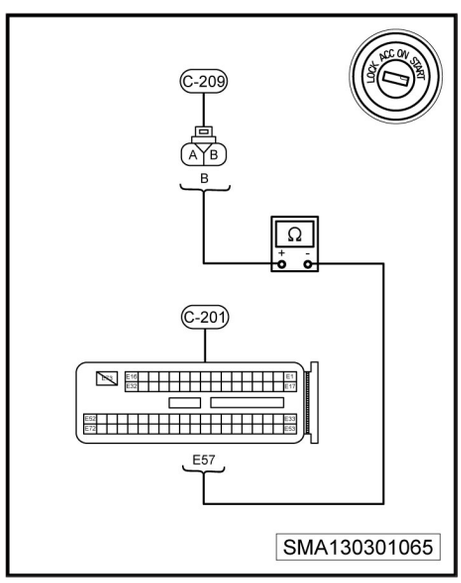
2. Disconnect the carbon canister solenoid valve connector C-209 and check if the pin A of C-209 is battery voltage.
   - If yes, go to step 3.
   - If not, the lead between the fuse FB36 and the pin A of C-209 fails and please repair the defective lead. ■



3. Disconnect the carbon canister solenoid valve connector C-209 and measure if the resistance value of the carbon canister solenoid valve coil is normal. (The resistance value of the carbon canister solenoid valve coil shall be 19～22 Ω).
   - If yes, go to step 4.
   - If not, the carbon canister solenoid valve fails and please replace it. ■

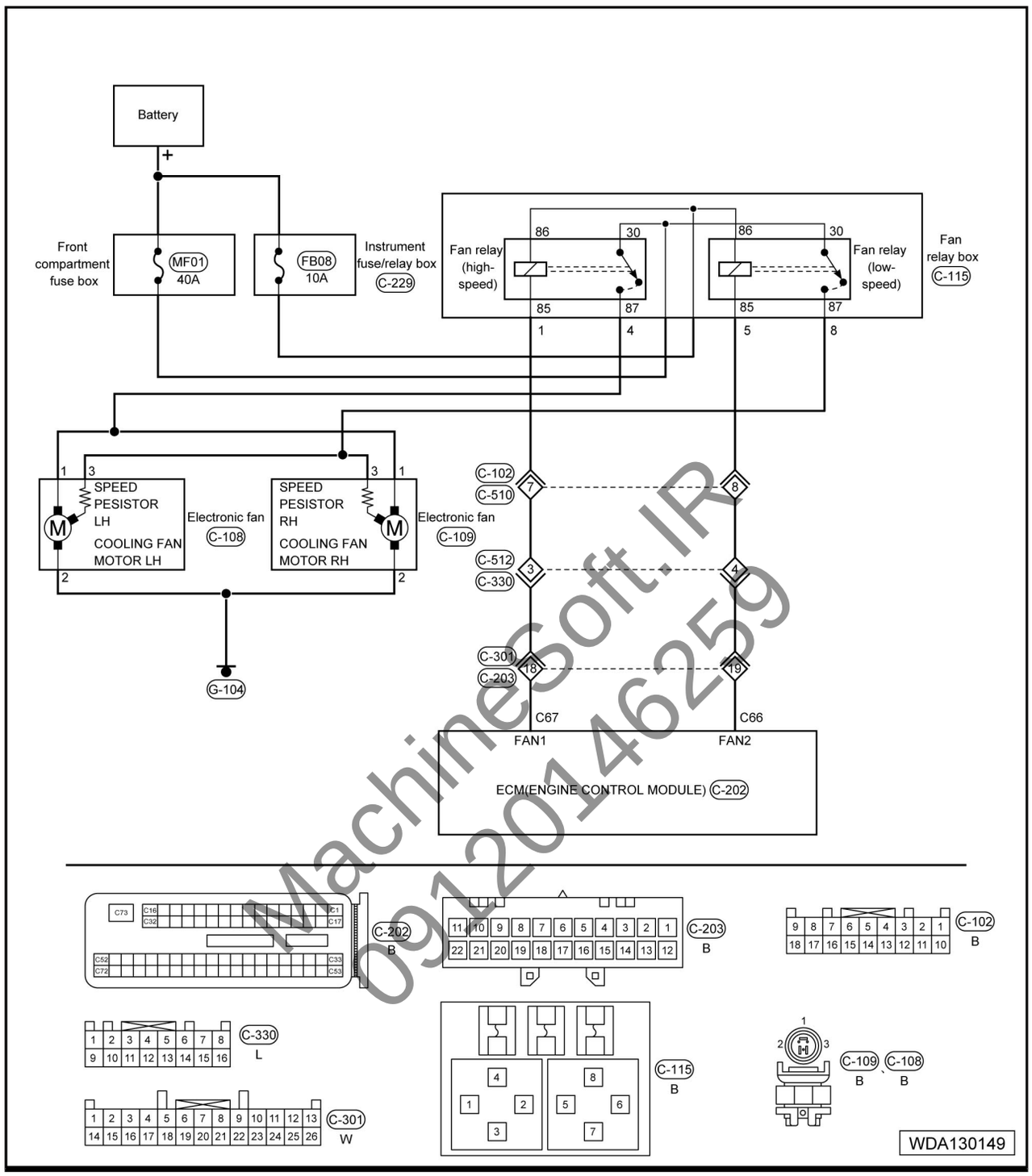


4. Disconnect the carbon canister solenoid valve connector C-209 and the ECM connector C-201 and check if the lead between the pin B of C-209 and the pin E57 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 6.



5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

2.6.16 P0480 Failure of the low speed cooling fan



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0480	Failure of the low speed cooling fan	Engine idle running when the cooling fan is working	The low speed cooling fan control terminal short to power	• Failure of the low speed cooling fan relay • Failure of the low speed cooling fan relay circuit

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

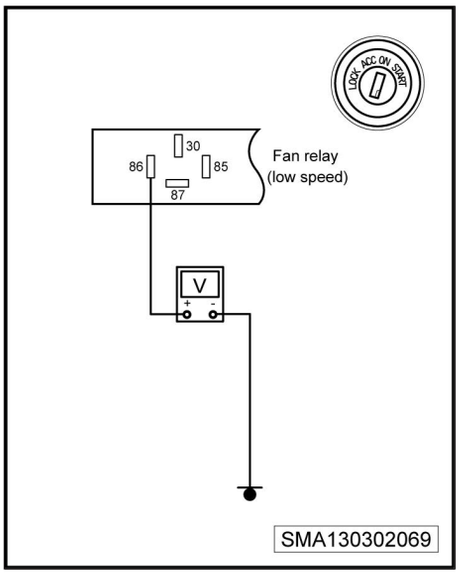
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the fuses FB08 (15A) and MFO1 (40A) of the cooling fan are normal.
   - If yes, go to step 2.
   - If not, the fuse fails and please replace the fuse FB08 or MFO1. ■

2. Pull out the low speed cooling fan relay and check if the resistance value of the relay coil is normal. Lever out the relay housing and check if the closed contact is normal.
   - If yes, go to step 3.
   - If not, the low speed cooling fan relay fails and please replace it. ■

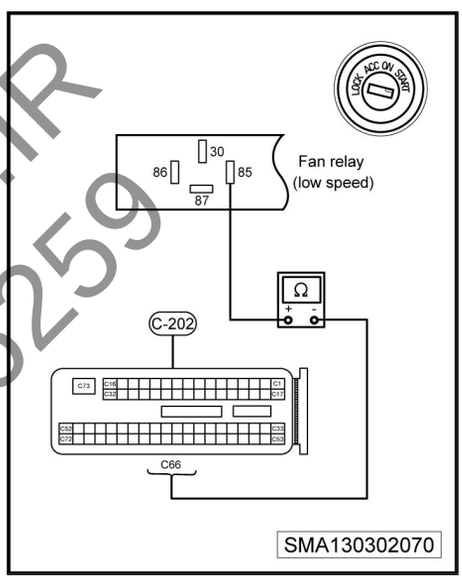
3. Pull out the low speed cooling fan relay and check if the voltage of its pin 86 is battery voltage.

- If yes, go to step 4.
- If not, the lead between the fuse FB08 and the pin 86 of the low speed cooling fan relay fails and please repair the defective lead. ■



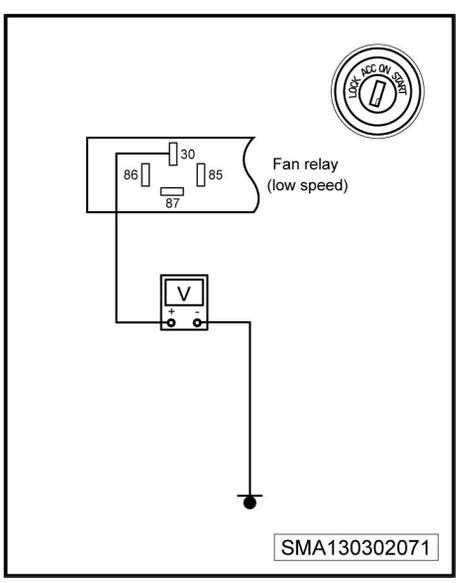
4. Pull out the low speed cooling fan relay, disconnect the ECM connector C-202 and check if the lead between the pin 85 of the low speed cooling fan relay and the pin C66 of C-202 has short or open circuit.

- If yes, the lead between the pin 85 of the low speed cooling fan relay and the pin C66 of C-202 fails and please repair the defective lead. ■
- If not, go to step 5.

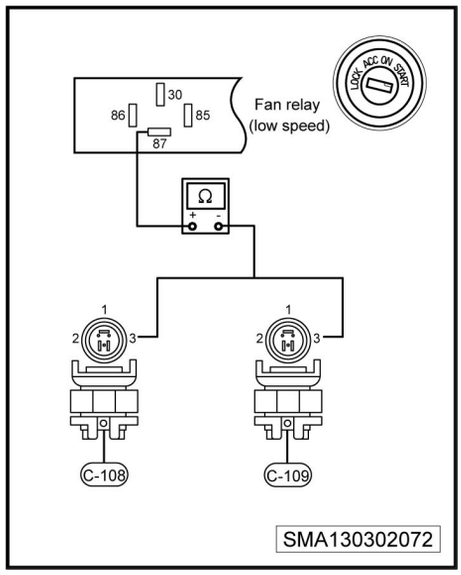


5. Pull out the low speed cooling fan relay and check if the voltage of its pin 30 is battery voltage.

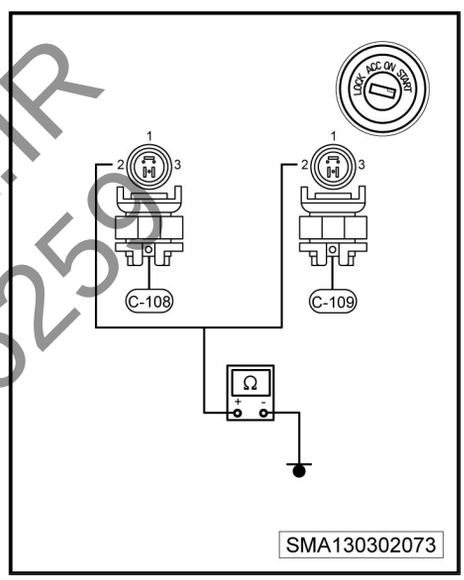
- If yes, go to step 6.
- If not, the lead between the fuse MFO1 and the pin 30 of the low speed cooling fan relay fails and please repair the defective lead. ■



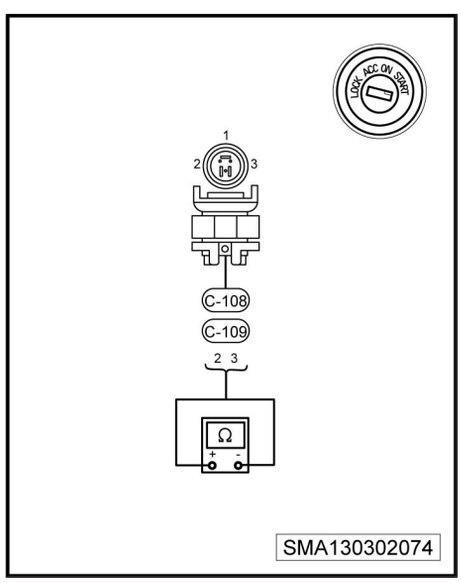
6. Pull out the low speed cooling fan relay, disconnect the cooling fan connectors C-108 and C-109, and check if the lead between the pin 87 of the low speed cooling fan relay and the pins 3 of C-108 and 3 of C-109 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 7.



7. Disconnect the cooling fan connectors C-108 and C-109 and check if the lead between the pins 2 of C-108 and 2 of C-109 and the earth terminal has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 8.



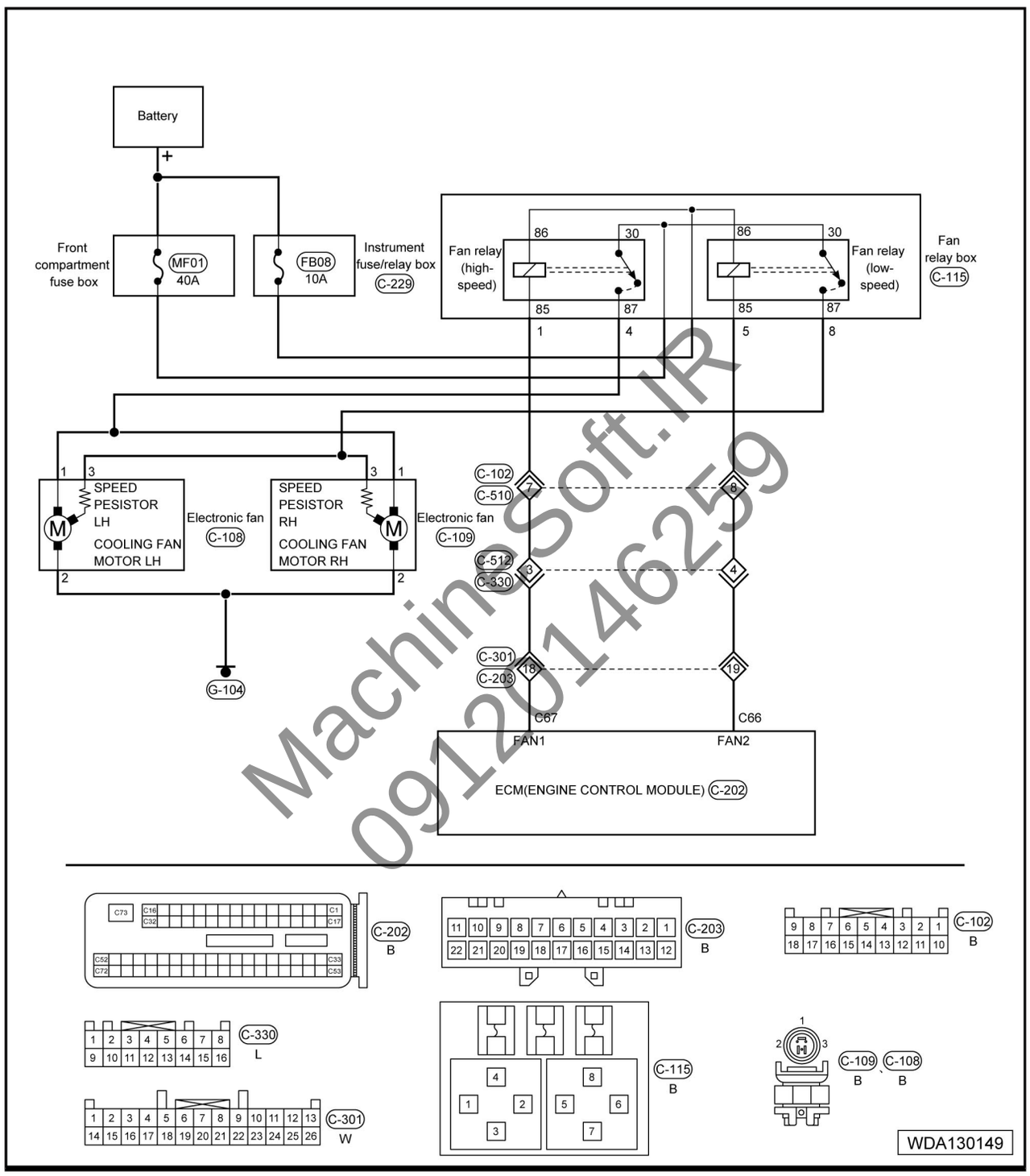
8. Disconnect the cooling fan connectors C-108 and C-109 and check if the resistance value between the pins 2 and 3 of C-108 or the pins 2 and 3 of C-109 is normal. (The measured value is about 0.8 Ω)
   - If yes, go to step 9.
   - If not, the cooling fan motor fails and please replace the cooling fan. ■



9. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.17 P0481 Failure of the high speed cooling fan



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0480	Failure of the high speed cooling fan	Engine idle running with the cooling fan working	The high speed cooling fan control terminal short to power	• Failure of the cooling fan high speed relay • Failure of the cooling fan high speed relay control circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach the cooling fan starting temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the cooling fan fuses FB08 (15A) and MFO1 (40A) are normal.

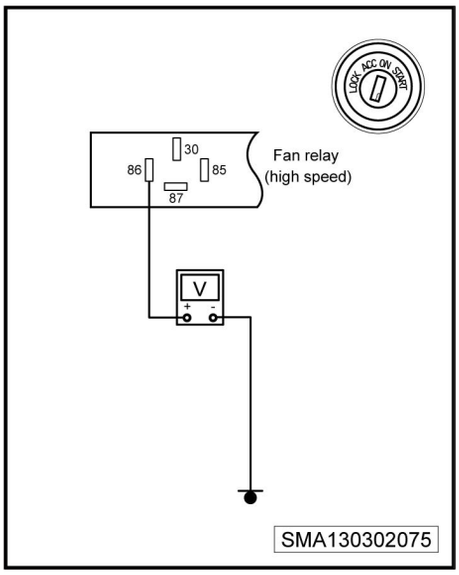
- If yes, go to step 2.
- If not, the fuse fails and replace the fuse FB08 or MFO1. ■

2. Pull out the high speed cooling fan relay to measure if the resistance value of the relay coil is normal. Lever out the relay housing to check if the contact switch is normal.

- If yes, go to step 3.
- If not, the high speed cooling fan relay fails and please replace it. ■

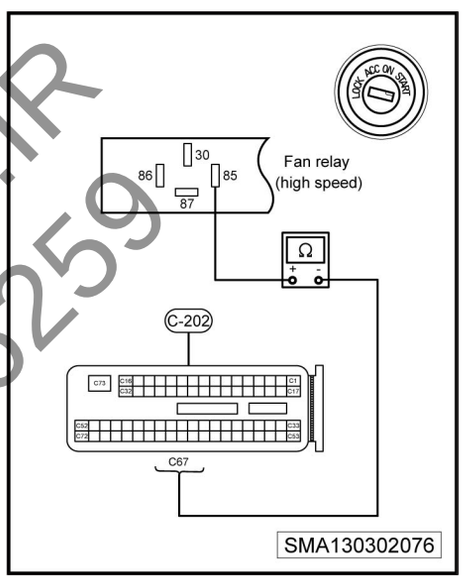
3. Pull out the high speed cooling fan relay to check if the voltage of its pin 86 is battery voltage.

- If yes, go to step 4.
- If not, the lead between the fuse FB08 and the high speed cooling fan relay pin 86 fails and please repair the defective lead. ■



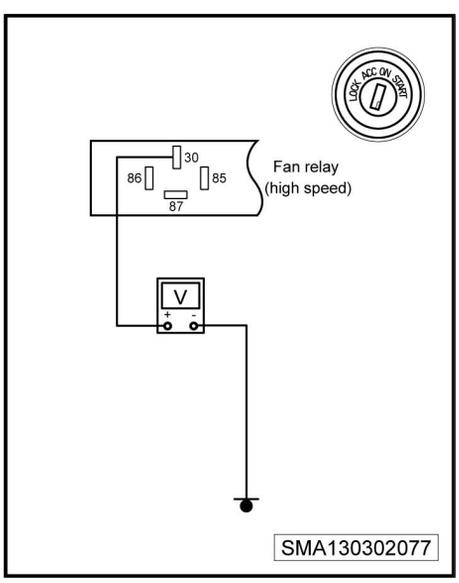
4. Pull out the high speed cooling fan relay, disconnect the ECM connector C-202 and check if the circuit between the pin 85 of the high speed cooling fan relay and the pin C67 of C-202 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.

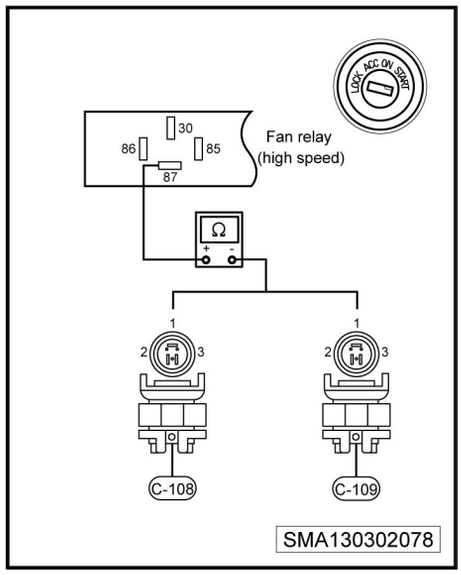


5. Pull out the high speed cooling fan relay to check if the voltage of its pin 30 is battery voltage.

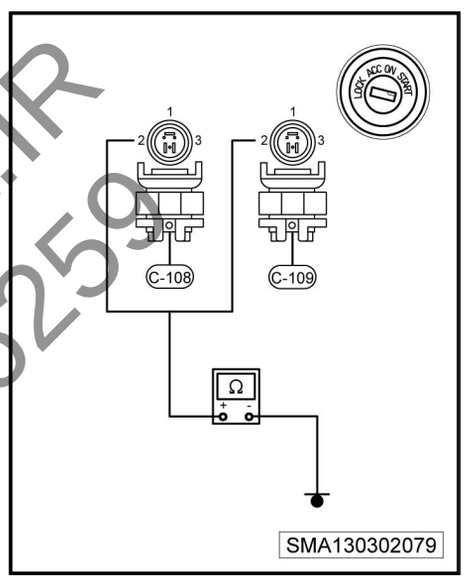
- If yes, go to step 6.
- If not, the lead between the fuse MFO1 and the high speed cooling fan relay pin 30 fails and please repair the defective lead. ■



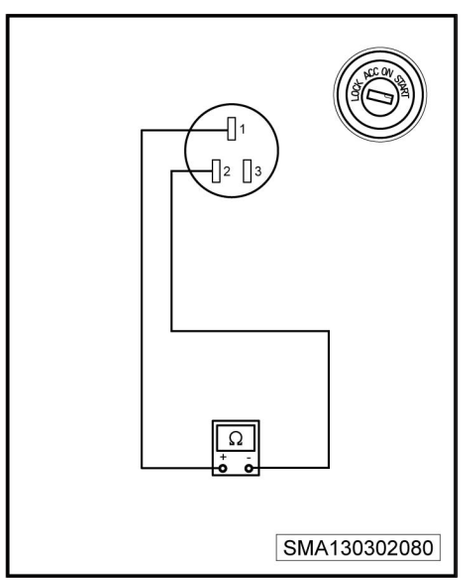
6. Pull out the high speed cooling fan relay, disconnect the cooling fan connectors C-108 and C-109, and check if the circuit between the pin 87 of the high speed cooling fan relay and the pins 1 of C-108 and 1 of C-109 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 7.



7. Disconnect the cooling fan connectors C-108 and C-109, and check if the lead between the earth terminal and the pins 2 of C-108 and 2 of C-109 is normal.
   - If yes, repair the defective lead. ■
   - If not, go to step 8.



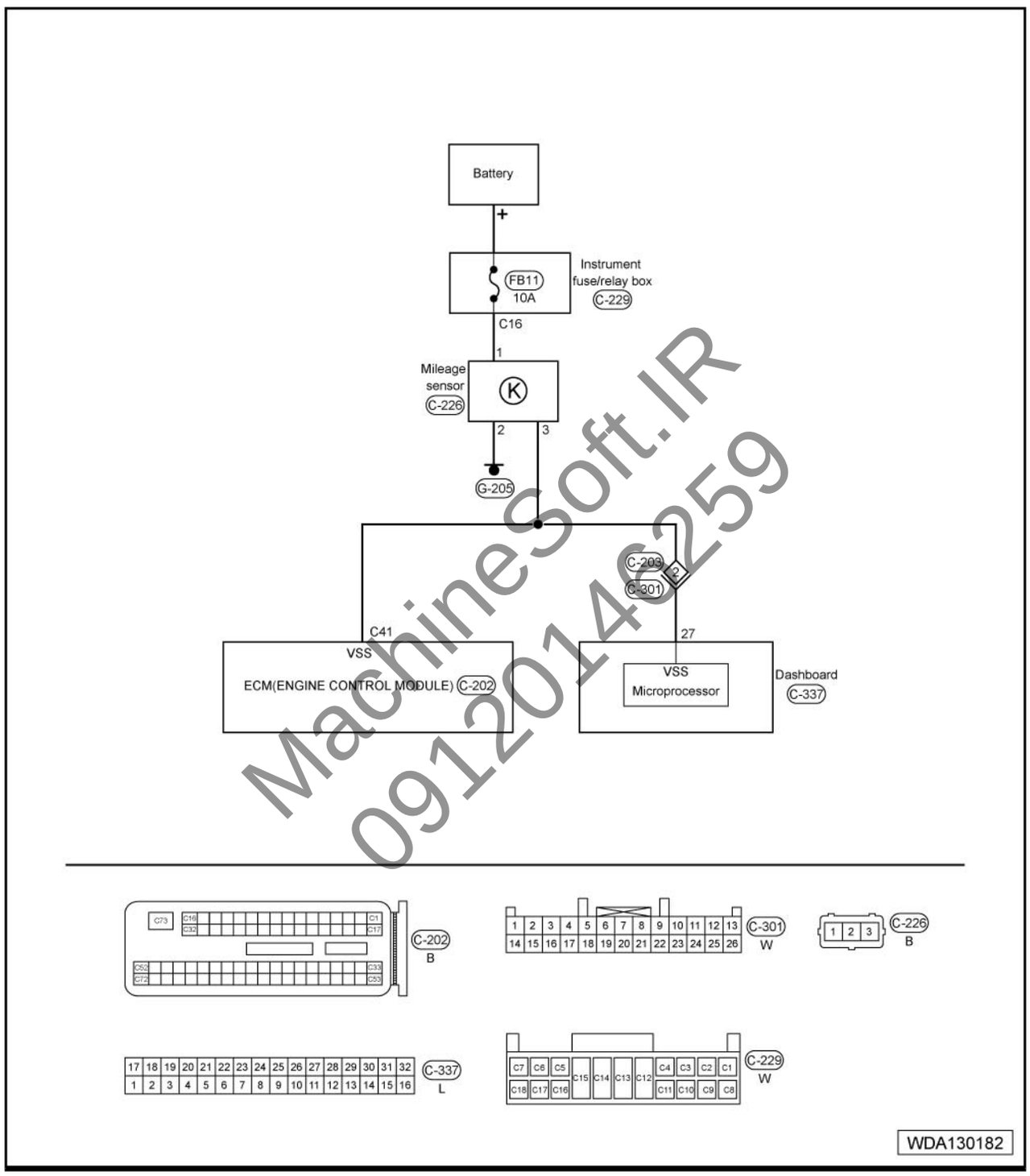
8. Disconnect the cooling fan connectors C-108 and C-109, and check if the resistance values between the pins 2 and 1 of C-108, and between the pins 2 and 1 of C-109 are normal.
   - If yes, go to step 9.
   - If not, the cooling fan fails and please repair it. ■



9. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.18 P0502 No signal in the vehicle speed sensor



Value between the ECM and the vehicle speed sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
C41	Vehicle speed sensor signal	The ignition switch in the ON position	10.7V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0502	No signal in the vehicle speed sensor	The vehicle in hot state and driven at 3rd gear	Cut off the speed sensor signal, press the accelerator pedal hard to accelerate above 4000 rpm and release immediately, then the engine speed, vehicle speed and MAP value will decrease	• Failure of the vehicle speed sensor • Failure of the vehicle speed sensor circuit • Failure of the engine control module
		The vehicle in hot state and driven at 4th gear	Cut off the speed sensor signal and press the accelerator pedal at moderate speed, then the engine speed, vehicle speed and MAP value will decrease	

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach the cooling fan high speed operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

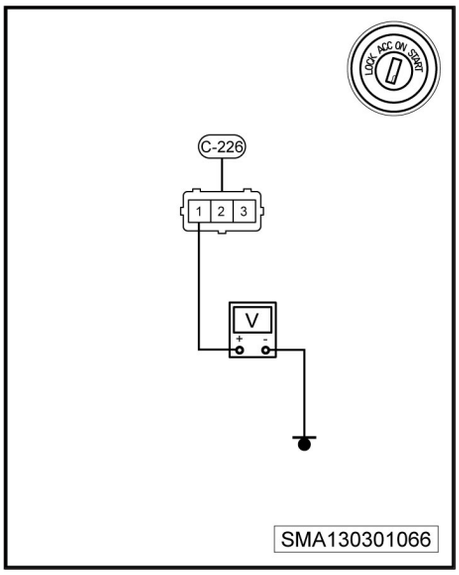
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power supply fuse FB11 (10A) of the vehicle speed sensor is normal.
   - If yes, go to step 2.
   - If not, the fuse fails and please replace the fuse FB11. ■

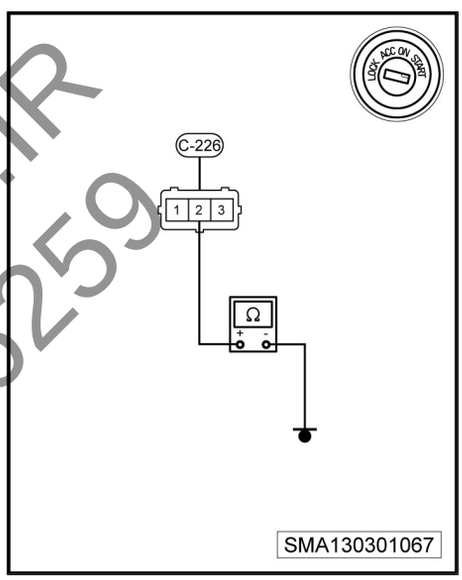
2. Turn the ignition switch to the ON position, disconnect the vehicle speed sensor connector C-226 and check if the voltage at the pin 1 of C-226 is battery voltage.

- If yes, go to step 3.
- If not, the lead between the fuse FB11 and the pin 1 of C-226 fails and please repair the defective lead. ■



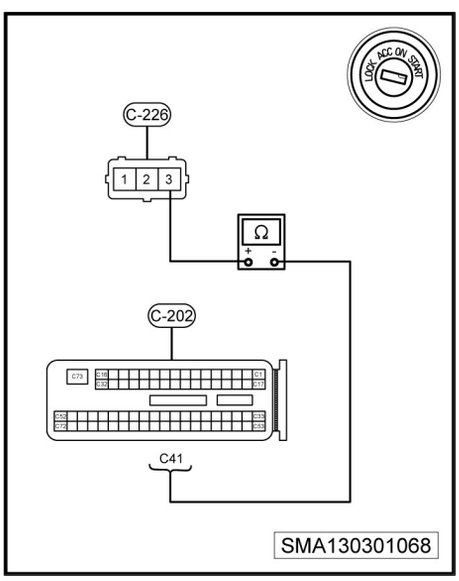
3. Disconnect the vehicle speed sensor connector C-226 and check if the lead between the pin 2 of C-226 and the earth terminal has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



4. Disconnect the vehicle speed sensor connector C-226 and the ECM connector C-202, and check if the lead between the pin 3 of C-226 and the pin C41 of C-202 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Remove the vehicle speed sensor, connect its connector and rotate the signal wheel of the speed sensor manually to check if the signal voltage at the

pin 3 of C-226 varies with the speed of the signal wheel.

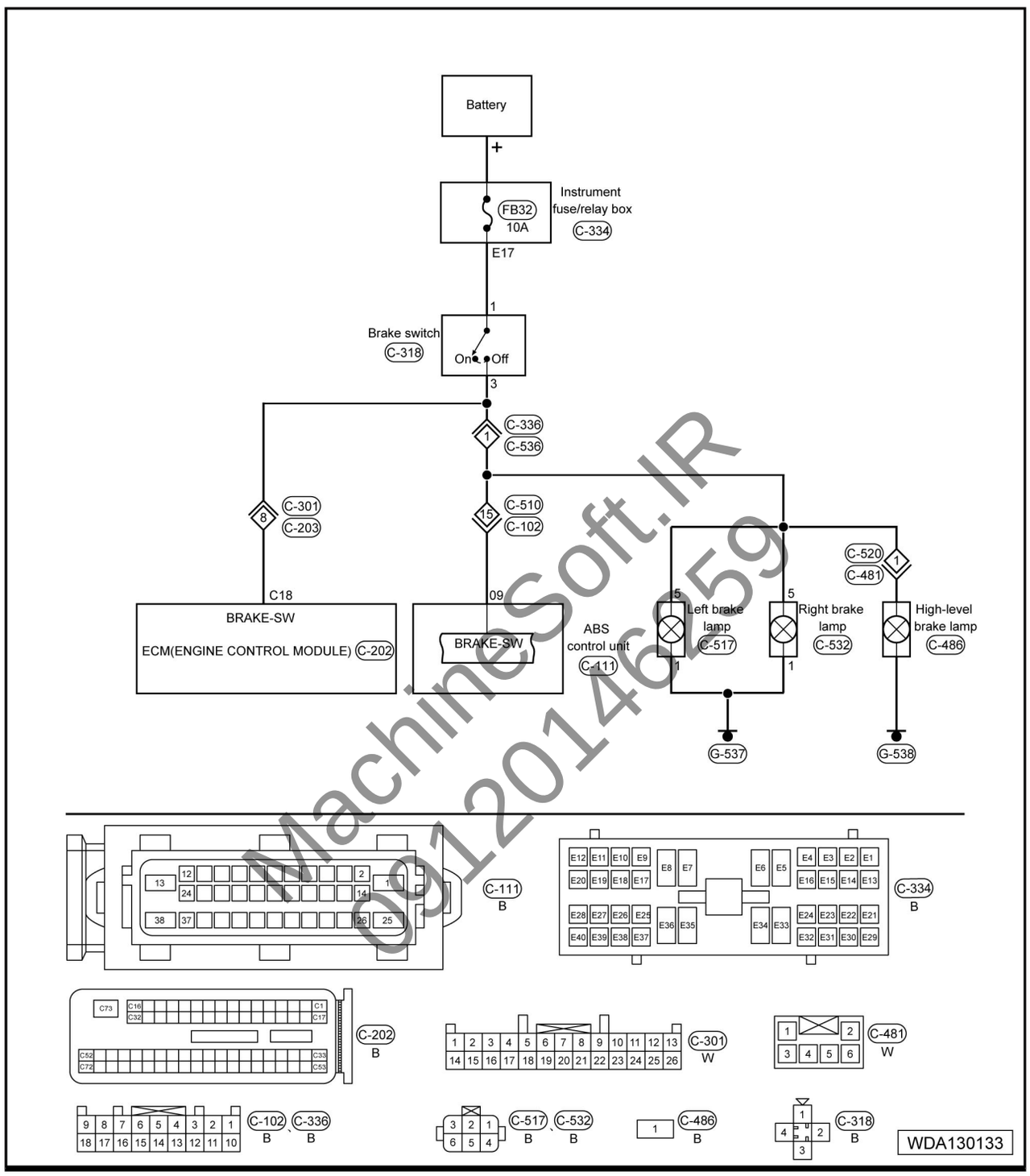
- If yes, go to step 6.
- If not, the vehicle speed sensor fails and please repair it. ■

6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.19 P0504 Correlation failure of the brake switch

P0571 No change in the brake lamp switch during braking



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0504	Correlation failure of the brake switch	The ignition switch in the ON position	The brake signal wire disconnected, the vehicle brake entering the diagnosis window	• Failure of the brake switch • Failure of the brake switch circuit

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
			and the fault code appearing several times after braking	• Failure of the engine control module
P0571	No change in the brake lamp switch during braking	The ignition switch in the ON position	The brake signal wire disconnected, the vehicle brake entering the diagnosis window and the fault code appearing several times after braking	

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine and press the brake switch for several times.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

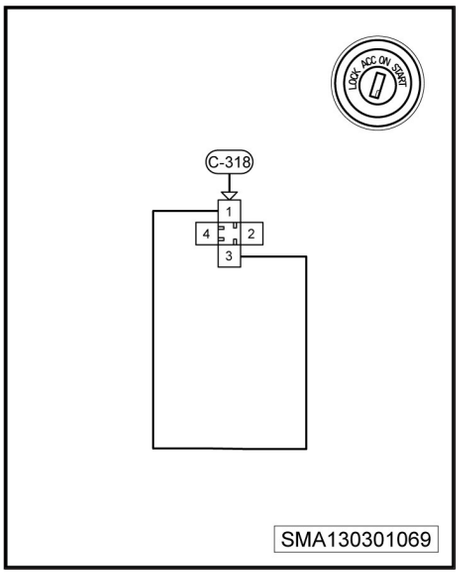
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the ON position, press the brake pedal and check if the brake light lights up.

- If yes, go to step 6.
- If not, go to step 2.

2. Disconnect the brake switch connector C-318, short-circuit the pins 1 and 3 of C-318 with the short connector and check if the brake light lights up.

- If yes, the brake switch fails and please replace it. ■
- If not, go to step 3.

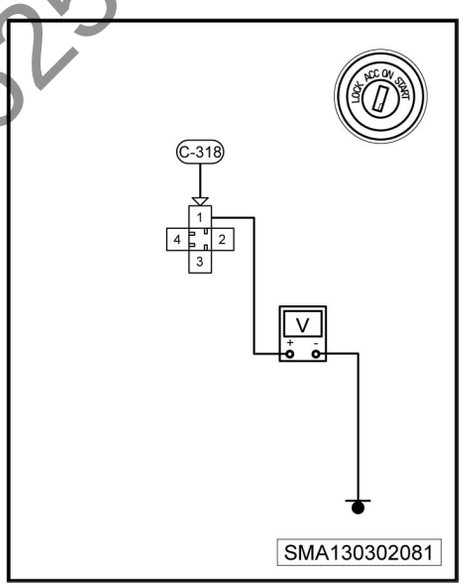


3. Check if the fuse FB32 (10A) of the brake switch is normal.

- If yes, go to step 4.
- If not, the fuse fails and please replace the fuse FB32. ■

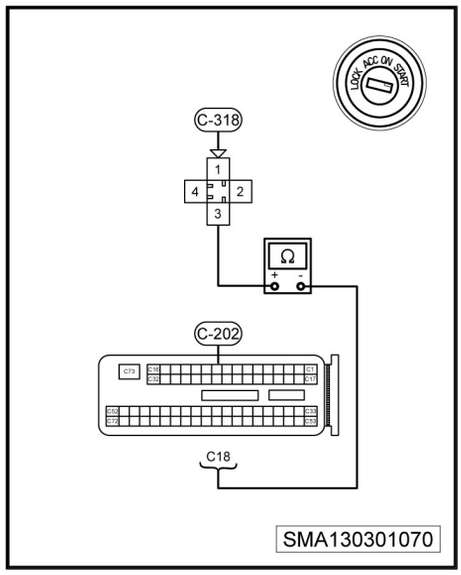
4. Turn the ignition switch to the ON position, disconnect the brake switch connector C-318 and check if the voltage at the pin 1 of C-318 is battery voltage.

- If yes, go to step 5.
- If not, the lead between the fuse FB32 and the pin 1 of C-318 fails and please repair the defective lead. ■



5. Disconnect the brake switch connector C-318 and the ECM connector C-202, and check if the lead between the pin 3 of C-318 and the pin C18 of C-202 has short, open or earthing circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.

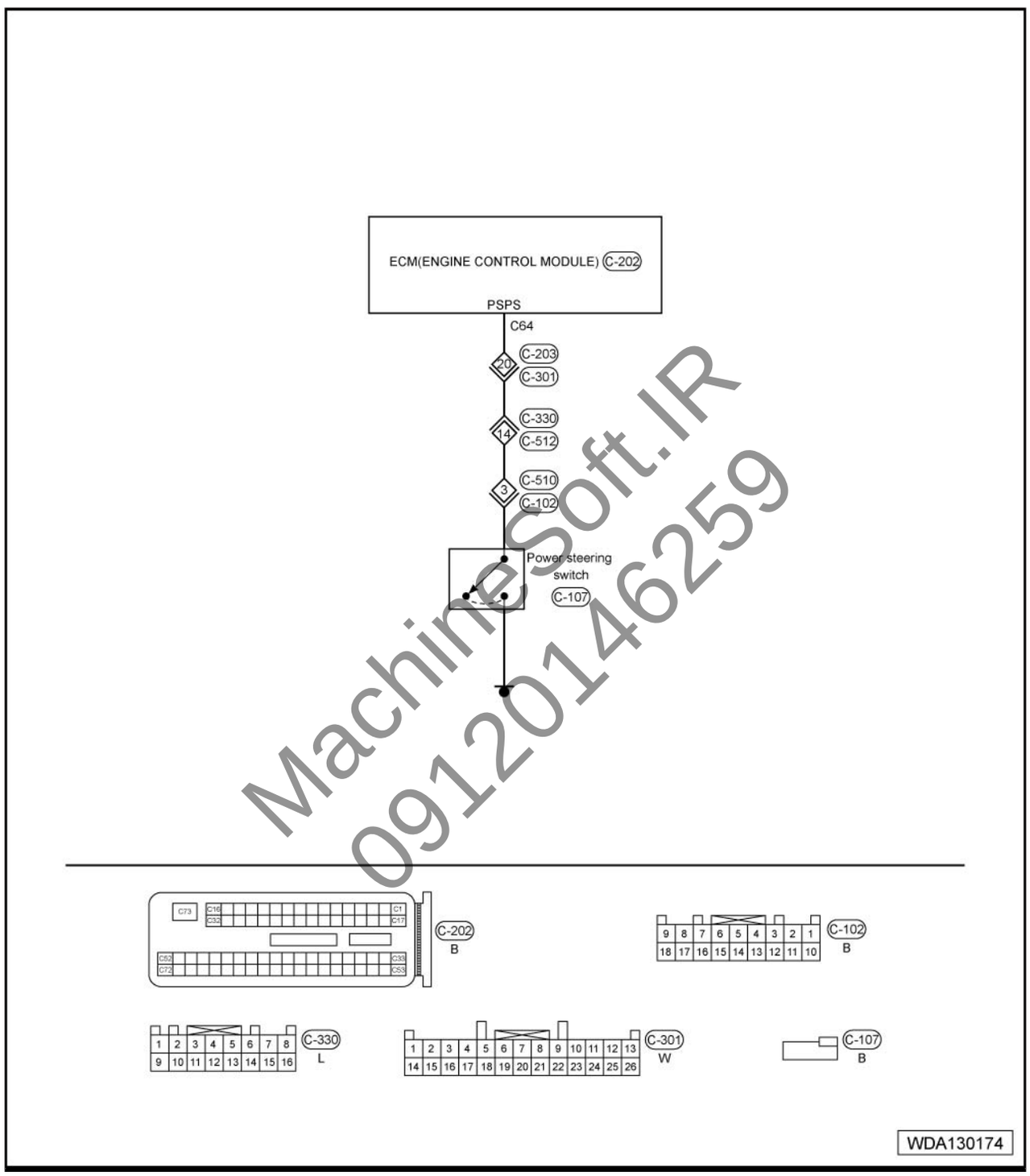


6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.20 P0551 Failure of the power steering switch circuit voltage range/performance

P0552 Power steering switch circuit short to low voltage
P0553 Power steering switch circuit short to high voltage



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0551	Failure of the power steering switch circuit voltage range/performance	Engine idle running with the speed of zero	Power steering switch circuit voltage deviating from the system specification	• Failure of the power steering switch • Failure of the power steering switch circuit • Failure of the engine control module
P0552	Power steering switch circuit short to low voltage	Engine idle running with the speed of zero	Power steering switch circuit open circuit or short to ground	• Failure of the power steering switch • Failure of the power steering switch circuit • Failure of the engine control module
P0553	Power steering switch circuit short to high voltage	Engine idle running with the speed of zero	Power steering switch circuit short to power	• Failure of the power steering switch • Failure of the power steering switch circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

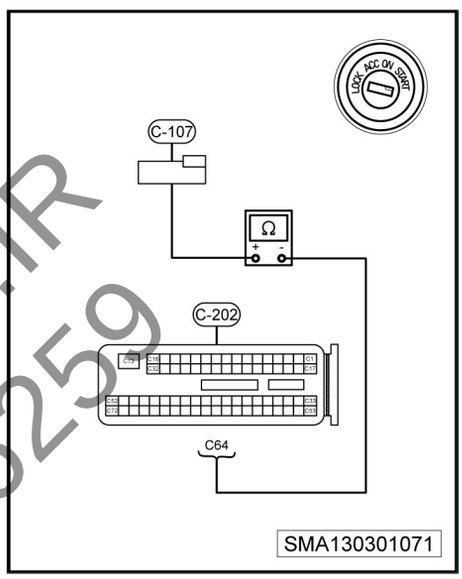
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power steering fluid level is normal.

- If yes, go to step 2.
- If not, refill the power steering fluid. ■

2. Disconnect the power steering switch connector C-107 and turn the steering wheel to one side as far as it will go. Check if the pin of the power steering switch is grounded.
   - If yes, go to step 3.
   - If not, the power steering switch fails and please replace it. ■

3. Disconnect the power steering switch connector C-107 and ECM connector C-202, and check if the lead between the pin of C-107 and the pin C64 of C-202 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 4.



4. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, locate fault causes from other symptoms.
   - If not, the fault has been rectified. ■

2.6.21 P0562 System voltage low

P0563 System voltage high

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0562	System voltage low	The ignition switch in the ON position	The system voltage less than 11V for 40 seconds	• Failure of the generator • Failure of the battery • Failure of the engine control module

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0563	System voltage high	The ignition switch in the ON position	The system voltage more than 16V for 40 seconds	• Failure of the generator • Failure of the battery • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the battery voltage is normal (or if the battery separator has short or open circuit).

- If yes, go to step 2.
- If not, the battery fails and please replace it. ■

2. Connect the diagnosis device, start the engine to perform road test and check if the "generator voltage data flow" is about 14.5V.

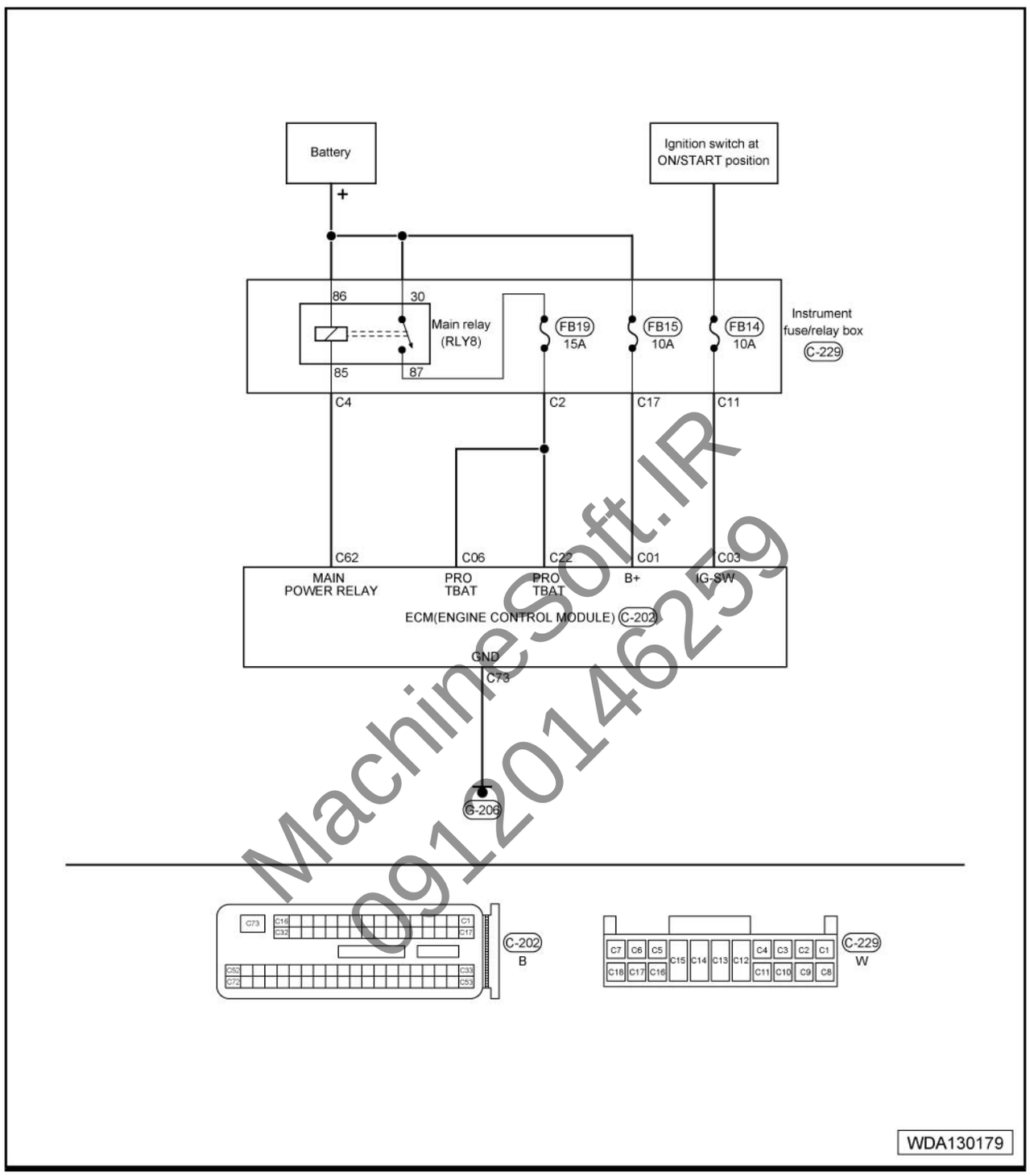
- If yes, go to step 3.
- If not, the generator fails and please replace it. ■

3. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.22 P0606 Failure of the ECM processor

P060A Failure of the ECM programming



Values of the ECM power supply line

ECM pin No.	Function	Condition	Value (DC voltage range)
C1	Control module energized	—	Battery voltage
C3	Control module energized	The ignition switch in the ON/START position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0606	Failure of the ECM processor	The ignition switch in the ON position with the ECM working	—	• Failure of the ECM power supply fuse • Failure of the ECM relay • Failure of the ECM circuit • Failure of ECM
P060A	Failure of the ECM programming	The ignition switch in the ON position with the ECM working	—	• Failure of the ECM power supply fuse • Failure of the ECM relay • Failure of the ECM circuit • Failure of ECM

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power supply fuses FB19, FB15 and FB14 of the ECM control module are loosened or damaged.

- If yes, replace the faulty fuse. ■
- If not, go to step 2.

2. Check if the ECM main relay is loosened or damaged.

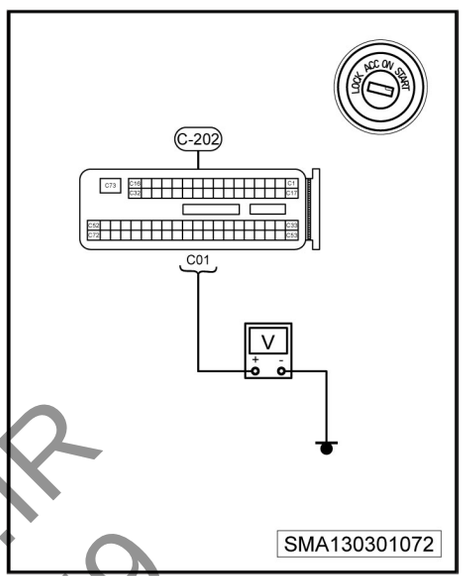
- If yes, the main relay fails and please replace it. ■
- If not, go to step 3.

3. Check if the ECM control module pins/connectors are corrosive, tainted or loose.

- If yes, rectify the fault. ■
- If not, go to step 4.

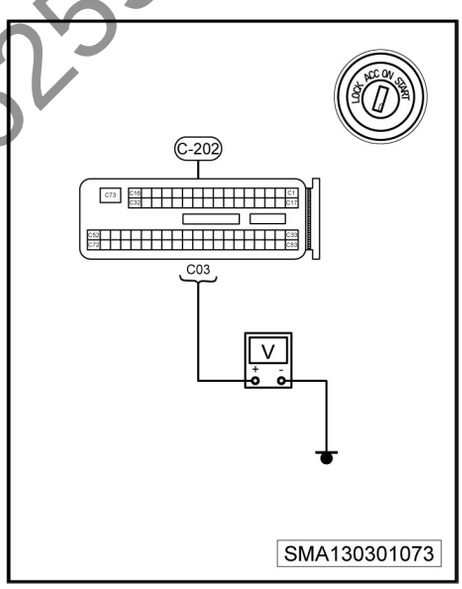
4. Turn the ignition switch to the OFF position, disconnect the ECM connector C-202 and check if the voltage at the pin C1 of C-202 is battery voltage.

- If yes, go to step 5.
- If not, the lead between the pin C1 of C-202 and the fuse box FB15 fails and please repair it. ■

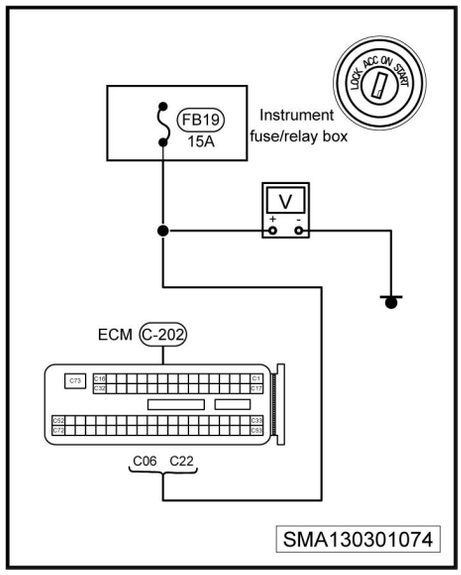


5. Turn the ignition switch to the ON position and check if the voltage at the pin C3 of C-202 is battery voltage.

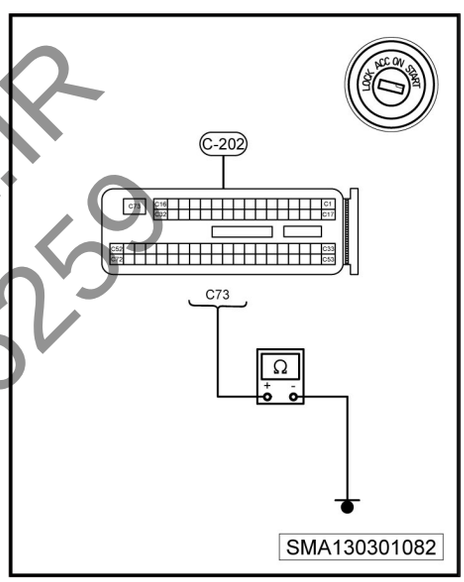
- If yes, go to step 6.
- If not, the lead between the pin C3 of C-202 and the fuse box FB14 fails and please repair it. ■



6. Turn the ignition switch to the ON position with the ECM connector connected, and check if the voltage between the pins C6 and C22 of the ECM connector C-202 is battery voltage.
   - If yes, go to step 7.
   - If not, the lead between the pin C6 of C-202 and the fuse box FB19 fails and please repair it. ■

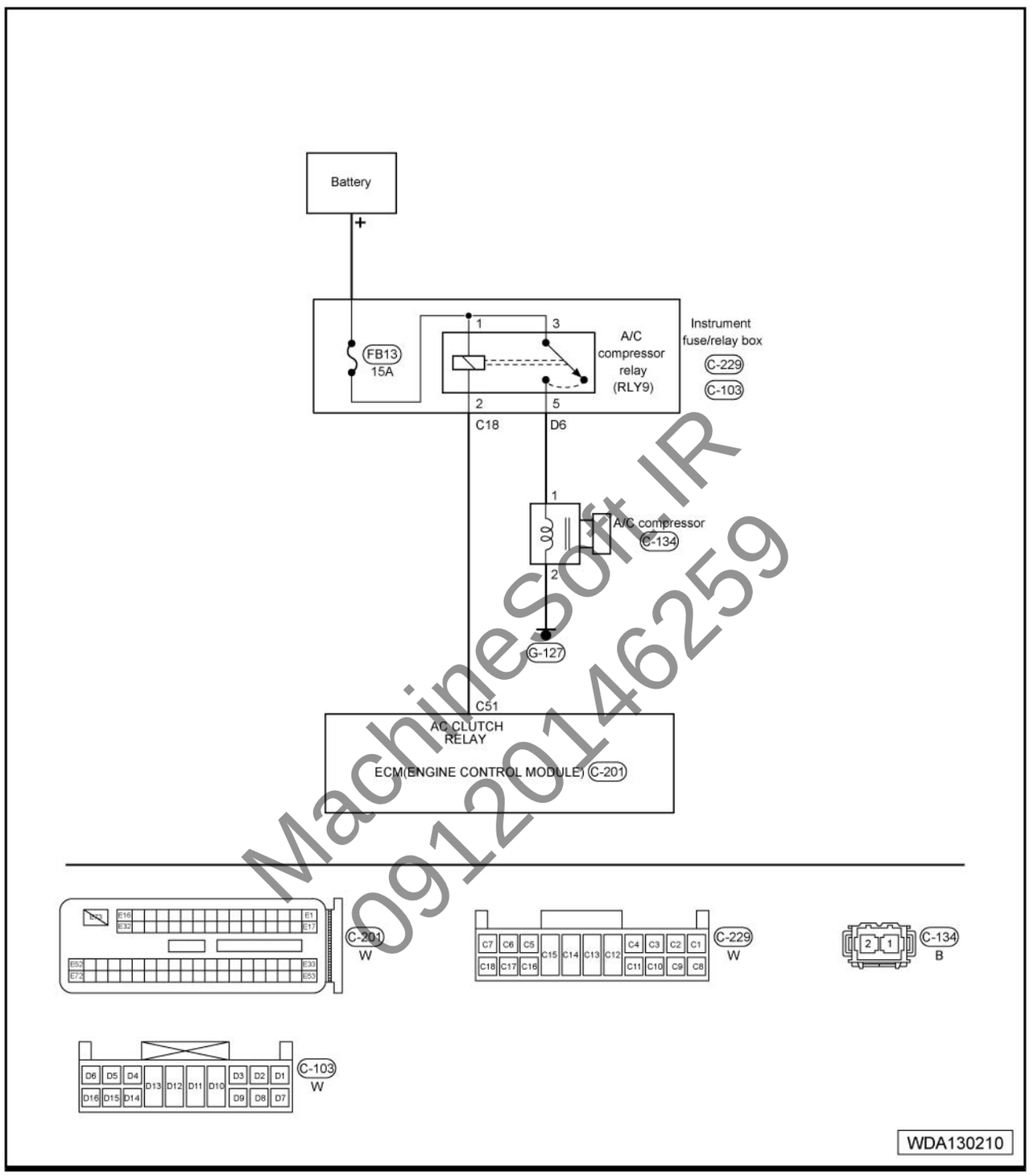


7. Check if the lead of the pin C73 of the ECM connector C-202 is properly grounded.
   - If yes, go to step 8.
   - If not, the lead between the pin C73 of C-202 and the G-206 earth terminal fails and please repair the defective lead. ■



8. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, locate fault causes from other symptoms.
   - If not, the fault has been rectified. ■

2.6.23 P0646 A/C clutch relay circuit short to low voltage or short circuit
P0647 A/C clutch relay circuit short to high voltage



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0646	A/C clutch relay circuit short to low voltage or short circuit	The A/C compressor not working	The A/C relay control terminal grounded or open circuit	• Failure of the A/C relay

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the A/C relay circuit • Failure of ECM
P0647	A/C clutch relay circuit short to high voltage	The A/C compressor working	The A/C relay control terminal short to 12V power	• Failure of the A/C relay • Failure of the A/C relay circuit • Failure of ECM

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

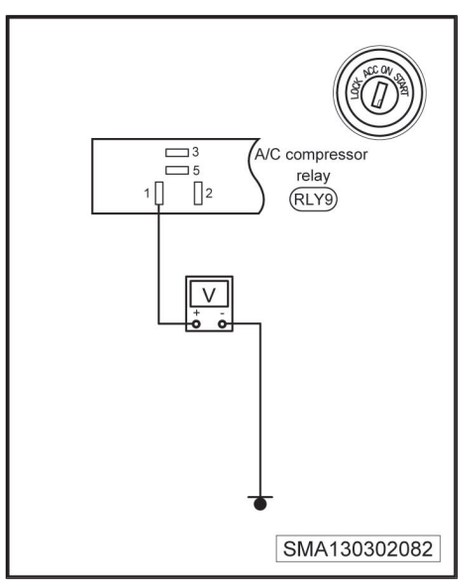
- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, switch on the air conditioner and operate it for several minutes.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Pull out the A/C relay RLY9 and check if the voltage at the pin 1 of the A/C relay RLY9 is battery voltage.
   - If yes, go to step 4.
   - If not, go to step 2.



2. Check if the main relay RLY8 coil has short or open circuit, and if the closed contact has corrosion.
   - If yes, the main relay fails and please replace it. ■

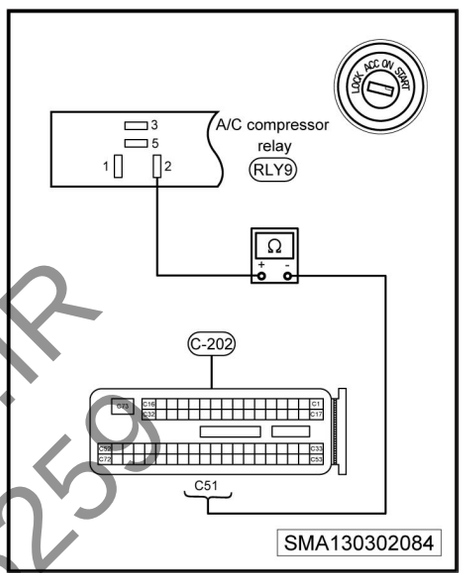
- If not, go to step 3.

3. Check if the A/C clutch relay coil has short or open circuit, and if the closed contact has corrosion.

- If yes, the A/C clutch relay fails and please replace it. ■
- If not, go to step 4.

4. Disconnect the battery negative terminal, the ECM connector C-202 and check if the lead between the pin 2 of the A/C relay RLY9 and the pin C51 of C-202 has short or open circuit.

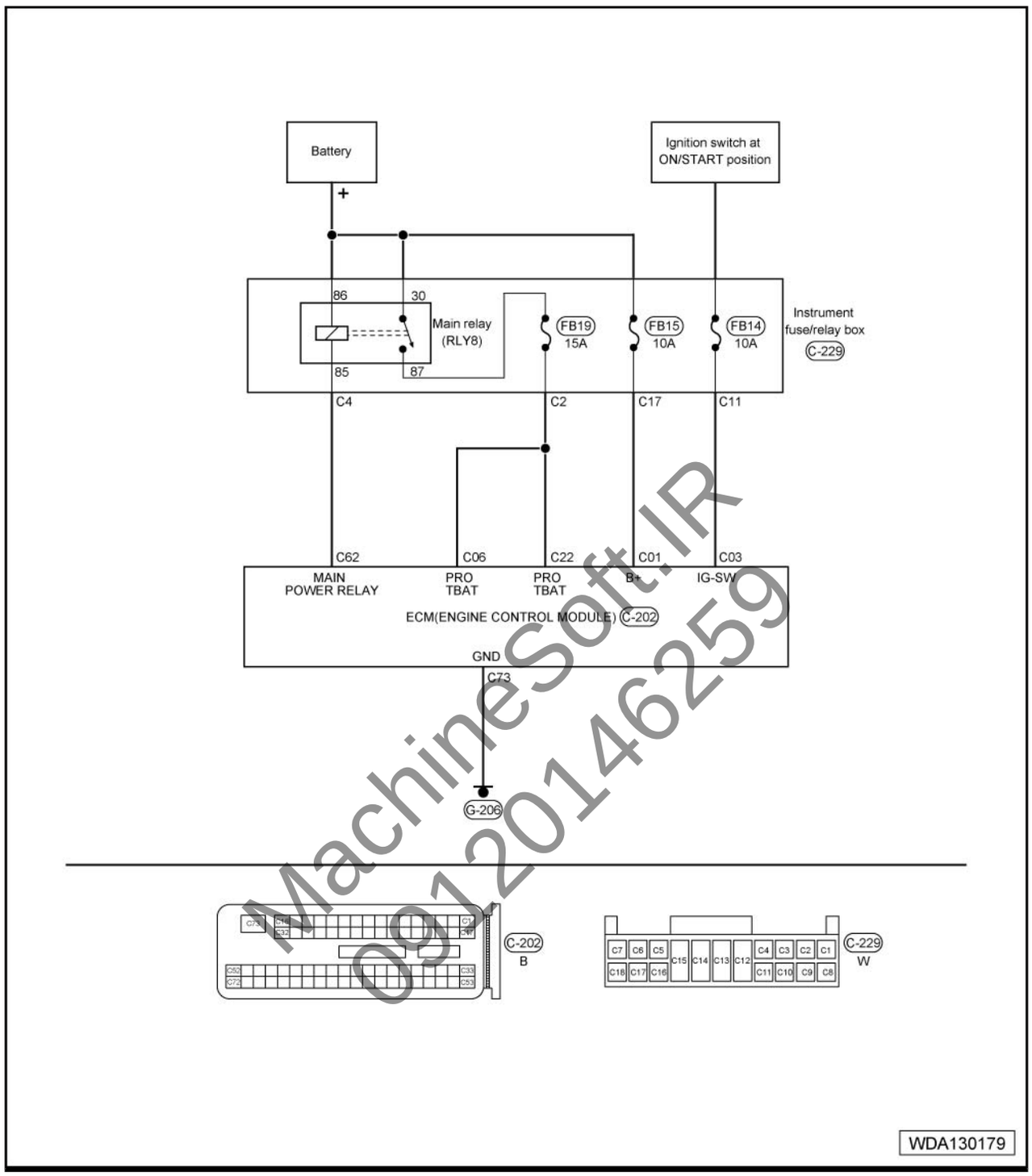
- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.24 P0685 Failure of the main relay



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0685	Failure of the main relay	The ignition switch in the ON position	The main relay control circuit not conform to the expected ECM value	• Failure of the main relay • Failure of the main relay circuit • Failure of the engine control module

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

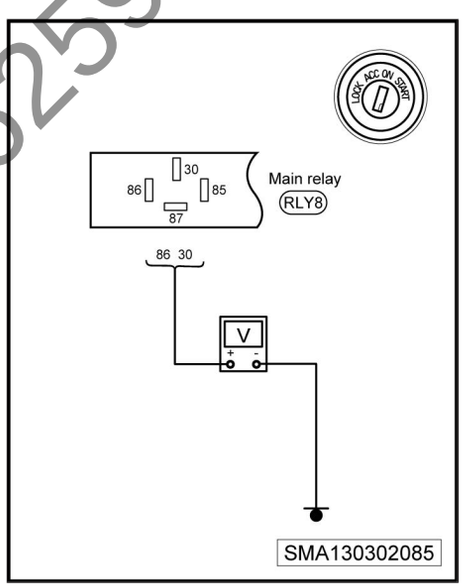
- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Pull out the main relay (RLY8), and check if the voltage between the main relay connectors 86 and 30 is battery voltage.

- If yes, go to step 5.
- If not, go to step 2.



2. Disconnect the battery negative terminal and check if the lead between the instrument fuse/relay box B+ stud and the battery positive terminal is conducted.

- If yes, go to step 3.
- If not, repair the defective lead. ■

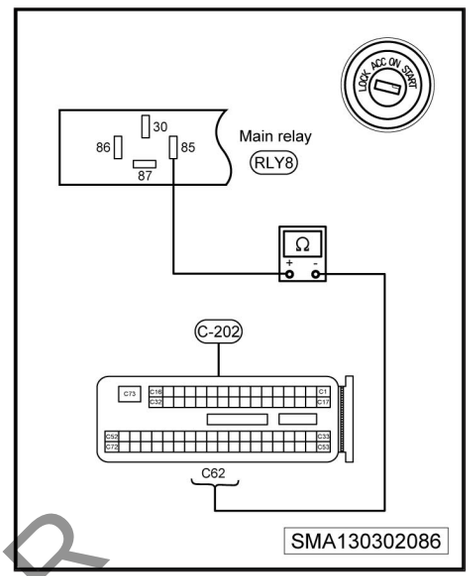
3. Disconnect the battery negative terminal and check if the voltage between the instrument fuse/relay box B+ stud and the pins 86 and 30 of the main relay is battery voltage.

- If yes, go to step 4.

- If not, the instrument fuse/relay box fails and please replace it. ■

4. Disconnect the battery negative terminal, pull out the main relay (RLY8) and the ECM connector C-202, and check if the lead between the pin 85 of the main relay (RLY8) and the pin C62 of C-202 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.25 P1336 58-tooth gear tolerance not learned

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P1336	58-tooth gear tolerance not learned	Engine running	The gear information not learned	• The gear information not learned after replacing the engine

Note

- The fault code is only applied in the condition that after replacing the engine control module, the 58-tooth gear tolerance is not learned or the learning method is incorrect. If the fault occurs, please make adaption with the following steps.

Learning the crankshaft position sensor target wheel gear tolerance

Preconditions:

- The ECM and the anti-theft control unit will be adapted after replacing the engine control module.
- The gear tolerance is not learned.

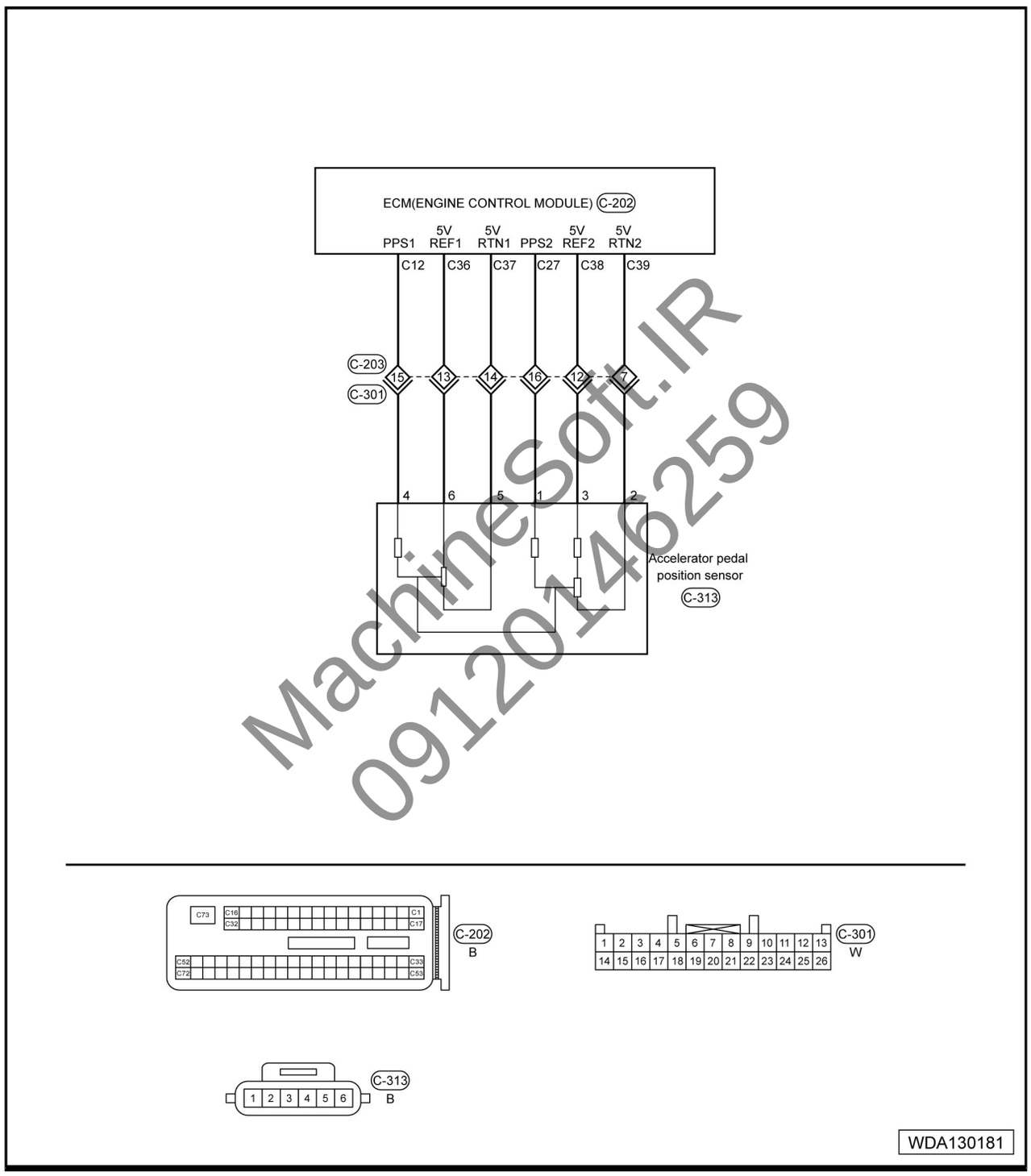
- The engine coolant temperature is higher than 60℃.
- Start the engine and turn off all electrical equipment in the vehicle, but do not turn on the air conditioner.
- The vehicle is driven for more than 10 seconds.

Procedures:

1. Turn off the ignition switch, connect the diagnosis device and turn the ignition switch to the ON position.
2. Access the selection menu of the diagnosis device and select "Engine control module" → "Gear information learning".
3. The ECM learns the gear information when the accelerator pedal is fully pressed in a rapid speed and held; while ends learning when the engine speed increases from 1300 rpm to 4500 rpm for 2 to 5 cycles and changes around 4500 rpm. (The above are typical features of the engine speed when the gear information is learned. These features can be used to determine if the gear information learning is performed or completed.)）
4. Switch off the engine, turn the ignition switch to the ON position after about 15 seconds to clear the fault code, and then turn off the ignition switch.
5. Start the engine after 15 seconds and check if the fault exists with the diagnosis device. If the fault code P1336 is no longer present, the learning is completed successfully.

2.6.26 P2122 Accelerator pedal position sensor circuit 1 low voltage

P2123 Accelerator pedal position sensor circuit 1 high voltage
P2127 Accelerator pedal position sensor circuit 2 low voltage
P2128 Accelerator pedal position sensor circuit 2 high voltage
P2138 Correlation failure of the accelerator pedal position sensor circuit 1 and 2



Values between the ECM and the accelerator pedal position sensor

ECM pin No.	Function	Condition	Value (DC voltage range)
C12	Signal of sensor 1	The ignition switch in the ON position	0V
C27	Signal of sensor 2	The ignition switch in the ON position	0V
C36	Sensor 1 energized	The ignition switch in the ON position	5V
C37	Sensor 1 grounded	The ignition switch in the ON position	5V
C38	Sensor 2 energized	The ignition switch in the ON position	5V
C39	Sensor 2 grounded	The ignition switch in the ON position	5V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P2122	Accelerator pedal position sensor circuit 1 low voltage	Engine running conditions depending on the ETC modes	Signal terminal APS1 grounded or open with the input signal less than 11%	• Failure of the accelerator pedal position sensor • Failure of the accelerator pedal position sensor circuit • Failure of the engine control module
P2123	Accelerator pedal position sensor circuit 1 high voltage	Engine running conditions depending on the ETC modes	Signal terminal APS1 short to power with the input signal more than 98%	• Failure of the accelerator pedal position sensor • Failure of the accelerator pedal position sensor circuit • Failure of the engine control module
P2127	Accelerator pedal position sensor circuit 2 low voltage	Engine running conditions depending on the ETC modes	Signal terminal APS2 grounded or open with the input signal less than 5.5%	• Failure of the accelerator pedal position sensor • Failure of the accelerator pedal position sensor circuit • Failure of the engine control module
P2128	Accelerator pedal position sensor circuit 2 high voltage	Engine running conditions depending on the ETC modes	Signal terminal APS2 short to power with	• Failure of the accelerator pedal position sensor

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
			the input signal more than 48%	• Failure of the accelerator pedal position sensor circuit • Failure of the engine control module
P213	Correlation failure of the electronic accelerator pedal position sensor circuit 1 and 2	Engine running conditions depending on the ETC modes	Signal terminal APS1 or APS2 short to power or grounded, making the singals of the two circuits incoherent and the input signals difference more than 4%	• Failure of the accelerator pedal position sensor • Failure of the accelerator pedal position sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

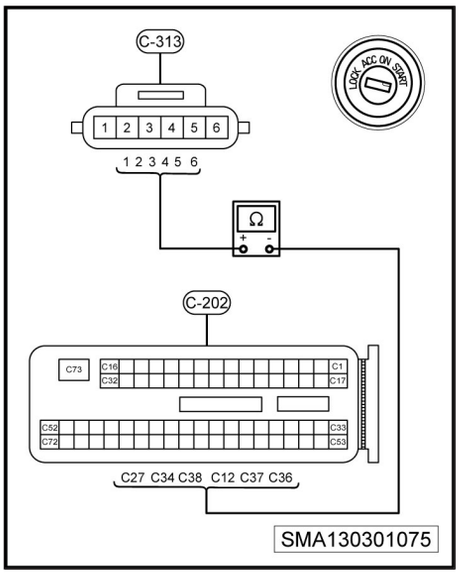
- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Disconnect the battery negative terminal firstly, and then disconnect the accelerator pedal position sensor connector C-313 and the ECM connector C-202. Check if the leads have short or open circuits between the pin 1 of C-313 and the pin C27 of C-202, between the pin 2 of C-313 and the pin C39 of C-202, between the pin 3 of C-313 and the pin C38 of C-202, between the pin 4 of C-313 and the pin C12 of C-202, between the pin 5 of C-313 and the pin C37 of C-202, between the pin 6 of C-313 and the pin C36 of C-202.
   - If yes, repair the defective leads. ■
   - If not, go to step 2.



2. Restore the vehicle to its normal state, connect the battery negative terminal, turn the ignition switch to the ON position and start the engine. Check if the output voltage signals of sensors 1 and 2 are normal without pressing the accelerator pedal. (The output voltage signal of the accelerator pedal position sensor 1 is 2.18 V; and the output voltage signal of the accelerator pedal position sensor 2 is 0.21V.)
   - If yes, go to step 3.
   - If not, the accelerator pedal position sensor fails and please replace it. ■

3. Turn the ignition switch to the ON position, check if the output voltage signals of sensors 1 and 2 are normal by pressing the accelerator pedal fully and without starting the engine. (The output voltage signal of the accelerator pedal position sensor 1 is 4.71 V; and the output voltage signal of the accelerator pedal position sensor 2 is 0.84V.)
   - If yes, go to step 4.
   - If not, the accelerator pedal position sensor fails and please replace it. ■

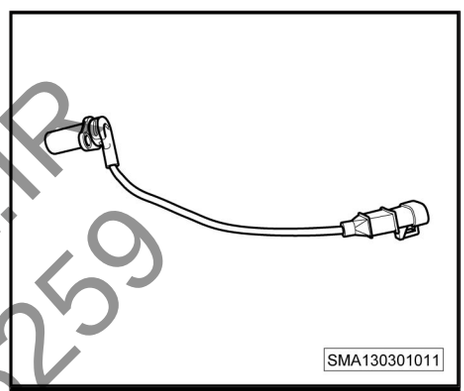
4. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, locate fault causes from other symptoms.
   - If not, the fault has been rectified. ■

3 Engine Electronic Control System Sensor

3.1 Crankshaft position sensor

3.1.1 Overview

The output signal of the crankshaft position sensor is the most important signal in the engine electronic control system, which works with the camshaft position sensor to determine the ignition time.



The sensor is an electromagnetic induction-type sensor and works with the 58x gear ring on the flywheel. When the crankshaft rotates, the tooth top and tooth slot of 58X ring gear pass the sensor at different distances and produces a sudden change with the magnetic resistance of sensor, which enables the sensor to generate a regular waveform signal output to the ECM. The notches on the 58X gear ring match with the top dead center of the engine. At the top dead center of cylinder 1, the sensor is aligned with the notch falling edge of 20th tooth of 58X gear ring. The ECM will determine the crankshaft position and the rotating speed according to this signal.

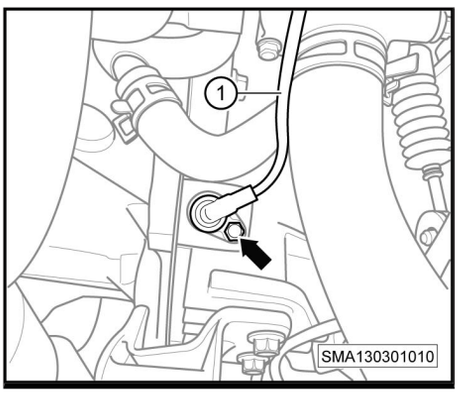
3.1.2 Technical data

Performance

Item	Value
Coil resistance	560Ω±10%
Coil inductance	240mH±15%
Gear ring clearance for 58SX	0.3 - 1.5mm

3.1.3 Removing and installing the crankshaft position sensor

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the crankshaft position sensor connector, unscrew the fixing bolt (-arrow-) and remove the crankshaft position sensor (-1-).

Installation

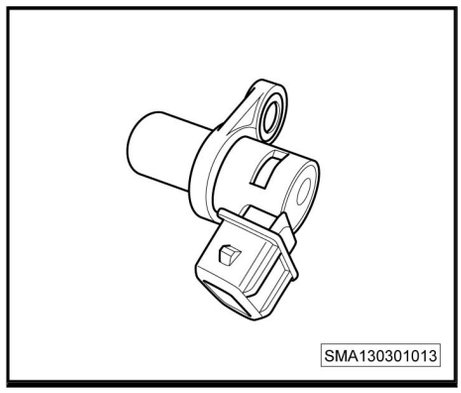
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Visually check for oil stain, scrap iron or other foreign matter on the sensor, if detected, clean it.
- When installing, apply the lubricant to O-ring of the sensor first to avoid damaging to the O-ring during the process.

3.2 Camshaft position sensor

3.2.1 Overview

The camshaft position sensor adopts Hall effect, whose integrated circuit is in front of one permanent magnet pole. When the camshaft is driving the signal wheel to rotate, the tooth profile variety causes changes in the strength of the magnetic field lines, with voltage signal output.



With the camshaft turning one circle, according to Hall effect the sensor produces a series of electromagnetic pulses. After getting this information, the ECM synthetically calculates the ignition timing, at the same time controls the fuel injector to eject fuel into the right cylinder. As an auxiliary sensor, the camshaft position sensor has a great impact on engine emissions.

3.2.2 Technical data

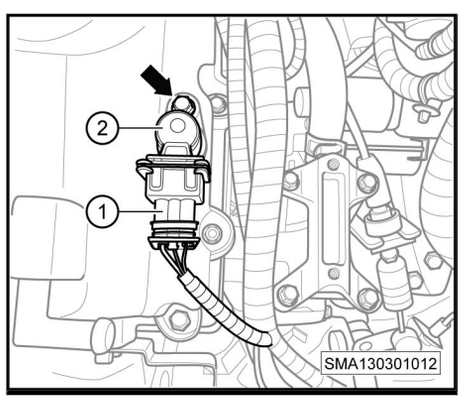
Performance

Item	Value
Operating voltage	4.5 - 1.3V
Operating clearance	0.3 - 1.2m

3.2.3 Removing and installing the camshaft position sensor

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the camshaft position sensor connector (-1-).
4. Unscrew the fixing bolt (-arrow-), and remove the camshaft position sensor (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

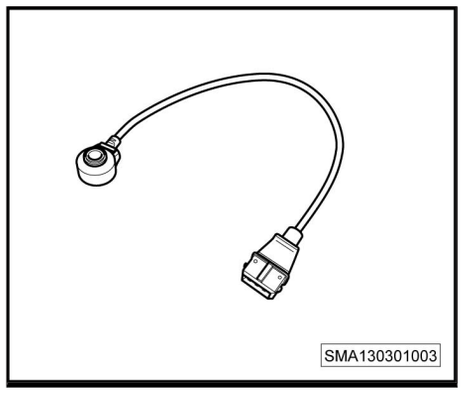
- Visually check for oil stain, scrap iron or other foreign matter on the sensor, if detected, clean it.

- When installing, apply lubricant to the O-ring of the sensor first to avoid damaging to the O-ring during the process.

3.3 Knock sensor

3.3.1 Overview

The knock sensor is used to monitor the gas mixture combustion status and the knocking trend in the engine combustion chamber, and to provide knocking signal to the ECM to better facilitate ECM's control of ignition advance angle.



The knock sensor is a vibration acceleration sensor, which produces an output voltage according to the engine mechanical vibration. If the engine produces knocking, the ECM will receive knocking signal, filter the non-knocking signals and then calculate. The engine position in the working cycle is determined through the camshaft and crankshaft position sensor signal. The ECM thus calculates which cylinder produces knocking, and the ignition advance angle of this cylinder will be delayed until the knocking phenomenon disappears. Then, readjust the ignition advance angle until the ignition angle to the optimal position.

3.3.2 Technical data

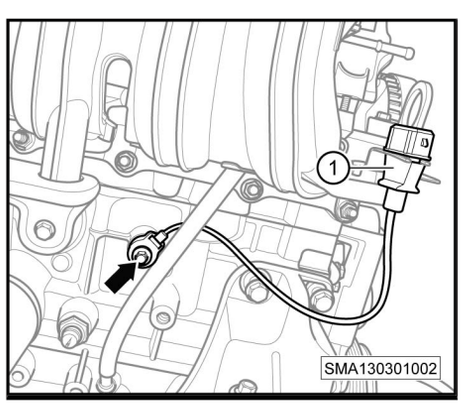
Performance

Frequency response range	Resistance	Capacitance
3 - 18KHz	More than 1 MΩ	1480 - 2220 pf

3.3.3 Removing and installing the knock sensor

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the knock sensor connector.
4. Disengage the knock sensor connector (-1-) from the bracket, unscrew the fixing bolt (-arrow-), and remove the knock sensor.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

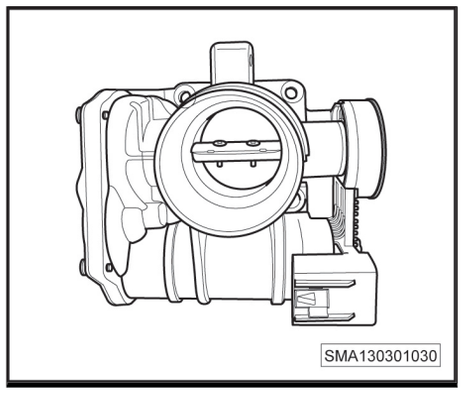
- Check the mounting surface flatness, perpendicularity and surface finish.
- During installation, make sure that the metal part at the sensor bottom have full contact with the engine cylinder block, and the washer cannot be used between the sensor and the engine cylinder block.
- Tightening torque of the bolt: 20±5 Nm.

3.4 Electronic throttle

3.4.1 Overview

The electronic throttle valve opening is determined by the ECM according to the output signal of the accelerator pedal position sensor controlled by the driver, as well as other sensor signals to calculate the engine output power required at this time in this condition; meanwhile to calculate the injection volume to ensure the engine running in the optimal control condition.

The electronic throttle mechanism consists of the components like drive motor, gear unit and throttle position sensor etc..



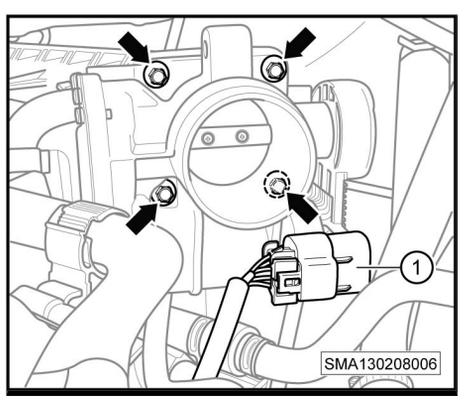
3.4.2 Technical data

Item	Value
Optimal operating temperature	- 40℃~125℃
Impedance between TPS ref and TPS rtn	1.9±0.9 KΩ
Resistance of DC motor	3.93Ω

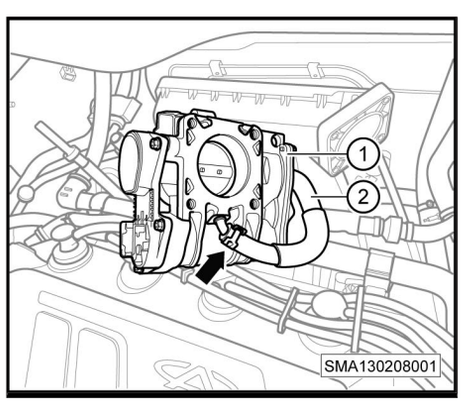
3.4.3 Removing and installing the electronic throttle body

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the air filter assembly.=> refer to page 239
4. Disconnect the electronic throttle connector (-1-) and unscrew the fixing bolts (-arrow-).



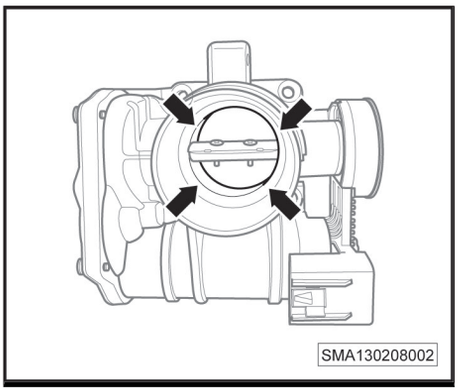
5. Loosen the clamp (-arrow-), pull out the hose (-2-) and remove the electronic throttle (-2-).



6. Clean the throttle body.

7. Open the throttle valve by hand and lock it in the fully open position with a proper object.

8. Carefully clean the throttle housing with the acetone and a clean brush, especially the closed throttle area (-arrow-). Then dry the throttle housing with a glabrous fiber cloth. The electronic throttle body can be installed only after the acetone fully evaporates.



Caution

- The acetone is flammable liquid. Please follow the accident prevention and safety regulations and tips when using this kind of flammable liquid.
- Do not use compressed air when cleaning the throttle. Take precautions to avoid the flammable liquid contacting with your skin or causing personal injury.

Installation

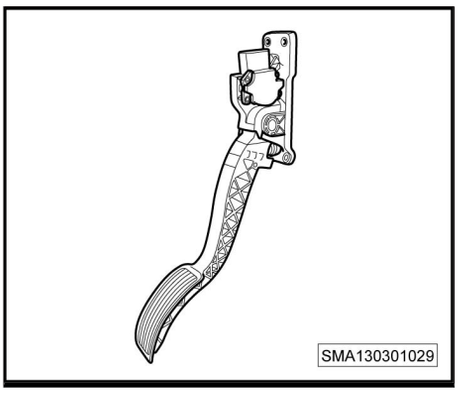
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- When replacing the engine control module, you must adapt the electronic throttle and the accelerator pedal position sensor.
- When replacing the electronic throttle body, you must adapt the ECM and the accelerator pedal position sensor.

3.5 Accelerator pedal position sensor

3.5.1 Overview

The accelerator pedal position sensor has two identical potentiometer sensors inside, which provides the ECM with the driving signals based on the driver's requirements; this process is the same operation as that of the current mechanical pedals which adapts the years of driving habits of drivers. The two identical sensors send the throttle signals to the ECM respectively, making the system safer and more reliable.



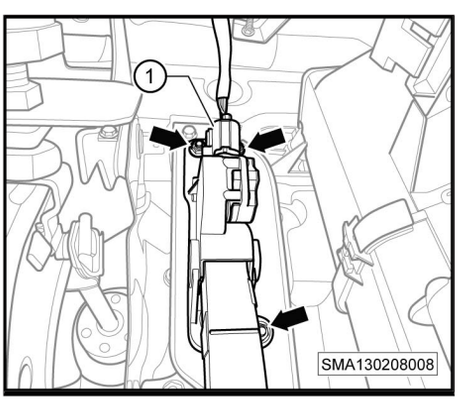
The ECM uses the ratio value to determine the movement range of the pedal. The ECM compares the input signals from sensor 1 and sensor 2 and verifies the authenticity of the sensor output signals with the other sensor signals such as the engine speed sensor or the load sensor. When a signal from one of the two sensors is abnormal, the ECM will switch the engine into the failure mode while taking appropriate actions so as to maintain the throttle opening at a certain angle, this will allow the vehicle to be driven to an authorized service station for maintenance.

3.5.2 Removing and installing the accelerator pedal position sensor

Note

- The accelerator pedal and throttle pedal position sensor are a single unit and cannot be disassembled separately.

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the accelerator pedal position sensor connector (-1-).
4. Unscrew the fixing bolts (-arrow-) and remove the accelerator pedal assembly.

Installation

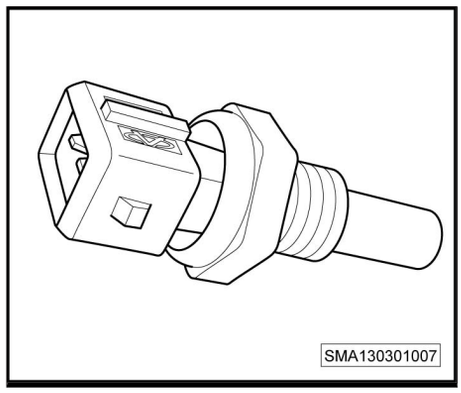
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- When replacing the engine control module, you must adapt the electronic throttle to the accelerator pedal position sensor.
- When replacing the accelerator pedal assembly, you must adapt the engine control module to the electronic throttle.

3.6 Coolant temperature sensor

3.6.1 Overview

The coolant temperature sensor provides coolant temperature information to the engine electronic control module. The engine electronic control module controls the engine starting, idling and ignition timing under normal operations. It also controls the fuel injection pulse width according to the coolant temperature signal. At the same time, the coolant temperature signal is sent to the dashboard via the CAN data communication cable after it is processed by the ECM to display the engine coolant temperature.



3.6.2 Technical data

Coolant temperature sensor

Item	Value
Operating voltage	5V
Operating temperature	-40～135℃
Rated resistance at 20℃	2.5KΩ±5%

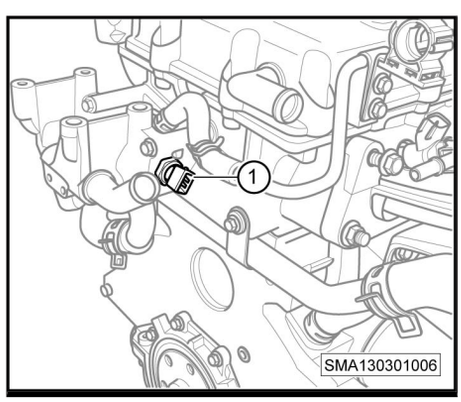
Reference values of the coolant temperature sensor signal voltage

Coolant temperature	Sensor voltage
59℃	1.89V
78℃	1.25V
90℃	0.94V

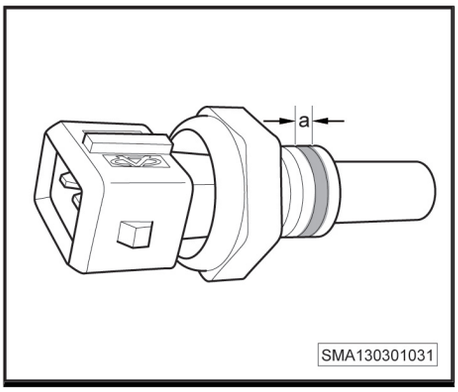
3.6.3 Removing and installing the coolant temperature sensor

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the coolant temperature sensor connector and unscrew the coolant temperature sensor (-1-).



Installation



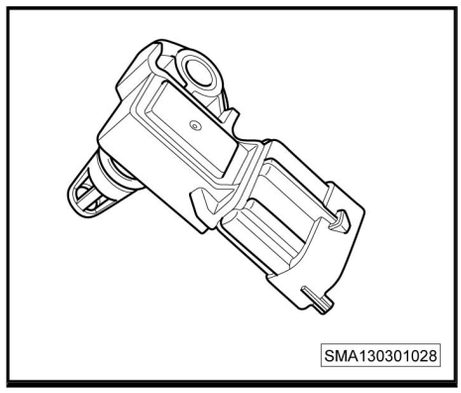
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- As shown in the figure, apply sealant in the area a before the installation of the coolant temperature sensor.
- Tightening torque of the coolant temperature sensor: 20～25 Nm.

3.7 Intake air pressure/temperature sensor

3.7.1 Overview

The intake air pressure/temperature sensor measures the intake manifold absolute pressure and temperature changes behind the throttle according to the engine load, and converts them to voltage signals to send to the ECM which corrects the fuel injection quantity acccording to the voltage signals.



3.7.2 Technical data

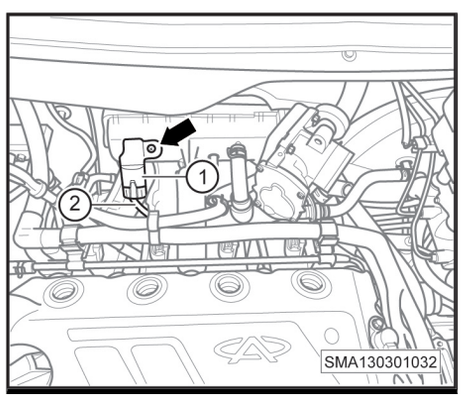
Performance

Item	Value
Operating voltage	5V
Operating current	Max. 12mA
Output impedance	＜10Ω

3.7.3 Removing and installing the intake air pressure/temperature sensor

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the connector (-2-) and unscrew the fixing bolt (-arrow-).
4. Remove the intake air pressure/temperature sensor (-1-).



Installation

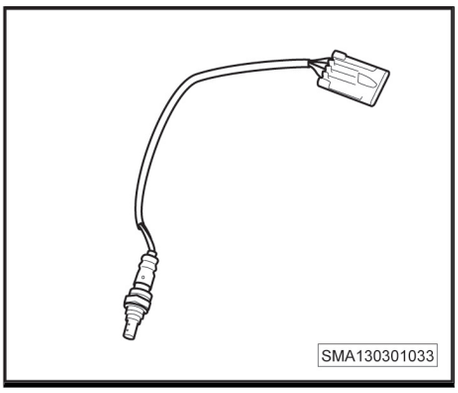
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Visually check for oil stain, scrap iron or other foreign matter on the sensor, if detected, clean it.
- When installing, apply lubricant to the O-ring of the sensor first to avoid damaging to the O-ring during the process.

3.8 Oxygen sensor

3.8.1 Overview

Front oxygen sensor



The front oxygen sensor is used to detect the oxygen content in the engine exhaust and convert this information into voltage signals to the ECM. Depending on the voltage signals, the ECM performs a closed-loop control to trim the fuel injection and reduce the three toxic components in the exhaust, i.e., hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOX) while enabling the three-way catalytic converter to develop its maximum catalytic conversion efficiency.

Rear oxygen sensor

The rear oxygen sensor monitors the oxygen content in the exhaust after it has passed through the three-way catalytic converters. The ECM makes a comparison based on the singals from the front oxygen sensor and the rear oxygen sensor to monitor the efficiency of the catalytic converter. If the catalytic converter is inefficient or is damaged, the rear oxygen sensor signals will fluctuate drastically. The ECM will light up the engine fault indicator to indicate that the engine exhaust system is faulty, or even carry out restrictive driving measures to avoid damage to the engine and prevent exhaust pollution.

3.8.2 Technical data

Operating temperature and performance of the oxygen sensor

Temperature	260℃	450℃	595℃
Rich-oxygen output voltage (mV)	＞800	＞800	＞750
Lean-oxygen output voltage (mV)	＜200	＜200	＜150
Response time from lean to rich (ms)	＜75	＜75	＜50
Response time from rich to lean (ms)	＜150	＜125	＜90
Internal resistance (Ω)	＜100K		

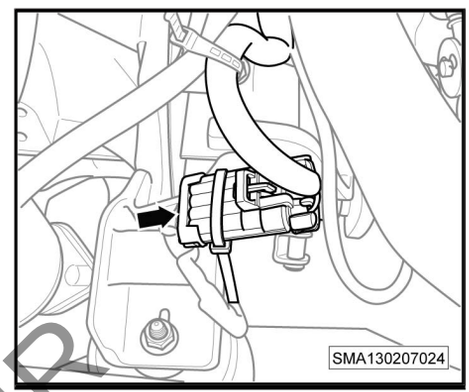
3.8.3 Removing and installing the oxygen sensor

Note

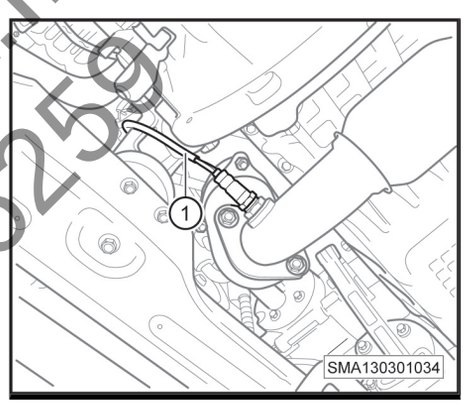
- The removal and installation procedures of the rear oxygen sensor are the same as that of the front oxygen sensor. Here only the removal and installation of the rear oxygen sensor is described.
- The exhaust pipe can only be removed after it has cooled down.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the oxygen sensor connector (-arrow-).



4. Unscrew the oxygen sensor (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

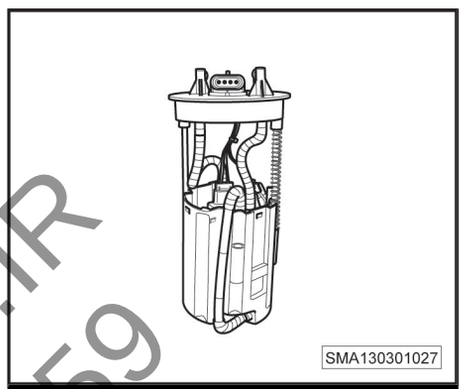
- The oxygen sensor generally uses zirconia (ZrO2, a ceramic material) as the sensor element. Do not knock it with a wrench or other hard object to avoid damage, because the ceramic is hard but very brittle. Impacted oxygen sensors cannot be used.
- Tightening torque of the oxygen sensor is 40 to 60 Nm.

4 Engine Electronic Control System Actuator

4.1 Fuel pump

4.1.1 Overview

After the ignition switch is switched on, the ECM initiates the fuel pump to work for 2-5 seconds to send fuel from the fuel tank and channel it to the pipeline to build up the startup oil pressure. If the engine is not turned on, the ECM will cut off the fuel pump control circuit to suspend the fuel pump; If the engine starts and continues running, the ECM will control the fuel pump for normal operations.



Note

- The fuel temperature has a great impact on the performance of the fuel pump. If it is operating in high temperature conditions for a long time and the fuel temperature passes a certain level, the pumping pressure of the fuel pump will drop dramatically; therefore, when the hot engine cannot start, please carefully check the fuel pump operating performance in high temperature condition.

4.1.2 Technical data

Output pressure	>350KPa	Operating voltage	8 - 16V
Maintenance pressure	≈24KPa	Overvoltage protection	-13.5 - 26V
Output flow	>10g/s	Fuel-free running	<60 seconds

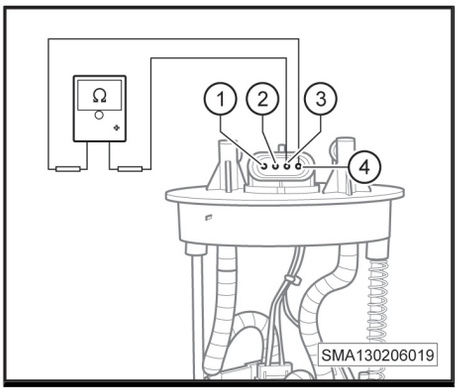
4.1.3 Removing and installing the fuel pump

For the removal and installation of the fuel pump, please refer to the Engine Mechanism.=> refer to page 206

4.1.4 Checking the fuel pump

Method:

1. Disconnect the connector and turn the digital multimeter to the Ohm range, with the two meter probes connecting to the fuel pumps (-3- and -4-) respectively, to measure if the fuel pump resistance is normal.

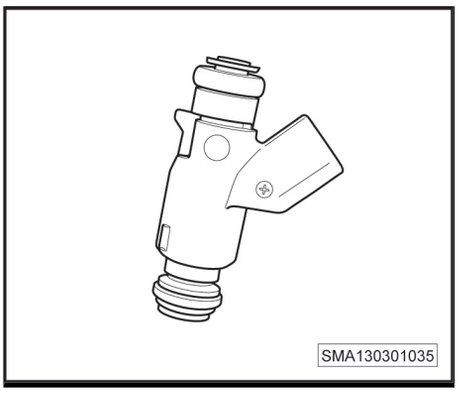


4.2 Fuel injector

4.2.1 Overview

Function:

The fuel injector jets fuel within the specified time according to ECM's instructions to provide atomized fuel to the engine.



4.2.2 Technical data

Item	Data
Coil resistance	12±0.4Ω
Minimum operating voltage	4.5V
Operating temperature	－40～130℃

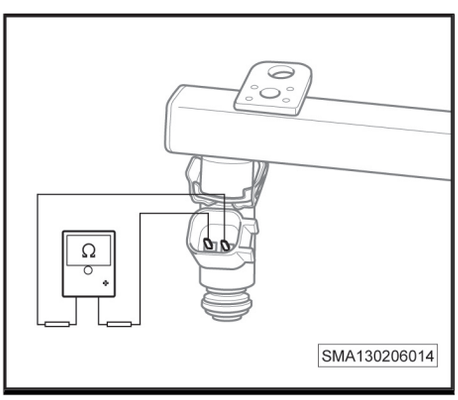
4.2.3 Removing and installing the fuel injector

For the removal and installation of the fuel injector, please refer to the Engine Mechanism.=> refer to page 213

4.2.4 Checking the fuel injector

Method:

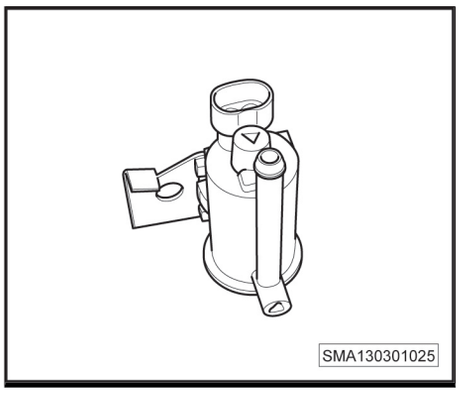
Turn the digital multimeter to the Ohm position, respectively connect the two probes to the two pins of the fuel injector. The rated resistance is 11～16 Ω at 20℃.



4.3 Activated carbon canister solenoid valve

4.3.1 Overview

The canister control valve, which is comprehensively monitored by the ECM based on a series of other signals such as the engine load, engine temperature and speed , will send out the electrical pulse duration and frequency (i.e. duty cycle) to control the opening frequency of the carbon canister solenoid valve. Over accumulation of the fuel vapor in the activated carbon canister will lead to gasline leakage and environmental pollution, so the function of the carbon canister is to open the solenoid valve at the right time to allow sufficient mixing of the fuel vapor and air in the canister before entering the intake pipe for combustion.



4.3.2 Technical data

Performance

Rated operating voltage	12V	Operating temperature	140～120℃
Operating voltage range	8～16V	Coil resistance	19 - 22Ω
Limit voltage	25V	Coil inductance	12 - 15mH

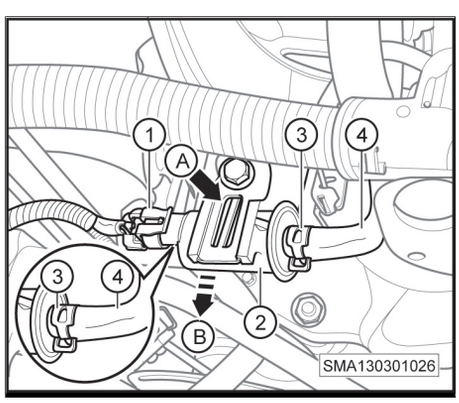
4.3.3 Removing and installing the carbon canister solenoid valve

Note

- Before removing, make identification marks on the inlet and outlet pipes to avoid possible confusions.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the connector (-1-), loosen the clamps (-3-), and pull out the inlet and outlet hoses (-4-).
4. Lever out the clip (-arrow A-) and remove the carbon canister solenoid valve (-2-) from the bracket in the (-arrow B-) direction.



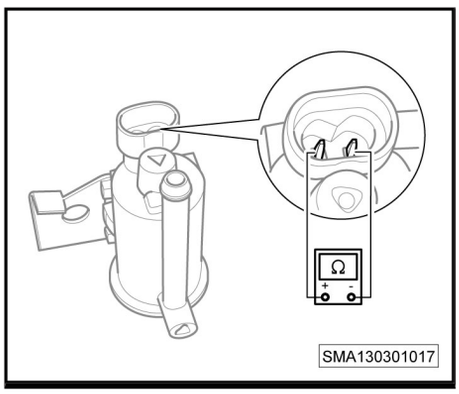
Installation

- Installation shall follow the reverse sequence of the removal procedure.

4.3.4 Checking the activated carbon canister solenoid valve

Inspection

Turn the digital multimeter to the Ohm range, with the two meter probes connecting to the two pins of the activated carbon canister solenoid valve, the rated resistance should be 21±1 Ω at 20 ℃.

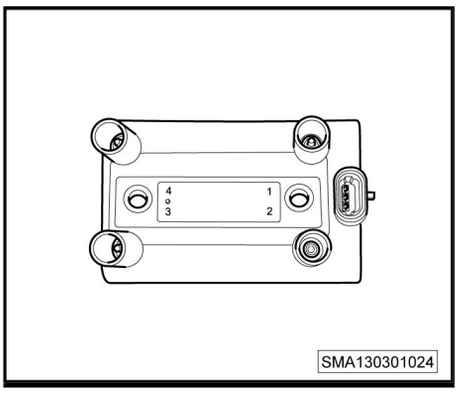


4.4 Ignition coil

4.4.1 Overview

The ignition coil transforms low voltage of the primary winding to high voltage of the secondary winding, and the high voltage produces spark through the electrode discharge of the spark plug to detonate the flammable gas mixture within the cylinder.

The ignition coil consists of two primary windings, two secondary windings, iron core, shell and so on. When a primary winding is connected to the ground, this primary winding is charged. Once the ECM cuts off the primary winding circuit, the charge will be terminated. At this point, high voltage is induced in the secondary winding to enable the spark plug discharging.



4.4.2 Technical data

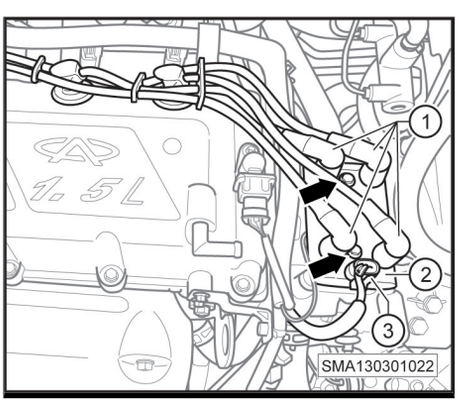
Performance

Primary resistance	0.5±0.05 Ω	Secondary inductance	17.5±1.2H
Secondary resistance	9840±980 Ω	Power-off current peak	9.5A
Primary inductance	2.75±0.25mH	Secondary output voltage	34KV

4.4.3 Removing and installing the ignition coil

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the ignition coil connector (-3-), and pull out the ignition cables (-1-).
4. Unscrew the fixing bolts (-arrow-), and remove the ignition coil (-2-).



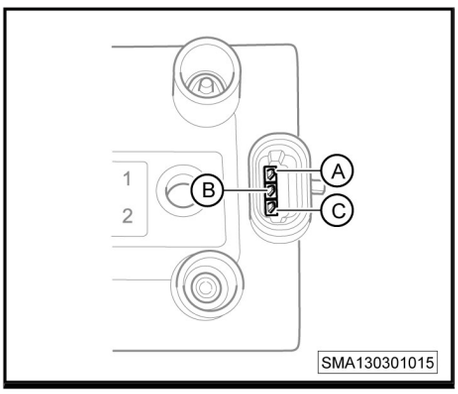
Installation

- Installation shall follow the reverse sequence of the removal procedure.

4.4.4 Checking the ignition coil

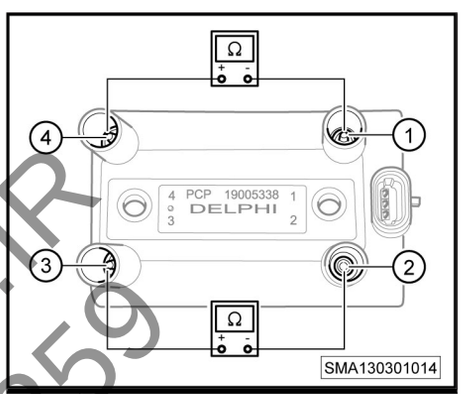
Method:

1. Turn the digital multimeter to the Ohm range, with the two meter probes measuring pins A and B, B and C respectively, the resistance should be 0.42～0.58Ω.



Method:

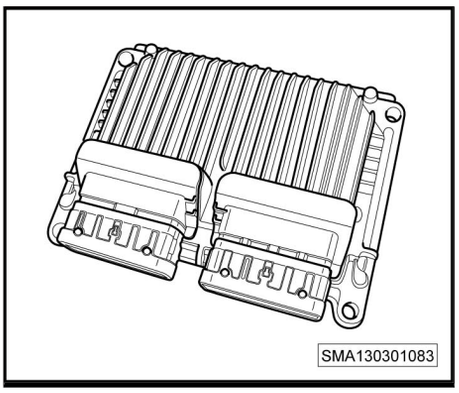
2. Turn the digital multimeter to the Ohm range, with two meter probes measuring pins 1 and 4, 2 and 3, the resistance of the secondary winding should be 11.2～14.8 Ω at 20℃.



4.5 Engine control module

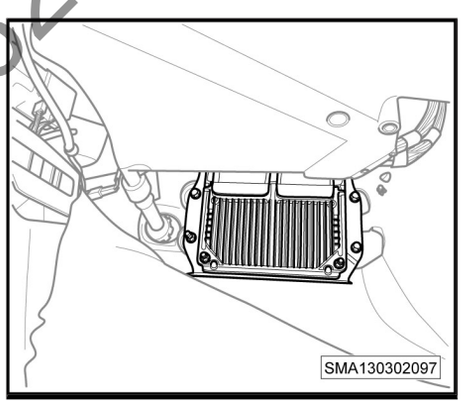
4.5.1 Overview

The engine control system functions include: electronic control fuel injection control, electronic ignition control, idle speed control, exhaust emission control, fail-safe, self-diagnosis system, data communication system and anti-theft system etc.. The core of the engine electronic control fuel injection system is the engine control module. This computes the required fuel injection quantity of the combustion cylinders (injection pulse width) based on the sensor feedback signals and various operating condition signals while opening the fuel injector at the right injection timing to inject the appropriate amount of fuel to the air intake channel so as to form the flammable mixture with optimal air-fuel ratio. A series of actuators such as the fuel injector and ignition coil work with together so that the engine works efficiently.



4.5.2 Installation position

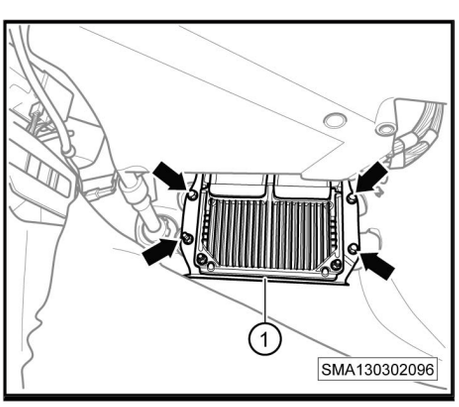
The engine control module is installed on the front passenger side and beneath the evaporation tank assembly.



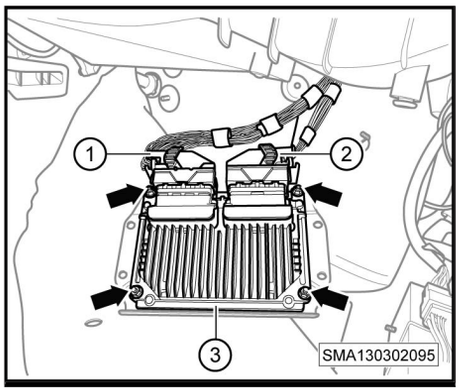
4.5.3 Removing and installing the engine control module

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the front right A-pillar lower trim, and open the front passenger's side carpet.
4. Unscrew the fixing bolts (-arrow-), and take out the engine control module and the bracket (-1-).



5. Disconnect the engine control module connectors (-1-) and (-2-), and unscrew the fixing bolts (-arrow-). Take out the engine control module (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. The engine control module must be adapted during the replacement or removal of the anti-theft control unit.
2. The anti-theft control unit must be adapted during the replacement of the engine control module.

4.5.4 Adapting the engine control module

Note

- The security code (PIN code) is only entered through a special diagnostic instrument of Chery; When entering, please note that the letters are case sensitive and the ECM will be locked after entering an erraneous code more than a certain number of times.
- The engine control module must be adapted with the anti-theft system control unit during the replacement of new engine control module.

Preconditions

- The battery voltage is within the normal range.
- There is no fault in the anti-theft system.
- There is no fault in the engine electronic control system actuators and sensors.
- It has been confirmed that the new engine control module model adapts the anti-theft control system.

Procedures

1. Turn off the ignition switch, and replace the engine control module.
2. Connect the diagnostic device.
3. Insert the key into the ignition lock and turn to the ON position.
4. Select the menu "Anti-theft control" → "Adaption function" → "Authorization code setting" → "Enter the security code".
5. Return to the selection menu "Anti-theft control" → "Adaption function" → "Replace the ECM" and perform the adaption operation according to the steps shown on the diagnostic device.
6. After completing the engine adaption, carry out the engine gear information learning.

5 Symptom Diagnosis and Inspection

5.1 Diagnosis processes of the inspection according to the symptoms

Preliminary inspection:

1. Check if the battery voltage is within the normal range.
2. Check if the engine malfunction indicator works properly.
3. Check if there is any failure record with the diagnostic device.
4. Check if the fault symptoms complained by the owner exists, and confirm its occurrence conditions (like on steep road, on smooth road, in accelerated motion, or at constant speed etc.).

Visual check:

1. Check the fuel pipe for leakage.
2. Check the vacuum pipe for fracture, kink, and correct connection.
3. Check the inlet pipe for blockage, air leakage, crushing or damage.
4. Check the high voltage wire of the ignition system for rupture, aging and ignition sequence.
5. Check the wiring harness grounding area for cleanness and firmness.
6. Check the connectors of the sensors and actuators for looseness or poor contact.

Note

- If the above phenomenons exist, repair the faults firstly. Then verify again if the failure still exists and carry out the fault diagnosis procedures.

5.2 Diagnostic tips

1. Check if there is any fault record in the engine.
2. Check if the symptom described by the customer exists.
3. The influence of the vehicle maintenance condition, cylinder pressure, ignition timing, fuel situation etc. on the system cannot be ignored in the inspection process.
4. If there is any fault diffcult to troubleshoot in the repair process, you can replace the ECM first for testing.

If now the fault symptom disappears, there is fault in the ECM. If the symptom still exists, locate the fault causes from other symptoms.

5.3 Symptom diagnosis and inspection list

Symptoms
1. Engine failure or low engine speed when started
2. Engine idling with start failure when started
3. Warm start difficulty
4. Cold start difficulty
5. Disabled acceleration and poor performance
6. Engine idling vibration
7. Normal speed but difficult to start all the time
8. Normal start but unstable idling speed all the time
9. Normal start but unstable idling speed during warming up
10. Unstable engine idling speed or even flameout when the throttle is released after acceleration
11. Normal start but excessive idling speed
12. Slow response in acceleration
13. Normal start but unstable idling speed after warming up

5.4 Symptom diagnosis and inspection

5.4.1 Engine failure or low engine speed when started

Possible causes:

1. Failure of the battery
2. Failure of the starter
3. Failure of the wiring harness
4. Mechanical failure of the engine

Diagnostic procedures

Note

- If the starter runs slowly, first check if the battery voltage is normal.

1. Check the voltage between the two battery terminals with a digital multimeter, and check if the battery voltage is normal when starting the engine.
   - If yes, go to step 2.
   - If not, the battery fails and please replace it. ■

2. Start the engine to run the starter, and check if the grounding between the battery and the engine is hot.
   - If yes, the engine grounding is poor and please repair it. ■
   - If not, go to step 3.

3. Pull out the starter relay and remove the relay housing to check if the relay pull-in point is rusted or burned.
   - If yes, the relay fails and please repair it. ■
   - If not, go to step 4.

4. Disassemble the starter to mainly check the starter brush for excessive wear, the rotor coil for short circuit and the bearing for damage.
   - If yes, the starter fails and please replace it. ■
   - If not, go to step 5.

5. Check if the resistance of the internal mechanical parts of the engine is excessive that results in abnormal or null operation of the starter.
   - If yes, the mechanical part of the engine fails and please rapair it. ■
   - If not, go to step 6.

6. Check if the power supply and grounding of the engine control module are normal.
   - If yes, locate fault causes from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.2 Engine idling with start failure when started

Possible causes:

1. Failure of the fuel system
2. Failure of the crankshaft position sensor
3. Failure of the ignition system
4. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Check if the "crankshaft position sensor waveform" is normal with an oscilloscope.
   - If yes, go to step 3.
   - If not, the crankshaft position sensor fails and please replace it. ■

3. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 4.
   - If not, the fuel system fails and please inspect it. ■

4. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 5.
   - If not, the ignition system fails and please inspect it. ■

5. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect a cylinder pressure gauge and check if the pressure of each cylinder is normal.
   - If yes, go to step 6.
   - If not, the mechanical part of the engine fails and please repair it. ■

6. Check if the power supply and grounding of the engine control module are normal.
   - If yes, locate fault causes from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.3 Warm start difficulty

Possible causes:

1. Failure of the coolant temperature sensor
2. Failure of the ignition system
3. Failure of the fuel system

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Check if the model and clearance of the spark plug of each cylinder are up to specifications.
   - If yes, go to step 3.
   - If not, adjust or replace the spark plug. ■

3. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 4.
   - If not, the ignition system fails and please inspect it. ■

4. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 5.
   - If not, the fuel system fails and please inspect it. ■

5. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 6.
   - If not, the coolant temperature sensor fails and please replace it. ■

6. Check if the failure occurs when the fuel is filled.
   - If yes, clean the fuel system and replace the fuel. ■
   - If not, go to step 7.

7. Check if the power supply and grounding of the engine control module are normal.
   - If yes, locate fault causes from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.4 Cold start difficulty

Possible causes:

1. Failure of the fuel system
2. Failure of the fuel injector
3. Failure of the throttle
4. Failure of the ignition system
5. Failure of the coolant temperature sensor

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 3.
- If not, the coolant temperature sensor fails and please replace it. ■

3. Connect the fuel pressure gauge to the common rail. Start the engine for seconds before turning it off, and check if the fuel system pressure is dropping.

- If yes, go to step 4.
- If not, go to step 7.

4. Visually check the fuel pipe for leakage.

- If not, the fuel pipe leaks and please replace it. ■
- If not, go to step 5.

5. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.

- If yes, the fuel injector fails and please replace it. ■
- If not, go to step 6.

6. Connect the fuel pressure gauge to the common rail. Start the engine for seconds before turning it off, and check if the fuel system pressure is dropping.

- If yes, the fuel pump fails and please replace it. ■
- If not, go to step 7.

7. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.

- If yes, go to step 8.
- If not, the ignition system fails and please inspect it. ■

8. Check if the "electronic throttle data flow" is normal with the diagnostic device.

- If yes, go to step 9.
- If not, the throttle fails and please clean or replace it. ■

9. Check if the power supply and grounding of the engine control module are normal.

- If yes, locate fault causes from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.5 Disabled acceleration and poor performance

Possible causes:

1. Failure of the air intake system

2. Failure of the exhaust system

3. Failure of the ignition coil

4. Failure of the fuel system

5. Failure of ignition timing

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Disassemble the air filter and check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 3.

3. Start the engine and check if the exhaust pipe is smooth.

- If yes, go to step 4.
- If not, the three-way catalytic converter is blocked and please replace it. Besides, replace the fuel and clean the fuel system. ■

4. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.

- If yes, go to step 5.
- If not, the ignition system fails and please inspect it. ■

5. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.

- If yes, go to step 6.
- If not, the fuel system fails and please inspect it. ■

6. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 7.
- If not, disassemble the timing belt and reinstall it. ■

7. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 8.
- If not, the intake air pressure/temperature sensor fails and please replace it. ■

8. Check if the power supply and grounding of the engine control module are normal.

- If yes, locate fault causes from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.6 Engine idling vibration

Possible causes:

1. Failure of the air intake system
2. Failure of the ignition coil
3. Failure of the fuel system
4. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Disassemble the air filter and check the air filter element for blockage.
   - If yes, replace the air filter element. ■
   - If not, go to step 3.

3. Start the engine and check if the exhaust pipe is smooth.
   - If yes, go to step 4.
   - If not, the three-way catalytic converter is blocked and please replace it. Besides, replace the fuel and clean the fuel system. ■

4. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 5.
   - If not, the ignition system fails and please inspect it. ■

5. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 6.
   - If not, the fuel system fails and please inspect it. ■

6. Disassemble the timing belt upper guard and check if the timing belt is installed properly.
   - If yes, go to step 7.
   - If not, disassemble the timing belt and reinstall it. ■

7. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 8.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

8. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect a cylinder pressure gauge and check if the pressure of each cylinder is normal.
   - If yes, the mechanical part of the engine fails and please rapair it. ■

- If not, go to step 9.

9. Check if the power supply and grounding of the engine control module are normal.

- If yes, locate fault causes from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.7 Normal speed, but start difficulty at any time

Possible causes:

1. Failure of the air intake system
2. Failure of the ignition system
3. Failure of the fuel system
4. Failure of the throttle
5. Failure of the coolant temperature sensor
6. Failure of the intake air pressure/temperature sensor
7. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Disassemble the air filter and check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 3.

3. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.

- If yes, go to step 4.
- If not, the ignition system fails and please inspect it. ■

4. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.

- If yes, go to step 5.
- If not, the fuel system fails and please inspect it. ■

5. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.

- If yes, the fuel injector fails and please replace it. ■
- If not, go to step 6.

6. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 7.

- If not, disassemble the timing belt and reinstall it. ■

7. Remove the air filter assembly and check if there is any carbon deposit on the throttle panel.
   - If yes, clean the throttle. ■
   - If not, go to step 8.

8. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 9.
   - If not, the coolant temperature sensor fails and please replace it. ■

9. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 10.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

10. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect a cylinder pressure gauge and check if the pressure of each cylinder is normal.
   - If yes, go to step 11.
   - If not, the mechanical part of the engine fails and please repair it. ■

11. Check if the power supply and grounding of the engine control module are normal.
   - If yes, locate fault causes from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.8 Normal start, but unstable idling speed at any time

Possible causes:

1. Failure resulting from bad fuel quality
2. Failure of the fuel injector
3. Failure of the spark plug
4. Failure of the throttle
5. Failure of the air intake system
6. Failure of ignition timing
7. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Disassemble the air filter and check the air filter element for blockage.
   - If yes, replace the air filter element. ■
   - If not, go to step 3.

3. Remove the air filter assembly and check if there is any carbon deposit on the throttle.
   - If yes, clean the throttle. ■
   - If not, go to step 4.

4. Check if the model and clearance of the spark plug of each cylinder are up to specifications.
   - If yes, go to step 5.
   - If not, adjust or replace the spark plug. ■

5. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 6.
   - If not, the ignition system fails and please inspect it. ■

6. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 7.
   - If not, the fuel system fails and please inspect it. ■

7. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.
   - If yes, the fuel injector fails and please replace it. ■
   - If not, go to step 8.

8. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 9.
   - If not, the coolant temperature sensor fails and please replace it. ■

9. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 10.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

10. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect a cylinder pressure gauge and check if the pressure of each cylinder is normal.
   - If yes, go to step 11.
   - If not, the mechanical part of the engine fails and please repair it. ■

11. Check if the failure occurs when the fuel is filled.
   - If yes, clean the fuel system and replace the fuel. ■
   - If not, go to step 12.

12. Check if the power supply and grounding of the engine control module are normal.
   - If yes, locate fault causes from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.9 Normal start, but unstable idling speed during warming up

Possible causes:

1. Failure of the throttle
2. Failure of the coolant temperature sensor
3. Failure of the spark plug
4. Failure of the ignition
5. Failure of the fuel injector
6. Failure of the air intake system
7. Failure of ignition timing
8. Failure resulting from bad fuel quality
9. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Remove the air filter assembly and check if there is any carbon deposit on the throttle panel.
   - If yes, clean the throttle. ■
   - If not, go to step 3.

3. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 4.
   - If not, the coolant temperature sensor fails and please replace it. ■

4. Check if the model and clearance of the spark plug of each cylinder are up to specifications.
   - If yes, go to step 5.
   - If not, adjust or replace the spark plug. ■

5. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 6.
   - If not, the ignition system fails and please inspect it. ■

6. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.
   - If yes, the fuel injector fails and please replace it. ■
   - If not, go to step 7.

7. Check the air intake system pipe for air leakage.
   - If yes, repair or replace the leaking pipe. ■
   - If not, go to step 8.

8. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 9.
- If not, disassemble the timing belt and reinstall it. ■

9. Check if the failure occurs when the fuel is filled.

- If yes, clean the fuel system and replace the fuel. ■
- If not, go to step 10.

10. Check if the power supply and grounding of the engine control module are normal.

- If yes, locate fault causes from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.10 Unstable engine idling speed or even flameout when the throttle is released after acceleration

Possible causes:

1. Failure of the exhaust system
2. Failure of the air intake system
3. Failure of the throttle
4. Failure of the spark plug
5. Failure of the ignition
6. Failure of the fuel injector
7. Failure resulting from bad fuel quality

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Start the engine to check if the exhaust emission is smooth.

- If yes, go to step 3.
- If not, the three-way catalytic converter is blocked, please replace it and check the fuel quality. ■

3. Disassemble the air filter element and check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 4.

4. Remove the air filter assembly and check if there is any carbon deposit on the throttle panel.

- If yes, clean the throttle. ■
- If not, go to step 5.

5. Check the air intake system pipe for air leakage.

- If yes, repair or replace the leaking pipe. ■
- If not, go to step 6.

6. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 7.
- If not, disassemble the timing belt and reinstall it. ■

7. Check if the failure occurs when the fuel is filled.

- If yes, clean the fuel system and replace the fuel. ■
- If not, go to step 8.

8. Check if the power supply and grounding of the engine control module are normal.

- If yes, locate fault causes from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.11 Normal start but excessive idling speed

Possible causes:

1. Failure of the throttle
2. Failure of the air intake system
3. Failure of the coolant temperature sensor
4. Failure of ignition timing

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Remove the air filter assembly and check if there is any carbon deposit on the throttle panel.

- If yes, clean the throttle. ■
- If not, go to step 3.

3. Start the engine and when idling, and check the intake manifold for leakage.

- If yes, repair or replace the leaking pipe. ■
- If not, go to step 4.

4. Start the engine, check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 5.
- If not, the coolant temperature sensor fails and please replace it. ■

5. Make sure that the A/C switch is OFF, turn the ignition switch to the "ON" position and check if the "A/C switch" is turned on with a diagnostic device.

- If yes, the A/C line fails. ■
- If not, go to step 6.

6. Check if the power steering switch is conducted when the steering wheel is returned to the original position .

- If yes, the power steering switch fails and please replace it. ■
- If not, go to step 7.

7. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 8.
- If not, reinstall the timing belts. ■

8. Check if the power supply and grounding of the engine control module are normal.

- If yes, locate fault causes from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.12 Slow response in acceleration

Possible causes:

1. Failure of the exhaust system
2. Failure of the air intake system
3. Failure of the throttle
4. Failure of the coolant temperature sensor
5. Failure of the intake air pressure/temperature sensor
6. Failure of ignition timing
7. Failure of the fuel system

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Start the engine to check if the exhaust system is smooth.

- If yes, go to step 3.
- If not, the three-way catalytic converter is blocked, please replace it and check the fuel quality. ■

3. Check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 4.

4. Remove the air filter assembly and check if the drive motor of the throttle panel is normal.

- If yes, go to step 5.

- If not, clean the throttle. ■

5. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 6.
   - If not, the fuel system fails and please inspect it. ■

6. Start the engine, check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 7.
   - If not, the coolant temperature sensor fails and please replace it. ■

7. Start the engine, check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 8.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

8. Disassemble the timing belt upper guard and check if the timing belt is installed properly.
   - If yes, go to step 9.
   - If not, reinstall the timing belts. ■

9. Check if the power supply and grounding of the engine control module are normal.
   - If yes, locate fault causes from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.13 Normal start but unstable idling speed after warming up

Possible causes:

1. Failure of the air intake system
2. Failure of the throttle
3. Failure of the fuel system
4. Failure of the coolant temperature sensor
5. Failure of the intake air pressure/temperature sensor

Diagnostic procedures

1. Turn the ignition switch to the ON position and check if there is any failure record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Remove the air filter assembly and check if there is any carbon deposit on the throttle panel.
   - If yes, clean the throttle. ■
   - If not, go to step 3.

3. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.

- If yes, go to step 4.
- If not, the fuel system fails and please inspect it. ■

4. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.

- If yes, the fuel injector fails and please replace it. ■
- If not, go to step 5.

5. Start the engine, check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 6.
- If not, the coolant temperature sensor fails and please replace it. ■

6. Start the engine, check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 7.
- If not, the intake air pressure/temperature sensor fails and please replace it. ■

7. Check if the power supply and grounding of the engine control module are normal.

- If yes, locate fault causes from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

6 Ignition Control System

6.1 General information

6.1.1 Overview

- The function of the ignition system is to ignite the flammable mixture in the corresponding cylinder in turn in accordance with a reasonable ignition timing sequence to maintain the normal operation of the engine.
- The ignition control system consists of the following components:

  a. Engine control module (ECM)
  b. Ignition coil
  c. Spark plug
  d. Ignition cable
  e. Camshaft position sensor
  f. Crankshaft position sensor

6.1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Spark plug	30±3
Fixing bolt of the ignition coil	6±1

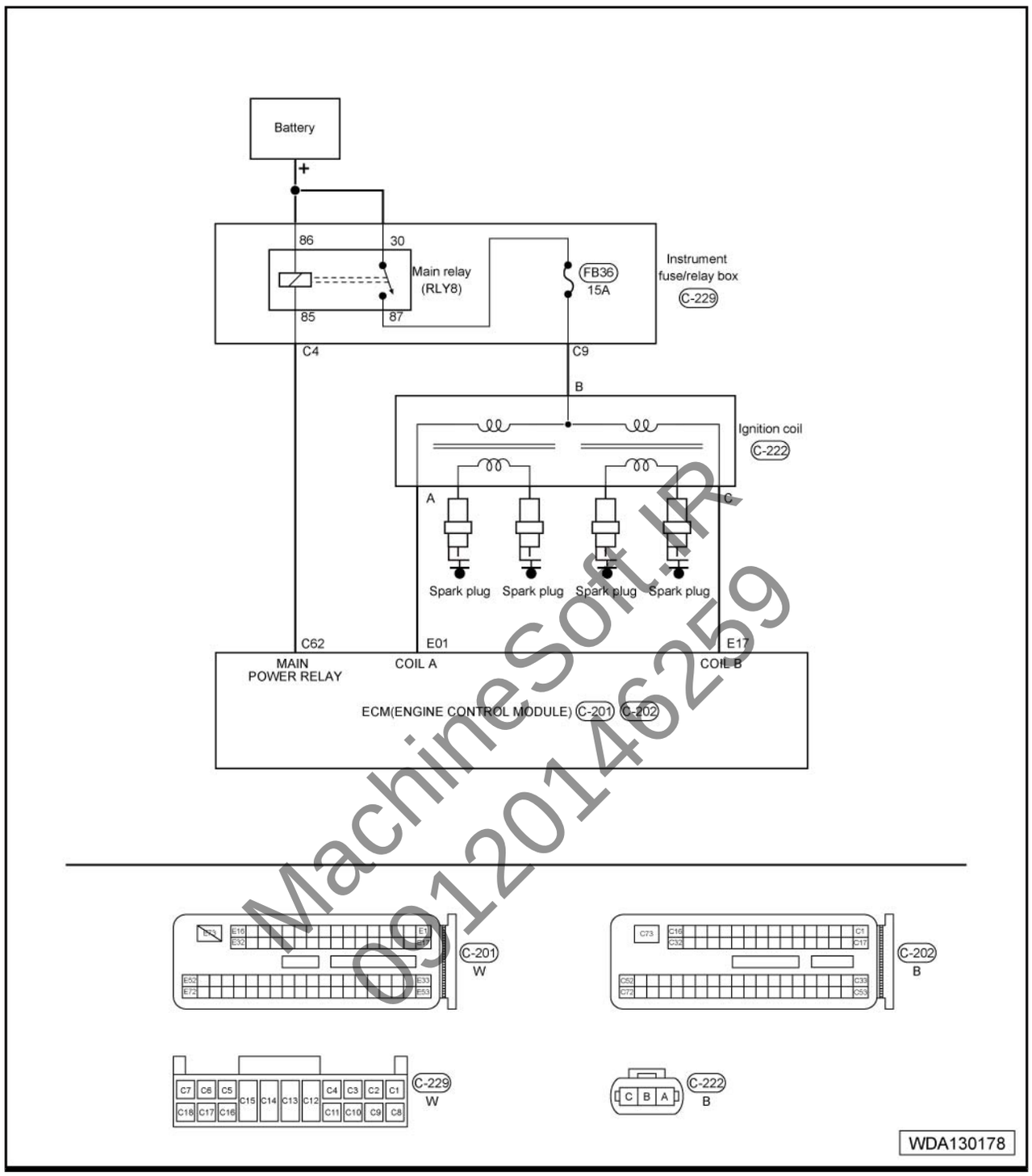
Spark plug

Component	Value
Type of spark plug	FR7DTC
Standard electrode clearance of the spark plug	0.7±0.1 mm

Ignition cable resistance

Component	Resistance value (KΩ)
Cylinder 1 ignition cable	7.5～11.2
Cylinder 2 ignition cable	5.8～9.3
Cylinder 3 ignition cable	4.2～7.7
Cylinder 4 ignition cable	4～7.5

6.1.3 Ignition system circuit diagram



6.2 Diagnosis and inspection

6.2.1 Ignition system troubleshooting

Symptoms	Possible causes	Maintenance recommendations
Engine idling vibration and disabled acceleration	Excessive spark plug electrode clearance	Replace the spark plug
	Spark plug out of work	Replace the spark plug
	Low ignition voltage of the ignition coil	Replace the ignition coil
	Excessive ignition cable resistance	Replace the ignition cable
	Ignition cable open circuit	Replace the ignition cable

6.3 Spark plug

6.3.1 Removing and installing the spark plug

Caution

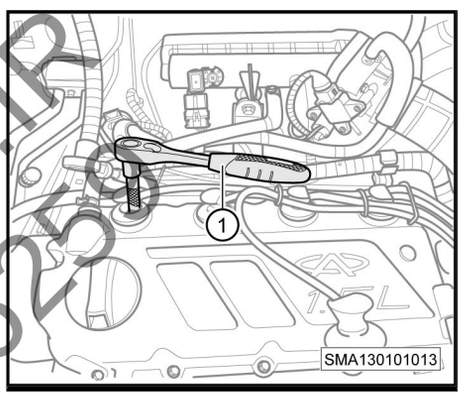
- Do not remove the spark plug when the engine is hot; otherwise, it may cause damage to the spark plug threaded hole on the cylinder head.

Note

- Remove the high voltage wires from the spark plug one by one, and make marks to avoid incorrect installation.
- Remove dust and impurities around the spark plug hole before removal to prevent them from falling into the cylinder.

Removal

1. Turn off the ignition switch and wait until the engine cools down.
2. Pull out the ignition cable.
3. Unscrew the spark plug with a special spark plug socket wrench (-1-).

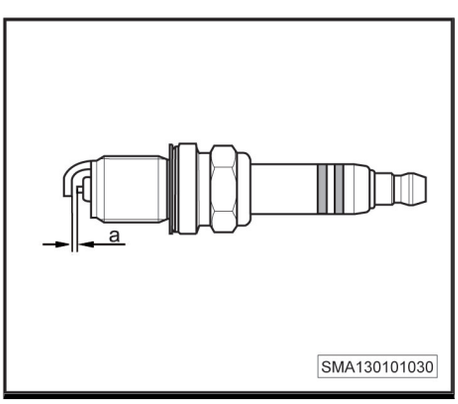


Installation

Note

- Check the spark plug type to see if it is applicable.
- Please use special socket for installation so as not to hit the cylinder wall and damage the normal spark plug clearance.

1. Manually screw the spark plug into the cylinder head as far as it will go and then tighten the spark plug with a torque wrench during installation.
   - Tightening torque of the spark plug: 30±3 N•m
2. Check the spark plug for clearance and the related data before installation.



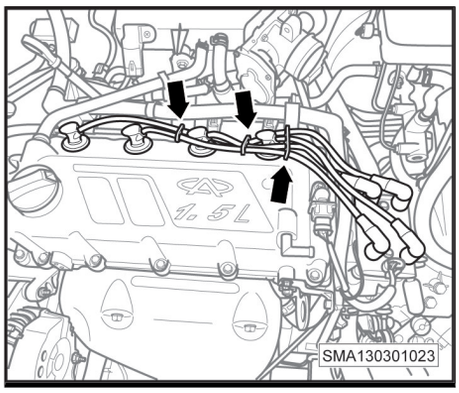
Spark plug	Value
Standard electrode clearance	0.7±0.1 mm
Type	FR7DTC

Spark plug	Value
Recommended replacement interval	Every 30000 Km or 18 months

6.4 Ignition cable

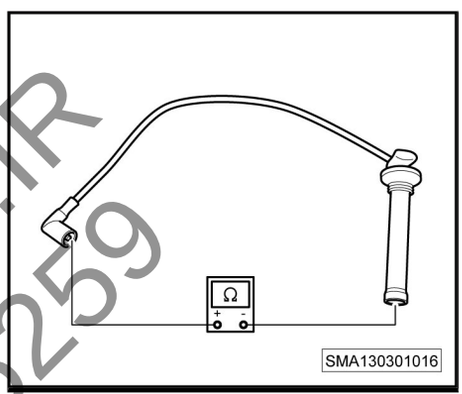
6.4.1 Removing and installing the ignition cable

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the fixing clips of the ignition cables (-arrow-), pull the big ends of the ignition cables out of the spark plugs sequentially and remove the small ends from the ignition coils in turn to take off the ignition cables.

Installation



Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

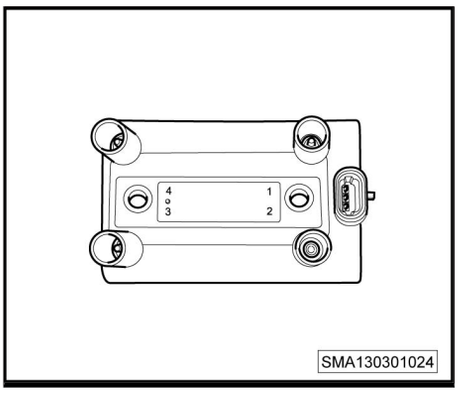
1. Pay attention to the installation positions of the ignition cables.
2. Check if the resistance of the ignition cable is normal and measure the resistances of the ignition cable at both ends as shown in the figure.

   - Standard resistance of cylinder 1 ignition cable:
   7.5 - 11.2 (KΩ)
   - Standard resistance of cylinder 2 ignition cable:
   5.8 - 9.3 (KΩ)
   - Standard resistance of cylinder 3 ignition cable:
   4.2 - 7.7 (KΩ)
   - Standard resistance of cylinder 4 ignition cable:
   4 - 7.5 (KΩ)

6.5 Ignition coil

6.5.1 Overview

The ignition coil transforms low voltage of the primary winding to high voltage of the secondary winding, and the high voltage produces spark through the electrode discharge of the spark plug to detonate the flammable gas mixture within the cylinder.

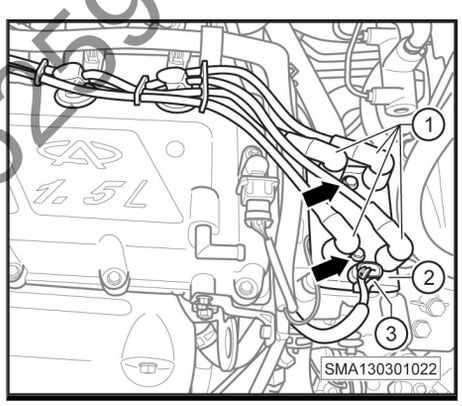


The ignition coil consists of two primary windings, two secondary windings, iron core, shell and so on. When a primary winding is connected to the ground, this primary winding is charged. Once the ECM cuts off the primary winding circuit, the charge will be terminated. At this point, high voltage is induced in the secondary winding to enable the spark plug discharging.

6.5.2 Removing and installing the ignition coil

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Pull out the ignition cable connector (-1-).
4. Disconnect the ignition coil connector (-3-).
5. Unscrew the bolts (-arrow-) and remove the ignition coil (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

a. The ignition cables must be installed as per the "-1-3-4-2-" ignition sequence.

7 Fuel Vapor Emission Control System

7.1 General information

7.1.1 Overview

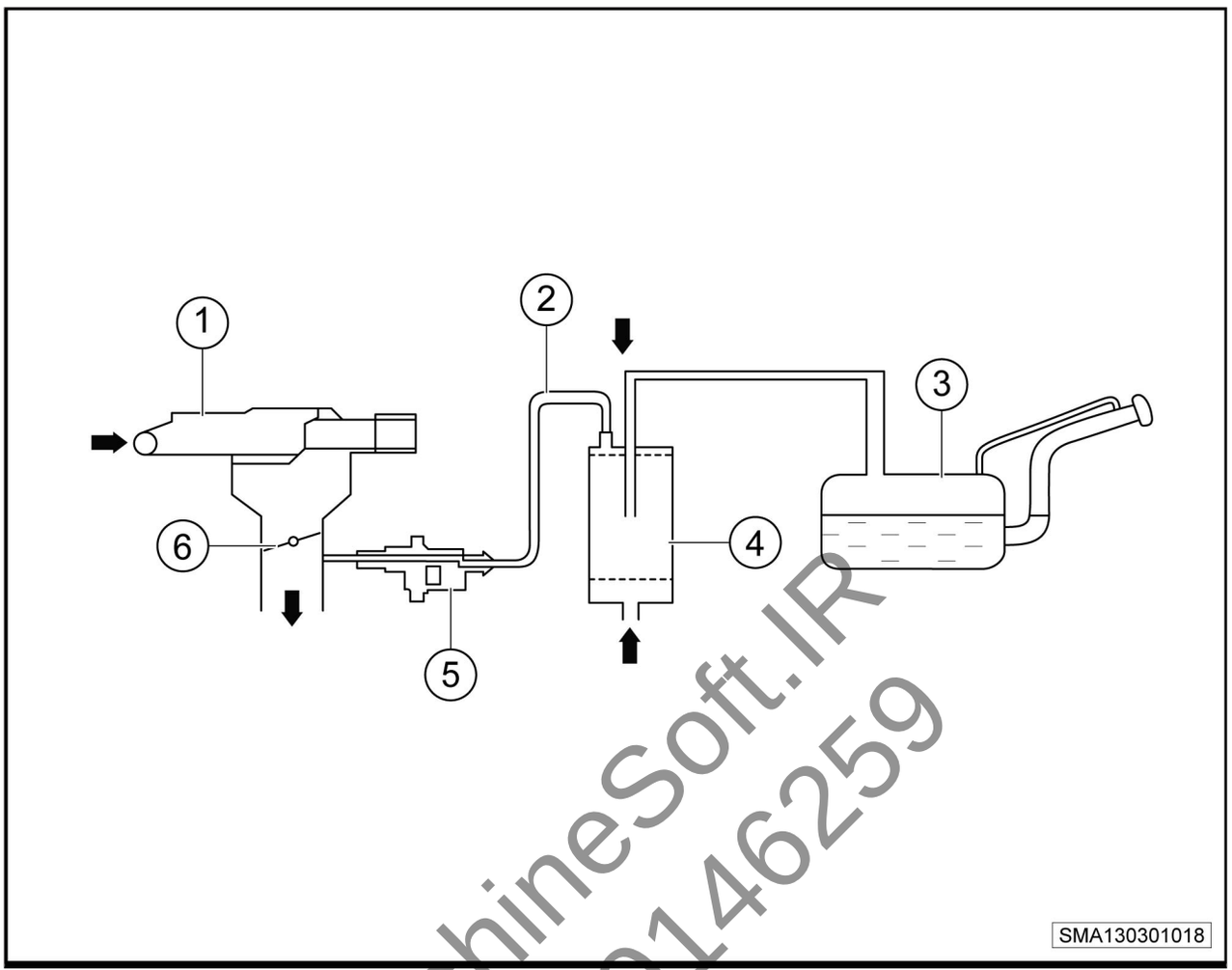
- The fuel vapor emission control system recovers and burns the fuel vapor so as to prevent the fuel vapor in the fuel tank from being discharged into the atmosphere.
- The activated carbon canister plays an important role in the fuel vapor emission control system. The activated carbon canister is used to absorb and filter the moisture and fuel vapor. The fuel vapor enters the top of the activated carbon canister through the pipe while the fresh air goes to the bottom of the activated carbon canister. When the engine stops, the fuel vapor and fresh air will be stored in the activated carbon canister; and when the canister solenoid valve opens, the fuel vapor will enter the intake manifold for combustion.

7.1.2 Product specifications

Torque specifications

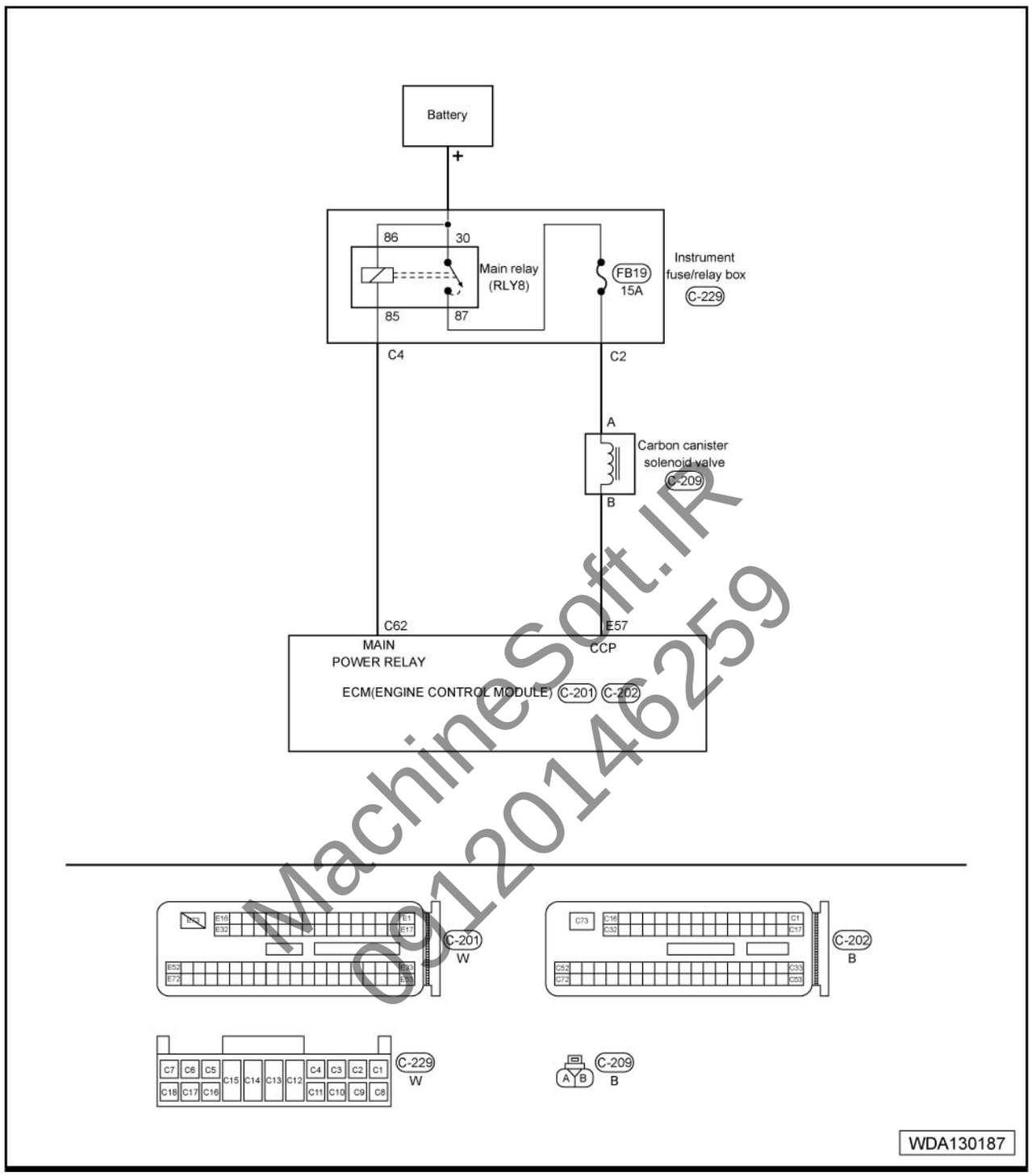
Component	Torque (N·m)
Mounting bracket of the activated carbon canister solenoid valve	18±2
Activated carbon canister assembly	7±2

7.1.3 The fuel vapor emission control system assembly



1. Air filter	2. Activated carbon canister outlet hose
3. Fuel tank	4. Activated carbon canister
5. Activated carbon canister solenoid valve	6. Throttle

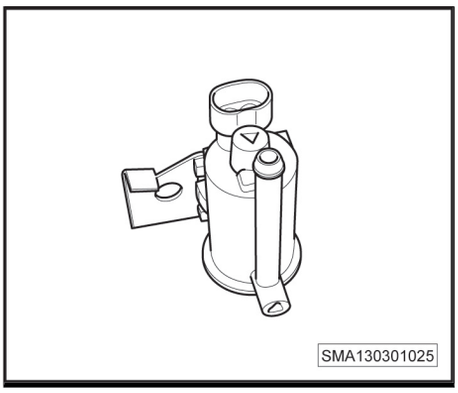
7.1.4 Fuel vapor emission control system circuit diagram



7.2 Activated carbon canister solenoid valve

7.2.1 Overview

Based on signals received from such as engine load, engine temperature and RPMs, the engine control module (ECM) computes the information to send out the electrical pulse duty ratio to control the opening and closing of the activated carbon canister solenoid valve.



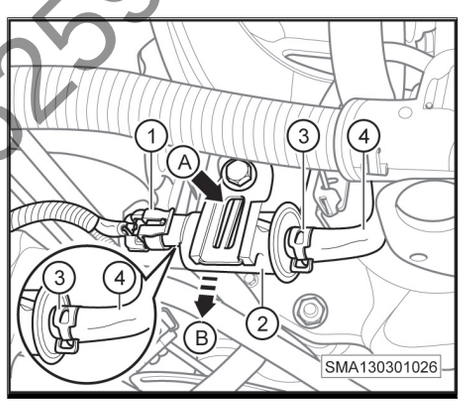
7.2.2 Removing and installing the activiated carbon canister solenoid valve

Note

- Before removal, mark at the inlet and outlet hoses to avoid confusion.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the carbon canister solenoid valve connector (-1-), loosen the clamps (-3-), and pull out the inlet and outlet hoses (-4-).
4. Lever out the clip (-arrow A-), and remove the carbon canister solenoid valve (-2-) in the (-arrow B-) direction.

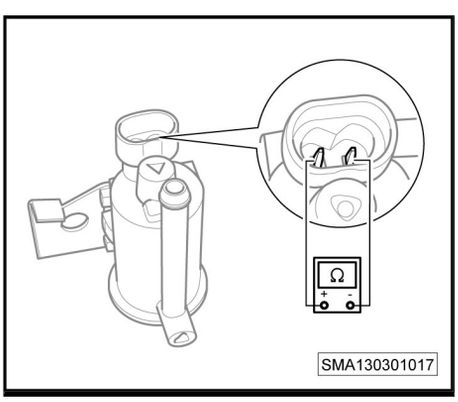


Installation

- Installation shall follow the reverse sequence of the removal procedure.

7.2.3 Checking the activated carbon canister solenoid valve

1. Remove the activated carbon canister solenoid valve.
2. Turn the digital multimeter to the Ohm range, with the two meter probes connecting to the two pins of the activated carbon canister solenoid valve. The measured resistance value should be 21 ± 1 Ω at 20°C.



7.3 Activated carbon canister

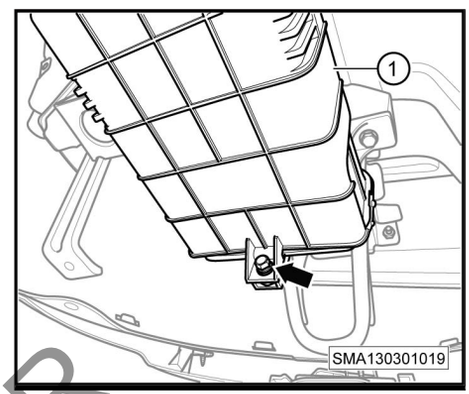
7.3.1 Overview

- The activated carbon canister is filled with activated carbon which can absorb, filter and store the fuel vapor.

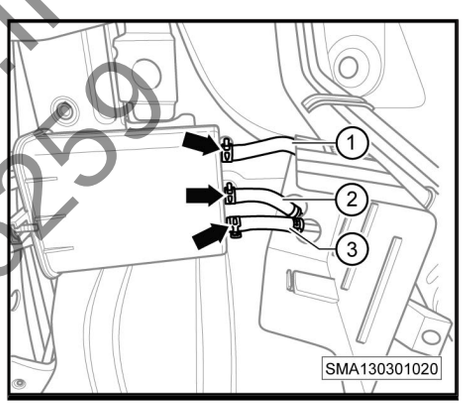
7.3.2 Removing and installing the activated carbon canister

Removal

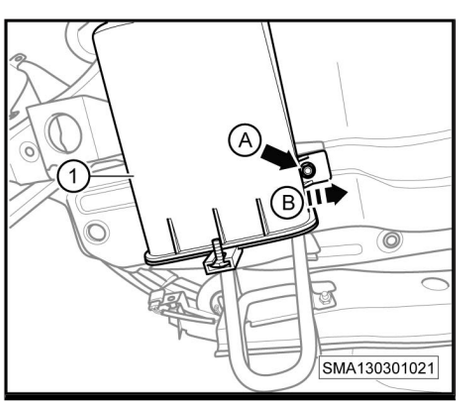
1. Unscrew the nut (-arrow-) and loosen the cover (-1-).



2. Loosen the clamps (-arrow-) and loosen the hoses (-1-, -2- and -3-).



3. Unscrew the bolt (-arrow A-) and loosen the body clip in the (-arrow B-) direction to take out the activated carbon canister (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

0302 UAES Engine Management System

1 General Information

1.1 Overview

Engine SQR477F applies the M7-Motronic engine management system to control the closed-loop control unit, the sequential fuel injection, the distributorless group direct ignition and the three-way catalytic converter aftertreatment.

The MT80 engine management system mainly consists of three parts: electronic control module (ECM), sensor and actuator. The sensor is used to detect the physical signals (temperature, pressure, speed, etc.) of the vehicle, convert them to voltage signals and send them to the ECM. The ECM calculates and analyzes the electric signal data input by the sensor according to the preset program after receiving them, and then sends the corresponding control command to the power drive circuit. The power drive circuit will drive each actuator to perform according to the command, thus enabling the engine to run efficiently and smoothly.

The fault diagnosis system of the engine electronic control module (ECM) is used to monitor every sensor and controller in the system randomly. If detecting and confirming a fault signal, it will store the relevant fault code and activate the "Limp Home" function to run the engine. If detecting that the fault has been eliminated, it will reactivate the normal engine function.

Functions of the engine management system

Intake air pressure/temperature sensor control:

1. Engine torque output control
2. Sequential fuel injection closed-loop control
3. Ignition timing and emission control
4. Knock control
5. Idling control
6. A/C control
7. Cooling fan control
8. Carbon canister solenoid valve control
9. System self-diagnosis
10. ECM anti-theft control
11. Built-in ignition drive module of ECM, distributorless group direct ignition

Features of ECM in the engine management system

1. ECM developed by the high-end market
2. Latest electronic hardware technology
3. 16-bit CPU, 40MHz clock frequency and 768k cache
4. New modularized software and hardware structure with high portability
5. Meeting the Euro IV emission standards and the EOBD (European On-Board Diagnostics) technology

1.2 System functions

Calculation of air flow by engine aerothermodynamics

The ECM calculates the air flow and air mass entering the cylinder via signals of the intake air pressure/temperature sensor, and then corrects the injection volume to make the air-fuel ratio meet the requirements of various conditions.

Torque control

The ECM estimates the current torque output required by the engine according to signals of the accelerator pedal position sensor, and controls the engine torque output via sensor information.

Measurement of crankshaft position and engine speed

The ECM determines the crankshaft position and the engine speed according to signals from the 58X ring gear, and accurately controls the engine ignition and the injection timing.

Determination of working sequence of engine cylinders

The ECM recognizes the top dead center of one cylinder via the camshaft position sensor, so as to determine the working sequence of engine cylinders.

Fuel control

There are two modes of fuel control: closed-loop fuel control and open-loop fuel control. The closed-loop fuel control can accurately regulate engine's air-fuel ratio, thus effectively controlling emissions. The open-loop fuel control is applied when the engine is starting or warming up or the oxygen sensor is malfunctioning.

Ignition control

The ignition control system of the engine applies group control.

Knock control

When a knocking is detected by the knock sensor, the system will calculate the ignition advance angle that needs to be delayed or advanced according to the current condition and knock intensity, and adjusts it to the proper ignition angle, thus avoiding or reducing knocking.

Emission control

The three-way catalytic converter can convert the engine exhaust into harmless gas and discharge it to the air. When the engine reaches the normal temperature after warming up, the ECM will activate the closed-loop fuel control to correct the air-fuel ratio, thus realizing the optimum conversion efficiency of the three-way catalytic converter.

Three-way catalytic converter protection

The engine management system has the function to protect the three-way catalytic converter. The ECM estimates the temperature of the three-way catalytic converter according to engine's operation. When it is estimated that the exhaust temperature will exceed converter's maximum permissible temperature for a long time, the ECM will automatically activate the function of three-way catalytic converter protection to keep it at a normal temperature.

System voltage protection

When the charging system malfunction causes an excessive system voltage, the engine electronic control system will activate the protection program to limit the engine speed, thus avoiding damage to ECM and battery.

1.3 System control logic

Start control

When starting the engine, special calculation method shall be taken to control the air intake, injection volume and ignition timing. Before starting the engine, the throttle is closed; the air in the intake manifold is static; the internal pressure of the intake manifold equals the atmospheric pressure; and the idling regulator uses the initial fixed parameter.

Soon after the engine starts, the control signal of the injection timing is the initial pulse signal. The fuel injection volume increases gradually with the temperature increase of the engine, causing the oil film to form on the intake manifold and cylinder walls. Before the engine reaches a certain speed, a rich mixture will be used in the cylinder.

When the engine reaches a certain speed and temperature, the system will gradually reduce the injection volume and use a flammable lean mixture. When the engine starts, the ignition advance angle will also be adjusted according to the engine's operation and will change with the engine temperature, intake temperature and engine speed.

Warming up and heating control of the three-way catalytic converter

When the engine starts from cold, the air intake, injection volume and ignition timing will accord with the starting mode. The high torque of the engine will be compensated though increasing the injection volume and adopting fixed ignition timing, until the engine reaches a certain temperature. After the engine starts normally, the three-way catalytic converter is required to be warmed up quickly to reach the operating temperature, thus reducing the exhaust emissions significantly. Therefore, the engine electronic control system will delay the ignition advance angle properly, and use the high-temperature exhaust to heat the three-way catalytic converter.

Fuel cut-off control when accelerating/decelerating

When accelerating, a small portion of fuel injected into the intake manifold by the injector can not reach the cylinder in time for combustion, thus forming a layer of oil film on the intake manifold wall. With the increase of engine load and injection volume, the oil film in the intake manifold will get more and more. When the throttle opening increases, some injected fuel will be absorbed by the oil film. Therefore, the injection volume must be increased to compensate the concentration of the mixture, preventing the flammable mixture from becoming lean when accelerating. In addition, when the throttle opening and the engine load decrease, the fuel on the intake manifold wall will be released to the cylinder. So the injection volume shall be reduced when decelerating.

When decelerating, the power at the flywheel provided by the engine is negative. In this case, the injector is cut off to reduce the fuel consumption and exhaust emission, especially to protect the three-way catalytic converter.

When the engine speed reduces to a speed higher than the idling speed, the injection system will start injecting fuel again. In fact, the engine electronic control system program will provide fuel again to keep the engine running according to the changes of engine temperature and engine speed, thus preventing the engine speed from becoming lower than the specified value. When the injection system provides fuel again, the system will use the initial pulse control signal to supply fuel and forms oil film on the intake manifold wall, enabling the engine to smoothly shift to the normal idling operation.

Idling control

When idling, the engine does not provide torque to the flywheel. To ensure the steady running of the engine at an idling speed as low as possible, the closed-loop idling control system must maintain the balance between the torque and engine power. Certain power is generated to meet the needs for various loads, such as the load needed to overcome the internal friction of engine crankshaft and valve train.

The closed-loop idling control of the M7 system determines the engine torque output needed to maintain the idling speed under certain operation conditions. The torque output increases when the engine speed decreases, and decreases when the engine speed increases. The system will increases the engine torque to respond to the new "interference factor", such as switching on the air conditioner compressor or shifting by automatic transaxle. When the engine temperature is low, the torque will also be increased to overcome the friction of internal parts and maintain the idling speed. All of the torque output requirements will be calculated by the torque input adaptor so as to obtain the corresponding air intake, air-fuel ratio and ignition timing.

λ closed-loop control

The three-way catalytic converter can efficiently reduce 98% of harmful elements in the exhaust, such as HC, CO and NO_x, and converts them to water, CO_2 and N_2. However, the three-way catalytic converter can reach the above efficiency only when the engine excess air factor λ is approximately 1. The purpose of the λ closed-loop control is to ensure that the mixture concentration is within the range.

The λ closed-loop control system works only when equipped with the oxygen sensor. The oxygen sensor is installed on the three-way catalytic converter and can detect the oxygen content in the exhaust at any time. When the mixture is lean ($\lambda > 1$), the oxygen sensor will output the signal voltage of about 100 mV to BCM. When the mixture is rich ($\lambda < 1$), the oxygen sensor will output the signal voltage of about 800 mV. When the engine is running, the signal voltage of the oxygen sensor may vary between 100 mV and 800 mV; and the closed-loop control will correct the injection volume and control the exhaust emissions according to the signal voltage.

Evaporation and emission control

Due to the outside temperature and heat produced by the fuel pump, the fuel in the fuel tank will be heated and generate fuel vapor. The fuel vapor is not allowed to be discharged to the atmosphere directly. It is collected and stored in the activated carbon canister by the guide tube, and sent to the engine for combustion at a proper time. The ECM controls the carbon canister solenoid valve so as to control the fuel vapor volume entering the cylinder, which is performed only under the closed-loop control.

1.4 Product specifications

Torque specifications

Item	Data (N·m)
Crankshaft position sensor	8±2
Camshaft position sensor	8±2
Knock sensor	20±5
Intake air pressure/temperature sensor	6±1
Throttle position sensor	2±0.5
Coolant temperature sensor	22±2
Ignition coil	6±1
Oxygen sensor	45±5
Idling stepper motor	7±1

1.5 Failures of engine management system input and output devices

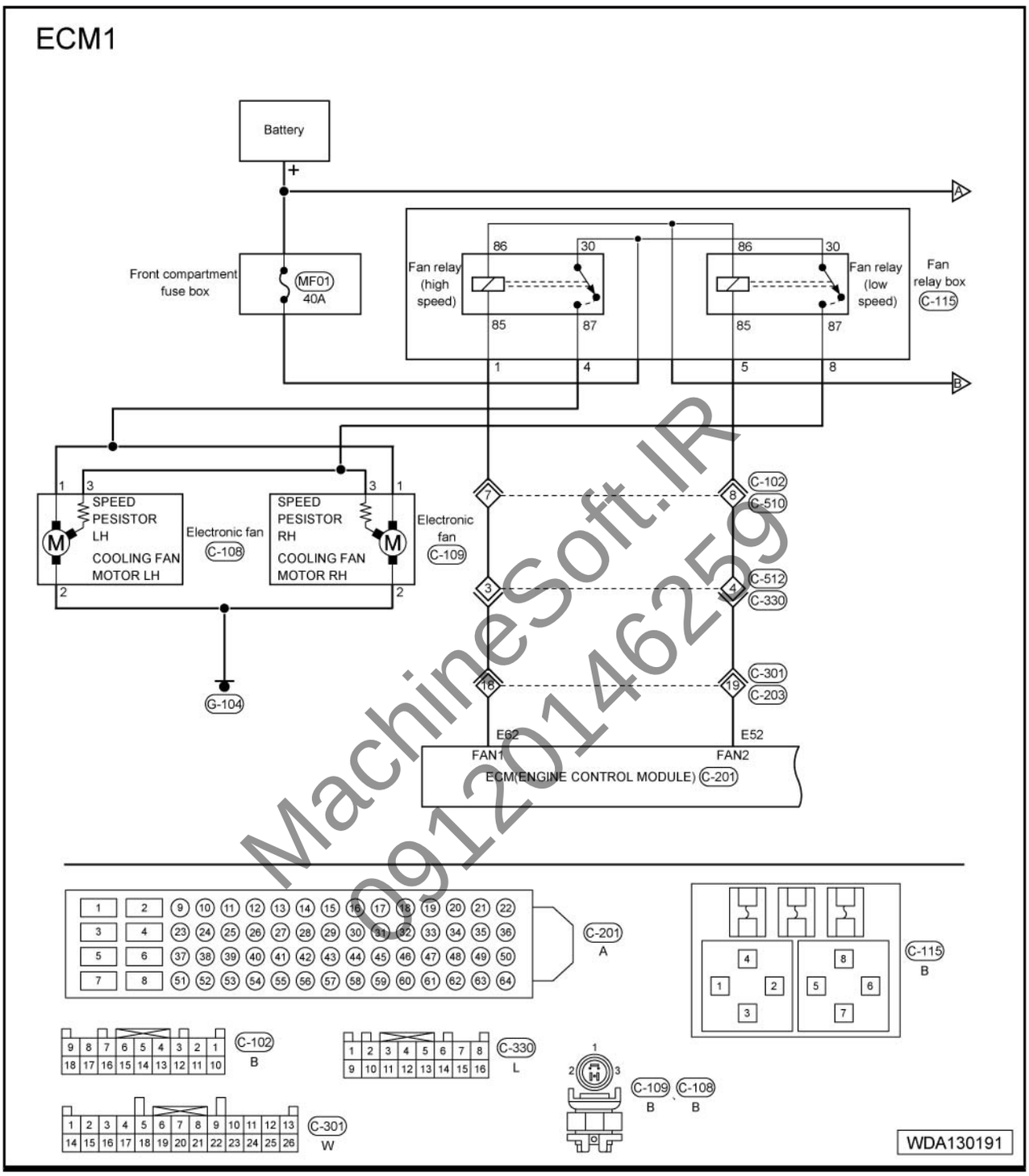
No.	Component	Symptoms	Maintenance recommendations
1	Crankshaft position sensor	• Engine start failure • Frequent engine flameout • Sporadic flameout • Maximum engine speed of less than 3800 rpm	Replace the crankshaft position sensor
2	Camshaft position sensor	• Engine start failure • Maximum engine speed of less than 4000 rpm • Increased fuel consumption	Replace the camshaft position sensor
3	Knock sensor	• Knocking when accelerating • Incorrect ignition timing • Increased fuel consumption • Inadequate engine power	Replace the knock sensor
4	Intake air pressure/temperature sensor	• High fuel consumption • Frequent engine flameout • Rough idling • Poor engine performance	Replace the intake air pressure/temperature sensor
5	Throttle position sensor	• Engine flameout when accelerating • Increased fuel consumption • Engine flameout at high speed	Replace the throttle position sensor
6	Coolant temperature sensor	• Engine start difficulty • Rough idling • Disabled cooling fan • Poor engine performance • Incorrect ignition timing	Replace the coolant temperature sensor
7	Oxygen sensor	• Improper air-fuel ratio and high exhaust emission • High fuel consumption	Replace the oxygen sensor
8	A/C pressure switch	• Excessive cooling temperature and poor cooling effect when the A/C is on	Replace the A/C pressure switch

No.	Component	Symptoms	Maintenance recommendations
		• Disabled magnetic clutch relay when the A/C is on	
9	Power steering switch	• Engine vibration when turning the steering wheel at idling • Disabled engine compensation and frequent flameout when idling	Replace the power steering switch
10	Brake lamp switch	• Unsmooth fueling • Vehicle hesitation	Replace the brake lamp switch
11	Idling stepper motor	• Excessive engine start time • Engine starts only when the accelerator pedal is depressed • Engine flameout when idling • High idling speed • No idling speed	Clean and replace the idling stepper motor
12	Ignition coil	• Engine start failure • Inadequate engine power and disabled acceleration • Incomplete combustion • Unstable engine operation	Replace the ignition coil
13	Carbon canister solenoid valve	• Poor idling • Incorrect air-fuel ratio	Replace the carbon canister solenoid valve
14	Injector	• Engine start failure or difficulty • Unstable engine operation and vibration • Frequent engine flameout • Black smoke in emissions • Inadequate engine power and disabled acceleration	Replace the injector
15	Fuel pump	• Engine start failure • Inadequate engine power and disabled acceleration • Engine start difficulty • Poor acceleration	Replace the fuel pump

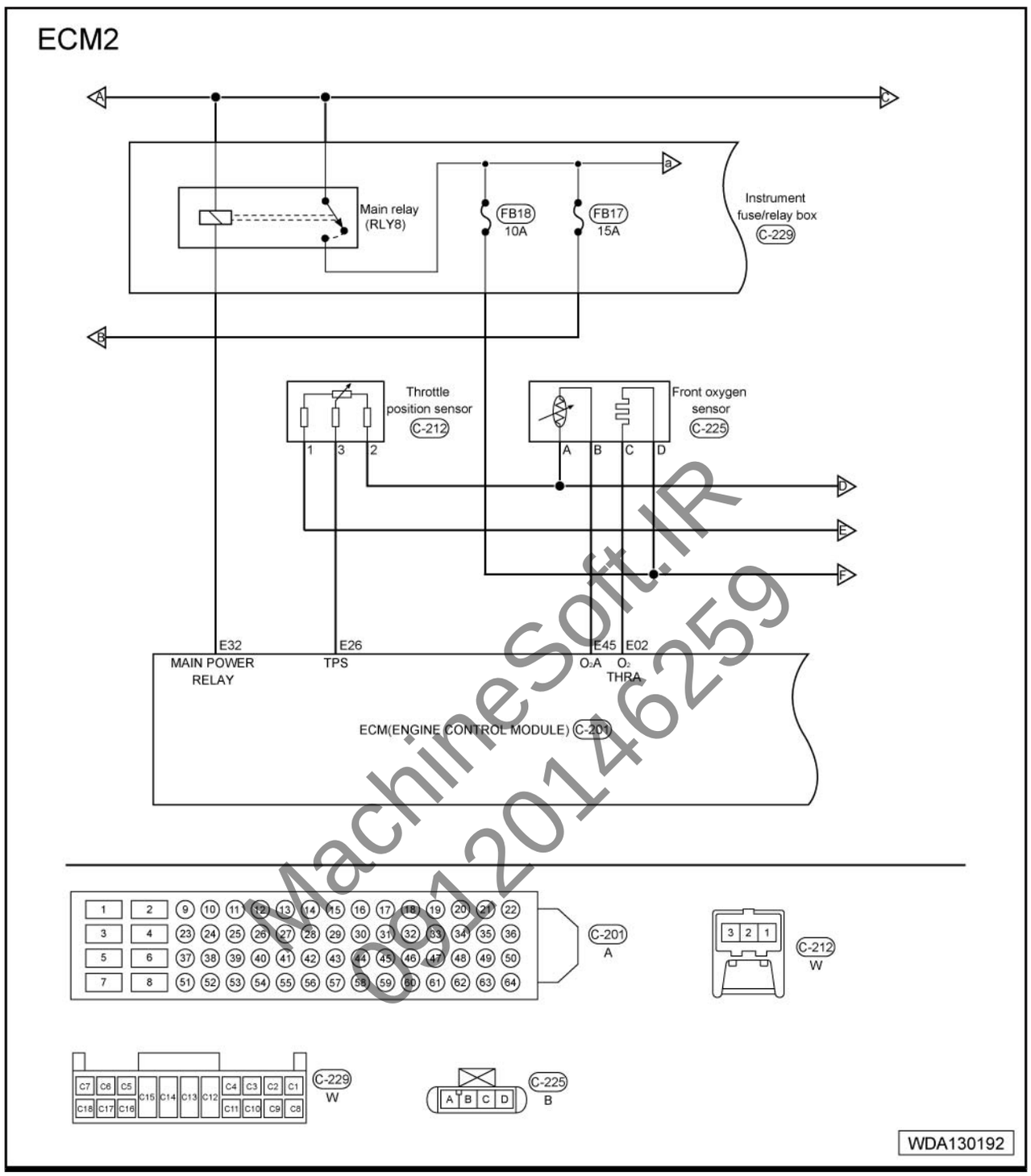
No.	Component	Symptoms	Maintenance recommendations
16	Cooling fan	• Excessive engine coolant temperature • Intermittent operation of the air conditioner • Low engine coolant temperature	Replace the cooling fan

1.6 Circuit diagram of UAES engine management system

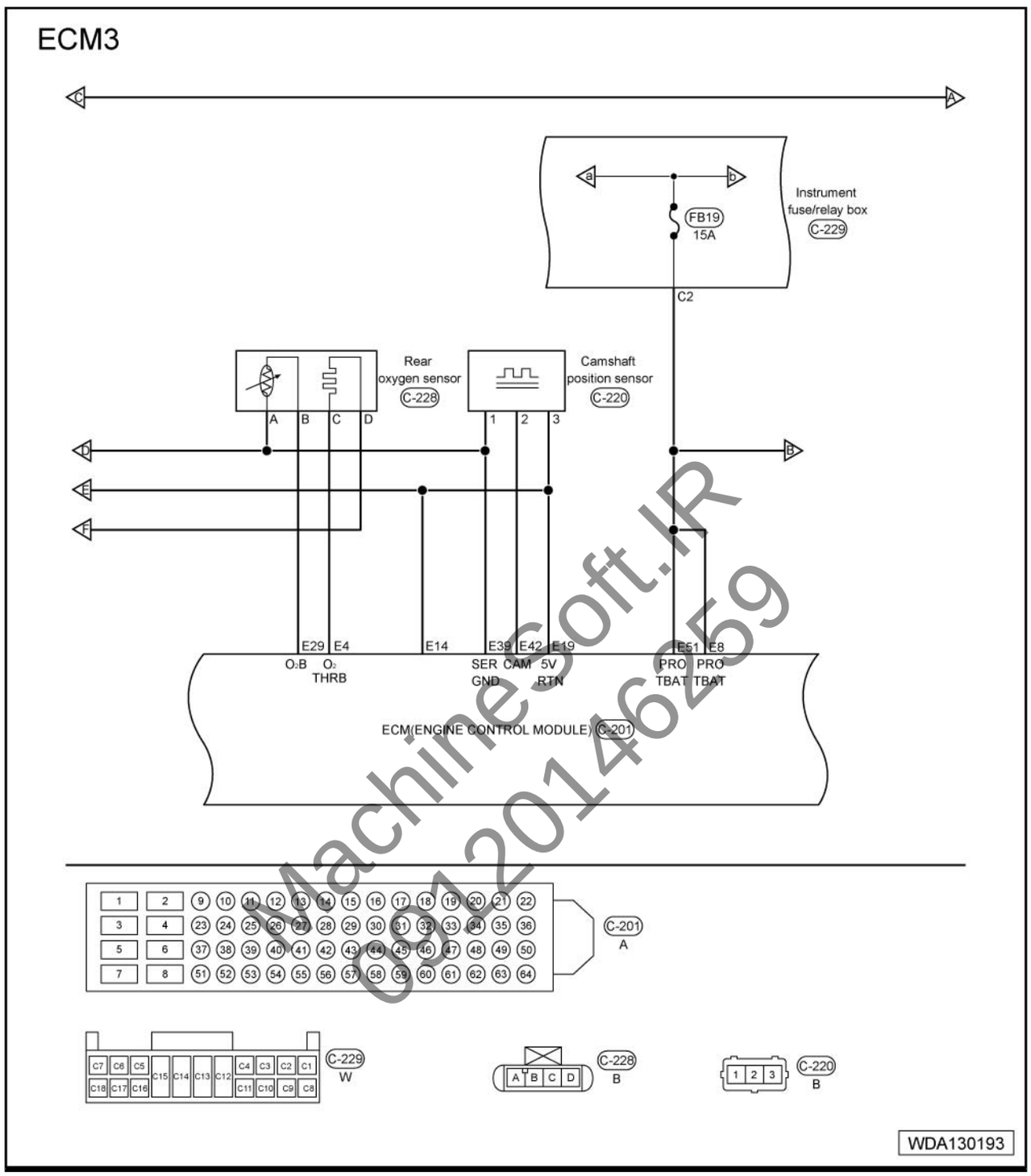
Engine circuit diagram (page 1)



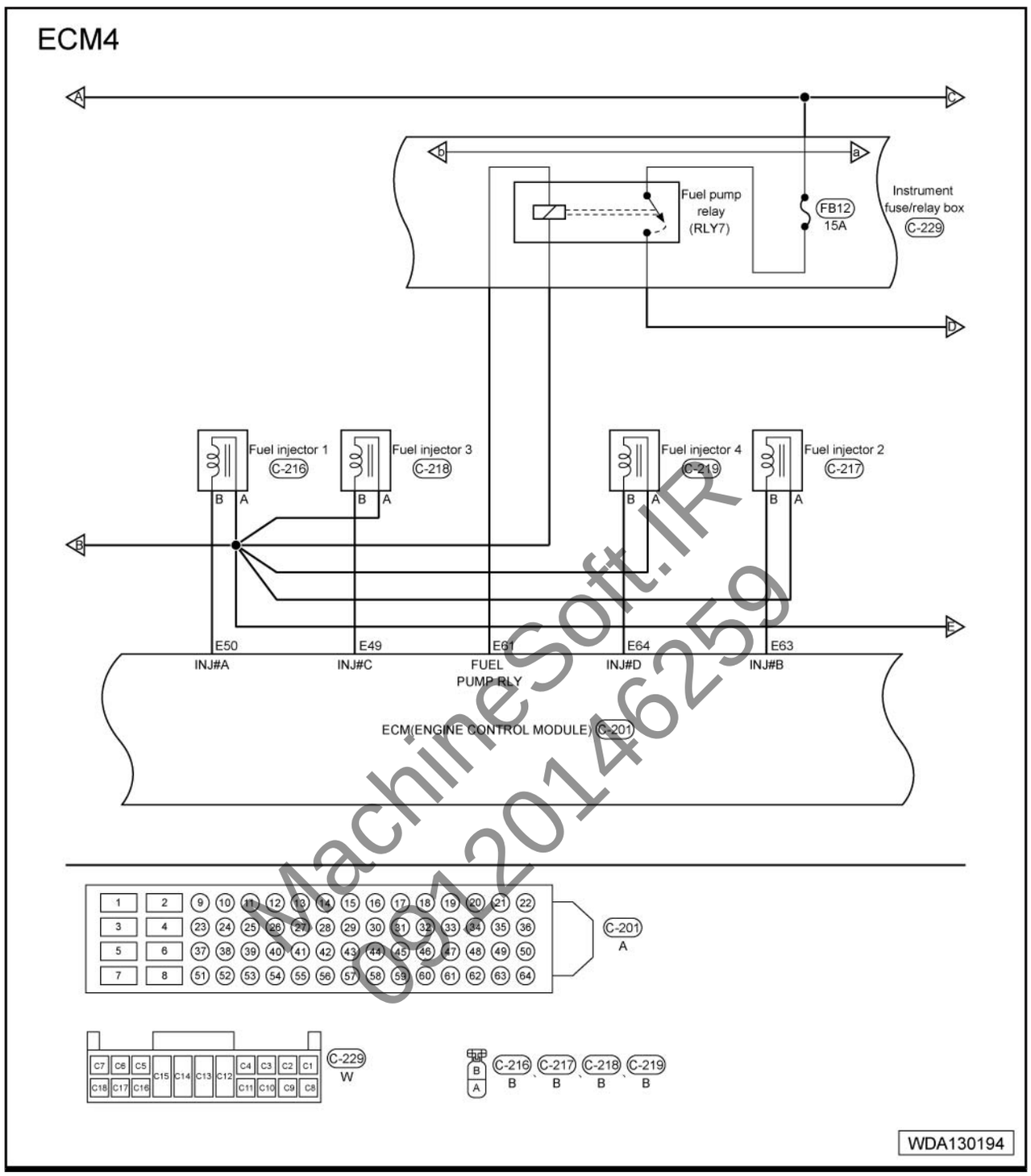
Engine circuit diagram (page 2)



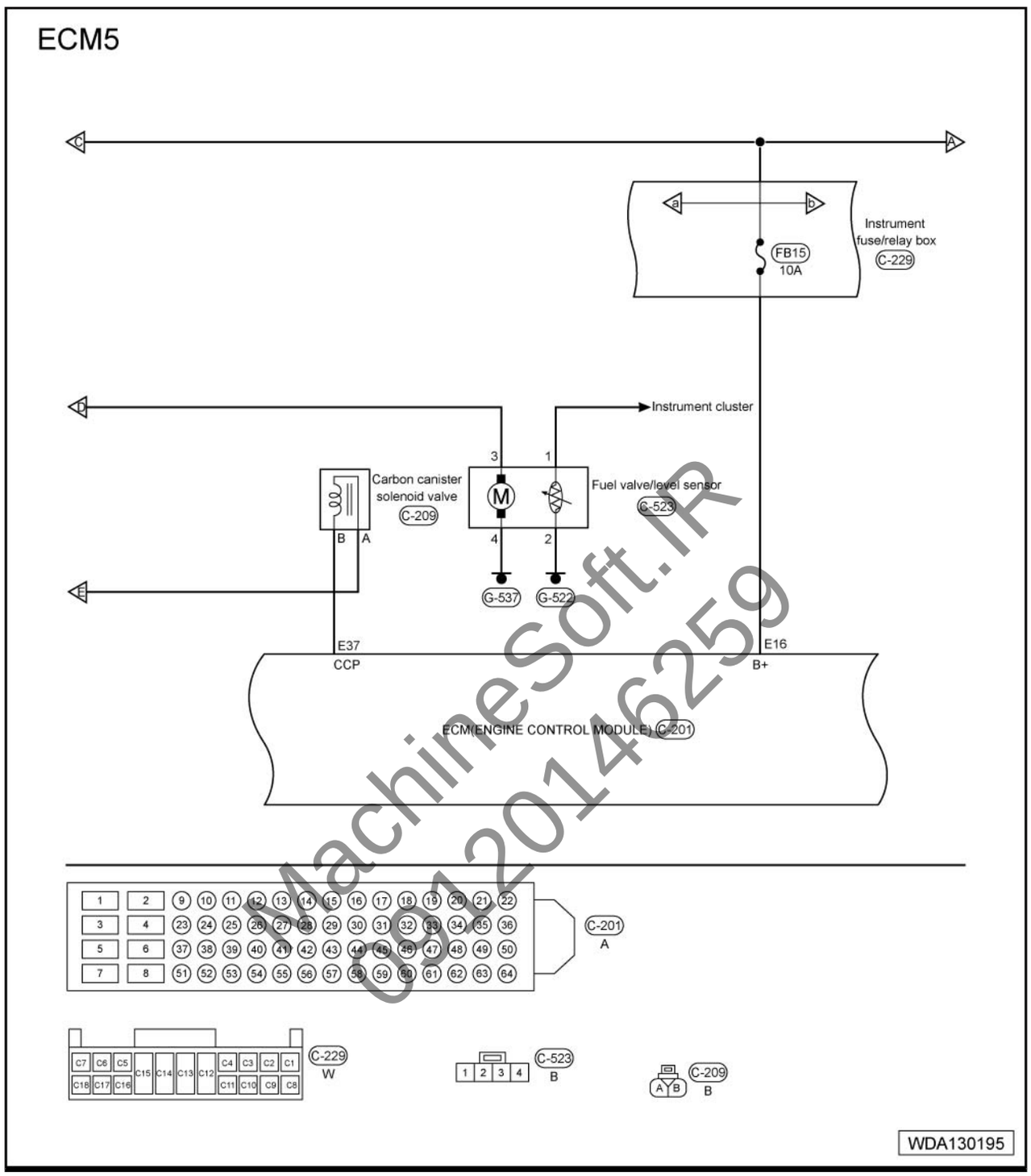
Engine circuit diagram (page 3)



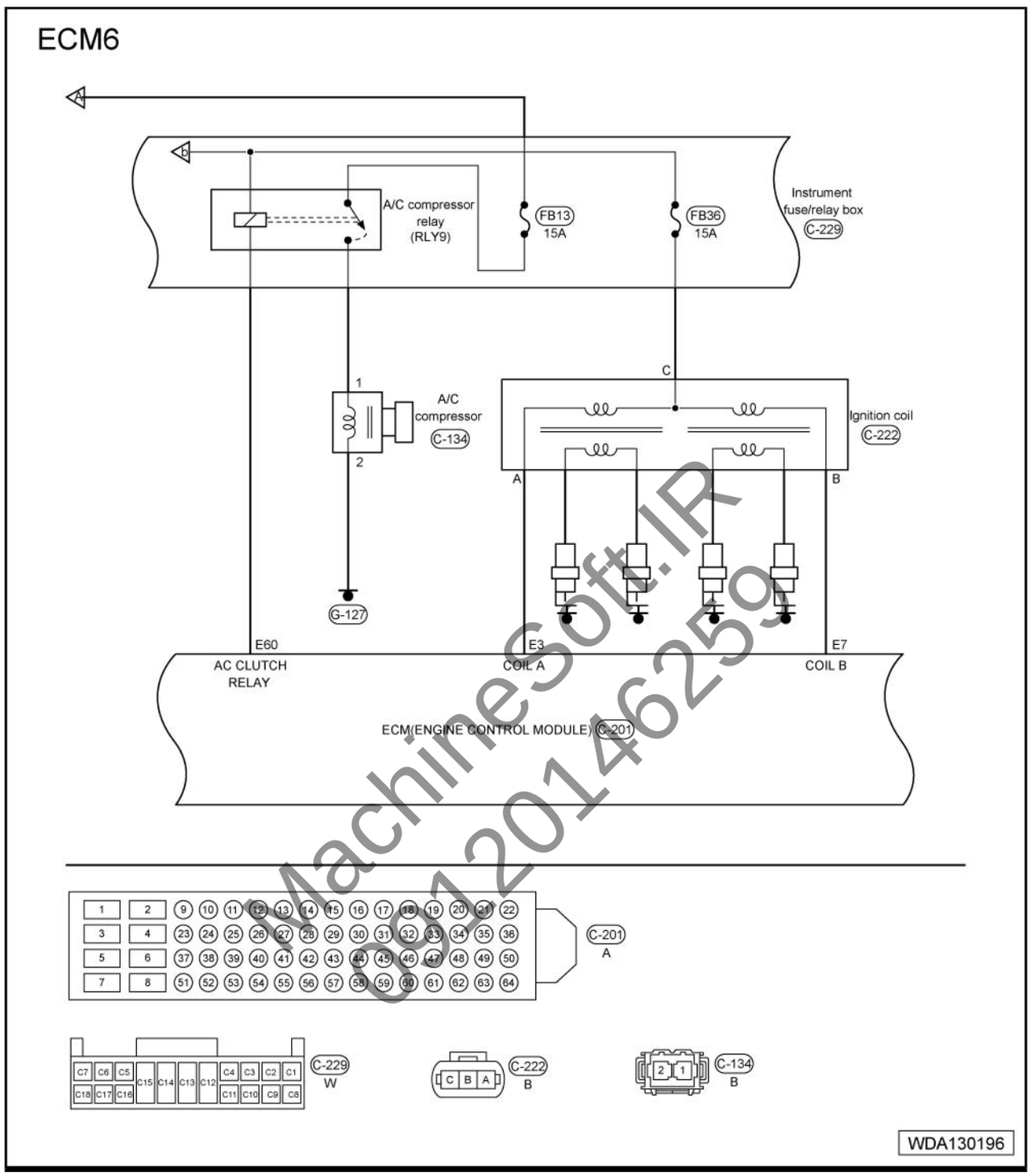
Engine circuit diagram (page 4)



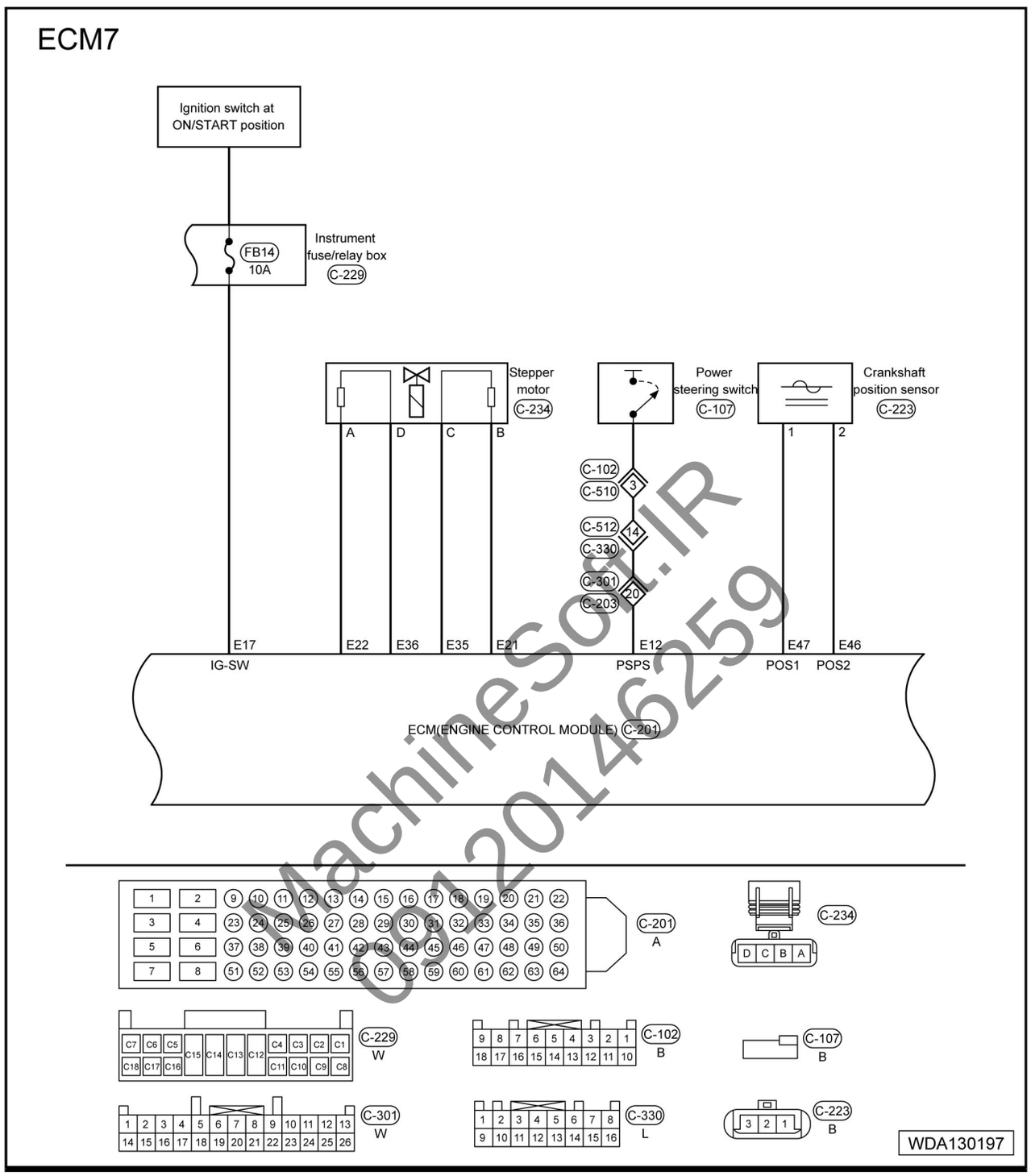
Engine circuit diagram (page 5)



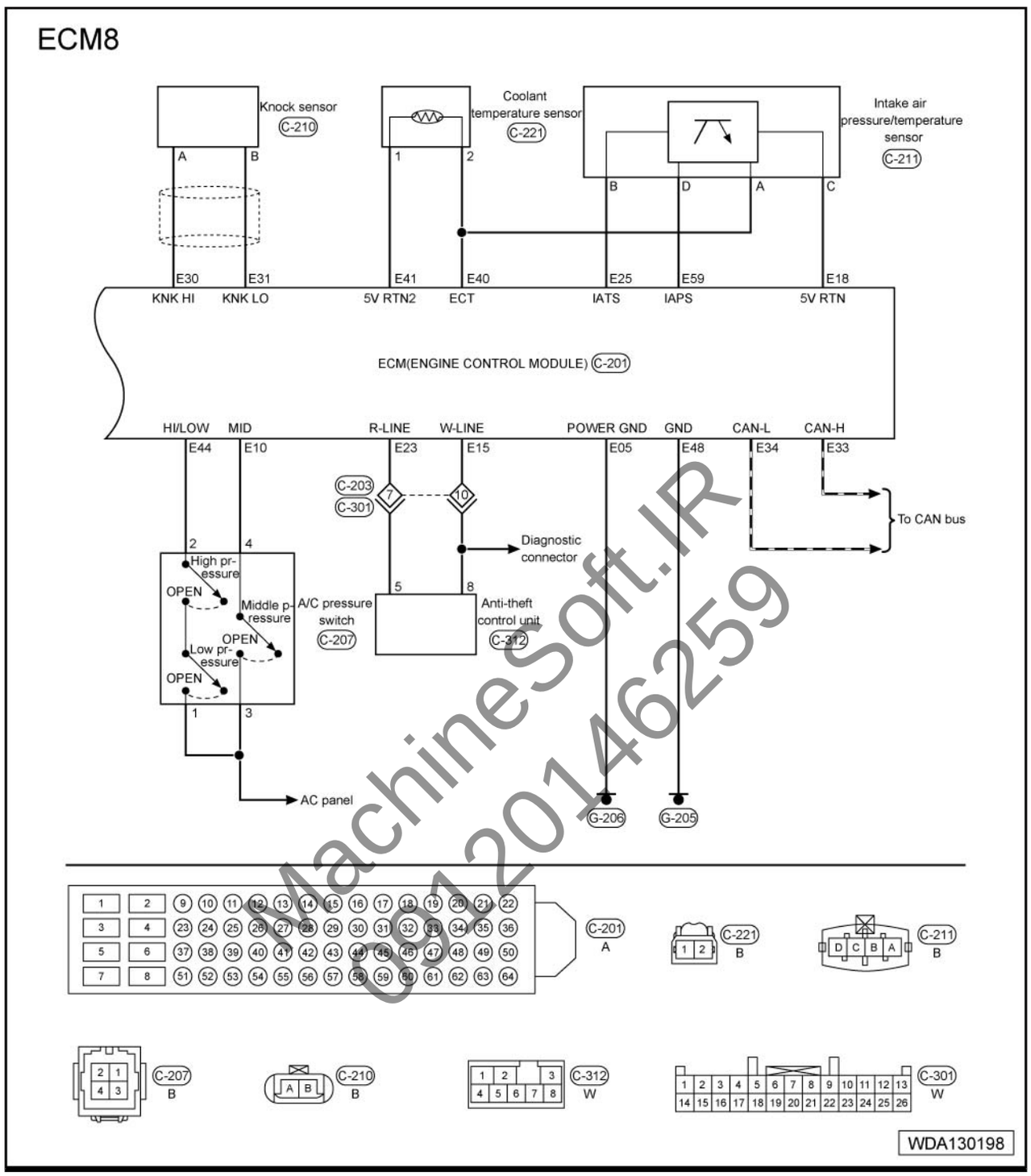
Engine circuit diagram (page 6)



Engine circuit diagram (page 7)



Engine circuit diagram (page 8)



2 Diagnosis and Inspection

2.1 Diagnosis and troubleshooting of sporadic faults

Diagnosis and inspection of sporadic DTC faults

If the sporadic DTC faults occur, please check the following items:

- Check if the connector of the DTC-related actuator or sensor is properly installed.
- Check the connector pins of the actuator or sensor for leakage and corrosion.
- Check the leads for bending or squeezing.
- Check the sensor for dirt or damage.
- Check if the routing of wire harness is correct and proper.

2.2 Checking earth connection

A good earth connection is prerequisite for ensuring the normal operation of the circuit. If the earth terminal of the circuit is always exposed to the wet and dusty environment, the metal of the earth terminal will corrode and affect the circuit smoothness, thus causing various electrical system malfunctions. As the control circuit is very sensitive, the loosened or corroded wires may significantly affect the transmission of various signals in the electronic control circuit. Therefore, please note the followings when inspecting:

- Replace the earth bolts or nuts.
- Check the earth terminal and coil for corrosion.
- Clean and polish the earth terminal and coil when necessary to ensure good contact.
- Check if there is any accessory interfering with the earth circuit.

2.3 Self-learning process of the idling stepper motor

If the following occurs, please perform self-learning on the idling stepper motor:

1. Remove the battery and disconnect the battery negative terminal.
2. Replace the engine control module.
3. Replace or clean the idling stepper motor.

Conditions of stepper motor self-learning:

1. The battery voltage is within the normal range.
2. The engine stops.
3. The throttle is fully closed.
4. The engine has no fault and fault code.
5. The engine performance is normal.

Methods of idling stepper motor self-learning:

1. Do not start the engine immediately after switching on the ignition switch. Wait for 5 seconds and then start the engine. If poor idling is detected at this time, repeat the above procedures until the engine idles steadily.

2.4 DTC diagnosis list

No.	Fault code	Description
1	P0016	Crankshaft position-camshaft position correlation
2	P0030	Front oxygen sensor heater control circuit open circuit
3	P0031	Front oxygen sensor heater control circuit short to ground
4	P0032	Front oxygen sensor heater control circuit short to power
5	P0036	Rear oxygen sensor heater control circuit open circuit
6	P0037	Rear oxygen sensor heater control circuit short to ground
7	P0038	Rear oxygen sensor heater control circuit short to power
8	P0053	Improper front oxygen sensor heater resistance
9	P0054	Improper rear oxygen sensor heater resistance
10	P0105	No signal change in the intake air pressure sensor (frozen)
11	P0106	Improper intake air pressure sensor
12	P0107	Intake air pressure sensor short to ground
13	P0108	Intake air pressure sensor short to power
14	P0112	Intake air temperature sensor signal low input
15	P0113	Intake air temperature sensor signal high input
16	P0116	Improper engine coolant temperature sensor
17	P0117	Engine coolant temperature sensor circuit low input
18	P0118	Engine coolant temperature sensor circuit high input
19	P0122	Throttle position sensor circuit low input
20	P0123	Throttle position sensor circuit high input
21	P0130	Improper front oxygen sensor signal
22	P0131	Front oxygen sensor signal low voltage
23	P0132	Front oxygen sensor signal high voltage
24	P0133	Front oxygen sensor slow response

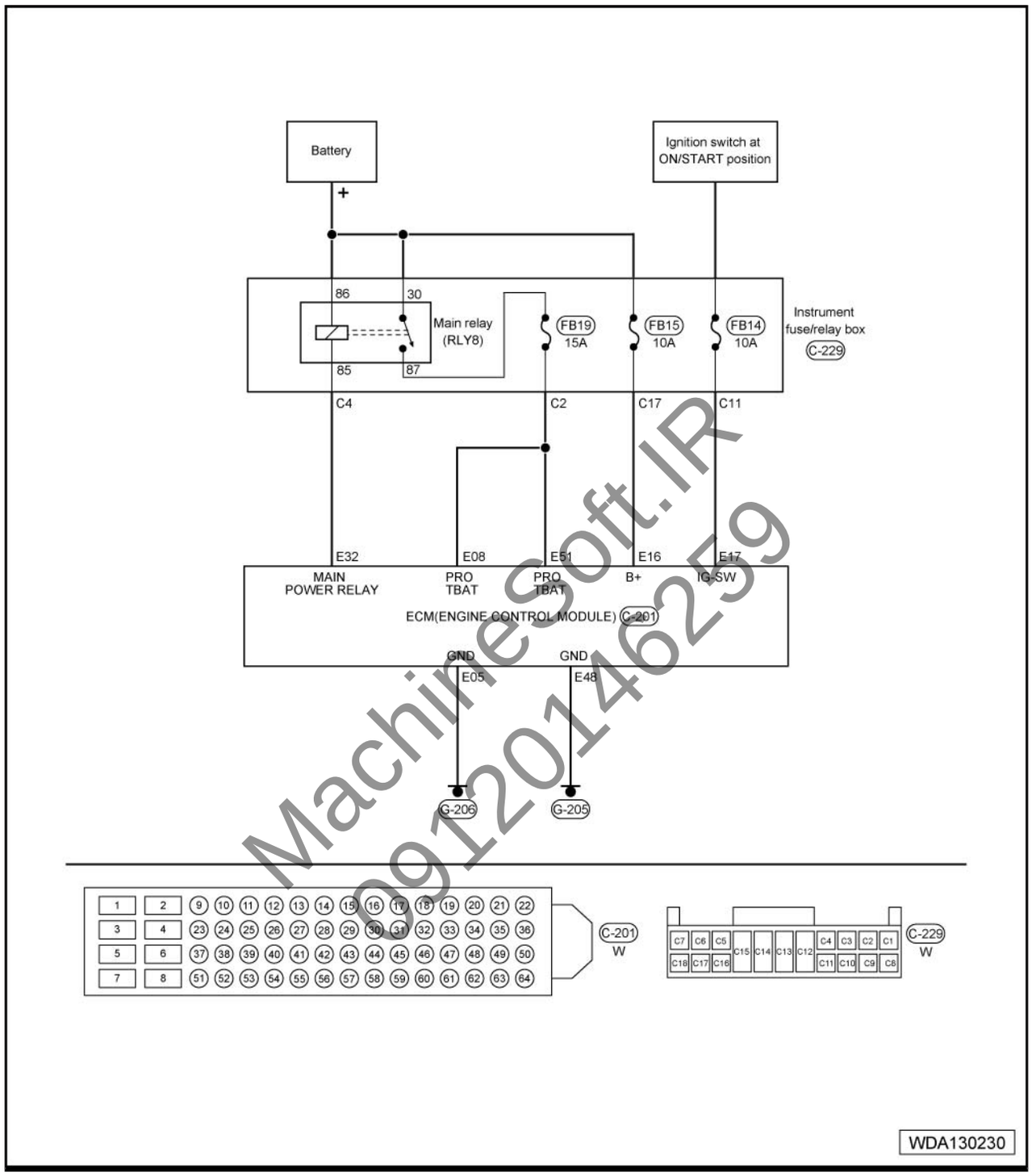
No.	Fault code	Description
25	P0134	Front oxygen sensor circuit signal failure
26	P0136	Improper rear oxygen sensor signal
27	P0137	Rear oxygen sensor signal low voltage
28	P0138	Rear oxygen sensor signal high voltage
29	P0140	Rear oxygen sensor circuit signal failure
30	P0170	Improper fuel trim
31	P0171	Fuel trim too lean
32	P0172	Fuel trim too rich
33	P0201	Cylinder 1- injector control circuit open circuit
34	P0202	Cylinder 2- injector control circuit open circuit
35	P0203	Cylinder 3- injector control circuit open circuit
36	P0204	Cylinder 4- injector control circuit open circuit
37	P0261	Cylinder 1- injector control circuit short to ground
38	P0262	Cylinder 1- injector control circuit short to power
39	P0264	Cylinder 2- injector control circuit short to ground
40	P0265	Cylinder 2- injector control circuit short to power
41	P0267	Cylinder 3- injector control circuit short to ground
42	P0268	Cylinder 3- injector control circuit short to power
43	P0270	Cylinder 4- injector circuit short to ground
44	P0271	Cylinder 4- injector control circuit short to power
45	P0300	Random/Multiple cylinder misfire
46	P0301	Cylinder 1 misfire
47	P0302	Cylinder 2 misfire
48	P0303	Cylinder 3 misfire
49	P0304	Cylinder 4 misfire
50	P0317	Rough road sensor signal lost
51	P0321	Crankshaft TDC signal failure
52	P0322	Speed sensor signal failure
53	P0327	Knock sensor signal circuit low input

No.	Fault code	Description
54	P0328	Knock sensor signal circuit high input
55	P0340	Improper camshaft position sensor
56	P0341	Camshaft position sensor poor contact
57	P0342	Camshaft position sensor short to ground
58	P0343	Camshaft position sensor short to power
59	P0420	Catalyst system efficiency below threshold
60	P0444	Carbon canister valve control circuit open circuit
61	P0458	Carbon canister valve control circuit low input
62	P0459	Carbon canister valve control circuit high input
63	P0480	Cooling fan relay control circuit failure (low speed)
64	P0481	Cooling fan relay control circuit failure (high speed)
65	P0501	Improper vehicle speed sensor
66	P0506	Idling control system RPM lower than expected
67	P0507	Idling control system RPM higher than expected
68	P0508	Idling stepper motor drive pin short to ground
69	P0509	Idling stepper motor drive pin short to power
70	P0511	Idling stepper motor drive pin failures
71	P0560	Improper system voltage signal
72	P0562	System voltage low
73	P0563	System voltage high
74	P0602	Control module programming error
75	P0627	Fuel pump relay control circuit open circuit
76	P0628	Fuel pump relay control circuit short to ground
77	P0629	Fuel pump relay control circuit short to power
78	P0645	A/C compressor relay control circuit open circuit
79	P0646	A/C compressor relay control circuit short to ground

No.	Fault code	Description
80	P0647	A/C compressor relay control circuit short to power
81	P0691	Cooling fan relay control circuit short to ground (low speed)
82	P0692	Cooling fan relay control circuit short to power (low speed)
83	P0693	Cooling fan relay control circuit short to ground (high speed)
84	P0694	Cooling fan relay control circuit short to power (high speed)
85	P1610	ECM defective
86	P1611	Security code reception error
87	P1612	Challenge request failure
88	P1613	IMMO code request failure
89	P1614	Transponder check error
90	P2177	System too lean (off idle)
91	P2178	System too rich (off idle)
92	P2195	Front oxygen sensor slow response
93	P2196	Front oxygen sensor slow response
94	P2270	Rear oxygen sensor slow response
95	P2271	Rear oxygen sensor slow response
96	U0001	CAN communication diagnosis
97	U0101	Lost communication of ECM and TCU control module
98	U0121	Lost communication of ECM and ABS control module
99	U0140	Lost communication of ECM and BCM control module
100	U0155	Abnormal communication of ECM and IPC (Instrument Panel Control) control module

2.5 Testing the ECM power and ground circuit

2.5.1 Testing the ECM power circuit



Testing the ECM power circuit value

ECM pin No.	Function	Condition	Value (DC voltage range)
E16	Providing power constantly	The ignition switch in the LOCK, ON and START position	Battery voltage

ECM pin No.	Function	Condition	Value (DC voltage range)
E17	Providing power to the ignition switch in the ON position	The ignition switch in the ON position	Battery voltage

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

1. Check if the ECM power supply fuses FB15 (10A) and FB14 (10A) are normal.

- If yes, go to step 2.
- If not, replace the defective fuse. ■

2. Check if the lead between the battery positive pole and FB15 (10A) fuse pin has short or open circuit.

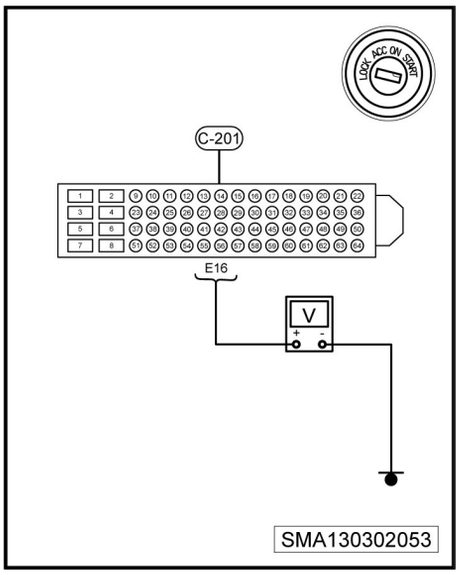
- If yes, repair the defective lead. ■
- If not, go to step 3.

3. Check if the lead between the ignition switch and FB14 (10A) fuse pin has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.

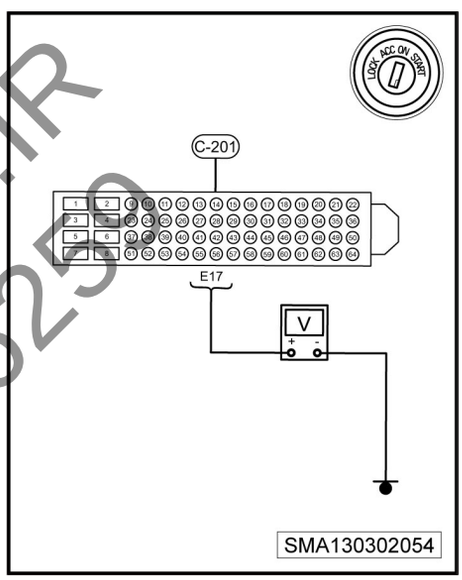
4. Turn the ignition switch to the ON position, disconnect the ECM connector C-201 and check if the voltage at the pin E16 of C-201 is battery voltage.

- If yes, go to step 5.
- If not, the lead between the ECM connector and the fuse/relay box fails. ■



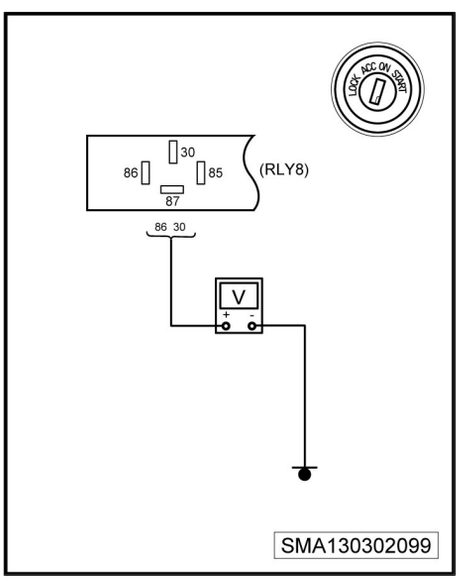
5. Turn the ignition switch to the ON position, disconnect the ECM connector C-201 and check if the voltage at the pin E17 of C-201 is battery voltage.

- If yes, go to step 6.
- If not, the lead between the ECM connector and the fuse/relay box fails. ■



6. Pull out the main relay (RLY8), and check if the voltage between the relay connectors 86 and 30 is battery voltage.

- If yes, go to step 7.
- If not, the lead between the fuse/relay box and the battery positive terminal or the fuse/relay box fails. ■



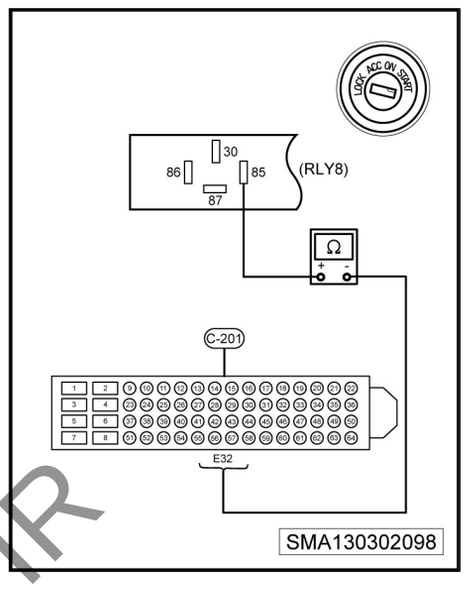
7. Pull out the main relay (RLY8) and check if the relay is normal.

- If yes, go to step 8.
- If not, the main relay fails and please replace it.

■

8. Pull out the main relay (RLY8) and check if the lead between the main relay pin 85 and the pin E32 of the ECM connector C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 9.



9. Check if the ECM power fuse FB19 (15A) is normal.

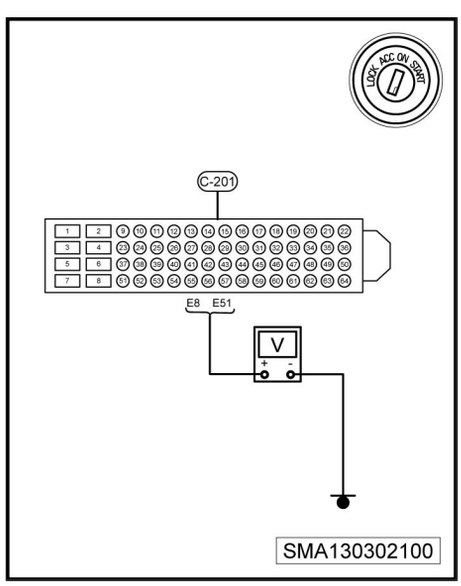
- If yes, go to step 10.
- If not, replace the fuse FB19 (15A). ■

10. Pull out the main relay (RLY8) and FB19 (15A). Check if the circuit between the relay pin 87 and pin FB19 is conducted.

- If yes, go to step 11.
- If not, the fuse/relay box fails. ■

11. Disconnect the ECM connector C-201 and pull out the main relay (RLY8). Short-circuit the main relay pins 30 and 87 with the short connector, and check if the voltage between the pins E8 and E51 of C-201 is battery voltage.

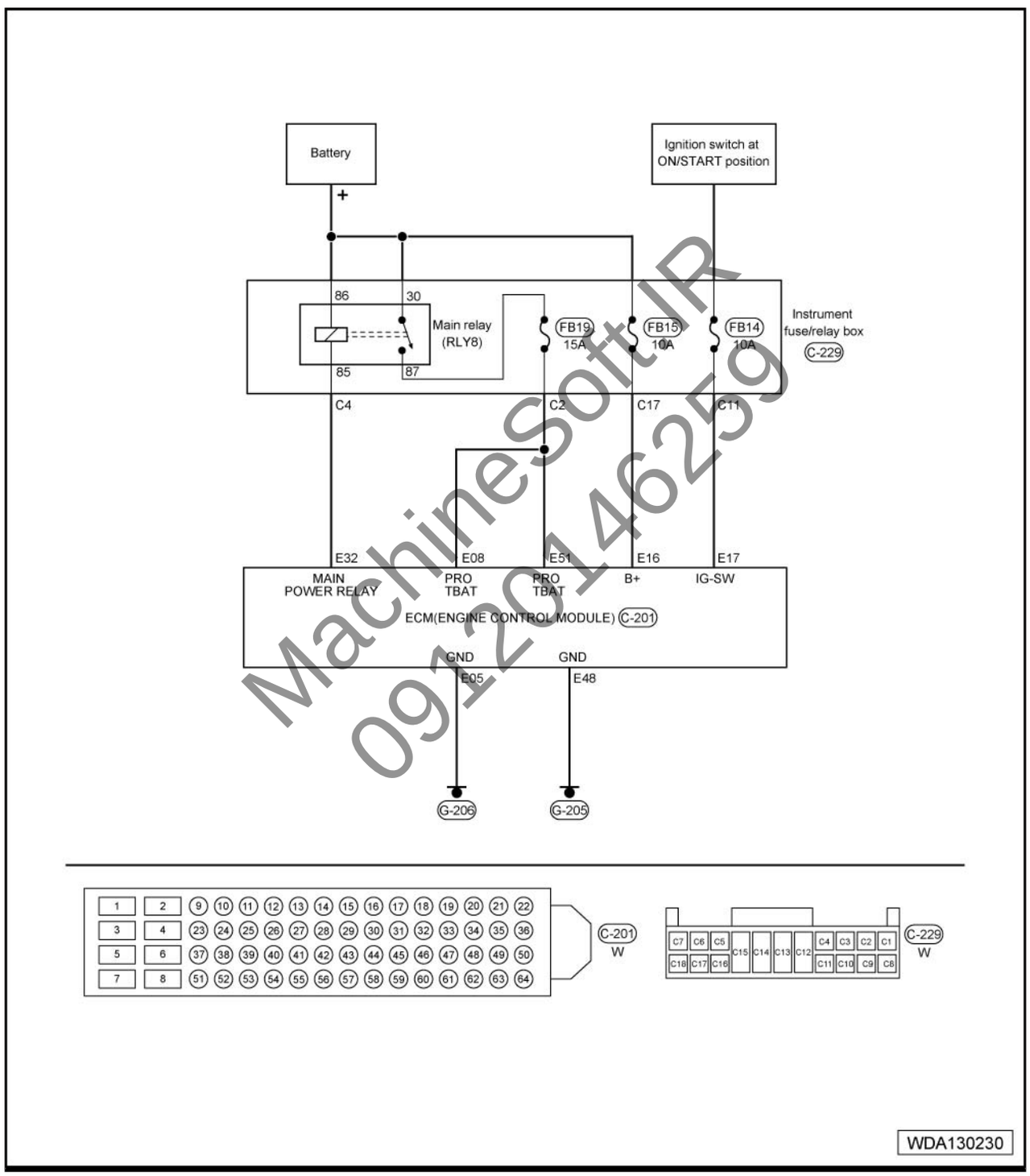
- If yes, go to step 12.
- If not, repair the defective lead. ■



12. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.5.2 Testing the ECM ground circuit



DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

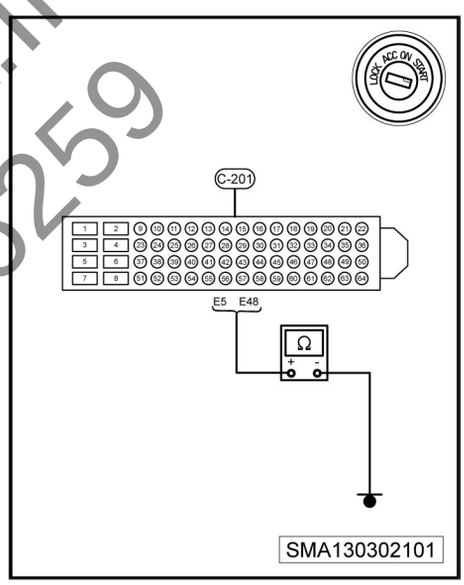
Diagnosis procedures:

1. Disconnect the battery negative terminal, and pull out the ECM connector C-201. Check if the circuit between the pins E05 and E48 of C-201 and the battery negative terminal is conducted.

- If yes, diagnosis ends. ■
- If not, go to step 2.

2. Remove the battery ground points G206 and G205 to check if the lead between the pins E5 and E48 of C-201 and the ground point has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 3.



3. Check if the ground points has oxide and corrosion.

- If yes, clean the ECM ground points. ■
- If not, go to step 4.

4. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6 DTC diagnosis procedures

2.6.1 P0016 Crankshaft position-camshaft position correlation

Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0016	Crankshaft position-camshaft position correlation	Engine running	Crankshaft position-camshaft position correlation	• Improper installation position • Failure of the drive gear and belt

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the timing belts are installed correctly.

- If yes, go to step 2.
- If not, reinstall the timing belts. ■

2. Check if the camshaft signal gear and the camshaft woodruff key are normal.

- If yes, go to step 3.
- If not, replace the camshaft and woodruff key. ■

3. Check if the crankshaft woodruff key exists.

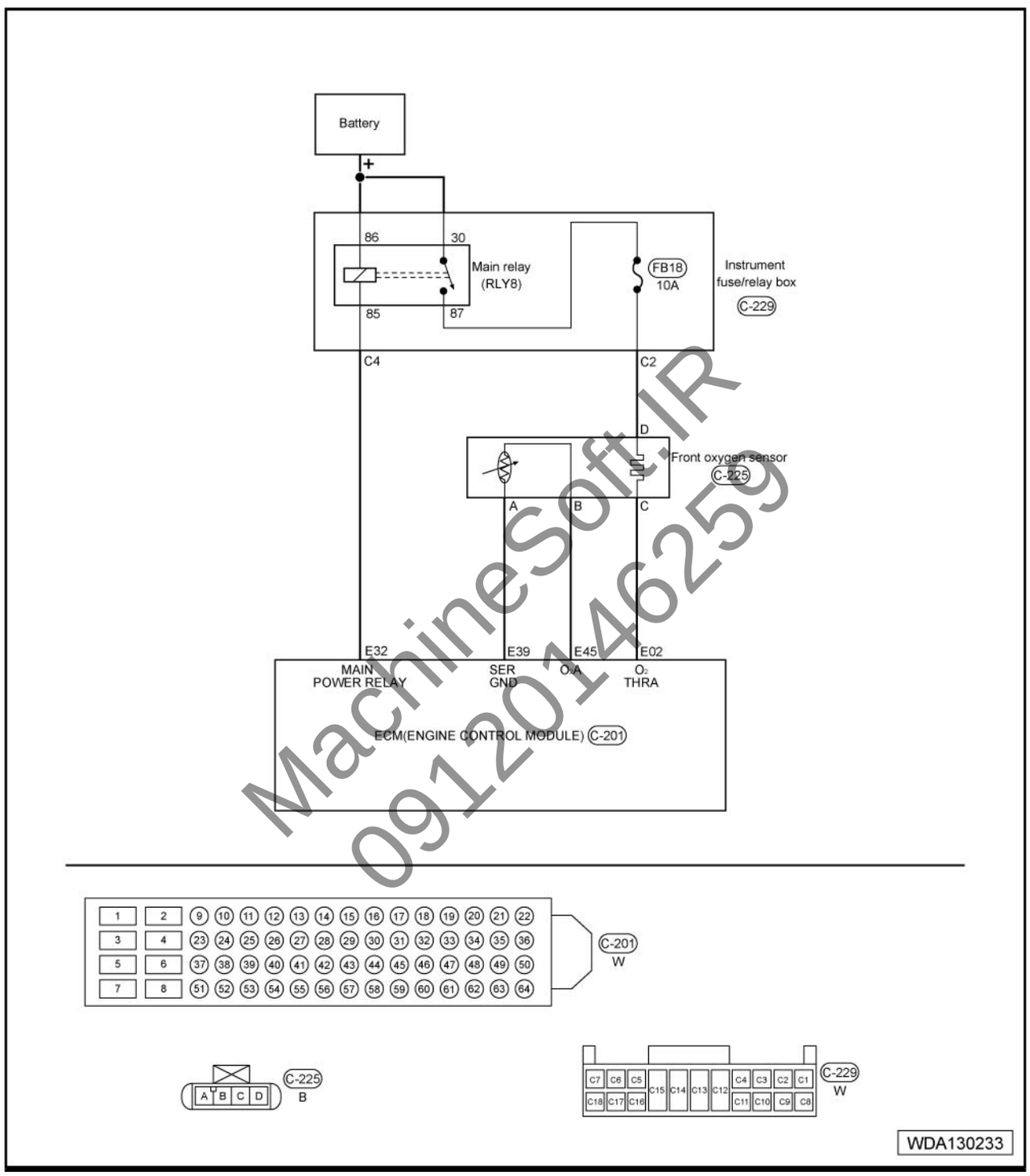
- If yes, go to step 4.
- If not, install the woodruff key and reinstall the timing belt. ■

4. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.2 P0030 Front oxygen sensor heater control circuit open circuit

P0031 Front oxygen sensor heater control circuit short to ground
P0032 Front oxygen sensor heater control circuit short to power
P0053 Improper front oxygen sensor heater resistance



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0030	Front oxygen sensor heater control circuit open circuit	The ignition switch in the ON or START position	The oxygen sensor connecting wiring harness open circuit	• Failure of the front oxygen sensor

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the wiring harness (open circuit) • Failure of the fuse • Failure of the engine control module
P0031	Front oxygen sensor heater control circuit short to ground	The ignition switch in the ON or START position	The oxygen sensor connecting wiring harness short circuit	• Failure of the front oxygen sensor • Failure of the wiring harness (short circuit) • Failure of the fuse • Failure of the engine control module
P0032	Front oxygen sensor heater control circuit short to power	The ignition switch in the ON or START position	The oxygen sensor connecting wiring harness short to power	• Failure of the front oxygen sensor • Failure of the wiring harness (short circuit) • Failure of the fuse • Failure of the engine control module
P0053	Improper front oxygen sensor heater resistance	The ignition switch in the ON or START position	The oxygen sensor connecting wiring harness heater resistor short/open circuit	• Failure of the front oxygen sensor • Failure of the wiring harness (short/open circuit) • Failure of the fuse • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.

- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the front oxygen sensor connector is corrosive, tainted or loose and if the wiring harness is damaged.

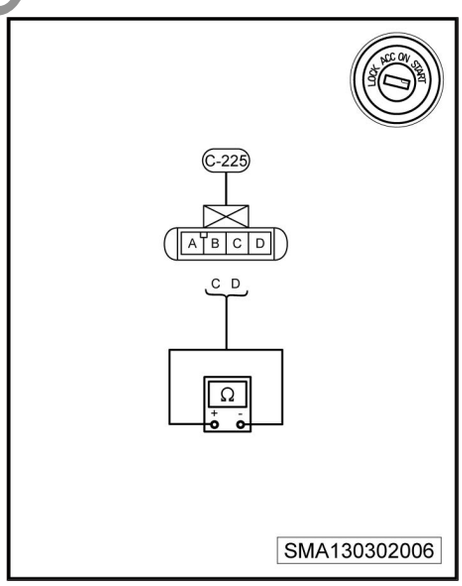
- If yes, the connector/wiring harness fails and please repair it. ■
- If not, go to step 2.

2. Check if the power fuse FB18 (10A) of the front oxygen sensor heater resistor is damaged.

- If yes, the fuse fails and please replace it. ■
- If not, go to step 3.

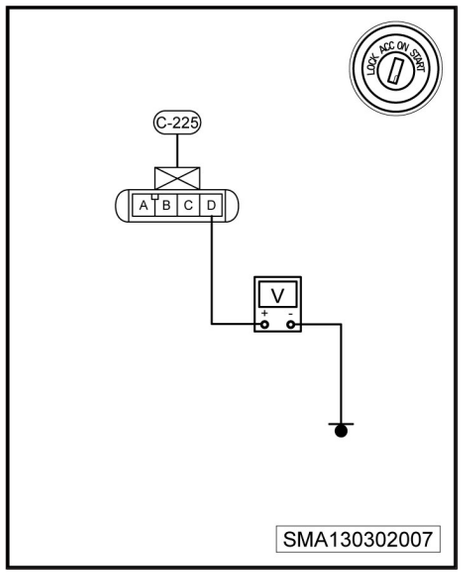
3. Turn the ignition switch to the LOCK position, disconnect the front oxygen sensor connector C－225 and check if the resistance between the pins C and D of C－225 is 7 Ω to 11 Ω.

- If yes, go to step 4.
- If not, the front oxygen sensor heater fails and please replace it. ■



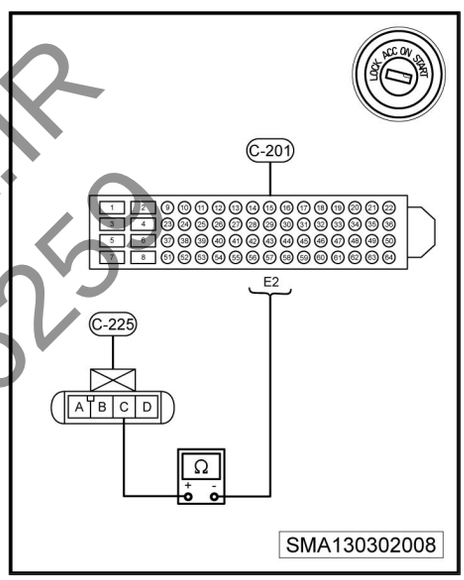
4. Turn the ignition switch to the ON position, check if the voltage at the pin D of C－225 is battery voltage.

- If yes, go to step 5.
- If not, the lead between the pin D of C-225 and the front compartment fuse box FB18 fails and please repair it. ■



5. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and check if the lead between the pin C of C－225 and E2 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.

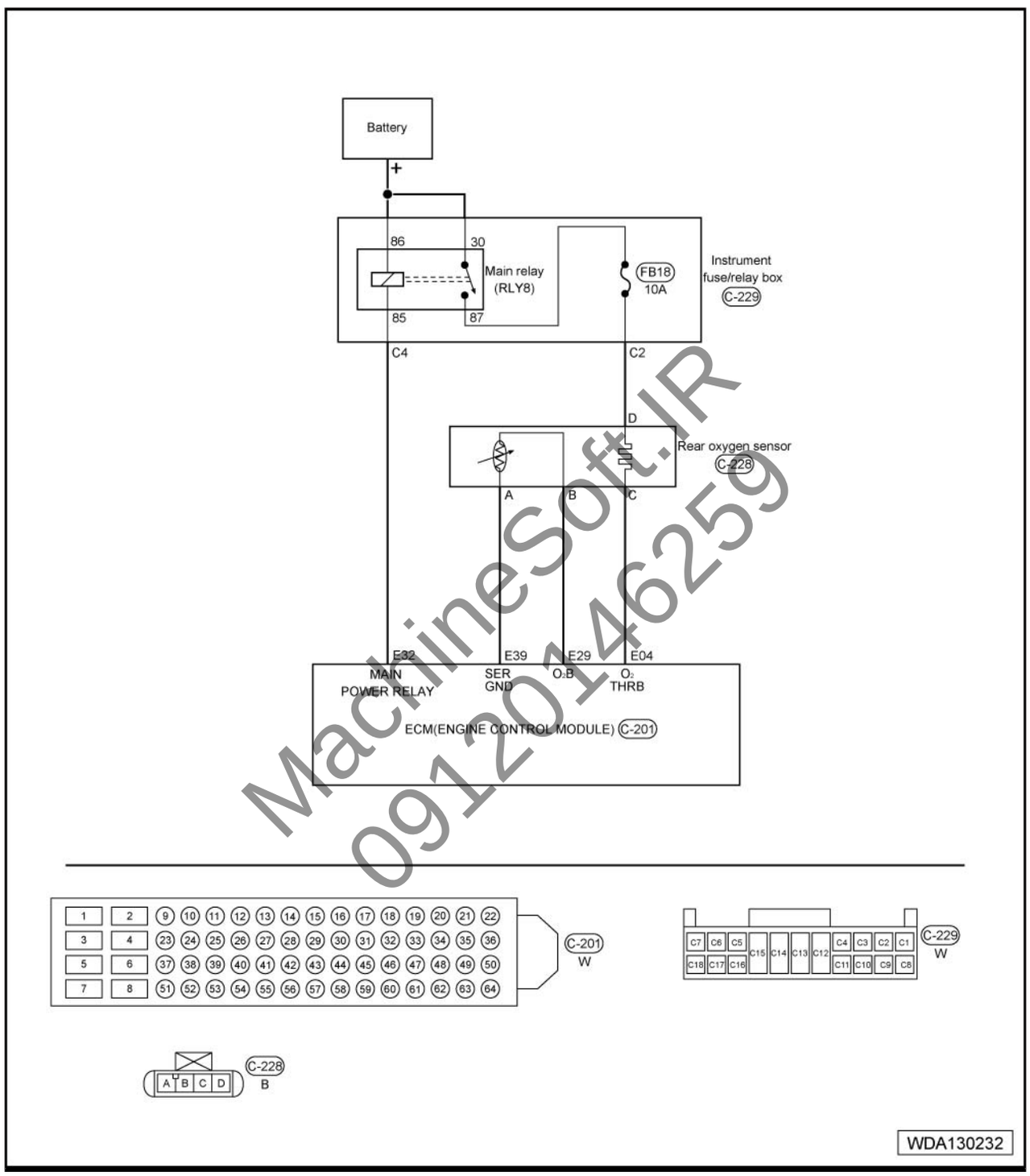


6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.3 P0036 Rear oxygen sensor heater control circuit open circuit

P0037 Rear oxygen sensor heater control circuit short to ground
P0038 Rear oxygen sensor heater control circuit short to power
P0054 Improper rear oxygen sensor heater resistance



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0036	Rear oxygen sensor heater control circuit open circuit	The ignition switch in the ON or START position	The oxygen sensor open circuit	• Failure of the rear oxygen sensor

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the rear oxygen sensor circuit • Failure of the engine control module
P0037	Rear oxygen sensor heater control circuit short to ground	The ignition switch in the ON or START position	The connecting wiring harness of the oxygen sensor short to ground	• Failure of the rear oxygen sensor • Failure of the rear oxygen sensor circuit • Failure of the engine control module
P0038	Rear oxygen sensor heater control circuit short to power	The ignition switch in the ON or START position	The connecting wiring harness of the oxygen sensor short to power	• Failure of the rear oxygen sensor • Failure of the rear oxygen sensor circuit • Failure of the engine control module
P0054	Improper rear oxygen sensor heater resistance	The ignition switch in the ON or START position	The connecting wiring harness of the oxygen sensor heater resistor short/open circuit	• Failure of the rear oxygen sensor • Failure of the rear oxygen sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the rear oxygen sensor connector is corrosive, tainted or loose and if the wiring harness is damaged.

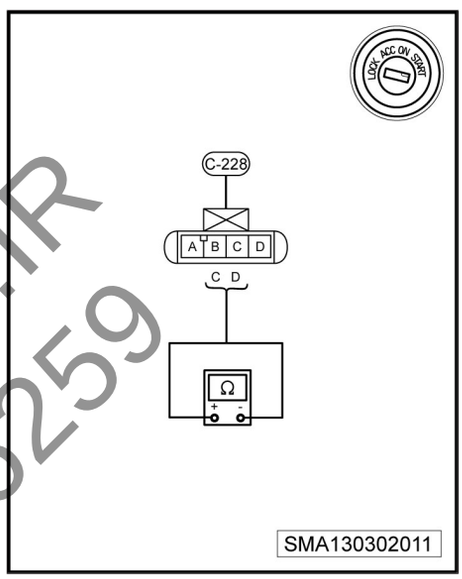
- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 2.

2. Check if the power fuse FB18 (10A) of the rear oxygen sensor heater resistor is damaged.

- If yes, the fuse fails and please replace it. ■
- If not, go to step 3.

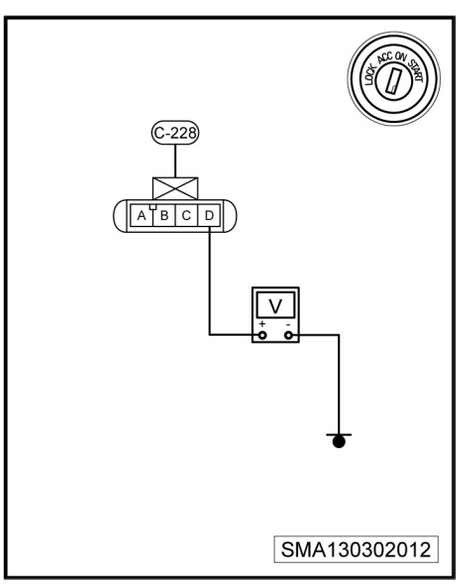
3. Turn the ignition switch to the LOCK position, disconnect the rear oxygen sensor connector C-228 and check if the resistance between the pins C and D of C-228 is 7 Ω to 11 Ω.

- If yes, go to step 4.
- If not, the rear oxygen sensor heater fails and please replace it. ■



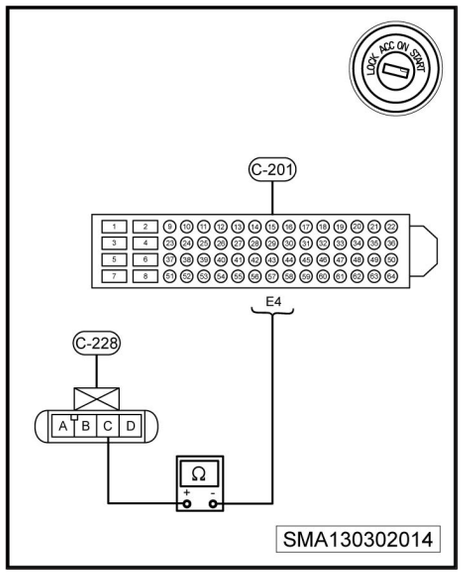
4. Turn the ignition switch to the ON position, check if the voltage at the pin D of C-228 is battery voltage.

- If yes, go to step 5.
- If not, the lead between the pin D of C-228 and the front compartment fuse box FB18 fails and please repair it. ■



5. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and check if the lead between the pin C of C-228 and the pin E4 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.

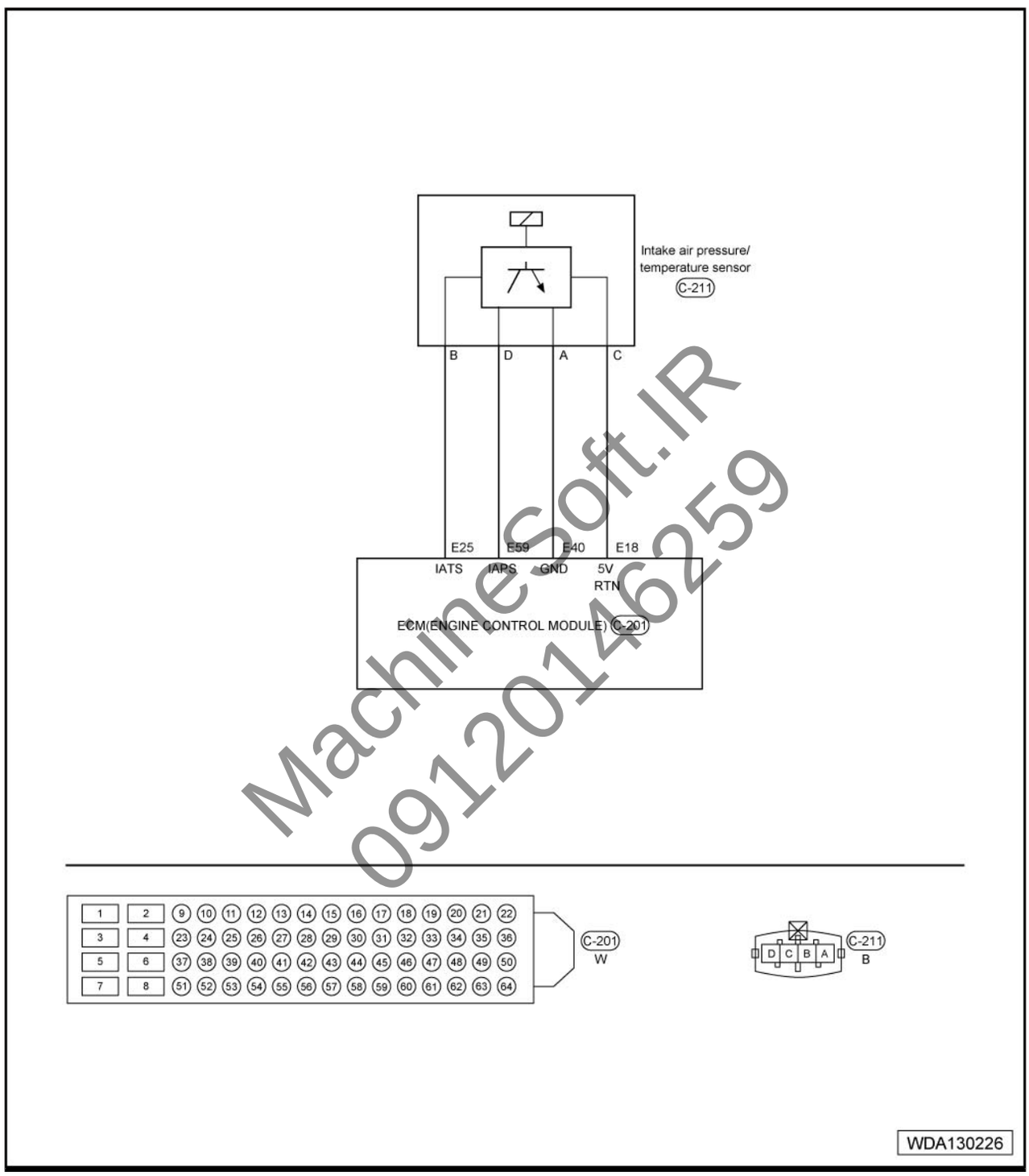


6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.4 P0105 No signal change in the intake air pressure sensor (frozen)

P0106 Improper intake air pressure sensor
P0107 Intake air pressure sensor short to ground
P0108 Intake air pressure sensor short to power



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0105	No signal change in the intake air	Engine running normally	No signal in the intake air pressure	• Failure of the intake air pressure sensor

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
	pressure sensor (frozen)		sensor detected by the ECM	• Failure of the intake air pressure sensor circuit • Failure of the engine control module
P0106	Improper intake air pressure sensor	Engine running normally	Improper intake air pressure sensor	• Failure of the intake air pressure sensor • Failure of the intake air pressure sensor circuit • Failure of the engine control module
P0107	Intake air pressure sensor short to ground	Engine running normally	Intake air pressure sensor short to ground	• Failure of the intake air pressure sensor • Failure of the intake air pressure sensor circuit • Failure of the engine control module
P0108	Intake air pressure sensor short to power	Engine running normally	Intake air pressure sensor short to power	• Failure of the intake air pressure sensor • Failure of the intake air pressure sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the ON position, connect the diagnostic device and check if the "intake air pressure data flow" severely deviates from the ambient pressure for about 101 kpa (in which the actual value is relevant to the atmospheric pressure).

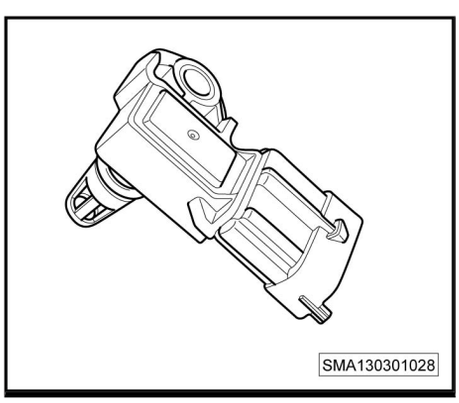
- If yes, the intake air pressure sensor fails and please repair or replace it. ■
- If not, go to step 2.

2. Disconnect the intake air pressure/temperature sensor connector and check if the connector pin is corrosive, tainted or loose. And check if the wiring harness is damaged.

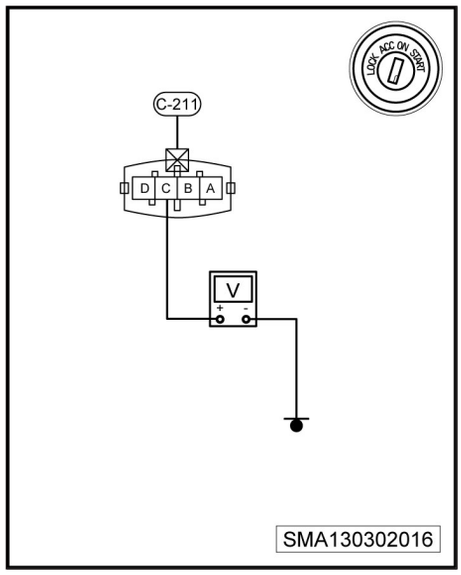
- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 3.

3. Remove the intake air pressure/temperature sensor and check if the sensor has any dust or other foreign matters on it.

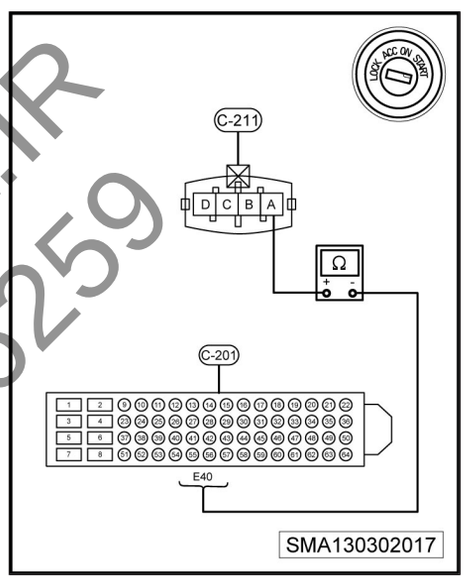
- If yes, clean or replace the intake air pressure/temperature sensor. ■
- If not, go to step 4.



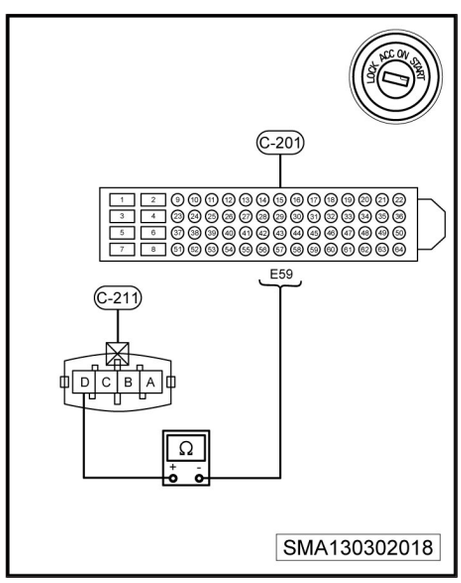
4. Turn the ignition switch to the ON position, disconnect the intake air pressure/temperature sensor connector C-211 and check if the voltage at the pin C of C-211 is 5 V.
   - If yes, go to step 5.
   - If not, the lead between the pin C of C-211 and the pin E18 of C-201 fails and please repair it. ■



5. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and intake air pressure/temperature sensor connector C-211, and check if the circuit between the pin A of C-211 and the pin E40 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 6.



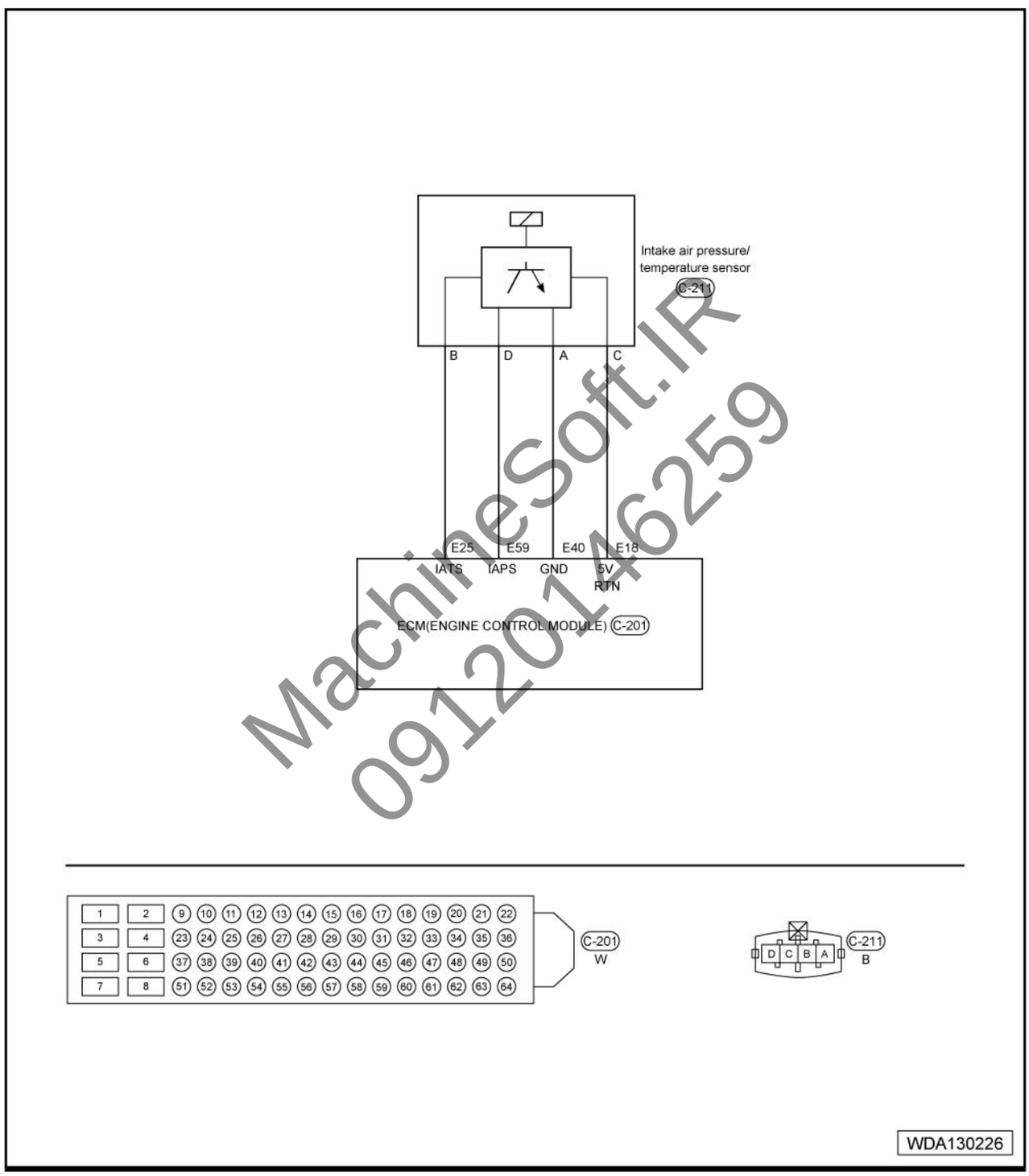
6. Turn the ignition switch to the LOCK position, check if the circuit between the pin D of C-211 and the pin E59 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 7.



7. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.5 P0112 Intake air temperature sensor signal low input
P0113 Intake air temperature sensor signal high input



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0112	Intake air temperature sensor signal low input	Engine running normally	The intake air temperature sensor signal pin opposite to ECM end short to ground	• Failure of the intake air pressure sensor • Failure of the intake air temperature sensor circuit • Failure of the engine control module
P0113	Intake air temperature sensor signal high input	Engine running normally	The intake air temperature sensor signal pin opposite to ECM end short to power or internal circuit damaged	• Failure of the intake air pressure sensor • Failure of the intake air temperature sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

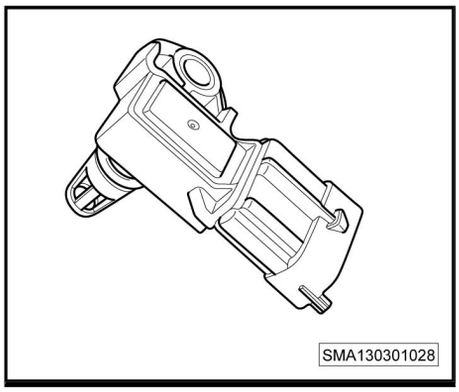
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Disconnect the intake air pressure/temperature sensor connector and check if the connector pin is corrosive, tainted or loose. And check if the wiring harness is damaged.
   - If yes, the connector/wiring harness fails and please repair or replace it. ■
   - If not, go to step 2.

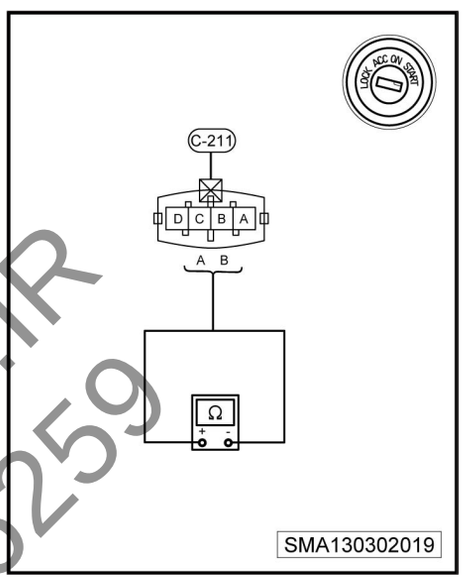
2. Remove the intake air pressure/temperature sensor and check if the sensor has any dust or other foreign matters on it.

- If yes, clean or replace the intake air pressure/temperature sensor. ■
- If not, go to step 3.



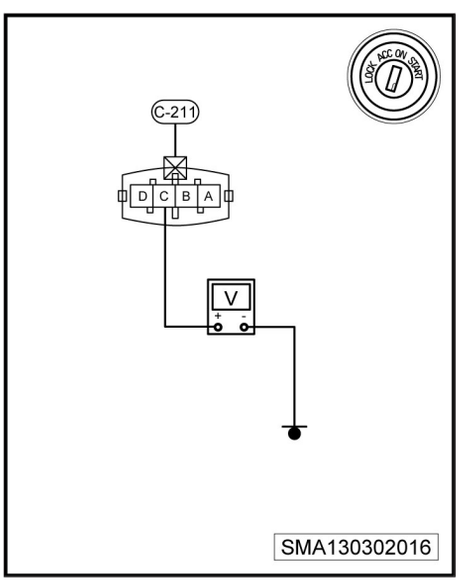
3. Turn the ignition switch to the LOCK position, disconnect the intake air pressure/temperature sensor connector C－211 and check if the resistance between the pins A and B of C－211 is normal (the rated resistance is 2.5 KΩ ± 5% at 20℃).

- If yes, go to step 4.
- If not, the intake air pressure/temperature sensor fails and please repair or replace it. ■



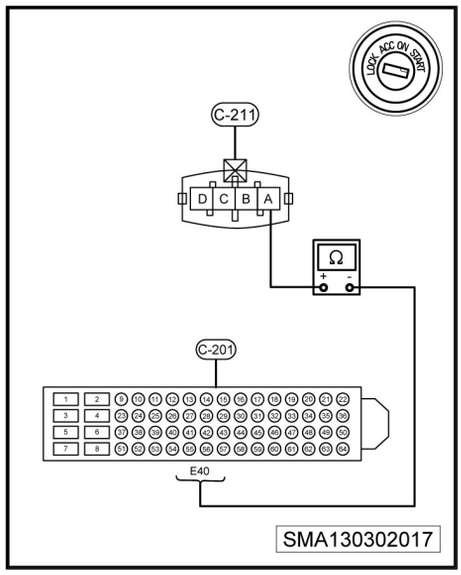
4. Turn the ignition switch to the ON position, disconnect the intake air pressure/temperature sensor connector C-211 and check if the voltage at the pin C of C-211 is 5 V.

- If yes, go to step 5.
- If not, the lead between the pin C of C-211 and the pin E18 of C-201 fails and please repair it. ■



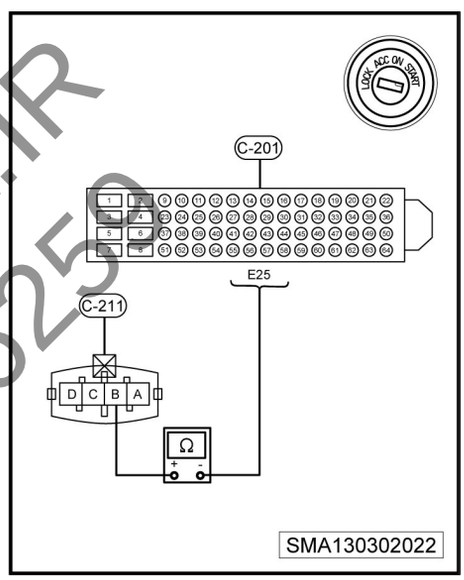
5. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and intake air pressure/temperature sensor connector C-211, and check if the lead between the pin A of C-211 and the pin E40 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.



6. Turn the ignition switch to the LOCK position, check if the lead between the pin C of C-211 and the pin E25 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 7.

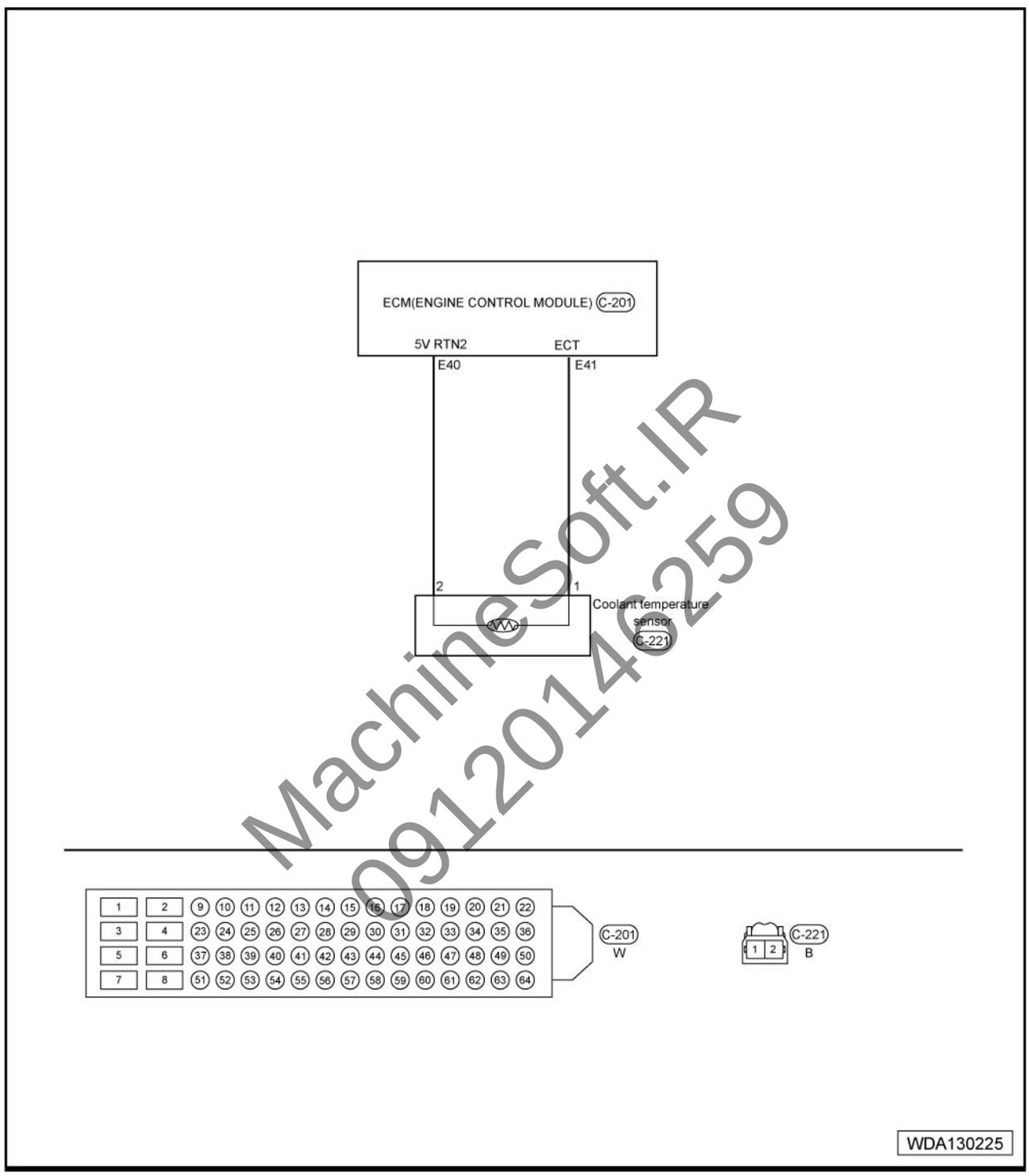


7. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.6 P0116 Improper engine coolant temperature sensor

P0117 Engine coolant temperature sensor circuit low input
P0118 Engine coolant temperature sensor circuit high input



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0116	Improper engine coolant temperature sensor	Engine running normally	Improper engine coolant temperature sensor	• Failure of the coolant temperature sensor

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the coolant temperature sensor circuit • Failure of the engine control module
P0117	Engine coolant temperature sensor circuit low input	Engine running normally	Coolant temperature sensor short or open circuit	• Failure of the coolant temperature sensor • Failure of the coolant temperature sensor circuit • Failure of the engine control module
P0118	Engine coolant temperature sensor circuit high input	Engine running normally	Coolant temperature sensor signal short to power or internal circuit damaged	• Failure of the coolant temperature sensor • Failure of the coolant temperature sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

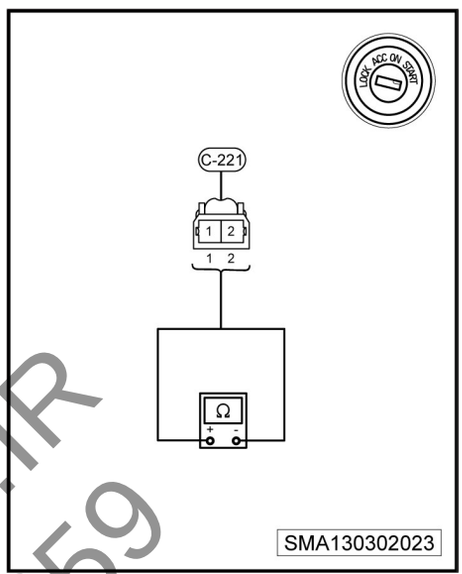
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the engine coolant temperature sensor connector is corrosive, tainted or loose. And check if the wiring harness is damaged.

- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 2.

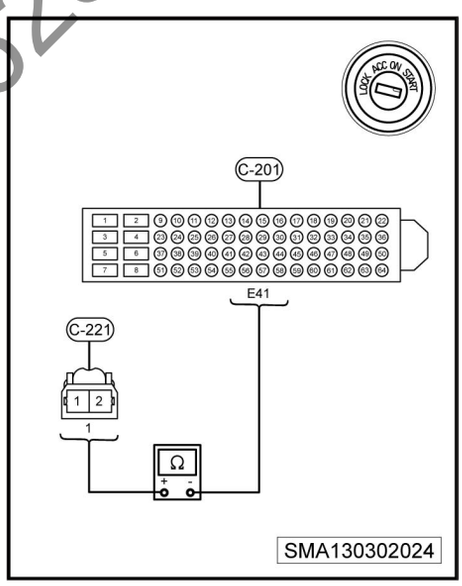
2. Turn the ignition switch to the LOCK position, disconnect the coolant temperature sensor connector C-221 and check if the resistance between the pins 1 and 2 of C-221 is normal (the rated resistance is 2.5 KΩ ± 5% at 20℃).

- If yes, go to step 3.
- If not, the coolant temperature sensor fails and please replace it. ■



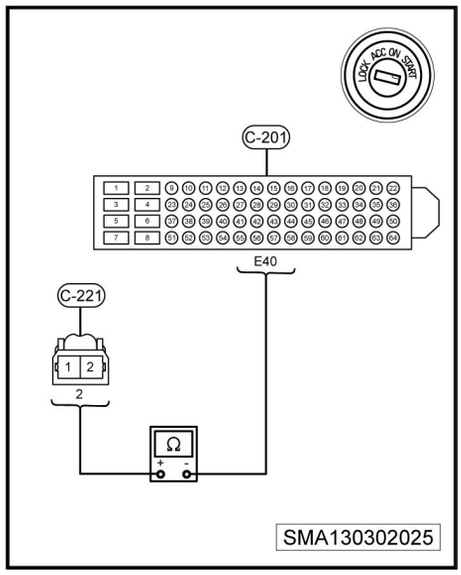
3. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and coolant temperature sensor connector C-221, and check if the lead between the pin E41 of C-201 and the pin 1 of C-221 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



4. Turn the ignition switch to the LOCK position, check if the lead between the pin E40 of C-201 and the pin 2 of C-221 has short or open circuit.

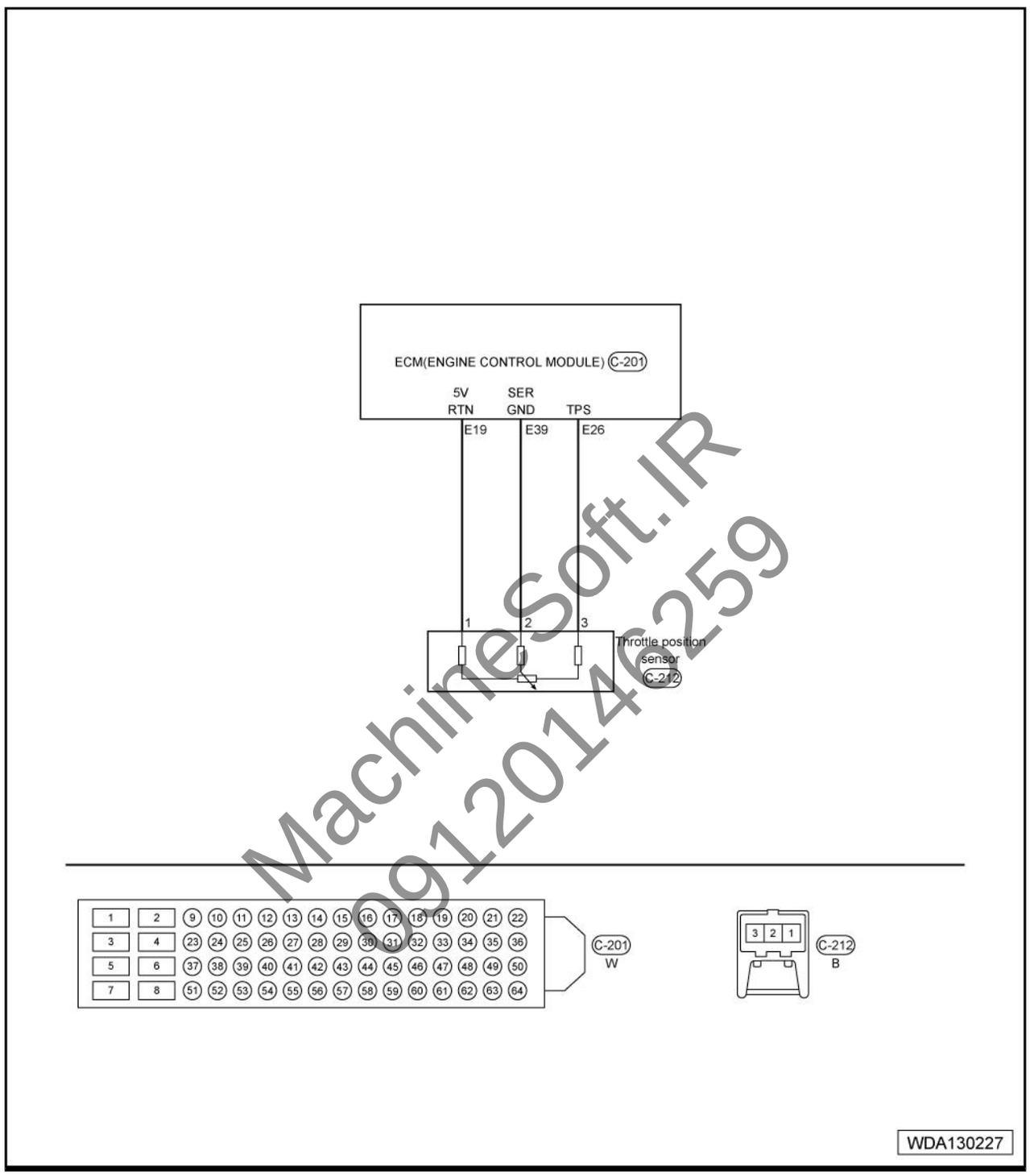
- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.7 P0122 Throttle position sensor circuit low input
P0123 Throttle position sensor circuit high input



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0122	Throttle position sensor circuit low input	The ignition switch in the ON or START position	Failure of the throttle position sensor detected by the ECM	• Failure of the throttle position sensor

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the throttle position sensor circuit • Failure of the engine control module
P0123	Throttle position sensor circuit high input	The ignition switch in the ON or START position	Failure of the throttle position sensor detected by the ECM	• Failure of the throttle position sensor • Failure of the throttle position sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

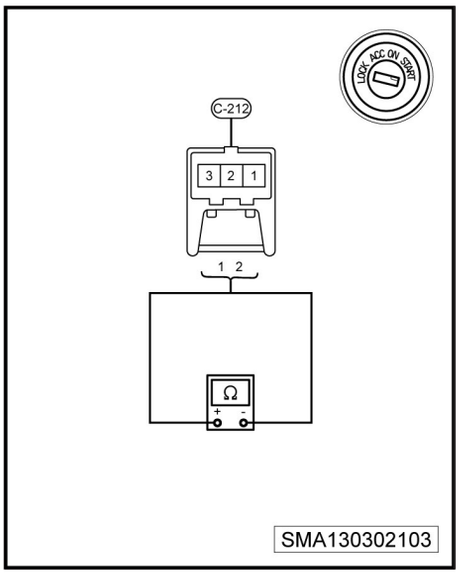
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the throttle position sensor connector is corrosive, tainted or loose. And check if the wiring harness is damaged.

   - If yes, the connector/wiring harness fails and please repair or replace it. ■
   - If not, go to step 2.

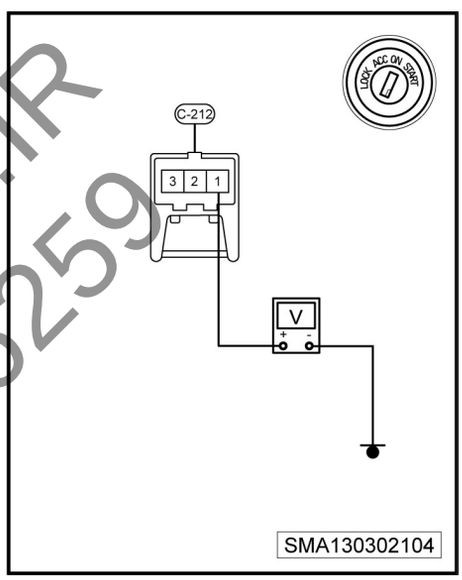
2. Turn the ignition switch to the LOCK position, disconnect the throttle position sensor connector C-212 and check if the resistance between the pins 1 and 2 of C-212 is 2 KΩ ± 20%.

- If yes, go to step 3.
- If not, the throttle position sensor fails and please replace it. ■



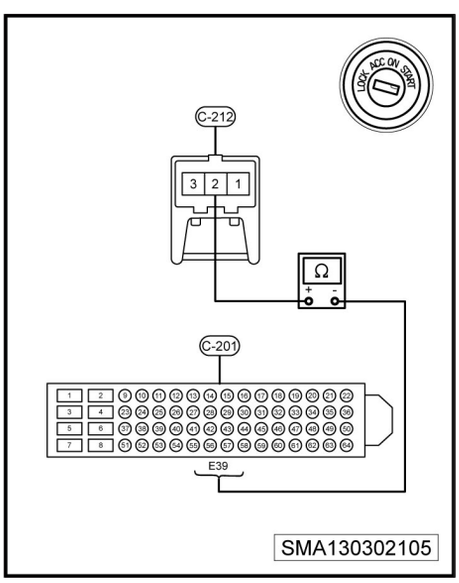
3. Turn the ignition switch to the ON position, disconnect the throttle position sensor connector C-212 and check if the voltage at the pin 1 of C-212 is 5 V.

- If yes, go to step 4.
- If not, the lead between the pin 1 of C-212 and the pin E19 of C-201 fails and please repair it. ■



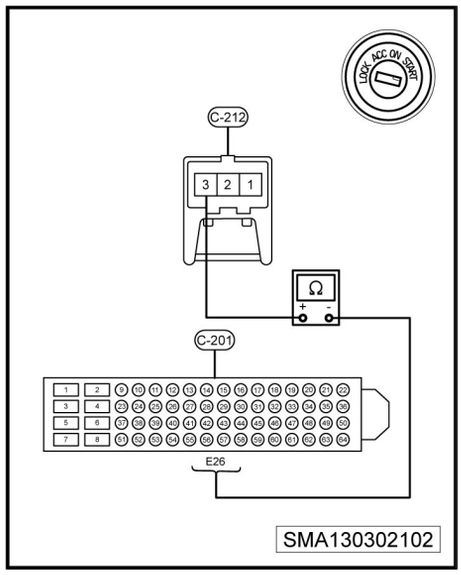
4. Turn the ignition switch to the LOCK position, disconnect the throttle position sensor connector C-212 and ECM connector C-201, and check if the lead between the pin 2 of C-212 and the pin E39 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Turn the ignition switch to the LOCK position, check if the lead between the pin 3 of C-212 and the pin E26 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.

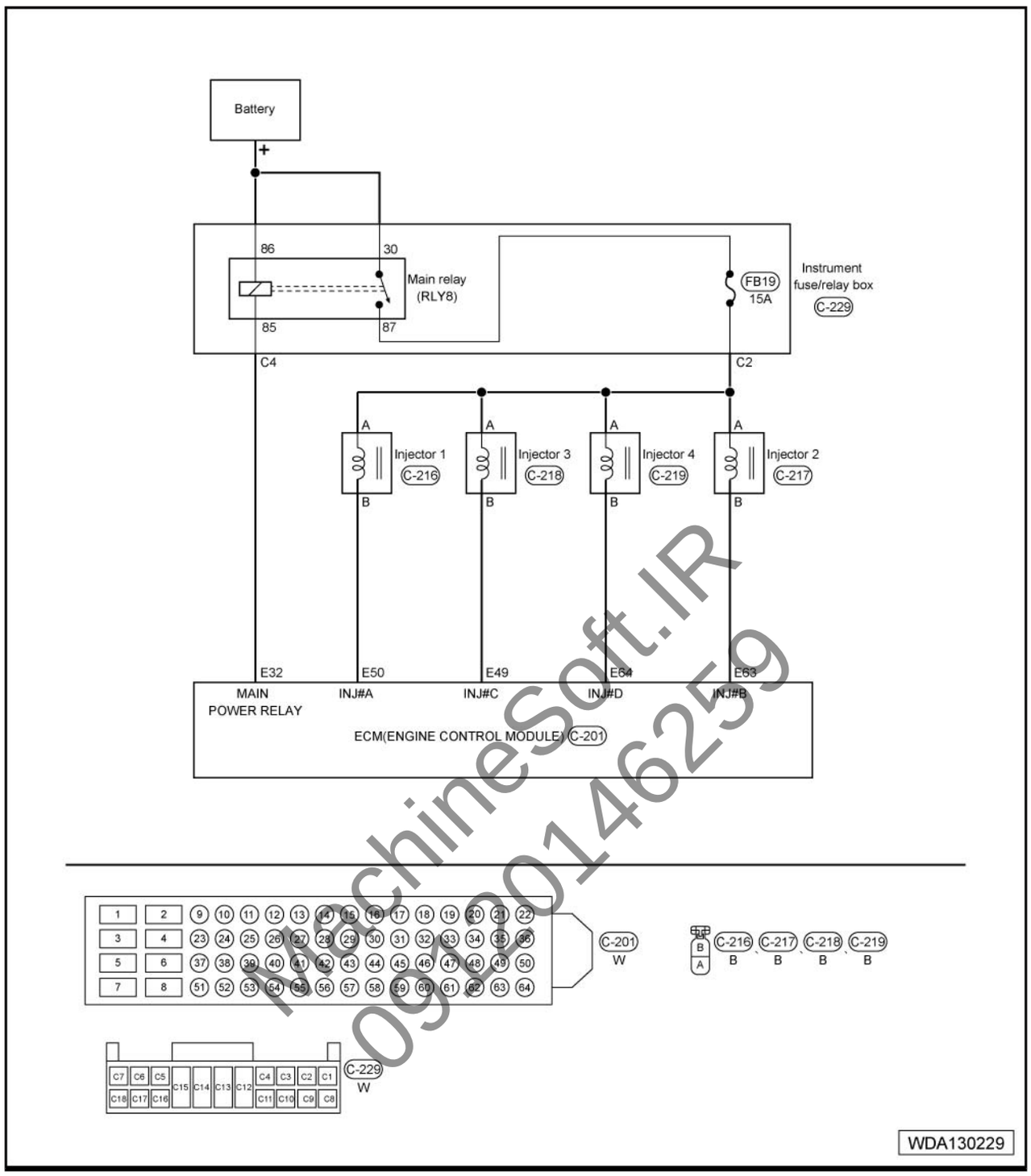


6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.8 P0201 Cylinder 1 - injector control circuit open circuit

P0202 Cylinder 2 - injector control circuit open circuit
P0203 Cylinder 3 - injector control circuit open circuit
P0204 Cylinder 4 - injector control circuit open circuit
P0261 Cylinder 1 - injector control circuit short to ground
P0262 Cylinder 1 - injector control circuit short to power
P0264 Cylinder 2 - injector control circuit short to ground
P0265 Cylinder 2 - injector control circuit short to power
P0267 Cylinder 3 - injector control circuit short to ground
P0268 Cylinder 3 - injector control circuit short to power
P0270 Cylinder 4 - injector control circuit short to ground
P0271 Cylinder 4 - injector control circuit short to power



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0201	Cylinder 1 - injector control circuit open circuit	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0202	Cylinder 2 - injector control circuit open circuit	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0203	Cylinder 3 - injector control circuit open circuit	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0204	Cylinder 4 - injector control circuit open circuit	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0261	Cylinder 1 - injector control circuit short to ground	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0262	Cylinder 1 - injector control circuit short to power	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0264	Cylinder 2 - injector control circuit short to ground	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0265	Cylinder 2 - injector control circuit short to power	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0267	Cylinder 3 - injector control circuit short to ground	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0268	Cylinder 3 - injector control circuit short to power	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0270	Cylinder 4 - injector control circuit short to ground	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module
P0271	Cylinder 4 - injector control circuit short to power	Engine running	Injector circuit short to ground	• Failure of the injector • Failure of the injector circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, wait until its natural flameout.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

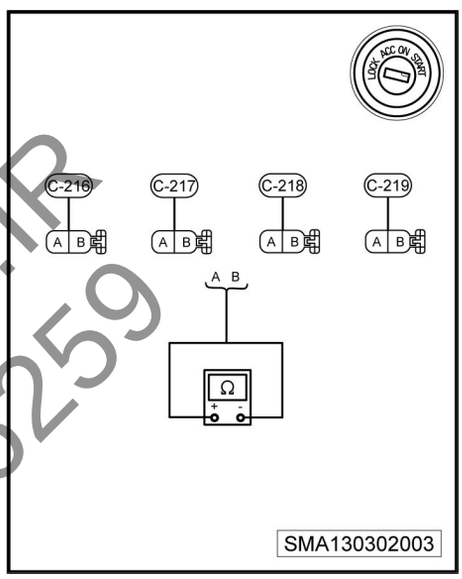
- Please verify again if the DTC and its symptoms are present after fault is rectified.
- The control principles and modes of the four injectors are the same. Therefore, cylinder 1 injector is given as an example to check the faults.

1. Check if the injector connector is corrosive, tainted or loose and if the wiring harness is damaged.

- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 2.

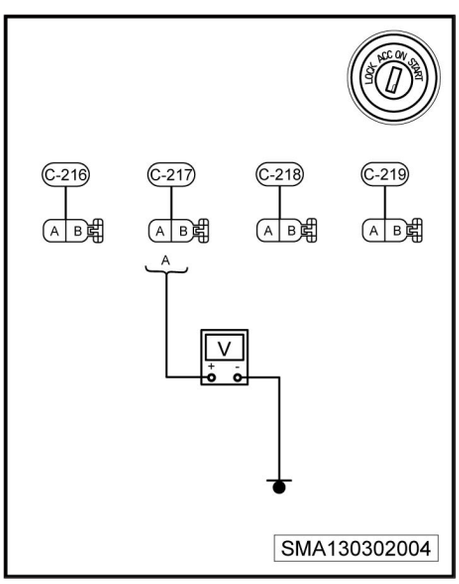
2. Turn the ignition switch to the LOCK position, disconnect the cylinder 1 injector connector C-216 and check if the resistance between the pins A and B of C-216 is normal. (The rated resistance is 11 Ω ～ 16 Ω at 20℃)

- If yes, go to step 3.
- If not, the injector fails and please replace it. ■



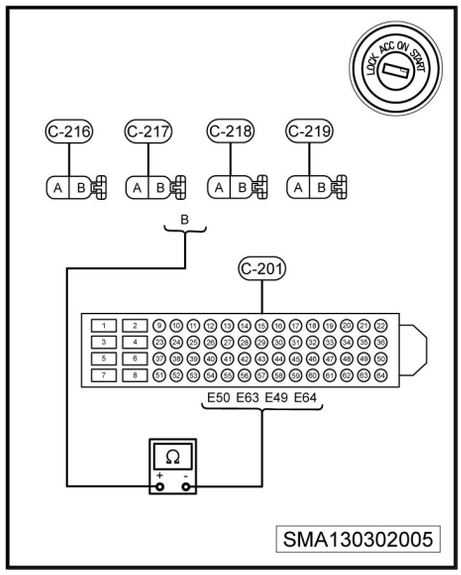
3. Turn the ignition switch to the ON position, disconnect the cylinder 1 injector connector C-216 and check if the voltage at the pin A of C-216 is battery voltage.

- If yes, go to step 4.
- If not, the lead between the pin A of C-216 and the front compartment fuse box FB19 fails and please repair it. ■



4. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and the cylinder 1 injector connector C-216, and check if the lead between the pin B of C-216 and the pin E50 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.

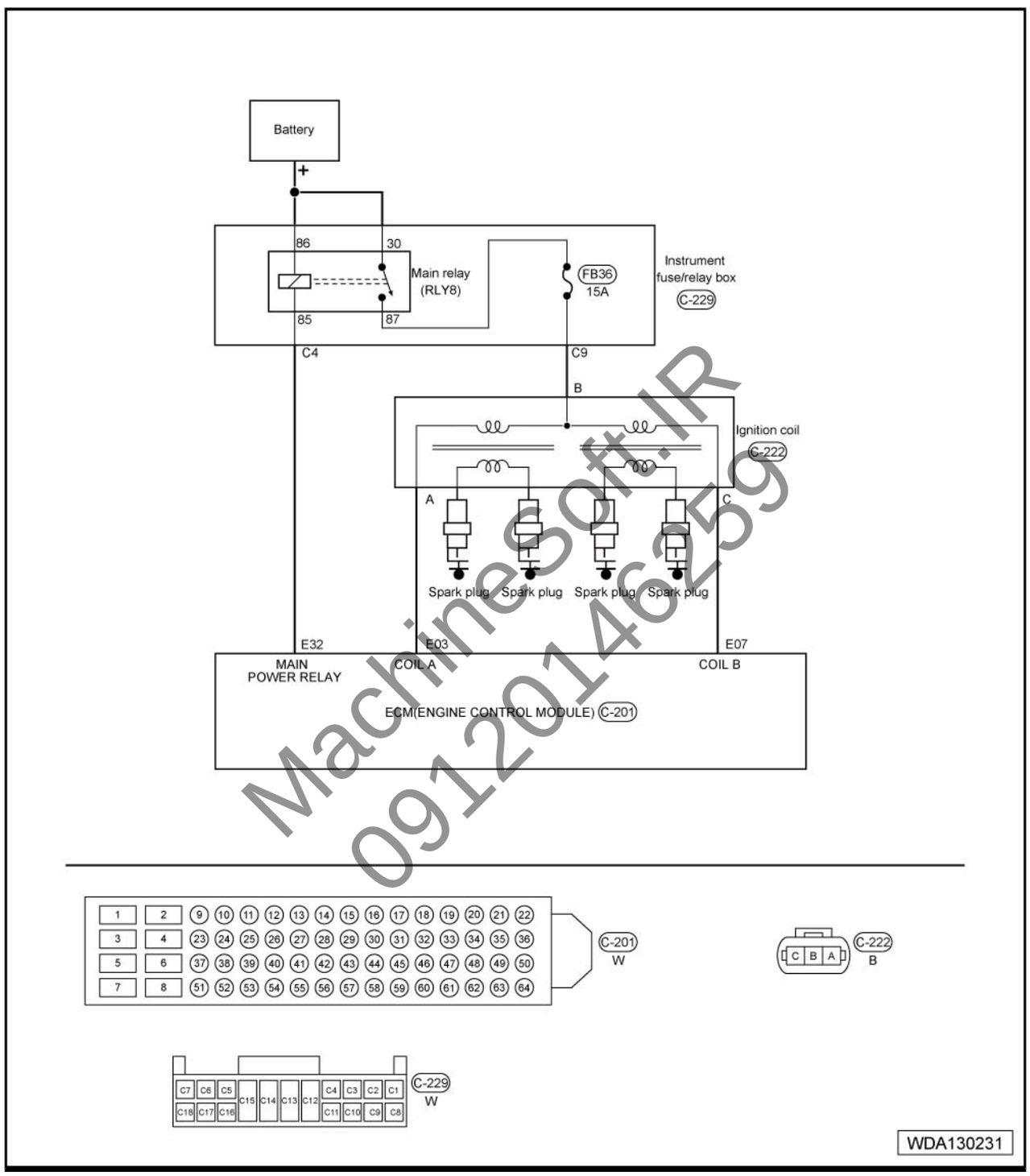


5. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.9 P0301 Cylinder 1 misfire

P0302 Cylinder 2 misfire
P0303 Cylinder 3 misfire
P0304 Cylinder 4 misfire



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0301	Cylinder 1 misfire	Engine running normally	Cylinder 1 misfire detected by the diagnostic device	• Failure of the ignition coil

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the spark plug or ignition cable • Failure of the ignition coil circuit • Failure of the engine control module
P0302	Cylinder 2 misfire	Engine running normally	Cylinder 2 misfire detected by the diagnostic device	• Failure of the ignition coil • Failure of the spark plug or ignition cable • Failure of the ignition coil circuit • Failure of the engine control module
P0303	Cylinder 3 misfire	Engine running normally	Cylinder 3 misfire detected by the diagnostic device	• Failure of the ignition coil • Failure of the spark plug or ignition cable • Failure of the ignition coil circuit • Failure of the engine control module
P03041	Cylinder 4 misfire	Engine running normally	Cylinder 4 misfire detected by the diagnostic device	• Failure of the ignition coil • Failure of the spark plug or ignition cable • Failure of the ignition coil circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the ignition coil connector is loose or disengaged. And check if the wiring harness has leakage of electricity or is damaged.

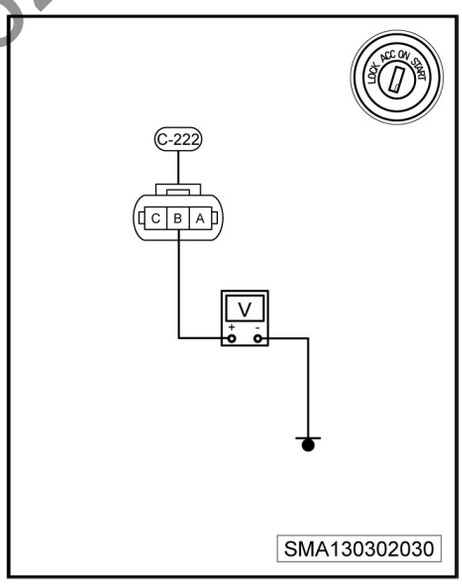
- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 2.

2. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine and check if there is blue and white high-pressure fire.

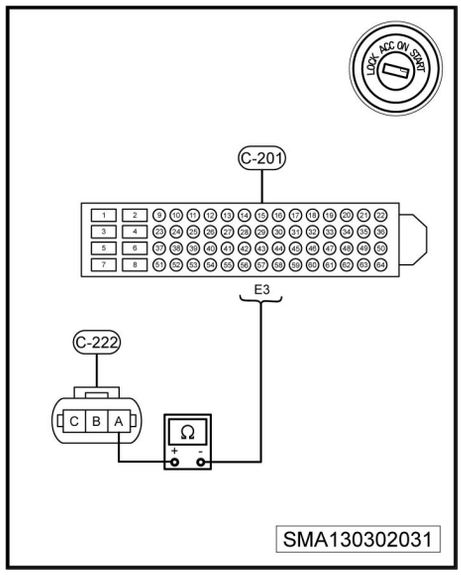
- If yes, go to step 3.
- If not, the spark plug or the ignition cable fails and please replace it. ■

3. Turn the ignition switch to the ON position, disconnect the ignition coil connector C-222 and check if the pin B of C-222 is battery voltage.

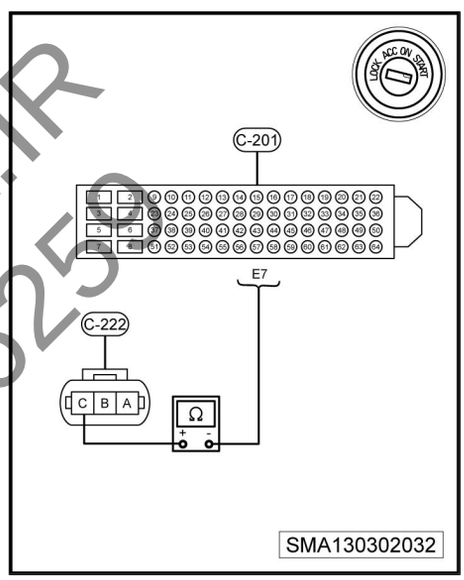
- If yes, go to step 4.
- If not, the lead between the pin B of C-222 and the front compartment fuse box FB36 fails and please repair it. ■



4. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and the ignition coil connector C-222, and check if the lead between the pin A of C-222 and the pin E3 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 5.



5. Turn the ignition switch to the LOCK position, check if the lead between the pin C of C-222 and the pin E7 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 6.

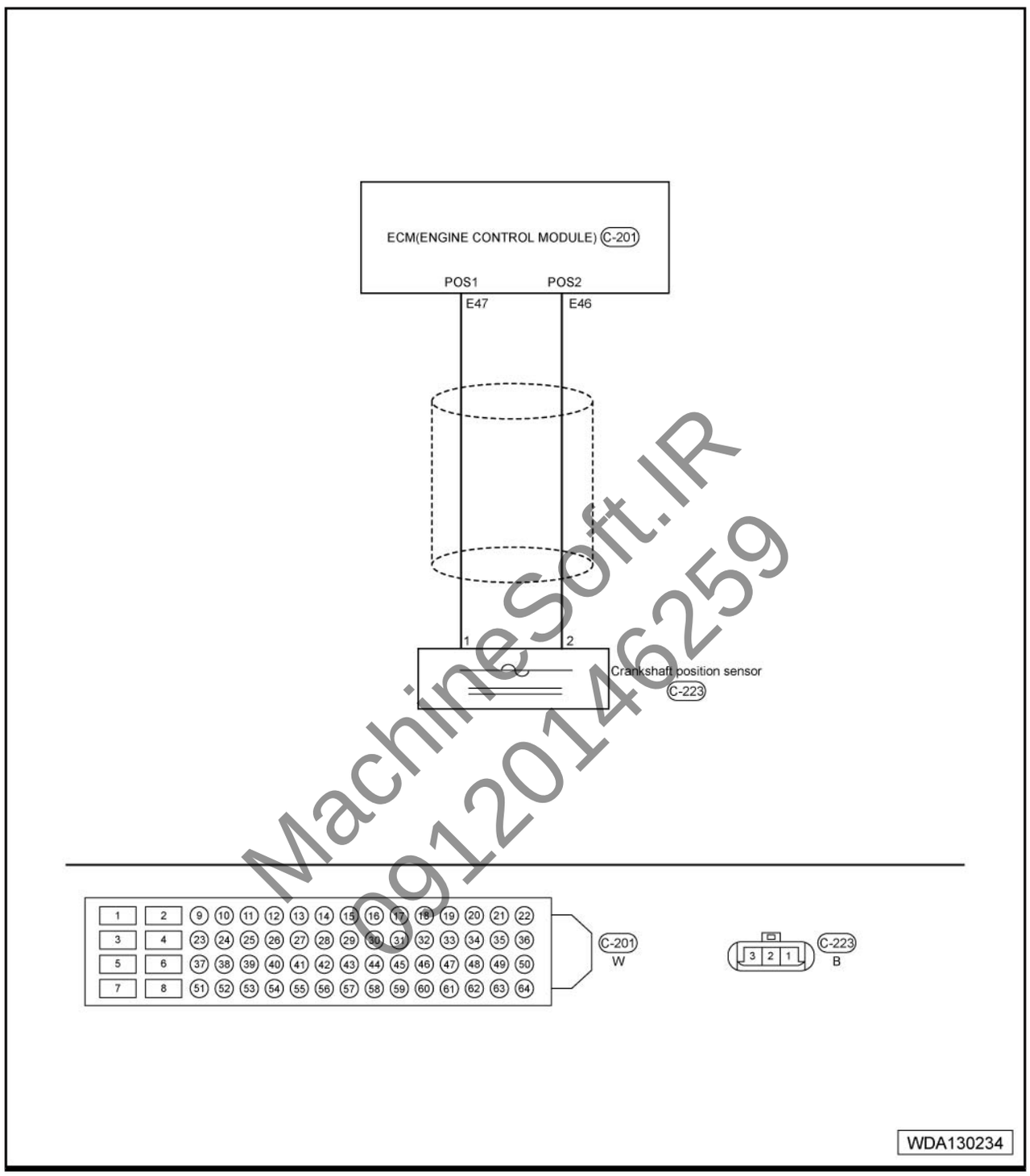


6. Check if the ignition coil itself fails.
   - If yes, the ignition coil fails and please replace it. ■
   - If not, go to step 7.

7. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, locate fault causes from other symptoms.
   - If not, the fault has been rectified. ■

2.6.10 P0321 Crankshaft TDC signal failure

P0322 Crankshaft position sensor signal failure



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0321	Crankshaft TDC signal failure	Engine starting	Failure of the crankshaft position sensor detected by the ECM	• Failure of the crankshaft position sensor • Failure of the crankshaft

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				position sensor circuit • Failure of the engine control module
P0322	Failure of the crankshaft position sensor signal	Engine starting	Failure of the crankshaft position sensor detected by the ECM	• Failure of the crankshaft position sensor • Failure of the crankshaft position sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

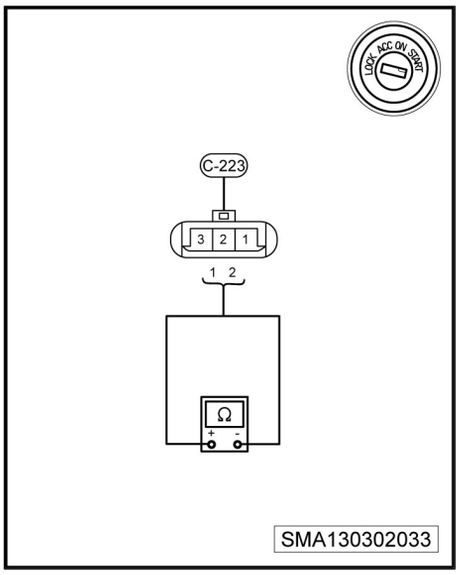
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the crankshaft position sensor connector is corrosive, tainted or loose and if the wiring harness is damaged.
   - If yes, the connector/wiring harness fails and please repair or replace it. ■
   - If not, go to step 2.

2. Turn the ignition switch to the LOCK position, disconnect the crankshaft position sensor connector C-223 and check if the resistance between the pins 1 and 2 of C-223 is normal. (The rated resistance is 860 Ω ± 20% at 23℃)

- If yes, go to step 3.
- If not, the crankshaft position sensor fails and please replace it. ■

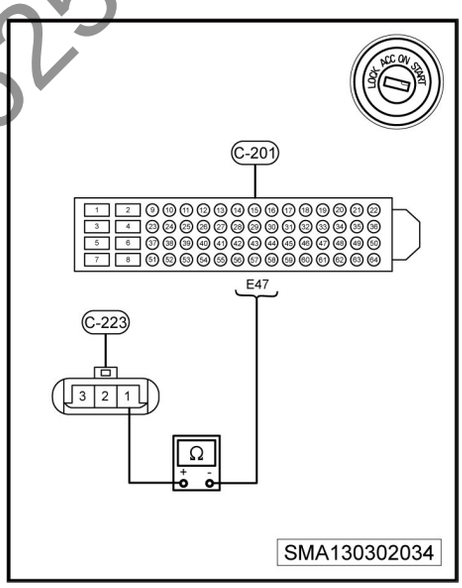


3. Check if the crankshaft position sensor is stained with foreign matters and damaged.

- If yes, the crankshaft position sensor fails and please clear or replace it. ■
- If not, go to step 4.

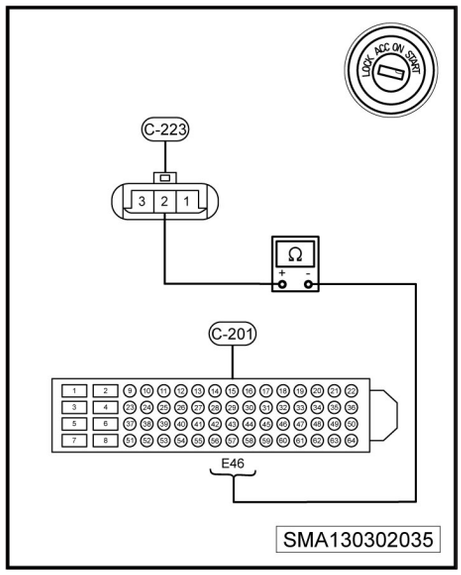
4. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and the crankshaft position sensor connector C-223, and check if the lead between the pin 1 of C-223 and the pin E47 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Turn the ignition switch to the LOCK position, check if the lead between the pin 2 of C-223 and the pin E46 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.

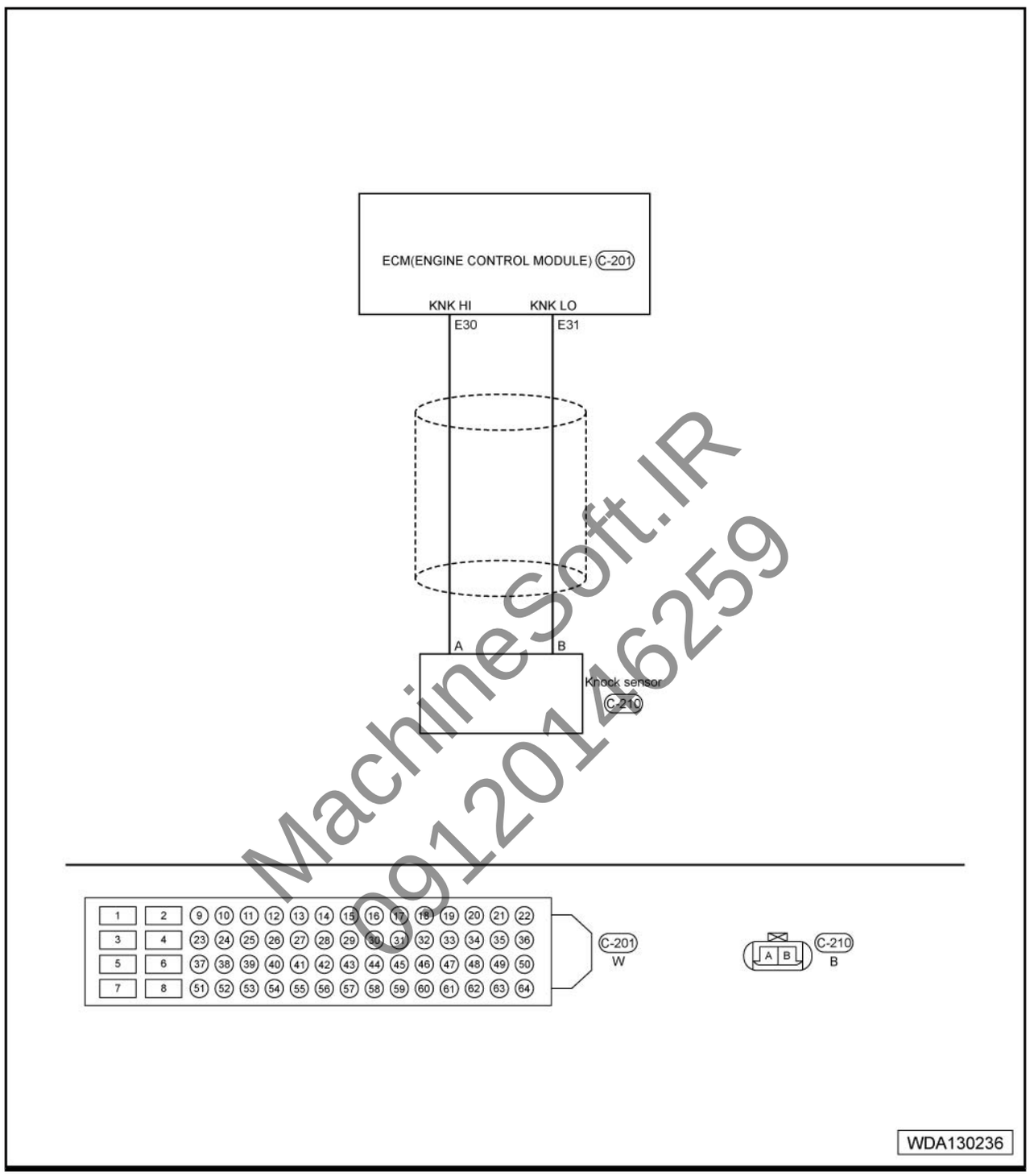


6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.11 P0327 Knock sensor signal circuit low input

P0328 Knock sensor signal circuit high input



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0327	Knock sensor signal circuit low input	Engine running	Knock sensor signal circuit low input	• Failure of the knock sensor • Failure of the knock sensor circuit

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the engine control module
P0328	Knock sensor signal circuit high input	Engine running	Knock sensor signal circuit high input	• Failure of the knock sensor • Failure of the knock sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

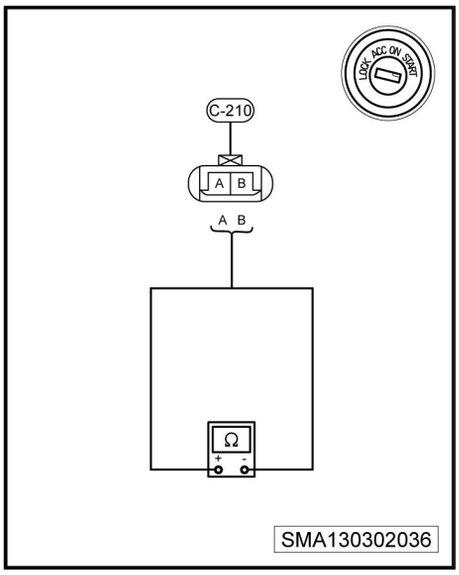
Diagnosis procedures:

Note

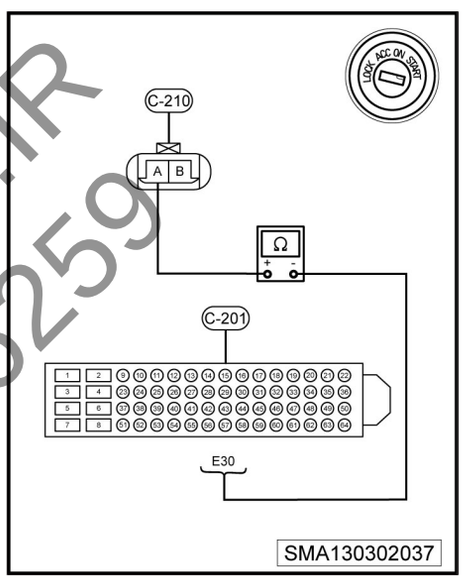
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the knock sensor connector is corrosive, tainted or loose. And check if the wiring harness is subject to electromagnetic interference etc..
   - If yes, the connector/wiring harness fails and please repair or replace it. ■
   - If not, go to step 2.

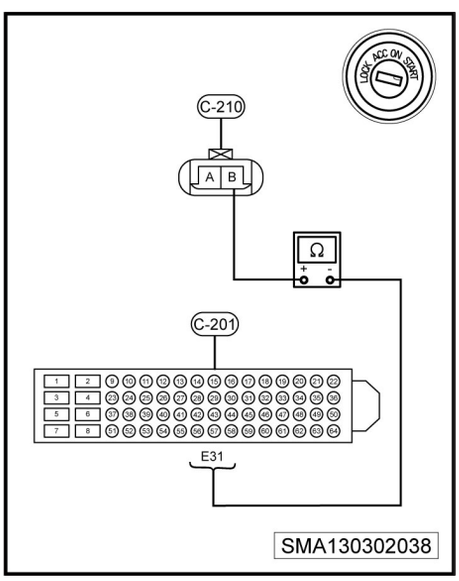
2. Turn the ignition switch to the LOCK position, disconnect the knock sensor connector C-210 and check if the resistance between the two pins of the knock sensor is greater than 1 MΩ.
   - If yes, go to step 3.
   - If not, the knock sensor fails and please replace it. ■



3. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and the knock sensor connector C-210, and check if the lead between the pin A of C-210 and the pin E30 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 4.



4. Turn the ignition switch to the LOCK position, check if the lead between the pin B of C-210 and the pin E31 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 5.



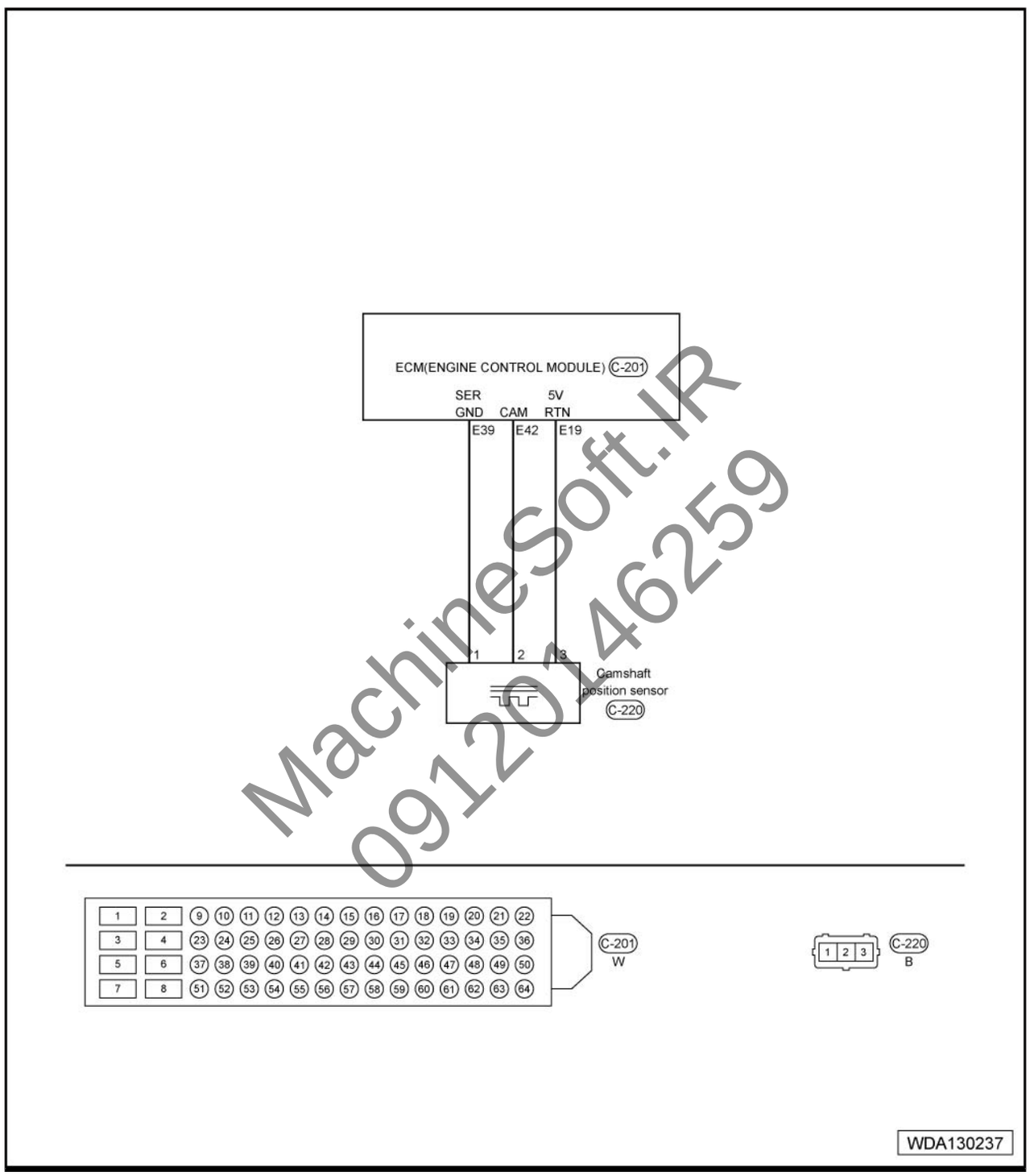
5. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

s

2.6.12 P0340 Improper camshaft position sensor

P0341 Camshaft position sensor poor contact
P0342 Camshaft position sensor short to ground
P0343 Camshaft position sensor short to power



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0340	Improper camshaft position sensor	The ignition switch in the ON position	Improper camshaft position sensor	• Improper timing belt position

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0341	Camshaft position sensor poor contact	The ignition switch in the ON position	Camshaft position sensor unstable signal	• Failure of the camshaft position sensor • Failure of the camshaft position sensor circuit • Failure of the engine control module
P0342	Camshaft position sensor short to ground	The ignition switch in the ON position	Camshaft position sensor wiring harness short to ground	• Failure of the camshaft position sensor • Failure of the camshaft position sensor circuit • Failure of the engine control module
P0343	Camshaft position sensor short to power	The ignition switch in the ON position	Camshaft position sensor wiring harness short to power	• Failure of the camshaft position sensor • Failure of the camshaft position sensor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the camshaft position sensor connector is corrosive, tainted or loose and if the wiring harness is damaged.

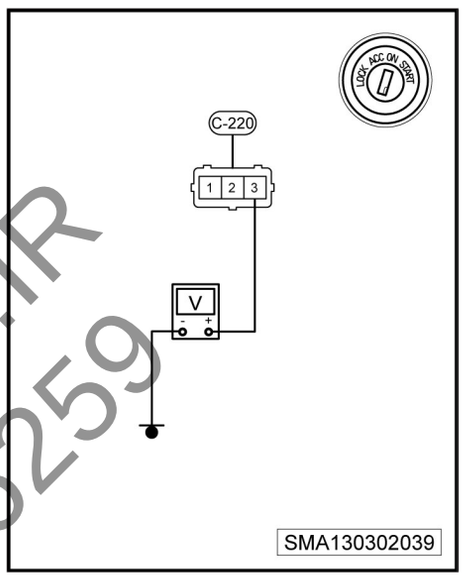
- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 2.

2. Check if the timing belts are installed correctly.

- If yes, go to step 3.
- If not, reinstall the timing belts. ■

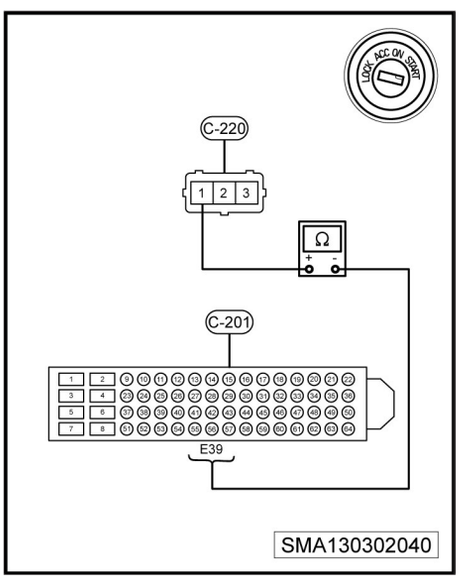
3. Turn the ignition switch to the ON position, disconnect the camshaft position sensor connector C-220 and check if the pin 3 of C-220 is 5 V.

- If yes, go to step 4.
- If not, the lead between the pin 3 of C-220 and the pin E19 of ECM C-201 fails and please repair it. ■



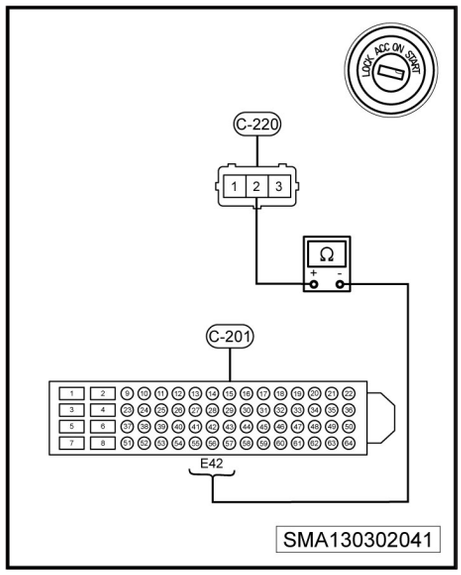
4. Turn the ignition switch to the LOCK position, disconnect the camshaft position sensor connector C-220 and the ECM connector C-201, and check if the lead between the pin 1 of C-220 and the pin E39 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Turn the ignition switch to the LOCK position, check if the lead between the pin 2 of C-220 and the pin E42 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.

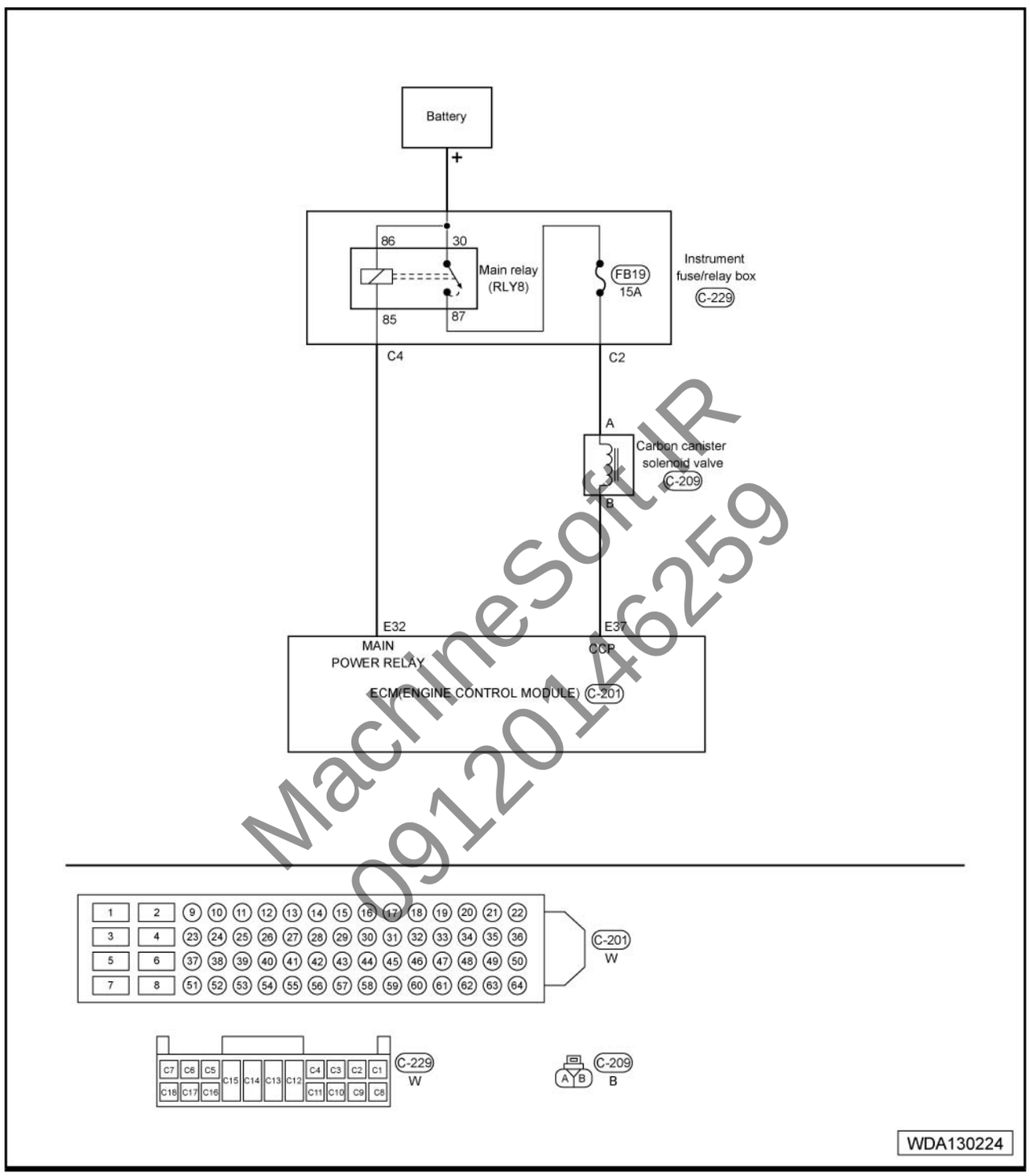


6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.13 P0444 Carbon canister solenoid valve control circuit open circuit

P0458 Carbon canister solenoid valve control circuit low input
P0459 Carbon canister solenoid valve control circuit high input



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0444	Carbon canister solenoid valve control circuit open circuit	Engine running	Carbon canister solenoid valve wiring harness open circuit	• Failure of the carbon canister solenoid valve

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the carbon canister solenoid valve circuit • Failure of the engine control module
P0458	Carbon canister solenoid valve control circuit low input	Engine running	The carbon canister solenoid valve wiring harness short to ground	• Failure of the carbon canister solenoid valve • Failure of the carbon canister solenoid valve circuit • Failure of the engine control module
P0459	Carbon canister valve control circuit high input	Engine running	The carbon canister solenoid valve wiring harness short to power	• Failure of the carbon canister solenoid valve • Failure of the carbon canister solenoid valve circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

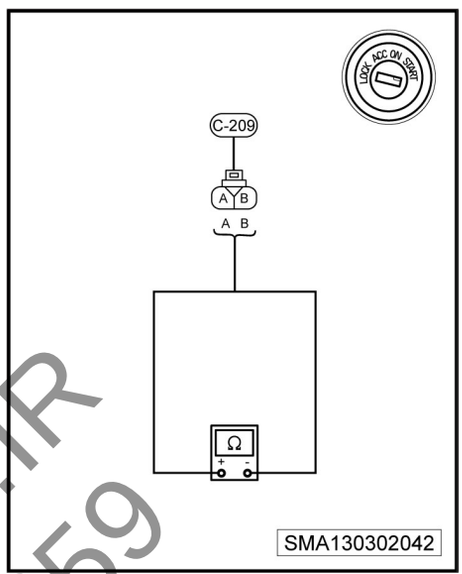
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the carbon canister solenoid valve connector is corrosive, tainted or loose and if the wiring harness is damaged.

- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 2.

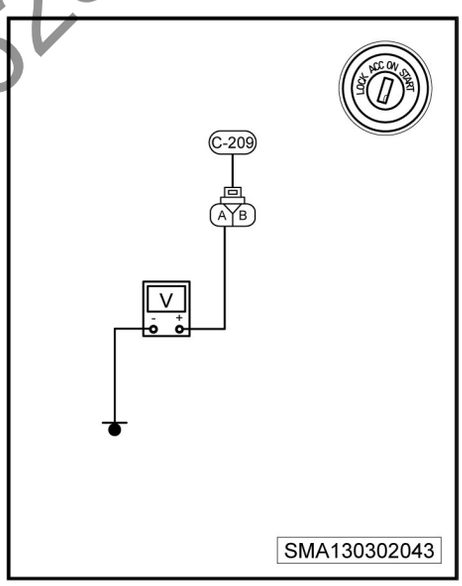
2. Turn the ignition switch to the LOCK position, disconnect the carbon canister solenoid valve connector C-209 and check if the resistance between the pins A and B of C-209 is normal. (The normal resistance in normal temperature is 26 Ω ± 4 Ω).

- If yes, go to step 3.
- If not, the carbon canister solenoid valve fails and please replace it. ■



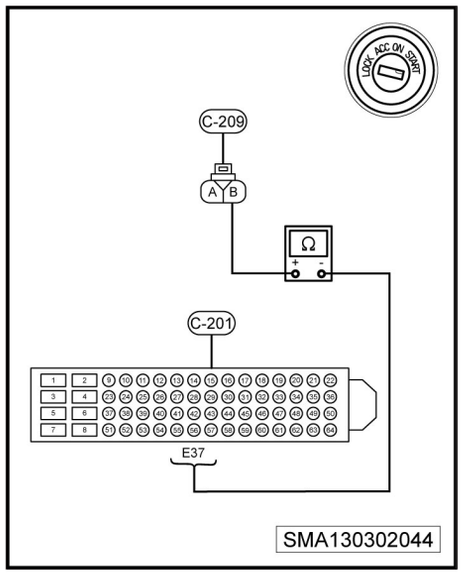
3. Turn the ignition switch to the ON position and check if the voltage at the pin A of C-209 is battery voltage.

- If yes, go to step 4.
- If not, the lead between the pin A of C-209 and the front compartment fuse box FB19 fails and please repair it. ■



4. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and check if the lead between the pin B of C-209 and the pin E37 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.

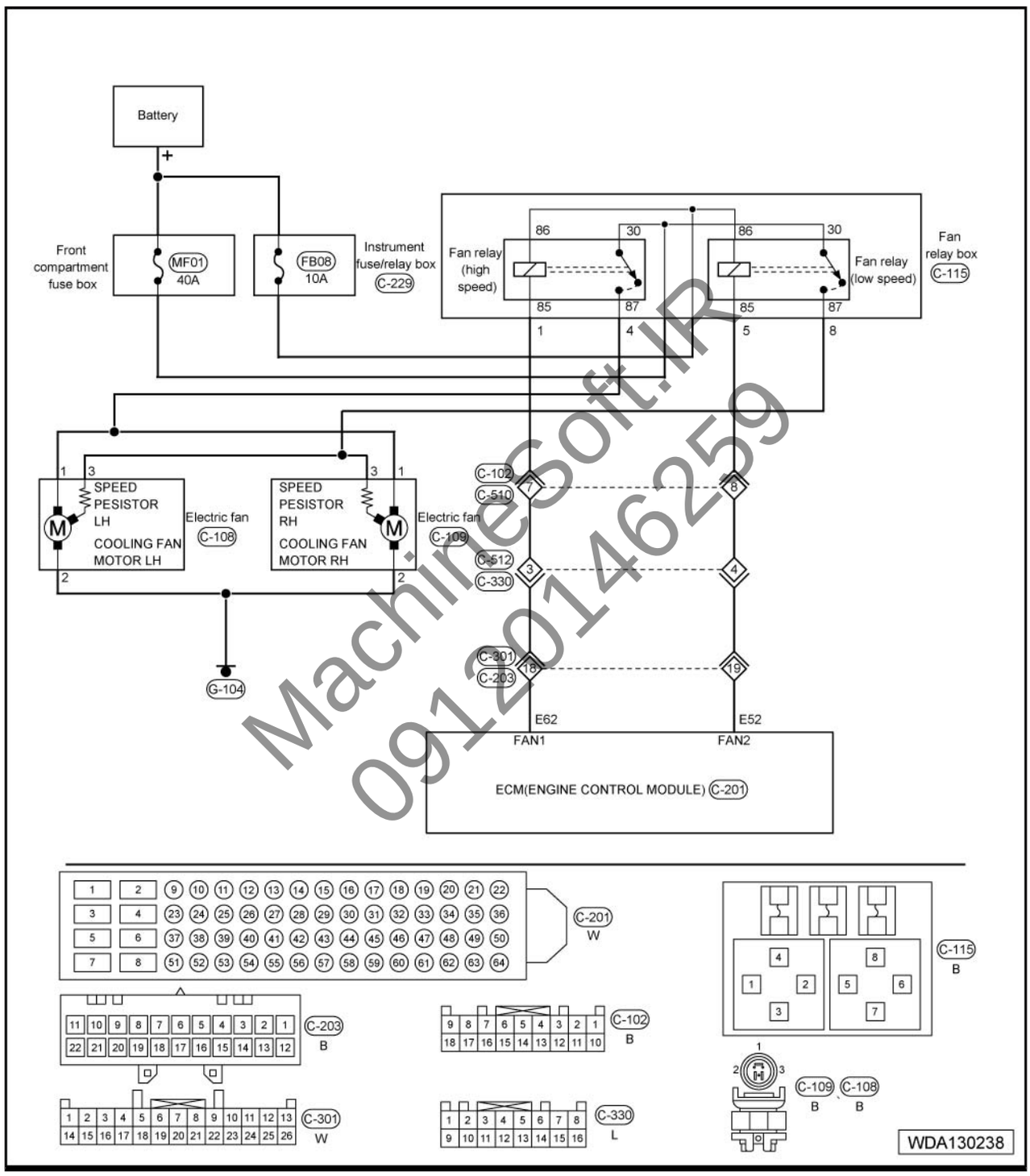


5. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.14 P0480 Cooling fan relay control circuit failure (low speed)

P0481 Cooling fan relay control circuit failure (high speed)
P0691 Cooling fan relay control circuit short to ground (low speed)
P0692 Cooling fan relay control circuit short to power (low speed)
P0693 Cooling fan relay control circuit short to ground (high speed)
P0694 Cooling fan relay control circuit short to power (high speed)



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0480	Cooling fan relay control circuit failure (low speed)	The engine running normally with the coolant temperature more than 95℃	The relay wiring harness open circuit	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module
P0691	Cooling fan relay control circuit short to ground (low speed)	The engine running normally with the coolant temperature more than 95℃	The relay wiring harness short to ground	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module
P0692	Cooling fan relay control circuit short to power (low speed)	The engine running normally with the coolant temperature more than 95℃	The relay wiring harness short to power	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module
P0481	Cooling fan relay control circuit failure (high speed)	The engine running normally with the coolant temperature more than 99℃	The relay wiring harness open circuit	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module
P0693	Cooling fan relay control circuit short to ground (high speed)	The engine running normally with the coolant temperature more than 99℃	The relay wiring harness short to ground	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module
P0694	Cooling fan relay control circuit short to power (high speed)	The engine running normally with the coolant temperature more than 99℃	The relay wiring harness short to power	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the cooling fan fuses FB17 (15A) and MFO1 (40A) are normal.

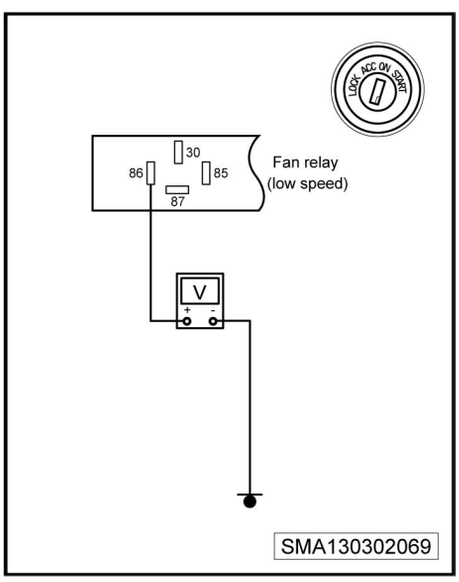
- If yes, go to step 2.
- If not, the fuse FB17 or MFO1 fails and please replace it. ■

2. Pull out the low speed cooling fan relay and check if the resistance value of the relay coil is normal. Lever out the relay housing to check if the closed contact is normal.

- If yes, go to step 3.
- If not, the low speed cooling fan relay fails and please repair it. ■

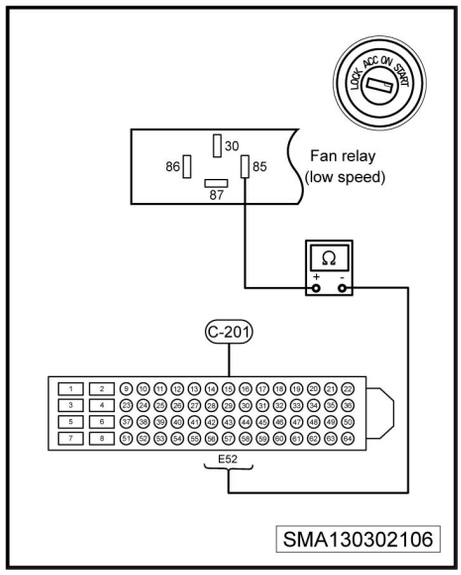
3. Pull out the low speed cooling fan relay to check if the voltage of its pin 86 is battery voltage.

- If yes, go to step 4.
- If not, the lead between the fuse FB17 and the low speed cooling fan relay pin 86 fails and please repair it. ■



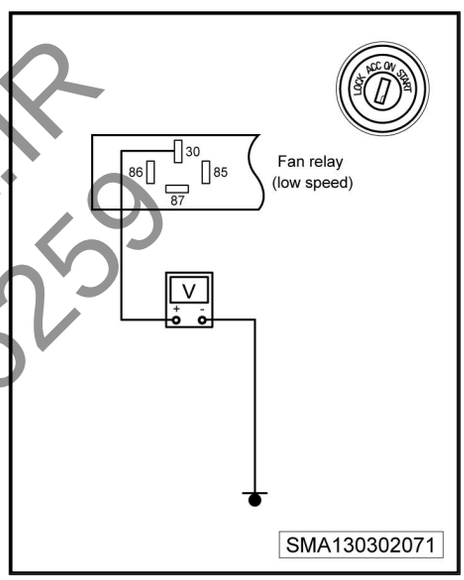
4. Pull out the low speed cooling fan relay, disconnect the ECM connector C-202 and check if the lead between the pin 85 of the low speed cooling fan relay and the pin E52 of C-202 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



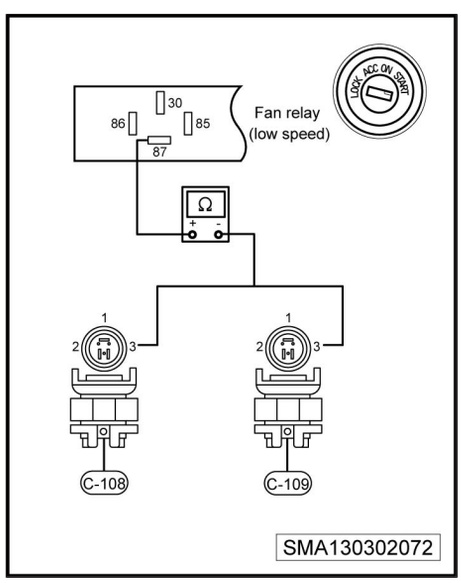
5. Pull out the low speed cooling fan relay to check if the voltage of its pin 30 is battery voltage.

- If yes, go to step 6.
- If not, the lead between the fuse MFO1 and the low speed cooling fan relay pin 30 fails and please repair it. ■



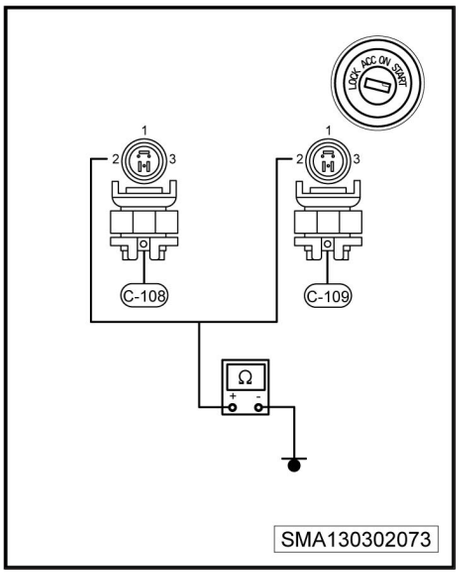
6. Pull out the low speed cooling fan relay, disconnect the cooling fan connectors C-108 and C-109, and check if the lead between the pin 87 of the low speed cooling fan relay and the pins 3 of C-108 and 3 of C-109 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 7.



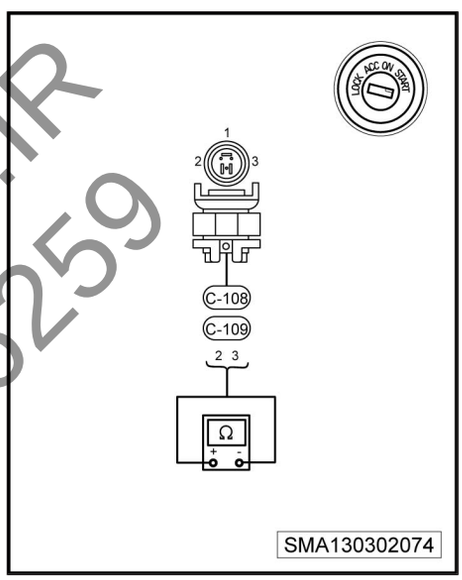
7. Disconnect the cooling fan connectors C-108 and C-109 and check if the lead between the ground point and the pins 2 of C-108 and 2 of C-109 is normal.

- If yes, go to step 8.
- If not, the lead between the ground point and the pins 2 of C-108 and 2 of C-109 fails and please repair it. ■



8. Disconnect the cooling fan connectors C-108 and C-109 and check if the resistance value between the pins 2 and 3 of C-108 or the pins 2 and 3 of C-109 is normal. (The measured value is about 0.8 Ω .)

- If yes, go to step 9.
- If not, the cooling fan fails and please repair it. ■

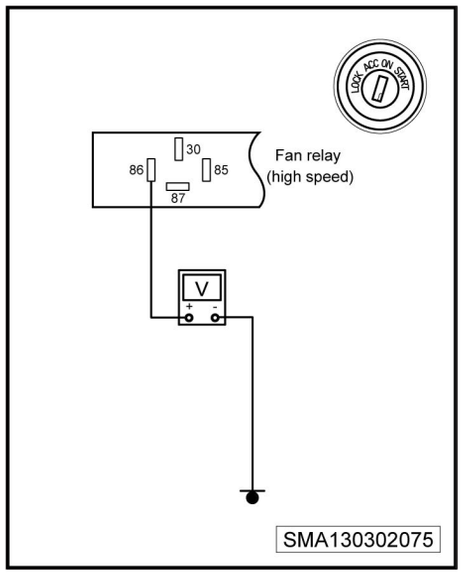


9. Pull out the high speed cooling fan relay and check if the resistance value of the relay coil is normal. Lever out the relay housing to check if the contact switch is normal.

- If yes, go to step 10.
- If not, the high speed cooling fan relay fails and please repair it. ■

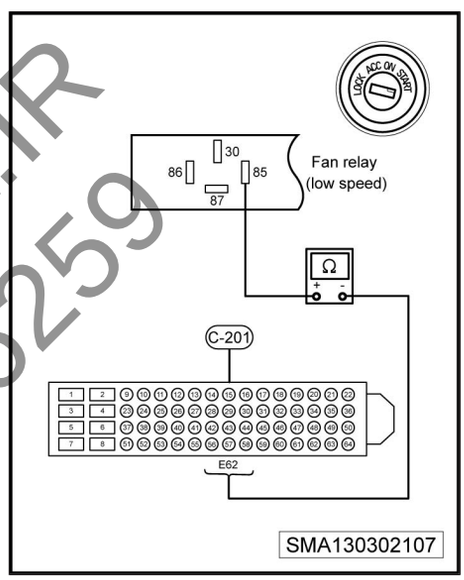
10. Pull out the low speed cooling fan relay to check if the voltage of its pin 86 is battery voltage.

- If yes, go to step 11.
- If not, the lead between the fuse FB17 and the high speed cooling fan relay pin 86 fails and please repair it. ■



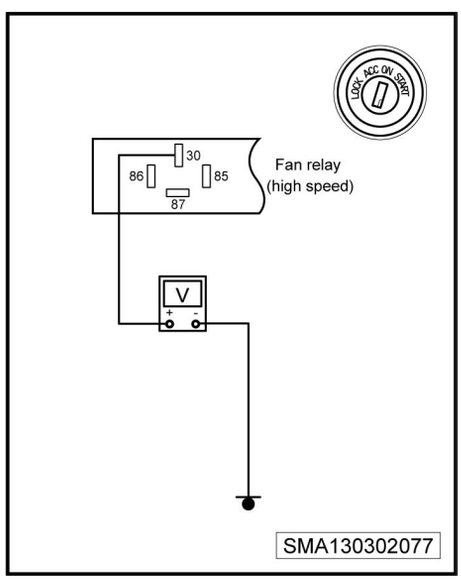
11. Pull out the high speed cooling fan relay, disconnect the ECM connector C-202 and check if the lead between the pin 85 of the high speed cooling fan relay and the pin E52 of C-202 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 12.



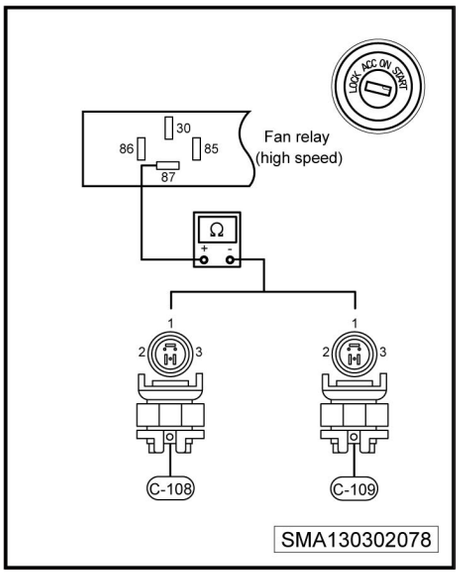
12. Pull out the low speed cooling fan relay to check if the voltage of its pin 30 is battery voltage.

- If yes, go to step 13.
- If not, the lead between the fuse MFO1 and the high speed cooling fan relay pin 30 fails and please repair it. ■



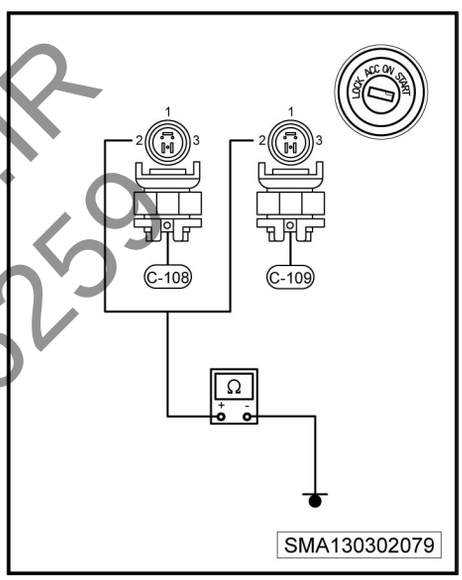
13. Pull out the high speed cooling fan relay, disconnect the cooling fan connectors C-108 and C-109, and check if the lead between the pin 87 of the high speed cooling fan relay and the pins 1 of C-108 and 1 of C-109 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 14.



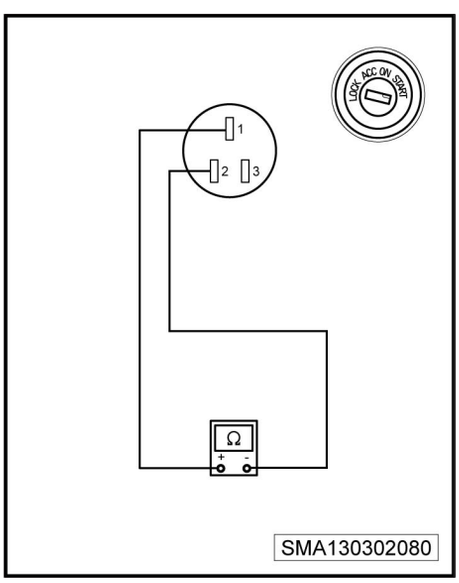
14. Disconnect the cooling fan connectors C-108 and C-109 and check if the lead between the ground point and the pins 2 of C-108 and 2 of C-109 is normal.

- If yes, the lead between the ground point and the pins 2 of C-108 and 2 of C-109 fails and please repair it. ■
- If not, go to step 15.



15. Disconnect the cooling fan connectors C-108 and C-109 and check if the resistance value between the pins 2 and 1 of C-108 or the pins 2 and 1 of C-109 is normal.

- If yes, go to step 16.
- If not, the cooling fan fails and please repair it. ■

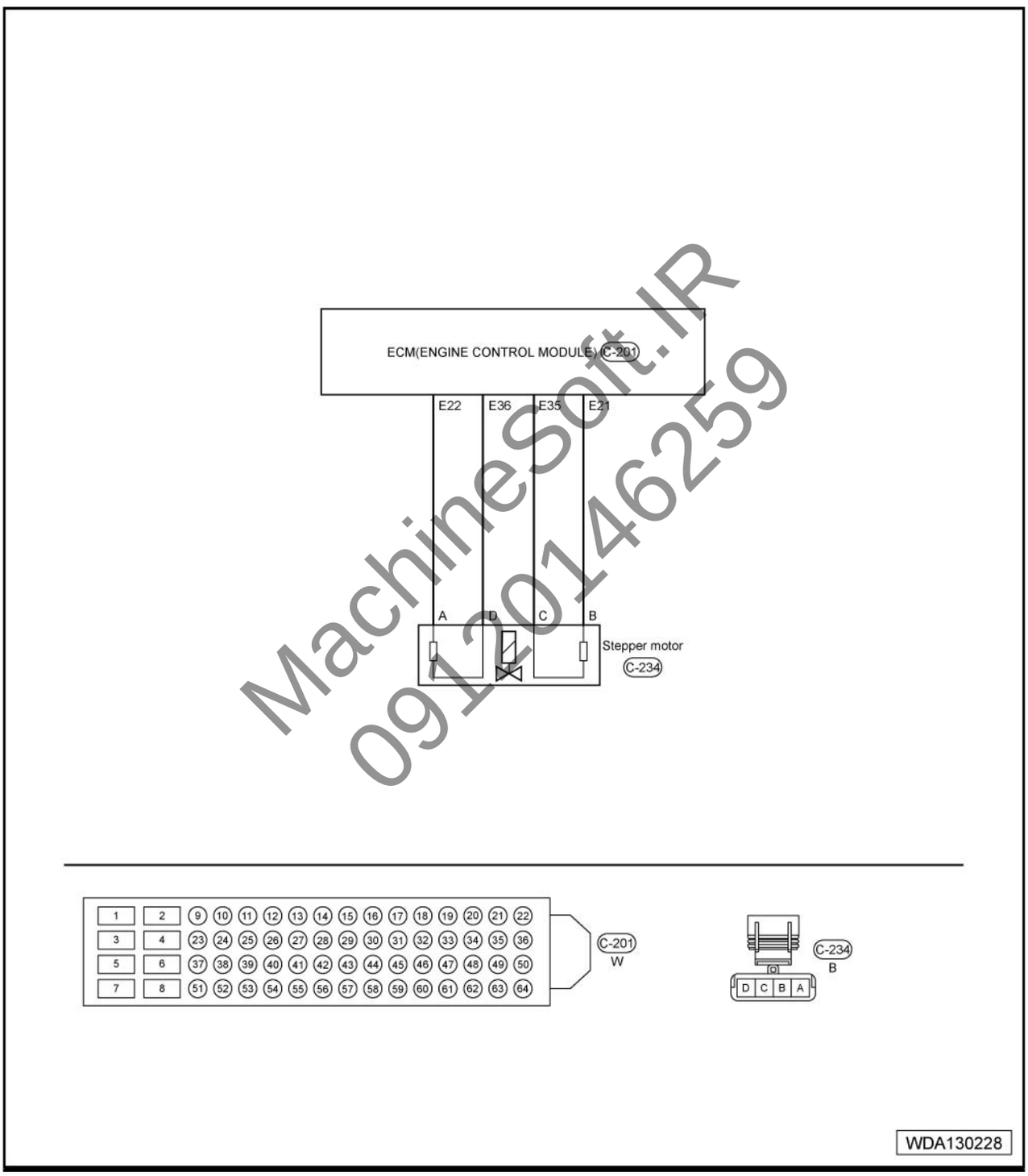


16. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.15 P0508 Idling stepper motor control circuit short to ground

P0509 Idling stepper motor control circuit short to power
P0511 Idling stepper motor control circuit failures



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0508	Idling stepper motor control circuit short to ground	Engine idle running	Idling stepper motor wiring harness short to ground	• Failure of the idling stepper motor • Failure of the idling stepper motor circuit • Failure of the engine control module
P0509	Idling stepper motor control circuit short to power	Engine idle running	Idling stepper motor wiring harness short to power	• Failure of the idling stepper motor • Failure of the idling stepper motor circuit • Failure of the engine control module
P0511	Idling stepper motor control circuit failures	Engine idle running	Failures of the idling stepper motor detected by the ECM	• Failure of the idling stepper motor • Failure of the idling stepper motor circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

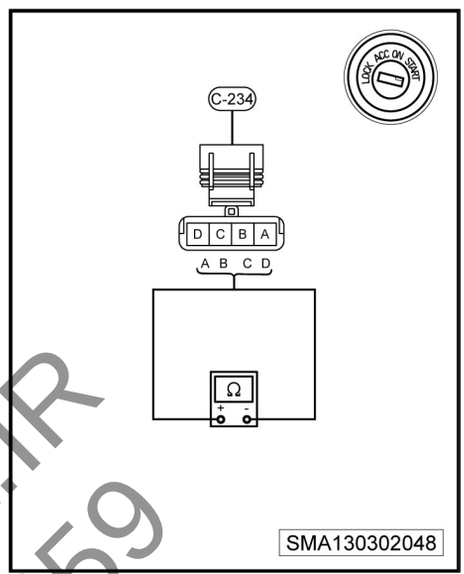
Diagnosis procedures:

Note

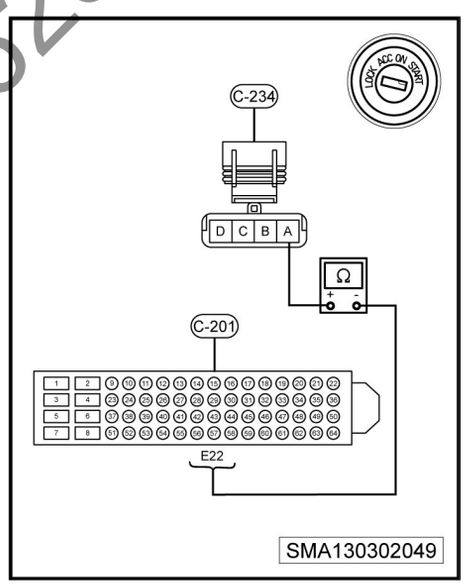
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the idling stepper motor connector is corrosive, tainted or loose. And check if the wiring harness is damaged.
   - If yes, the connector/wiring harness fails and please repair or replace it. ■
   - If not, go to step 2.

2. Turn the ignition switch to the LOCK position, disconnect the idling stepper motor connector C-234 and respectively check if the resistance value between the pins A and D of C-234 or the pins B and C of C-234 is normal. (The rated resistance value is 53±5.3 Ω at 27℃.)
   - If yes, go to step 3.
   - If not, the idling stepper motor fails and please replace it. ■

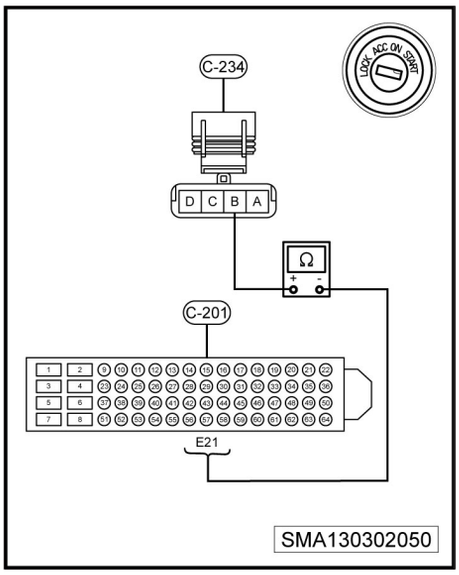


3. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and the idling stepper motor connector C-234 and check if the lead between the pin A of C-234 and the pin E22 of C-201 has short or open circuit.
   - If yes, repair the defective lead. ■
   - If not, go to step 4.



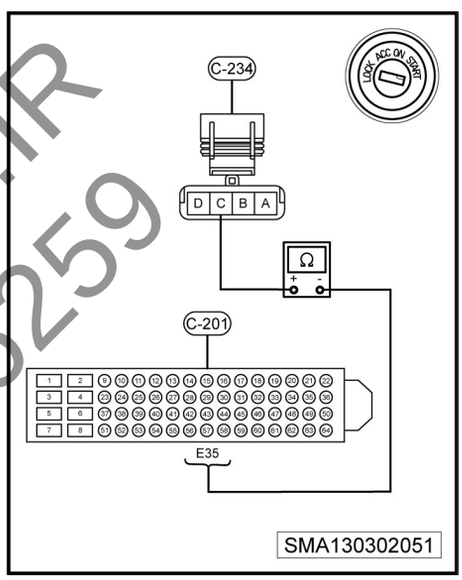
4. Turn the ignition switch to the LOCK position, check if the lead between the pin B of C-234 and the pin E21 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 5.



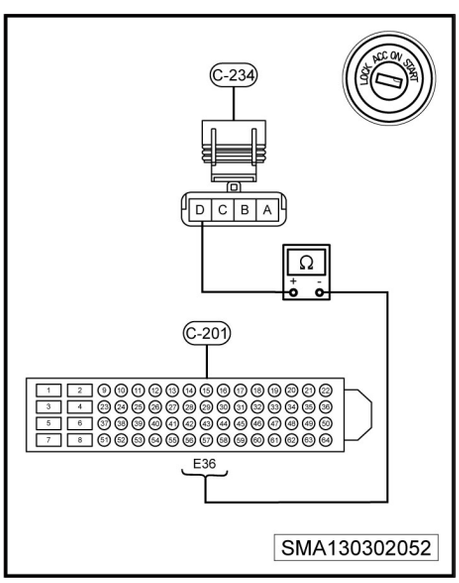
5. Turn the ignition switch to the LOCK position, check if the lead between the pin C of C-234 and the pin E35 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 6.



6. Turn the ignition switch to the LOCK position, check if the lead between the pin D of C-234 and the pin E36 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 7.



7. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.16 P0560 Improper system voltage signal

P0562 System voltage low
P0563 System voltage high

Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0560	Improper system voltage signal	Engine running	System voltage unstable	• Failure of the battery • Failure of the generator • Failure of the engine control module
P0562	System voltage low	Engine running	System voltage lower than 9.5 V	• Failure of the battery • Failure of the generator • Failure of the engine control module
P0563	System voltage high	Engine running	System voltage higher than 16 V	• Failure of the battery • Failure of the generator • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the battery/generator connector is corrosive, tainted or loose. And check if the wiring harness is damaged.

- If yes, the connector/wiring harness fails and please repair or replace it. ■
- If not, go to step 2.

2. Check if the generated energy of the generator is in the normal range.

- If yes, go to step 3.
- If not, the generator fails and please replace it. ■

3. Check if the battery is normal.

- If yes, go to step 4.
- If not, the battery fails and please replace it. ■

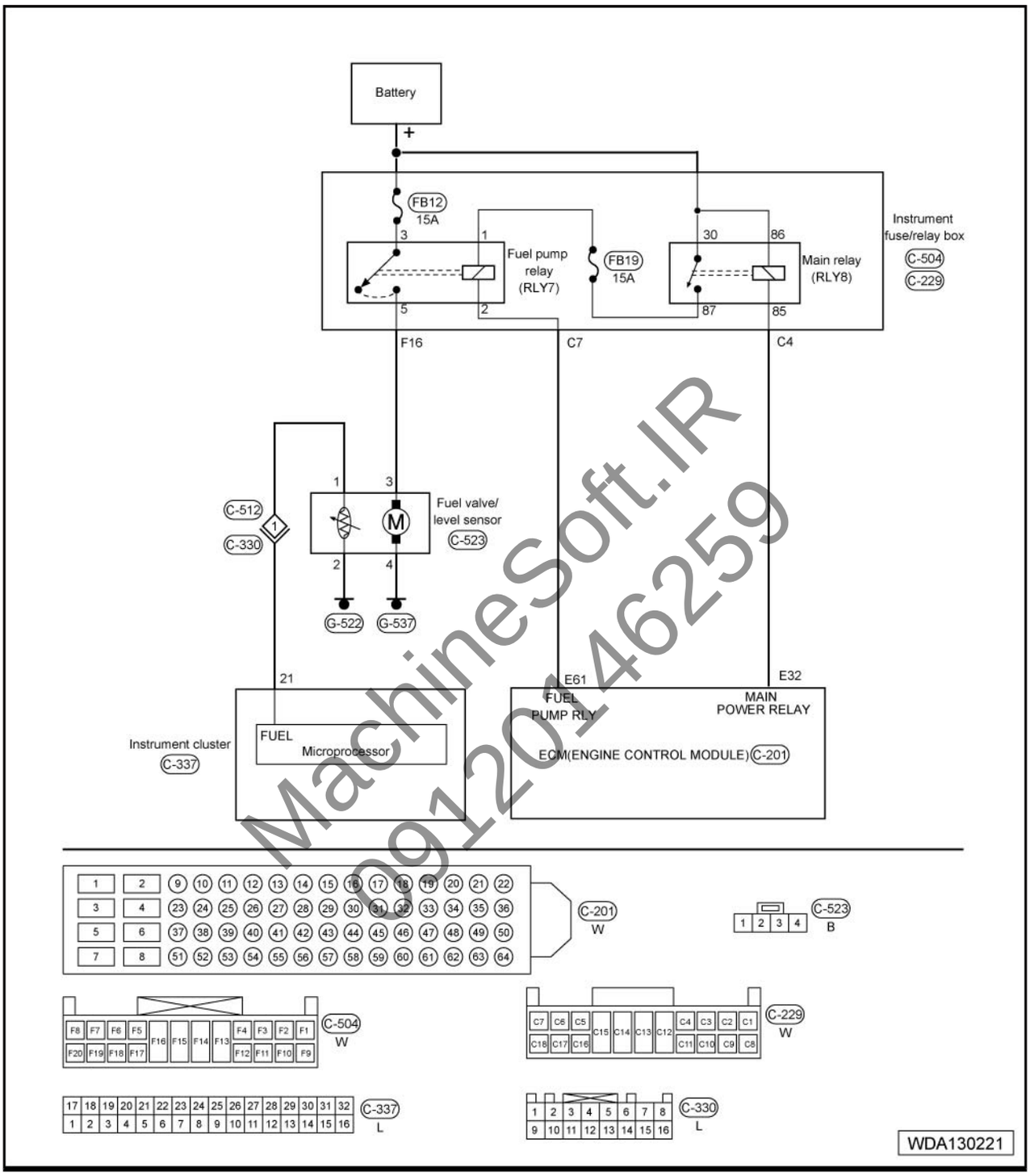
4. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.17 P0627 Fuel pump relay control circuit open circuit

P0628 Fuel pump relay control circuit short to ground

P0629 Fuel pump relay control circuit short to power



Fault code definition and fault causes

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
P0627	Fuel pump relay control circuit open circuit	The ignition switch in the ON position	Fuel pump relay control circuit open circuit	• Failure of the relay

DTC	DTC definition	DTC detection condition	DTC triggering condition	Possible causes
				• Failure of the relay control circuit • Failure of the engine control module
P0628	Fuel pump relay control circuit short to ground	The ignition switch in the ON position	Fuel pump relay control circuit short to ground	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module
P0629	Fuel pump relay control circuit short to power	The ignition switch in the ON position	Fuel pump relay control circuit short to power	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

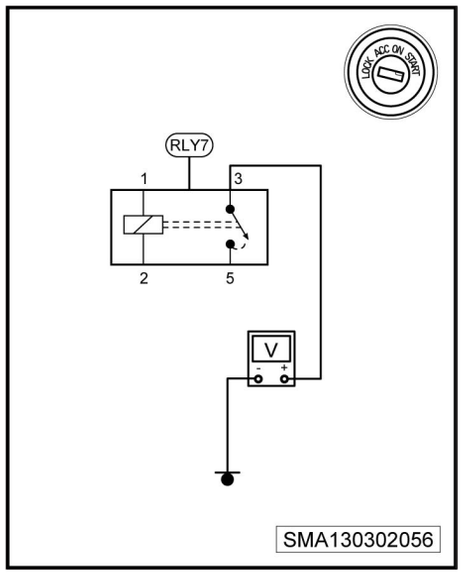
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the fuel pump relay RLY7 fails.
   - If yes, the relay fails and please replace it. ■
   - If not, go to step 2.

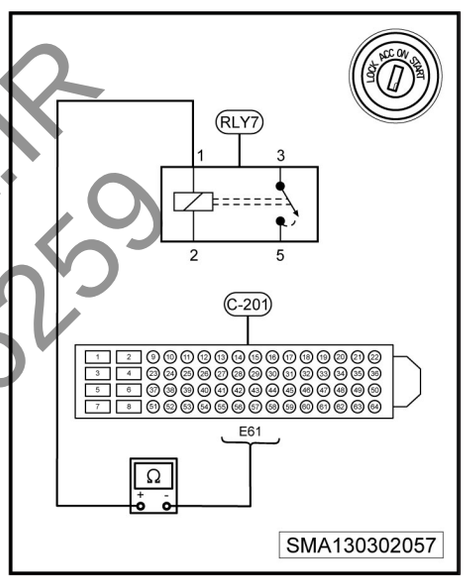
2. Turn the ignition switch to the LOCK position and check if the voltage at the pin 3 of the fuel pump relay is the battery voltage.

- If yes, go to step 3.
- If not, the lead between the pin 3 of the fuel pump relay and the front compartment fuse box FB12 fails and please repair it. ■



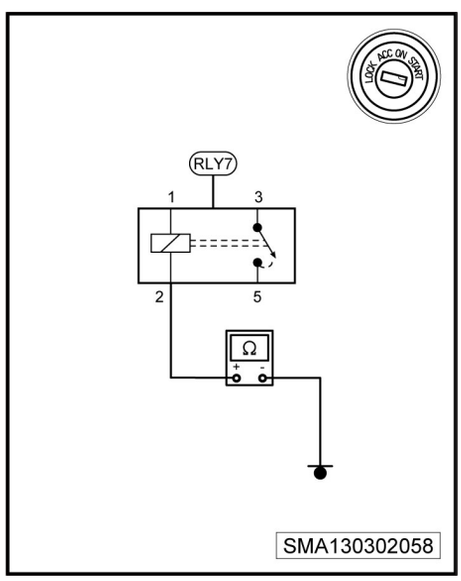
3. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201, pull out the fuel pump relay RLY7 and check if the lead between the pin E61 of C-201 and the pin 1 of RLY7 has short or open circuit.

- If yes, the lead between the pin E61 of C-201 and the pin 1 of the RLY7 fails and please repair it. ■
- If not, go to step 4.



4. Turn the ignition switch to the LOCK position and check if the lead between the pin 2 of the fuel pump relay and the ground point of G-205 has short or open circuit.

- If yes, the lead between the pin 2 of the fuel pump relay and the ground point of G-205 fails and please repair it. ■
- If not, go to step 5.



5. Turn the ignition switch to the LOCK position and check if the ground point of G-205 is corrosive or bad grounded.

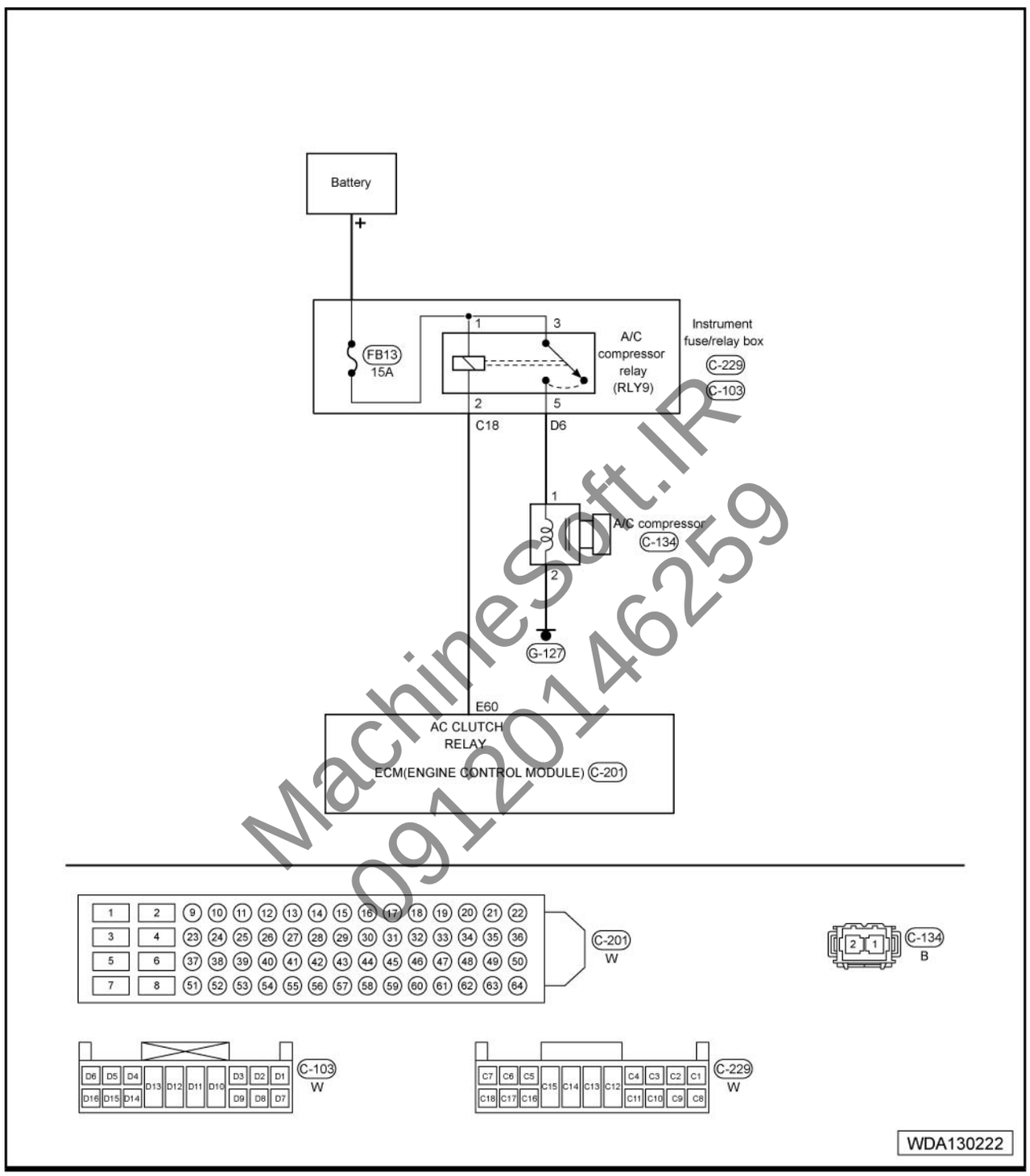
- If yes, repair the G-205 ground point. ■
- If not, go to step 6.

6. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

2.6.18 P0645 A/C compressor relay control circuit open circuit

P0646 A/C compressor relay control circuit short to ground
P0647 A/C compressor relay control circuit short to power



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P0645	A/C compressor relay control circuit open circuit	Engine running normally with the A/C button on	Relay connecting wiring harness open circuit	• Failure of the relay

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the relay control circuit • Failure of the engine control module
P0646	A/C compressor relay control circuit short to ground	Engine running normally with the A/C button on	Relay connecting wiring harness short to ground	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module
P0647	A/C compressor relay control circuit short to power	Engine running normally with the A/C button on	Relay connecting wiring harness short to power	• Failure of the relay • Failure of the relay control circuit • Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Start the engine, and make it reach normal operating temperature, then turn on air conditioner.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

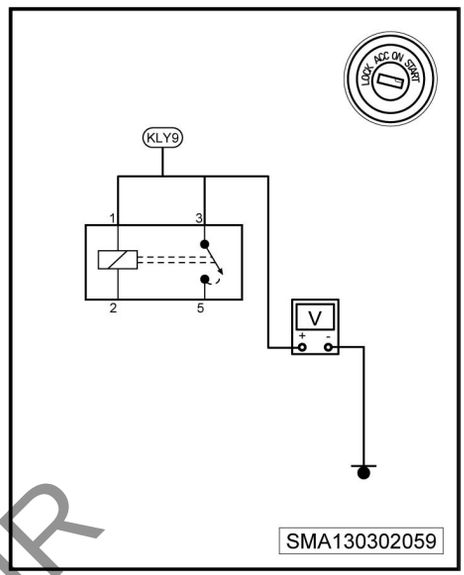
1. Check if the A/C clutch relay fuse FB13 is faulty.
   - If yes, replace the failed fuse. ■
   - If not, go to step 2.

2. Check if the A/C relay RLY9 is faulty.

- If yes, replace the relay. ■
- If not, go to step 3.

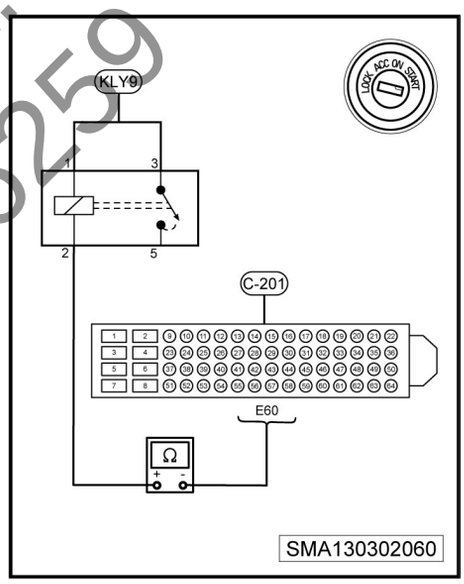
3. Turn the ignition switch to the ON position, pull out the A/C relay (RLY9), and check if the voltage between the pins 1 and 3 of the A/C relay is the battery voltage.

- If yes, go to step 4.
- If not, the lead between the pins 1 and 3 of the A/C relay (RLY9) and the front compartment fuse box FB13 fails and please repair the defective lead. ■



4. Turn the ignition switch to the LOCK position, pull out the A/C relay (RLY9), and disconnect the ECM connector C-201, and check if the lead between the pin E60 of C-201 and the pin 2 of the A/C relay (RLY9) has short or open circuit.

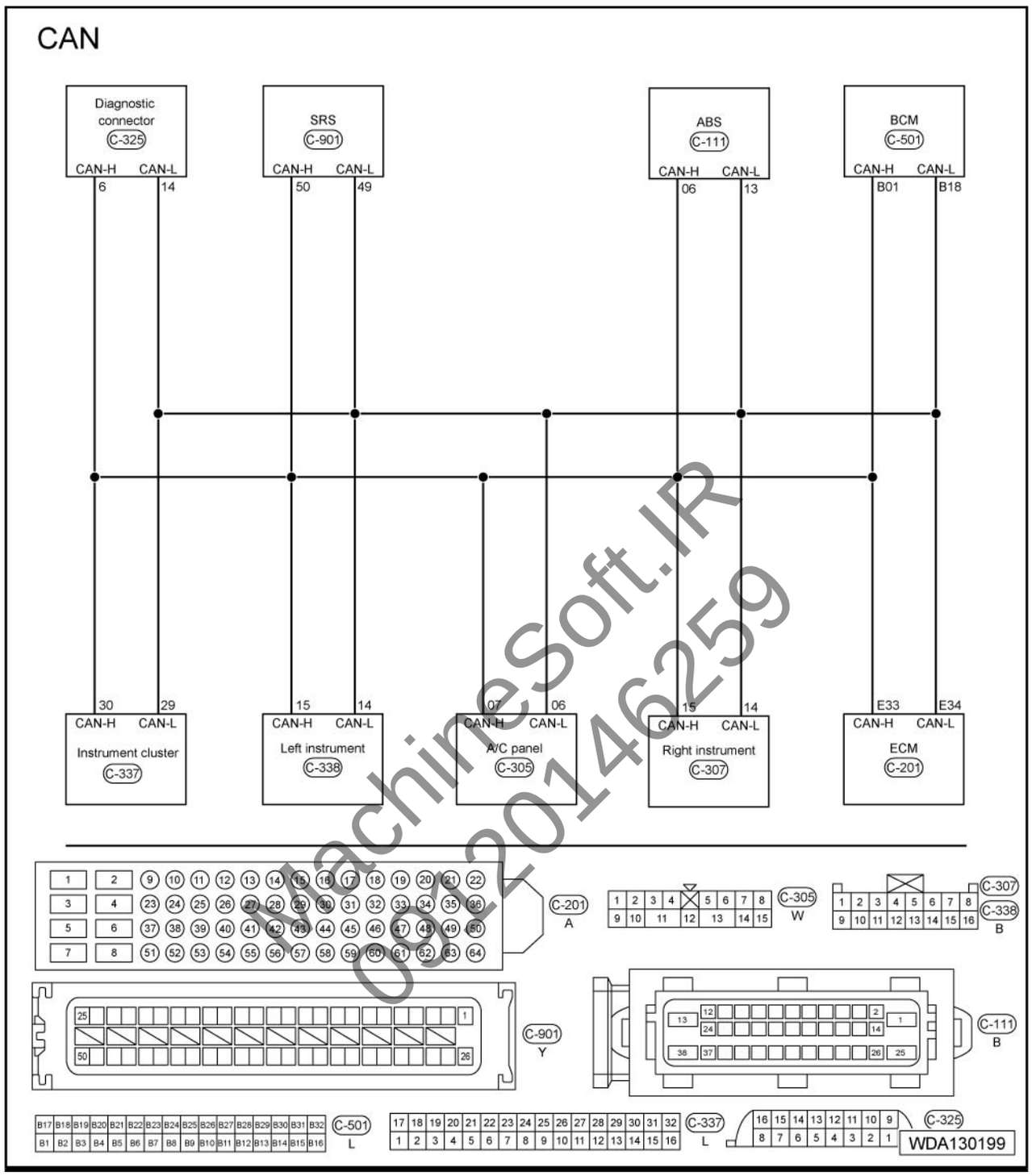
- If yes, repair the defective lead. ■
- If not, go to step 5.



5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.19 U0001 CAN communication diagnosis



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
U0001	CAN communication diagnosis	The ignition switch in the ON position	The diagnostic device cannot communicate with ECM control module	• Failure of the wiring harness short/open circuit • Failure of the ECM

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

Note

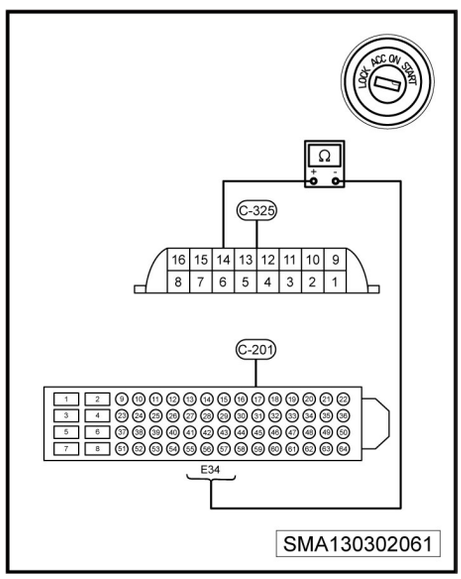
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the ECM control module pin/connector is corrosive, tainted and loose. Check if the wiring harness is interfered.

- If yes, the connector/wiring harness fails and please repair or replace the connector/wiring harness. ■
- If not, go to step 2.

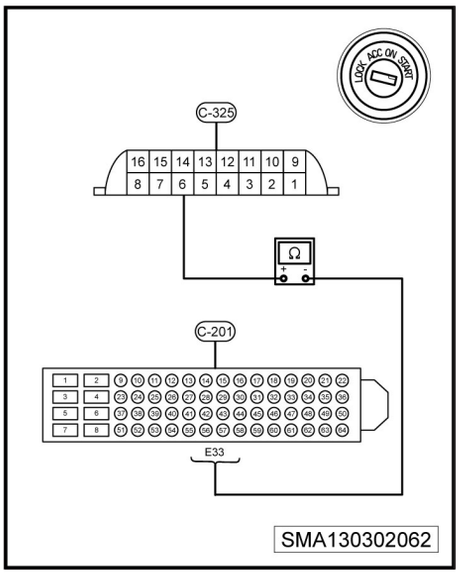
2. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201, and check if the lead between the pin 14 of the diagnostic connector and the pin E34 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 3.



3. Turn the ignition switch to the LOCK position, and check if the lead between the pin 6 of the diagnostic connector and the pin E33 of C-201 has short or open circuit.

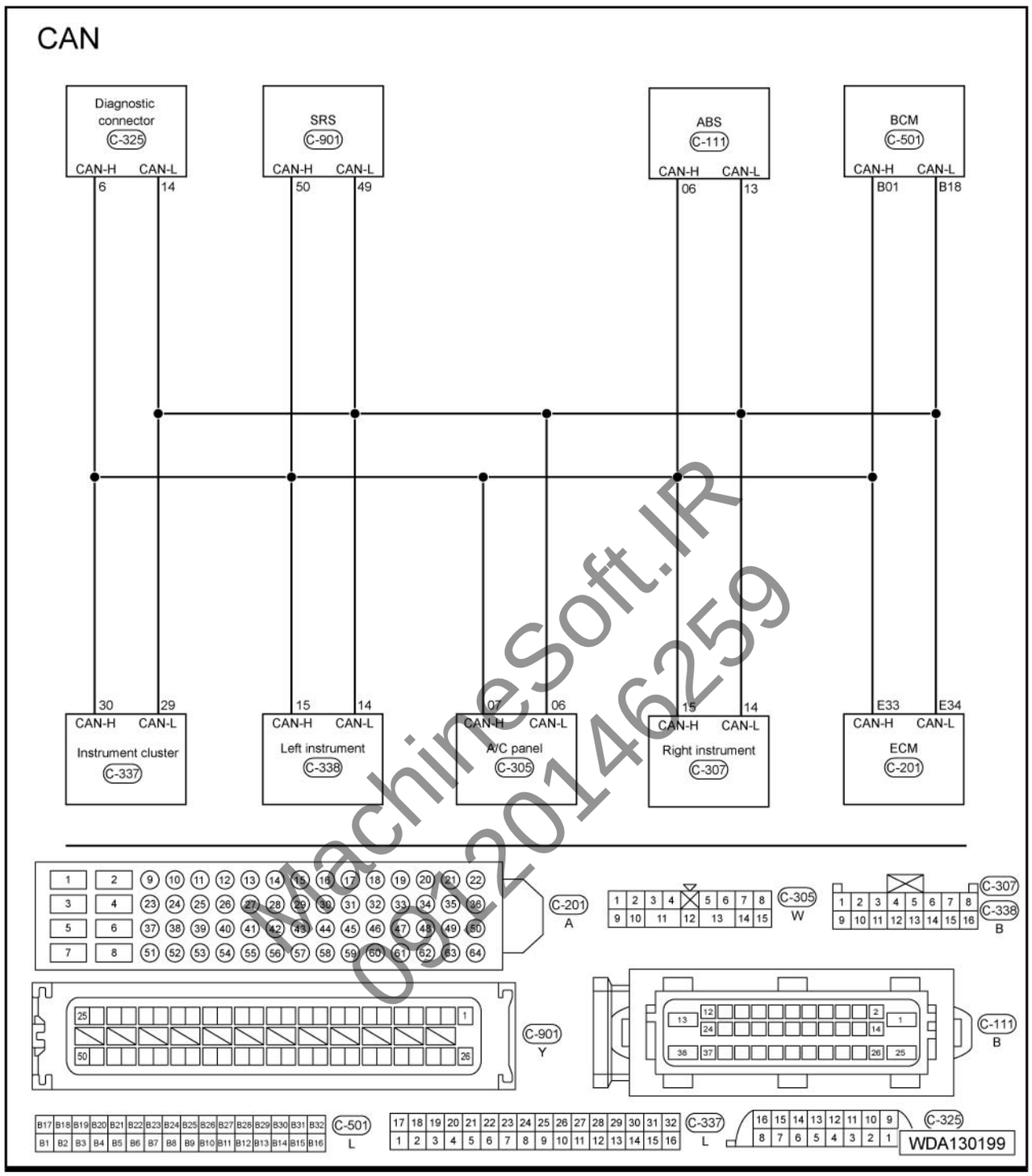
- If yes, repair the defective lead. ■
- If not, go to step 4.



4. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.20 U0121 Lost communication of ECM and ABS control module



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
U0121	Lost communication of ECM and ABS control module	The ignition switch in the ON position	The diagnostic device cannot communicate with ECM control module	• Failure of the wiring harness (open/short circuit) • Failure of the ABS control unit

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the ECM

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

Note

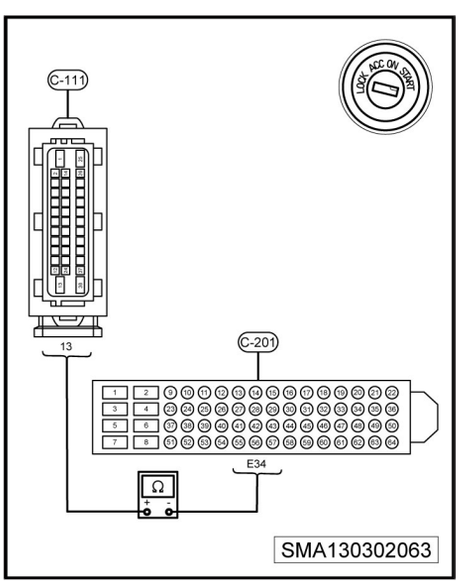
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the ABS control unit pin/connector is corrosive, tainted and loose. Check if the wiring harness is interfered.

- If yes, the connector/wiring harness fails and please repair or replace the connector/wiring harness. ■
- If not, go to step 2.

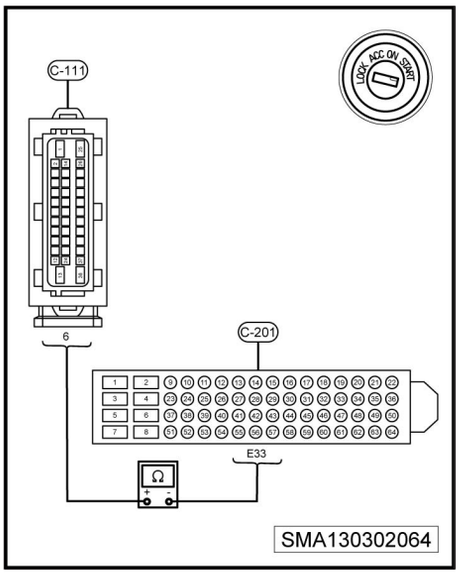
2. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and ABS control unit connector C-111, and check if the lead between the pin 13 of C-111 and the pin E34 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 3.



3. Turn the ignition switch to the LOCK position, and check if the lead between the pin 6 of C-111 and the pin E33 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



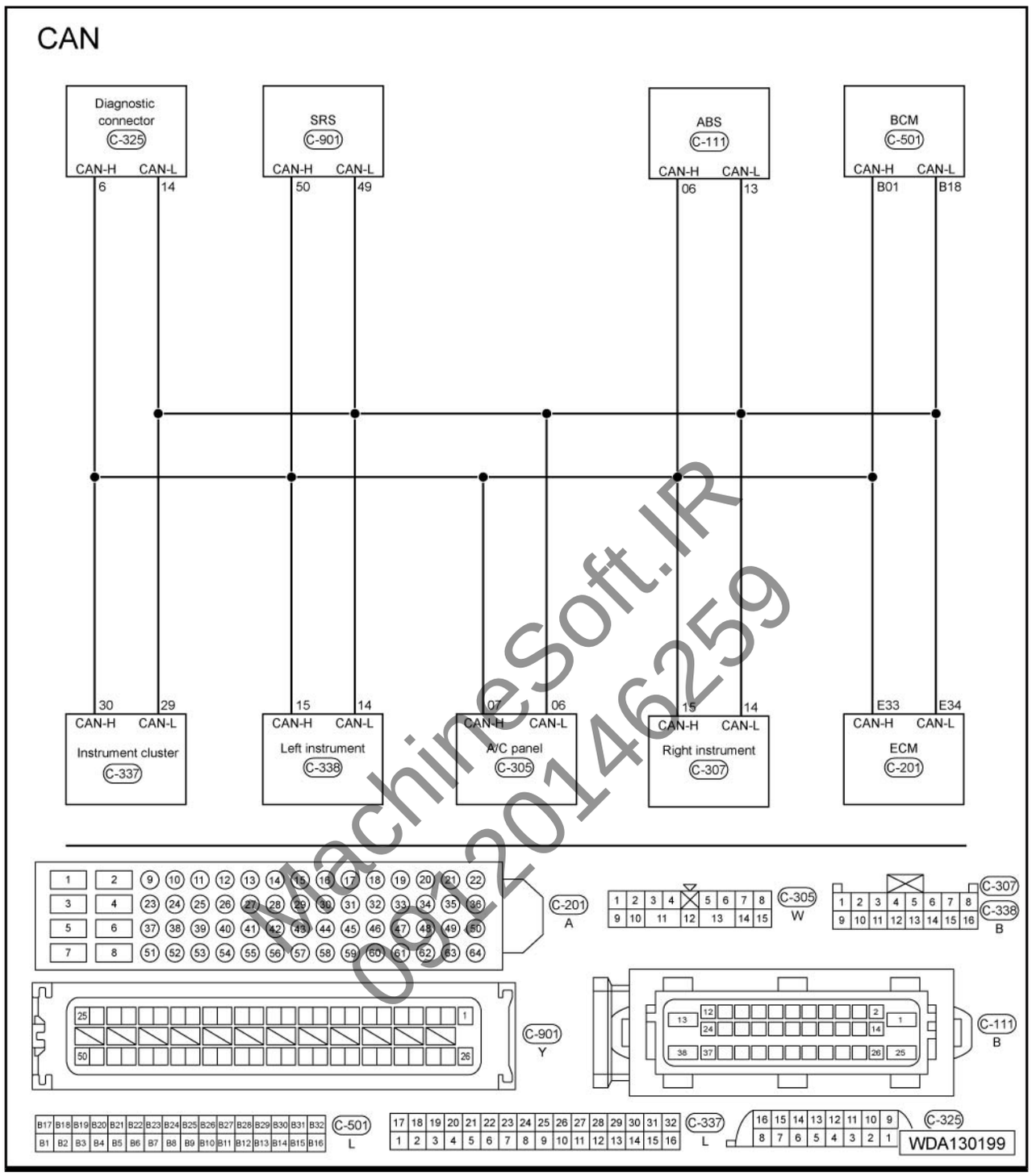
4. Turn the ignition switch to the ON position, communicate with another control unit module with the diagnostic device, and check if this system can be normally communicated with.

- If yes, go to step 5.
- If not, the ABS control unit fails and please replace it. ■

5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.21 U0140 Lost communication of ECM and BCM control module



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
U0140	Lost communication of ECM and BCM control module	The ignition switch in the ON position	The diagnostic device cannot communicate with ECM control module	• Failure of the wiring harness (open/short circuit) • Failure of the BCM

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the ECM

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

Note

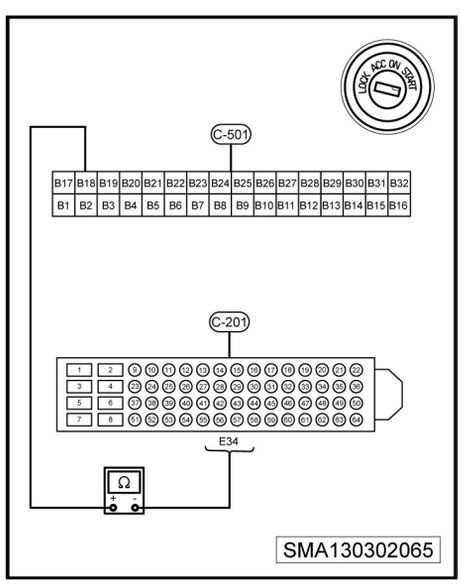
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the BCM control module pin/connector is corrosive, tainted and loose. Check if the wiring harness is interfered.

- If yes, the connector/wiring harness fails and please repair or replace the connector/wiring harness. ■
- If not, go to step 2.

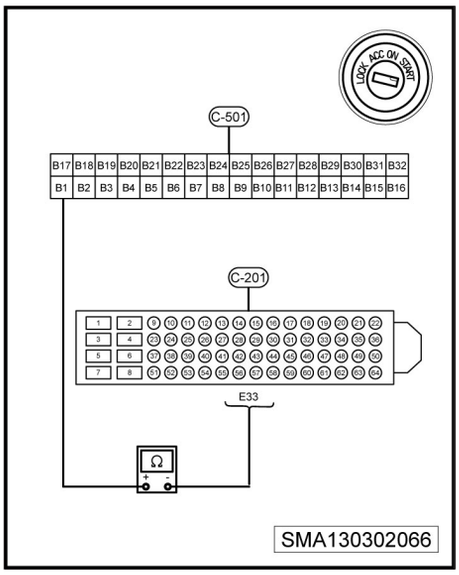
2. Turn the ignition switch to the LOCK position, disconnect the BCM connector C-501 and the ECM connector C-201, and check if the lead between the pin B18 of C-501 and the pin E34 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 3.



3. Turn the ignition switch to the LOCK position, and check if the lead between the pin B1 of C-501 and the pin E33 of C-201 has short or open circuit.

- If yes, go to step 4.
- If not, check if the lead between the pin B1 of the BCM control module and the pin E33 of the ECM control module has short or open circuit. And repair or replace the defective lead. ■



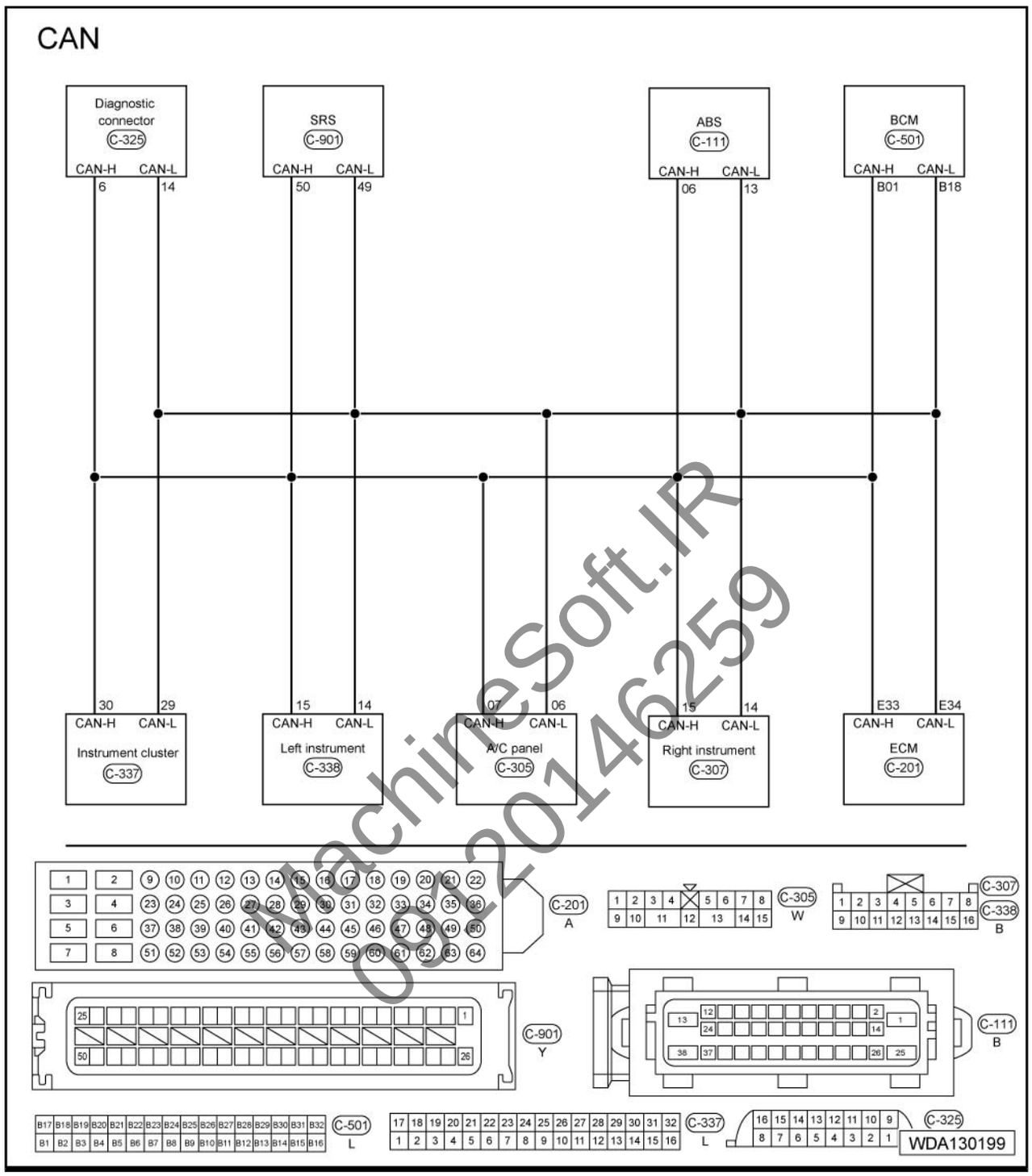
4. Turn the ignition switch to the ON position, communicate with another control unit module with the diagnostic device, and check if this system can be normally communicated with.

- If yes, go to step 5.
- If not, the BCM control module fails and please replace it. ■

5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.6.22 U0155 Abnormal communication of ECM and IPC control module



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
U0155	Abnormal communication of ECM and IPC control module	The ignition switch in the ON position	The diagnostic device cannot communicate with IPC control unit module	• Failure of the wiring harness (open/short circuit) • Failure of the IPC control unit

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the ECM

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

Note

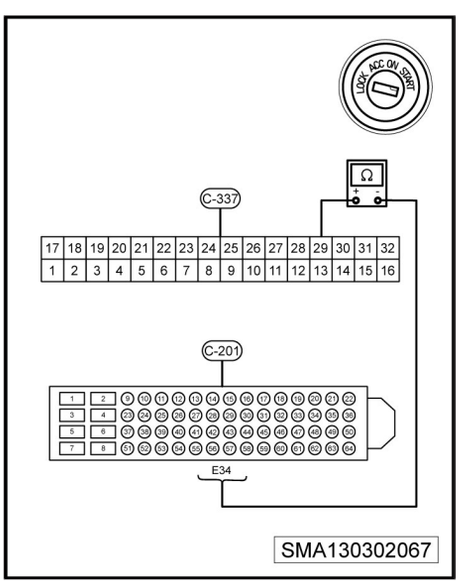
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the IPC instrument panel control module pin/connector is corrosive, tainted and loose. Check if the wiring harness is interfered.

- If yes, the connector/wiring harness fails and please repair or replace the connector/wiring harness. ■
- If not, go to step 2.

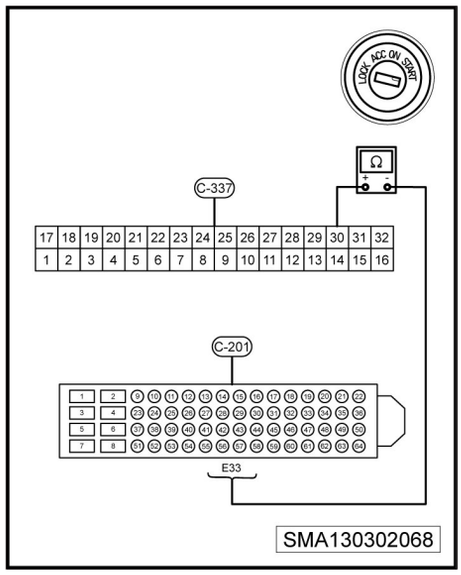
2. Turn the ignition switch to the LOCK position, disconnect the ECM connector C-201 and IPC instrument panel connector C-337, and check if the lead between the pin 29 of C-337 and the pin E34 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 3.



3. Turn the ignition switch to the LOCK position, and check if the lead between the pin 30 of C-337 and the pin E33 of C-201 has short or open circuit.

- If yes, repair the defective lead. ■
- If not, go to step 4.



4. Turn the ignition switch to the ON position, communicate with another control unit module with the diagnostic device, and check if this system can be normally communicated with.

- If yes, go to step 5.
- if not, the IPC control unit fails and please replace it. ■

5. Replace the ECM, carry out the function test again, and read the fault code to verify if it exists or not.

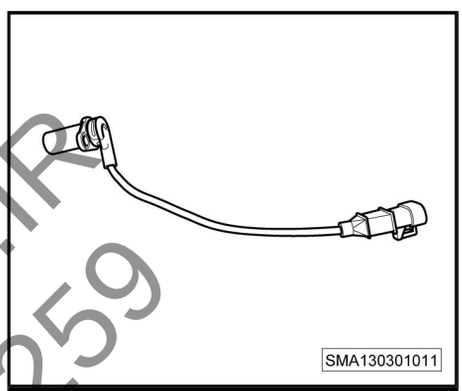
- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

3 Engine Electronic Control System Sensor

3.1 Crankshaft position sensor

3.1.1 Overview

Crankshaft position sensor output signal is the most important signal to ECM, which works together with the camshaft position sensor to determine the basic ignition timing. This sensor is an electromagnetic induction sensor, and works together with the gear ring 58X on the flywheel. When the crankshaft is rotating, the crest and tooth space of the gear ring 58X pass through the sensor with different distances. The sensor senses changes in reluctance, this alternating reluctance results in an alternating output signal, and the gap location on the gear ring 58X corresponds to the engine top dead center position. At the top dead center of the first cylinder, the sensor aims at the negative-edge of the 20th tooth of the gear ring 58X, and ECM uses this signal to determine crankshaft rotation position and speed.



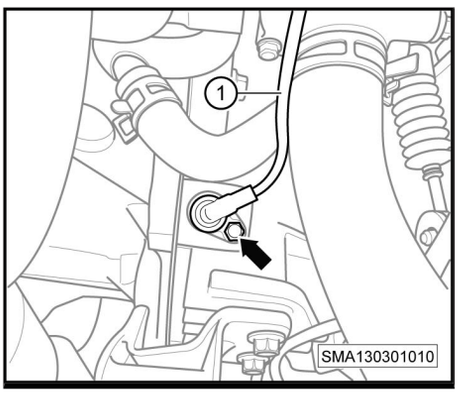
3.1.2 Technical data

Performance

Item	Value
Coil resistance	860±86 Ω
Coil inductance	370±60 mH
Gear ring clearance for 58SX	0.8～1.2 mm

3.1.3 Removing and installing the crankshaft position sensor

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the crankshaft position sensor connector, unscrew the fixing bolt (-arrow-), and remove the crankshaft position sensor (-1-).

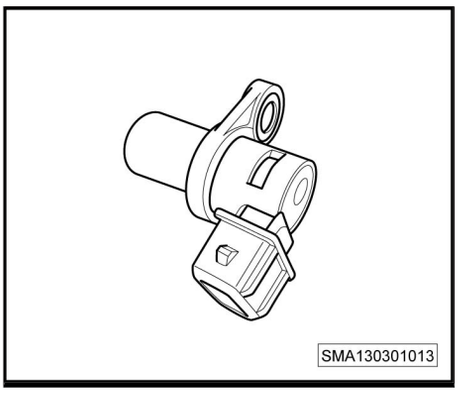
Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Visually check for oil stain, scrap iron or other foreign matter on the sensor, if detected, clean it.
- During installation, first apply lubricant on the sensor O-ring to prevent the O-ring damage during installation.

3.2 Camshaft position sensor

3.2.1 Overview



Camshaft position sensor adopts Hall effect, whose integrated circuit is in front of one permanent magnet pole. When the camshaft is driving the signal wheel to rotate, tooth profile variety causes changes in the strength of the magnetic field lines, with voltage signal output.

Camshaft position sensor provides the phase information of the camshaft to ECM, this information is integrated with that from the crankshaft position sensor to determine each cylinder stroke in engine's working cycle.

With the camshaft turning one circle, according to Hall effect the sensor produces a series of electromagnetic pulses. After getting this information, ECM synthetically calculates the ignition timing, at the same time controls the fuel injector to eject fuel into the right cylinder. As an auxiliary sensor, the camshaft position sensor has a great impact on engine emissions.

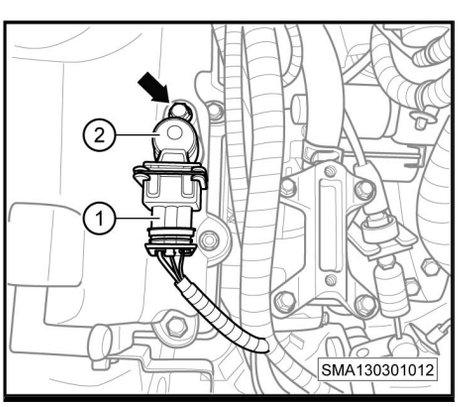
3.2.2 Technical data

Performance

Item	Value
Operating voltage	4.5～1.3 V
Operating clearance	0.8～1.2 mm

3.2.3 Removing and installing the camshaft position sensor

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the camshaft position sensor connector (-1-).
4. Unscrew the fixing bolt (-arrow-), and remove the camshaft position sensor (-2-).

Installation

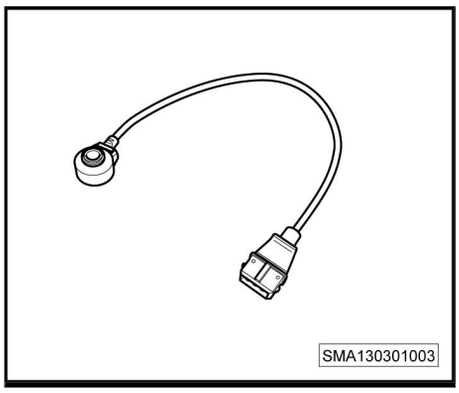
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Visually check for oil stain, scrap iron or other foreign matter on the sensor, if detected, clean it.
- During installation, first apply lubricant on the sensor O-ring to prevent the O-ring damage during installation.

3.3 Knock sensor

3.3.1 Overview

Knock sensor is used to monitor the gas mixture combustion status and the knocking trend in the engine combustion chamber, and provides knocking signal to ECM, to facilitate ECM's better control of ignition advance angle.



Knock sensor is a vibration acceleration sensor, which produces an output voltage according to the engine mechanical vibration. If the engine produces knocking, ECM will receive knocking signal, filter non-knocking signals and calculate. The engine position in the working cycle is determined through the camshaft and crankshaft position sensor signal, ECM thus calculates which cylinder produces knocking, and the ignition advance angle of this cylinder will be delayed until the knocking phenomenon disappears. Then the ignition advance angle will be advanced again until the ignition advance angle is at the best location in the condition.

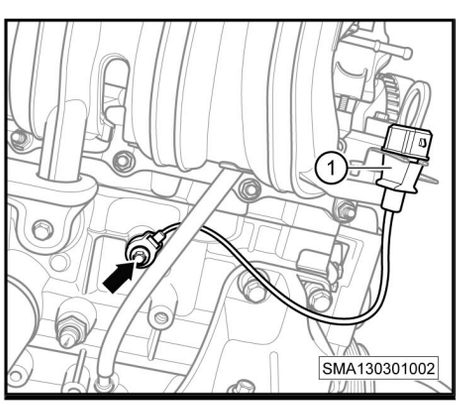
3.3.2 Technical data

Performance

Frequency response range	Resistance	Capacitance
3～18 KHz	More than 1 MΩ	1150±200 pF

3.3.3 Removing and installing the knock sensor

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disengage the knock sensor connector (-1-) from the bracket, unscrew the fixing bolt (-arrow-), and remove the knock sensor.

Installation

1. Check the mounting surface flatness, perpendicularity, and surface finish.
2. During installation, make sure that the metal part at the sensor bottom have full contact with the engine

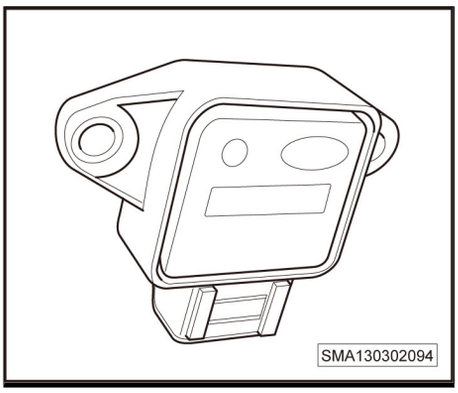
cylinder block, and the washer cannot be used between the sensor and the engine cylinder block.

3. Tightening torque of the bolt: 20±5 Nm.

3.4 Throttle position sensor

3.4.1 Throttle position sensor

Throttle position sensor transforms the throttle opening (engine load) into the electric signal as ECM input, ECM determines the engine condition (such as idling speed, high load, etc.) according to the signal voltage and controls the fuel injection volume on the basis of different conditions.



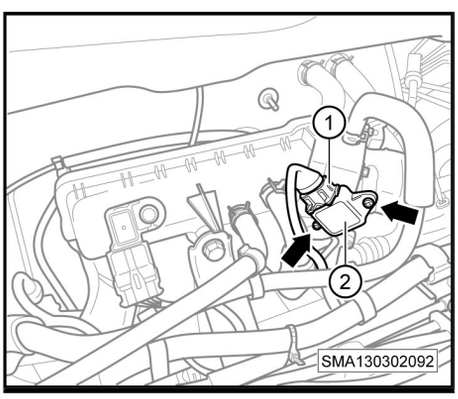
3.4.2 Technical data

Item	Data
Appropriate temperature of operating condition	- 40℃～125℃
Total resistance	2.0±0.4 KΩ
Sliding contact arm protection resistance (sliding contact arm at zero, pins 2-3)	Minimum 710 Ω, maximum 1380 Ω

3.4.3 Removing and installing the throttle position sensor

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the air filter assembly.=> refer to page 239
4. Disconnect the throttle position sensor connector (-1-), unscrew the fixing bolts (-arrow-), and remove the throttle position sensor (-2-).



Installation

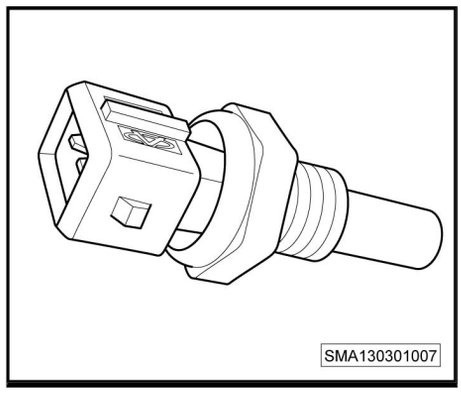
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

Considering the leakage at the throttle shaft seal after long time running, it is recommended to install the throttle shaft with at least 30 degrees deflection over the vertical direction.

3.5 Coolant temperature sensor

3.5.1 Overview

Coolant temperature sensor provides coolant temperature information to the engine electronic control module. ECM controls engine start, idling speed, ignition timing of normal running, fuel injection pulse width according to coolant temperature signal. After the signal is processed by ECM, it will be transmitted to the instrument through CAN data communication lines to be used by the coolant temperature gauge. Therefore, if the coolant temperature gauge in the instrument is not accurate, in addition to the instrument, coolant temperature sensor and relevant lines, the proper working of ECM should also be considered.



3.5.2 Technical data

Coolant temperature sensor

Condition	Value
Operating voltage	5VDC
Operating temperature	-30～130℃
Rated resistance at 20 ℃	2.5 KΩ±5%

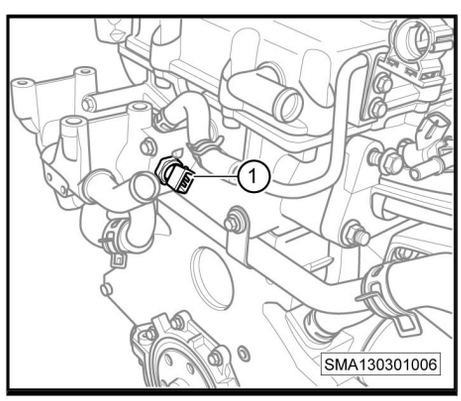
Voltage reference

Condition	Value (voltage)
The sensor voltage at 59℃ (coolant temperature)	1.89 V
The sensor voltage at 78℃ (coolant temperature)	1.25 V
The sensor voltage at 90℃ (coolant temperature)	0.94 V

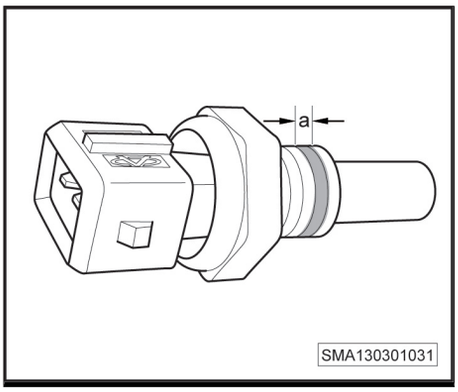
3.5.3 Removing and installing the coolant temperature sensor

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the coolant temperature sensor connector, and unscrew the coolant temperature sensor (-1-).



Installation



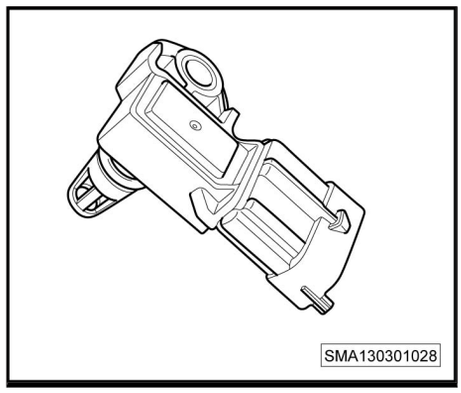
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- As shown in the figure, apply the sealant in the area a before the installation of the coolant temperature sensor.
- Tightening torque of the coolant temperature sensor: 20～25 Nm.

3.6 Intake air pressure/temperature sensor

3.6.1 Overview

The intake air pressure/temperature sensor measures the intake manifold absolute pressure and temperature changes behind the throttle according to the engine load, convert them to voltage signals and send them to ECM. ECM corrects the fuel injection volume according to the voltage signals.



3.6.2 Technical data

Performance

Intake air pressure sensor

Item	Data
Operating voltage	5 V
Operating current	Maximum 12 mA
Pressure testing range	20～115 kPa

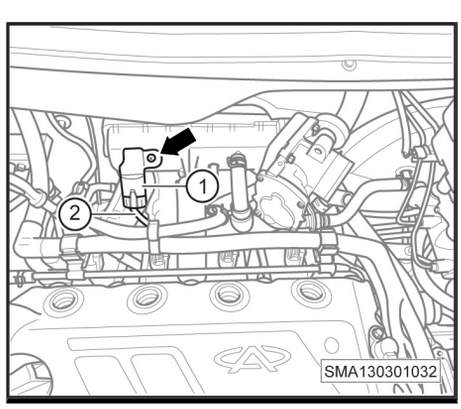
Intake air temperature sensor

Item	Data
Operating voltage	5 V
Operating current	Maximum 12 mA
Temperature testing range	-40～125℃
Rated resistance at 20℃	2.5 kΩ± 5%

3.6.3 Removing and installing the intake air pressure/temperature sensor

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the connector (-2-), and unscrew the fixing bolt (-arrow-).
4. Remove the intake air pressure/temperature sensor (-1-).



Installation

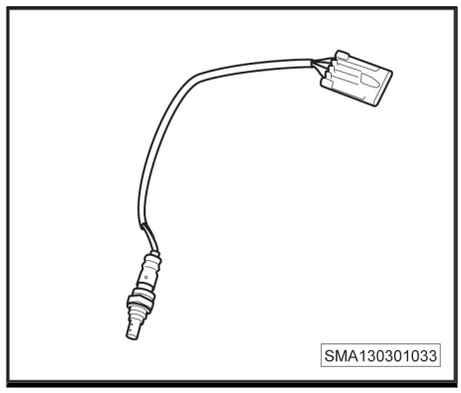
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Visually check for oil stain, scrap iron or other foreign matter on the sensor, if detected, clean it.
- During installation, first apply lubricant on the sensor O-ring to prevent the O-ring damage during installation.

3.7 Oxygen sensor

3.7.1 Overview

Front oxygen sensor



The front oxygen sensor is used to detect the oxygen content in the engine exhaust emissions and convert this information to voltage signal and send it to ECM. ECM can use this information to realize the fuel-quantitative closed-loop control, making the three main toxic elements in the engine exhaust hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxides (NOX) able to be transformed and purified furthest in the three-way catalytic converter.

Rear oxygen sensor

The rear oxygen sensor is used to monitor the oxygen content of emissions after the three-way catalytic converter. The detected signals of the front and rear oxygen sensors are compared by ECM to monitor the efficiency of the catalytic converter. When the catalytic converter works inefficiently or is damaged and the signals of the rear oxygen sensor detected by ECM varies considerably, the engine warning light will light up and the oxygen sensor failure will also occur. At this moment, ECM may even take restrictive driving measures to protect the environment.

3.7.2 Technical data

Performance

Temperature	260℃	450℃	595℃
Rich-oxygen output voltage (mV)	＞800	＞800	＞750
Lean-oxygen output voltage (mV)	＜200	＜200	＜150
Response time from lean to rich (ms)	＜75	＜75	＜50
Response time from rich to lean (ms)	＜150	＜125	＜90
Internal resistance (Ω)	＜100 K		

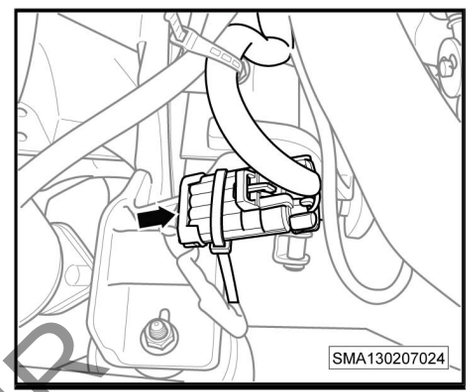
3.7.3 Removing and installing the oxygen sensor

Note

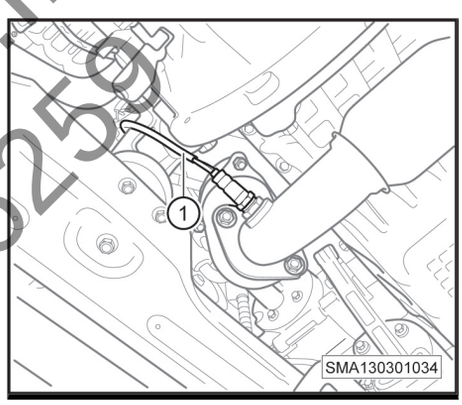
- The removal and installation procedures of the rear oxygen sensor are the same as that of the front oxygen sensor. Here only the removal and installation of the rear oxygen sensor is described.
- The exhaust pipe can only be removed after it has cooled down.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the oxygen sensor connector (-arrow-).



4. Unscrew the oxygen sensor (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

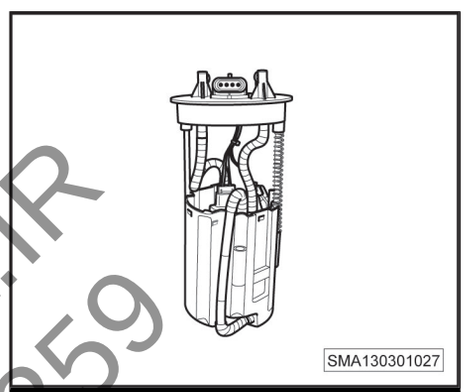
- The oxygen sensor generally uses zirconia (ZrO2, a ceramic material) as the sensor element. Do not knock it with a wrench or other hard object to avoid damage, because the ceramic is hard and brittle. The oxygen sensor impacted cannot be used any more. Tightening torque of the oxygen sensor is 40 to 60 Nm.

4 Engine Electronic Control System Actuator

4.1 Fuel pump

4.1.1 Overview

After the ignition switch is turned on, ECM controls the fuel pump to work for 2 to 5 seconds, to establish an appropriate starting fuel pressure, suck the fuel out of the tank, and then into the fuel pipe. At this time if the engine does not start, ECM will cut off the fuel pump control circuit, stopping the fuel pump. If the engine starts and continues running, ECM will control normal running of the fuel pump.



Note

- The fuel temperature has a great impact on the performance of the fuel pump. When the fuel pump has run for a long time in high temperature condition, if the fuel temperature is higher than a certain value, the fuel pressure of the pump will quickly descend; therefore, when the hot engine cannot start, please carefully check the fuel pump operating performance in high temperature condition.

4.1.2 Technical data

Output pressure	>350 KPa	Operating voltage	8-16 V
Maintenance pressure	≈24 KPa	Overvoltage protection	-13.5~26 V
Output flow	>10 g/s	Fuel-free running	<60 seconds

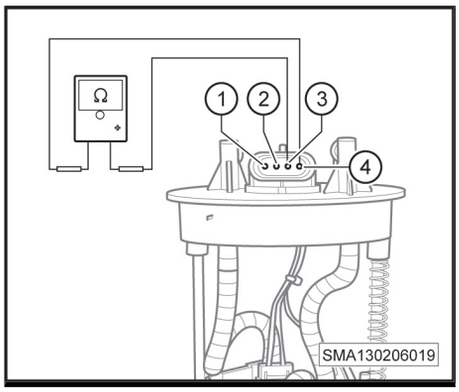
4.1.3 Removing and installing the fuel pump

The removal and installation of the fuel pump (refer to the Engine Mechanism)=> refer to page 206

4.1.4 Checking the fuel pump

Methods:

1. Disconnect the connector, turn the digital multimeter to the "ohm" position, respectively connect the two probes to the two pins of the fuel pump, and measure the internal resistance, not zero or infinity (i.e. non-short, non-open circuit state).
2. Connect the connector, connect the fuel pressure gauge onto the fuel inlet pipe, start the engine, and observe if the fuel pump is running. If not, check if the voltage of the pin "+" at the battery level; if running, check if the fuel pressure is about 400 kPa in idling condition. Press the accelerator pedal until the engine speed reaches 2500 rpm, and observe if at this time the fuel pressure is about 400 kPa.

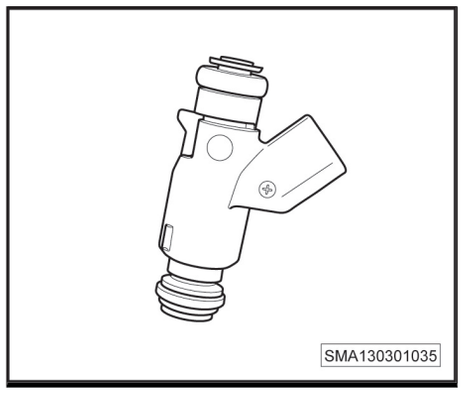


4.2 Fuel injector

4.2.1 Overview

Function:

The fuel injector jets fuel within the specified time according to ECM's instructions, to provide atomized fuel to the engine. It stores high-pressure fuel and eliminates the resonance caused by the pumping of the fuel pump to keep the stable fuel pressure.



4.2.2 Technical data

Item	Data
Coil resistance	12±0.4 Ω
Minimum operating voltage	4.5 V
Operating temperature	－40－130℃

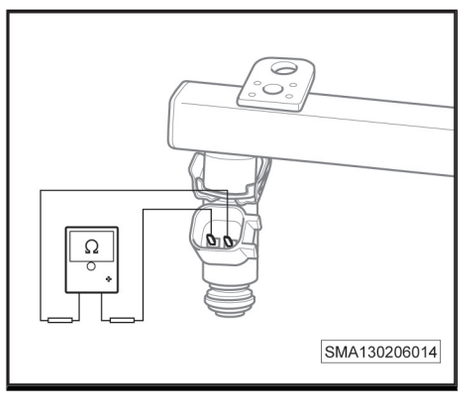
4.2.3 Removing and installing the fuel injector

The removal and installation of the fuel injector (refer to the Engine Mechanism)=> refer to page 213

4.2.4 Checking the fuel injector

Methods:

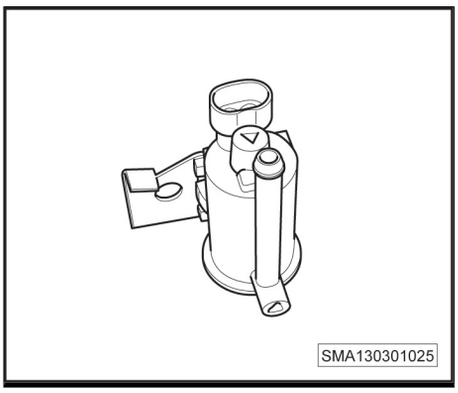
Turn the digital multimeter to the "ohm" position, and respectively connect the two probes to the two pins of the fuel injector. The rated resistance is 11-16 Ω at 20℃.



4.3 Activated carbon canister solenoid valve

4.3.1 Overview

The carbon canister control valve is controlled through electrical pulse duration and frequency (i.e. duty cycle) synthetically calculated by ECM according to engine load, engine temperature, speed and a series of signals. Gasoline vapor in the carbon canister will leak in the case of excessive accumulation, causing environmental pollution. Therefore, the carbon canister solenoid valve is used to open the solenoid valve at the right time, in order to make the gasoline vapor fully mixed with air and then into the intake manifold for combustion.



4.3.2 Technical data

Performance

Rated operating voltage	12 V	Operating temperature	140－120℃
Operating voltage range	8－16 V	Coil resistance	19－22 Ω
Limit voltage	25 V	Coil inductance	12－15 mH

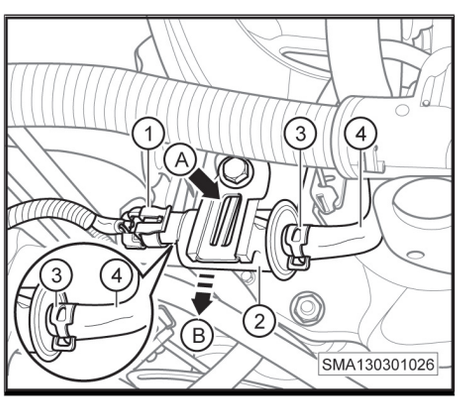
4.3.3 Removing and installing the carbon canister solenoid valve

Note

- Before removal, mark at the inlet and outlet pipes to avoid confusion.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the connector (-1-), loosen the clamp (-3-), and pull out the inlet and outlet hose (-4-).
4. Lever out the clip (-arrow A-), and remove the carbon canister solenoid valve (-2-) from the bracket in the (-arrow B-) direction.



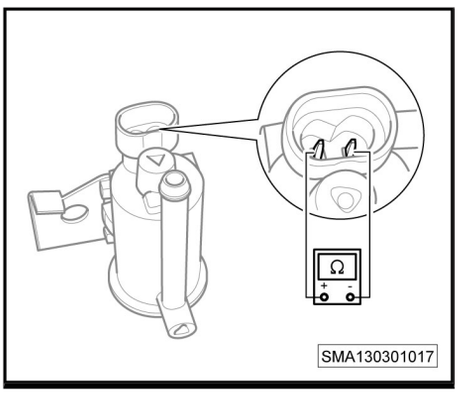
Installation

- Installation shall follow the reverse sequence of the removal procedure.

4.3.4 Checking the activated carbon canister solenoid valve

Inspection

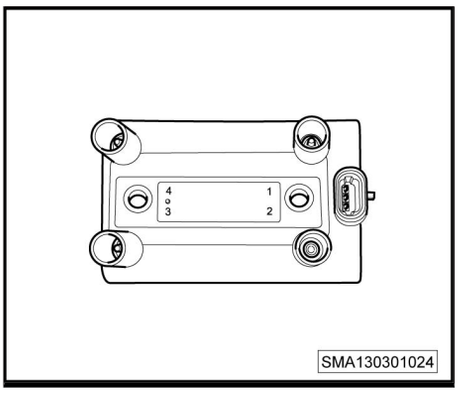
Turn the digital multimeter to the "ohm" position, and respectively connect the two probes to the two pins of the activated carbon canister solenoid valve. The rated resistance is 21±1 Ω at 20℃.



4.4 Ignition coil

4.4.1 Overview

The ignition coil transforms low voltage of the primary winding to high voltage of the secondary winding, and the high voltage produces spark through the electrode discharge of the spark plug, to detonate the flammable gas mixture within the cylinder.



The ignition coil consists of two primary windings, two secondary windings and iron core, shell and so on. When a primary winding is connected to the ground, this primary winding is charged. Once ECM cuts off the primary winding circuit, the charging stops, at this time the secondary winding induces a high voltage, to make the spark plug electrode discharge.

4.4.2 Technical data

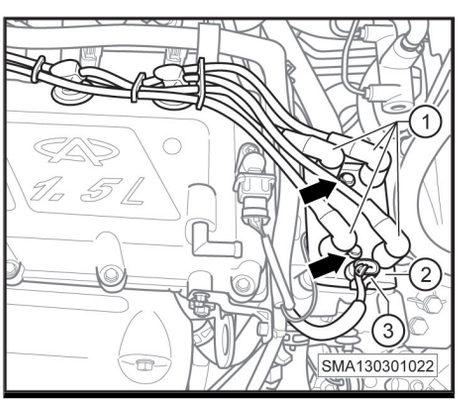
Performance

Primary resistance	0.5±0.05 Ω	Secondary inductance	17.5±1.2 H
Secondary resistance	9840±980 Ω	Power-off current peak	9.5 A
Primary inductance	2.75±0.25 mH	Secondary output voltage	34 KV

4.4.3 Removing and installing the ignition coil

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the ignition coil connector (-3-), and pull out the ignition cable (-1-).
4. Unscrew the fixing bolts (-arrow-), and remove the ignition coil (-2-).



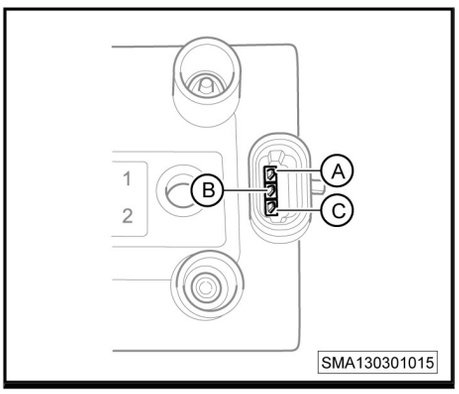
Installation

- Installation shall follow the reverse sequence of the removal procedure.

4.4.4 Checking the ignition coil

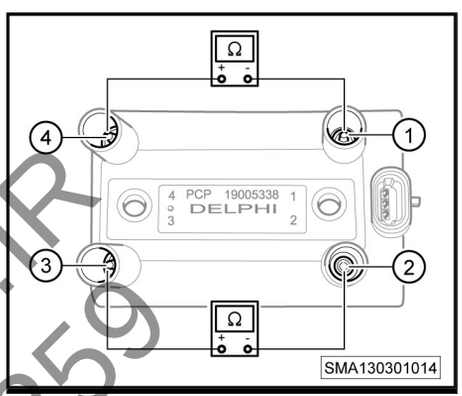
Methods:

1. Turn the digital multimeter to the "ohm" position, and respectively measure the pins 1 and 2, 2 and 3 with the two probes. The resistance is 0.42-0.58 Ω at 20℃;



Methods:

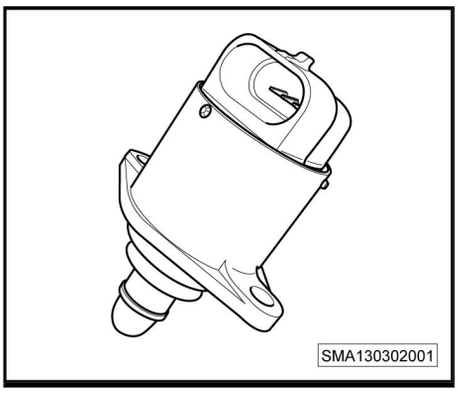
2. Turn the digital multimeter to the "ohm" position, and respectively measure the pins 1 and 4, 2 and 3 with the two probes. The secondary winding resistance is 11.2-14.8 kΩ at 20℃.



4.5 Idling stepper motor

4.5.1 Overview

The idling stepper motor is mainly used for engine idling control. In idling condition, the main valve plate of the mechanical throttle body is closed, and the air flows into the intake manifold through the air bypass of the throttle body. The engine control module controls the position of the stepper motor adjuster in the air bypass via controlling its moving steps, and thus controls the engine's air input, making the engine achieve the best in idling condition.



4.5.2 Technical data

Performance

Primary resistance	0.5±0.05 Ω	Secondary inductance	17.5±1.2 H
Secondary resistance	9840±980 Ω	Power-off current peak	9.5 A
Primary inductance	2.75±0.25 mH	Secondary output voltage	34 KV

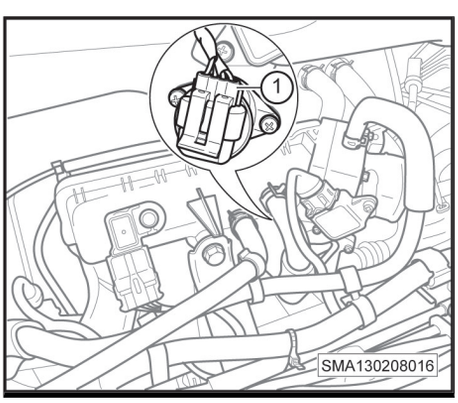
4.5.3 Removing and installing the idling stepper motor

Caution

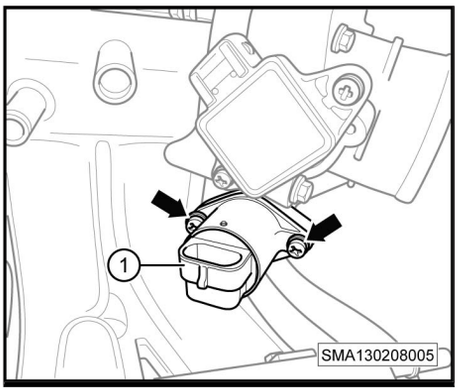
- Do not push and pull the idling stepper motor valve when cleaning the idling stepper motor.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the idling stepper motor connector (-1-).



4. Unscrew the fixing bolts (-arrow-) and remove the idling stepper motor (-1-).



Installation

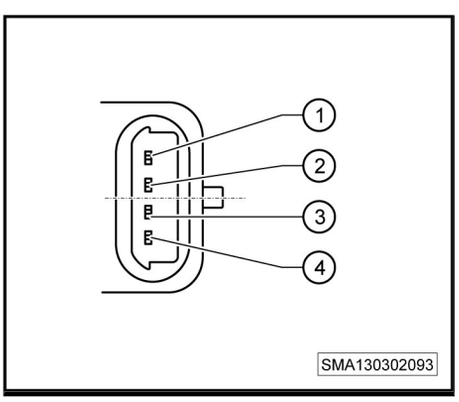
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

1. Replace the throttle seal ring. Remove the dust on the working surface of the idling stepper motor and the carbon deposit on the throttle seat.
2. Replace the O-ring of the idling stepper motor.
3. After cleaning the idling stepper motor, you shall take the adaptation and learning procedure.

4.5.4 Checking the idling stepper motor

Methods:

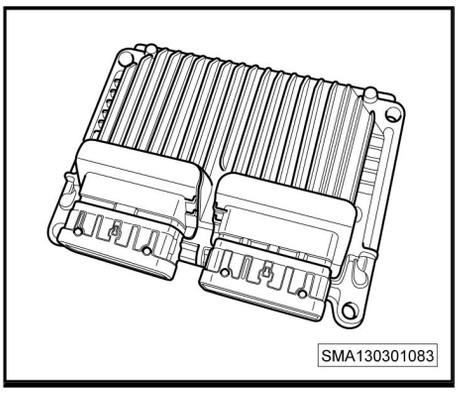
1. Turn the digital multimeter to the "ohm" position, and respectively connect the two probes to the pins AD, BC of the idling stepper motor. The rated resistance is 53±5.3 Ω at 27℃.



4.6 Engine control module

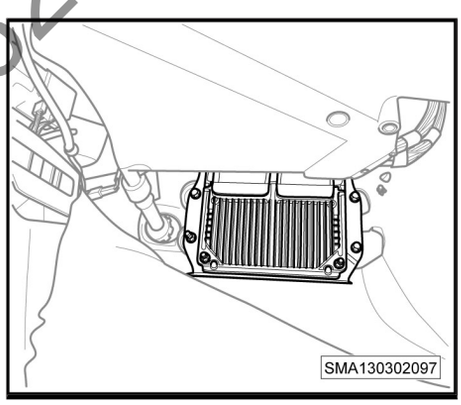
4.6.1 Overview

The engine control system function consists of electronic fuel injection control, electronic ignition control, idling control, exhaust emission control, fail-safe, self-diagnosis system, data communication system, anti-theft system and etc.. The engine control module is the core of the engine electronic fuel injection system, which calculates the required fuel injection volume (injection pulse width) for combustion in the cylinder according to the sensor feedback signal and the signals of various conditions, and opens the fuel injector at the right injection timing, jets appropriate amount of fuel into the intake pipe to form the flammable gas mixture with the best air-fuel ratio, and keeps the engine in good running condition through the harmonious working of the fuel injector, ignition coil and a series of actuators.



4.6.2 Installation location

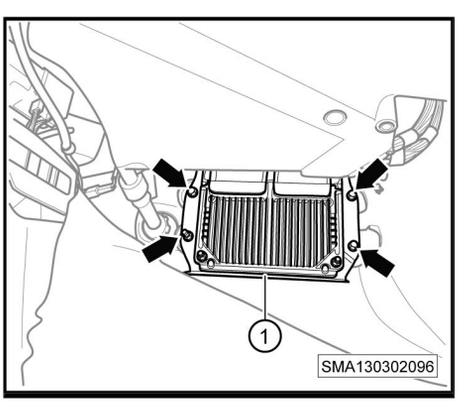
Engine control module is installed on the front passenger side, below the evaporation tank assembly.



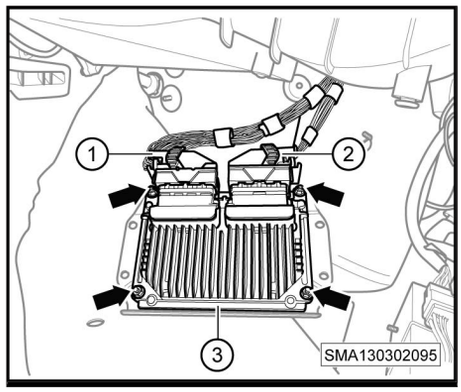
4.6.3 Removing and installing the engine control module

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the front right A pillar lower trim, and open the front passenger's side carpet.
4. Unscrew the fixing bolts (-arrow-). Take out the engine control module and the bracket (-1-).



5. Disconnect the engine control module connectors (-1-) and (-2-), and unscrew the fixing bolts (-arrow-). Take out the engine control module (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- **1**The engine control module must be adapted during the replacement or removal of the anti-theft control unit.
- **2**The anti-theft control unit must be adapted during the replacement of the engine control module.

4.6.4 Adapting the engine control module

Note

- The engine control module must be adapted with the anti-theft system control unit during the replacement of new engine control module.

Preconditions

- The battery voltage is within the normal range.
- There is no fault in the anti-theft system.
- There is no fault in the engine electronic control system actuators and sensors.
- It has been confirmed that the new engine control module model matches the anti-theft control system.

Preconditions

1. Turn off the ignition switch, and replace the engine control module.
2. Insert the key into the ignition lock and turn to the ON position.
3. Connect X-431.
4. Select the menu "Anti-theft control"→"Enter code"→"Enter the security code".
5. Select the menu "Anti-theft control"→"Anti-theft control adaption"→"Read from the anti-theft control to the engine control module " to adapt the engine control module with the anti-theft control.

5 Symptom Diagnosis and Inspection

5.1 Diagnosis processes of the inspection according to the symptoms

Preliminary inspection:

1. Check if the battery voltage is normal.
2. Check if the engine malfunction indicator works properly.
3. Check if there is any fault record with the diagnostic device.
4. Check if the fault symptoms complained by the owner exists, and confirm its occurrence conditions (like on steep road, on smooth road, in accelerated motion, or at constant speed etc.)

Visual check:

1. Check the fuel pipe for leakage.
2. Check for fracture, kink, and correct connection of the vacuum tube.
3. Check for blockage, air leakage, crushing or damage of the intake pipe.
4. Check for rupture, aging, correct ignition sequence of the high-voltage wire in the ignition system.
5. Check the wiring harness grounding area for cleanness and firmness.
6. Check loose or poor contact of each sensor and actuator connector.

Note

- If any symptom above exists, first carry out maintenance work for that symptom, or it will affect the following fault diagnosis and maintenance work.

5.2 Diagnostic tips

1. Check if there is any fault record in the engine.
2. Check if the symptom described by the customer exists.
3. The influence of the vehicle maintenance condition, cylinder pressure, mechanical ignition timing, fuel situation and etc. on the system cannot be ignored in the inspection process.
4. If there is any fault difficult to troubleshoot in the repair process, you can replace ECM first for testing.

If now the fault symptom disappears, there is fault in ECM. If the symptom still exists, find fault causes from other symptoms.

5.3 Symptom diagnosis and inspection list

Symptoms
1. Engine failure or low engine speed when started
2. Engine idling with start failure when started
3. Warm start difficulty
4. Cold start difficulty
5. Disabled acceleration and poor performance
6. Engine idling vibration
7. Normal speed but difficult to start all the time
8. Normal start but unstable idling speed all the time
9. Normal start but unstable idling speed during warming up
10. Unstable engine idling speed or even flameout when the throttle is released after acceleration
11. Normal start but excessive idling speed
12. Slow response in acceleration
13. Normal start but unstable idling speed after warming up

5.4 Symptom diagnosis and inspection

5.4.1 Engine failure or low engine speed when started

Possible causes:

1. Failure of the battery
2. Failure of the starter
3. Failure of the wiring harness
4. Mechanical failure of the engine

Diagnostic procedures

Note

- If the starter operates slowly, first check if the battery voltage is normal.

1. Check the voltage between the two battery terminals with a digital multimeter, and check if the battery voltage is normal when starting the engine.
   - If yes, go to step 2.
   - If not, the battery fails and please replace the battery. ■

2. Start the engine to run the starter, and check if the grounding between the battery and the engine is hot.
   - If yes, the engine grounding is poor and please repair it. ■
   - If not, go to step 3.

3. Remove the starter relay and the relay housing, and check the relay pull-in point for corrosion and burning.
   - If yes, the relay fails and please replace it. ■
   - If not, go to step 4.

4. Disassemble the starter to mainly check the starter brush for excessive wear, the rotor coil for short circuit and the bearing for damage.
   - If yes, the starter fails and please replace it. ■
   - If not, go to step 5.

5. Check if the resistance of the internal mechanical parts of the engine is excessive that results in abnormal or null operation of the starter.
   - If yes, the mechanical part of the engine fails and please repair it. ■
   - If not, go to step 6.

6. Check if the power supply and grounding of the engine control module is normal.
   - If yes, find the fault cause from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.2 Engine idling with start failure when started

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the fuel system
3. Failure of the crankshaft position sensor
4. Failure of the ignition system
5. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Press the accelerator pedal to slightly open the throttle. Start the engine and check if the engine is successfully starting.
   - If yes, the idling stepper motor fails and please clean or replace it. ■
   - If not, go to step 3.

3. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 4.
   - If not, the fuel system fails and please inspect it. ■

4. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 5.
   - If not, the ignition system fails and please inspect it. ■

5. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect an engine cylinder pressure gauge and check if the pressure of each cylinder is normal.
   - If yes, the mechanical part of the engine fails and please repair it. ■
   - If not, go to step 6.

6. Start the engine and check if the "crankshaft position sensor waveform" is normal with an oscilloscope.
   - If yes, go to step 7.
   - If not, the crankshaft position sensor fails and please replace it. ■

7. Check if the power supply and grounding of the engine control module is normal.
   - If yes, find the fault cause from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.3 Warm start difficulty

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the coolant temperature sensor
3. Failure of the ignition system
4. Failure of the fuel system

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Check if the failure occurs when the fuel is filled.
   - If yes, clean the fuel system and replace the fuel. ■
   - If not, go to step 3.

3. Check if the reading of the "coolant temperature sensor data flow" is normal with a vehicle diagnostic device.
   - If yes, go to step 4.
   - If not, the coolant temperature sensor fails and please replace it. ■

4. Press the accelerator pedal to slightly open the throttle. Start the engine and check if the engine is successfully starting.
   - If yes, the idling stepper motor fails and please clean or replace it. ■
   - If not, go to step 5.

5. Check if the model and clearance of the spark plug of each cylinder are up to specifications.
   - If yes, go to step 6.
   - If not, replace the spark plug. ■

6. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 7.
   - If not, the ignition system fails and please inspect it. ■

7. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 8.
   - If not, the fuel system fails and please inspect it. ■

8. Check if the power supply and grounding of the engine control module is normal.
   - If yes, find the fault cause from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.4 Cold start difficulty

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the fuel system
3. Failure of the fuel injector
4. Failure of the ignition system
5. Failure of the coolant temperature sensor

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Press the accelerator pedal to slightly open the throttle. Start the engine and check if the engine is successfully starting.
   - If yes, the idling stepper motor fails and please clean or replace it. ■
   - If not, go to step 3.

3. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 4.
   - If not, the coolant temperature sensor fails and please replace it. ■

4. Connect the fuel pressure gauge to the common rail. Start the engine for seconds before turning it off, and check if the fuel system pressure is dropping.
   - If yes, go to step 5.
   - If not, go to step 8.

5. Visually check the fuel pipe for leakage.
   - If yes, go to step 6.
   - If not, the fuel pipe is leaking and please replace it. ■

6. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.
   - If yes, the injector fails and please replace it. ■
   - If not, go to step 7.

7. Connect the fuel pressure gauge to the common rail. Start the engine for seconds before turning it off, and check if the fuel system pressure is dropping.
   - If yes, the fuel pump fails and please replace it. ■
   - If not, go to step 8.

8. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.

- If yes, go to step 9.
- If not, the ignition system fails and please inspect it. ■

9. Check if the power supply and grounding of the engine control module is normal.

- If yes, find the fault cause from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.5 Disabled acceleration and poor performance

Possible causes:

1. Improper adjustment of the throttle cable
2. Failure of the air intake system
3. Failure of the exhaust system
4. Failure of the ignition coil
5. Failure of the fuel system
6. Failure of ignition timing

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Check if the throttle cable is loose.

- If yes, adjust the throttle cable. ■
- If not, go to step 3.

3. Disassemble the air filter and check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 4.

4. Start the engine and check if the exhaust pipe is smooth.

- If yes, go to step 5.
- If not, the three-way catalytic converter is blocked and please replace it. Besides, replace the fuel and clean the fuel system. ■

5. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.

- If yes, go to step 6.
- If not, the ignition system fails and please inspect it. ■

6. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.

- If yes, go to step 7.

- If not, the fuel system fails and please inspect it. ■

7. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 8.
- If not, disassemble the timing belt and reinstall it. ■

8. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 9.
- If not, the intake air pressure/temperature sensor fails and please replace it. ■

9. Check if the power supply and grounding of the engine control module is normal.

- If yes, find the fault cause from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.6 Engine idling vibration

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the air intake system
3. Failure of the ignition coil
4. Failure of the fuel system
5. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Disassemble the idling stepper motor and throttle, clean the idling stepper motor and throttle, and recheck if the fault still exists.

- If yes, the idling stepper motor and throttle are too dirty. ■
- If not, go to step 3.

3. Disassemble the air filter and check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 4.

4. Start the engine and check if the exhaust pipe is smooth.

- If yes, go to step 5.
- If not, the three-way catalytic converter is blocked and please replace it. Besides, replace the fuel and clean the fuel system. ■

5. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
   - If yes, go to step 6.
   - If not, the ignition system fails and please inspect it. ■

6. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
   - If yes, go to step 7.
   - If not, the fuel system fails and please inspect it. ■

7. Disassemble the timing belt upper guard and check if the timing belt is installed properly.
   - If yes, go to step 8.
   - If not, disassemble the timing belt and reinstall it. ■

8. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 9.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

9. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect an engine cylinder pressure gauge and check if the pressure of each cylinder is normal.
   - If yes, go to step 10.
   - If not, the mechanical part of the engine fails and please repair it. ■

10. Check if the power supply and grounding of the engine control module is normal.
   - If yes, find the fault cause from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.7 Normal speed but difficult to start all the time

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the air intake system
3. Failure of the ignition system
4. Failure of the fuel system
5. Failure of the coolant temperature sensor
6. Failure of the intake air pressure/temperature sensor
7. Failure of the fuel injector
8. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■

- If not, go to step 2.

2. Press the accelerator pedal to slightly open the throttle. Start the engine and check if the engine is successfully starting.

- If yes, the idling stepper motor fails and please clean or replace it. ■
- If not, go to step 3.

3. Disassemble the air filter and check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 4.

4. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.

- If yes, go to step 5.
- If not, the ignition system fails and please inspect it. ■

5. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.

- If yes, go to step 6.
- If not, the fuel system fails and please inspect it. ■

6. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.

- If yes, go to step 7.
- If not, the injector fails and please replace it. ■

7. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 8.
- If not, disassemble the timing belt and reinstall it. ■

8. Remove the air filter assembly and check if the throttle panel is too dirty.

- If yes, clean the throttle. ■
- If not, go to step 9.

9. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 10.
- If not, the coolant temperature sensor fails and please replace it. ■

10. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 11.
- If not, the intake air pressure/temperature sensor fails and please replace it. ■

11. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect an engine cylinder pressure gauge and check if the pressure of each cylinder is normal.

- If yes, go to step 12.
- If not, the mechanical part of the engine fails and please repair it. ■

12. Check if the power supply and grounding of the engine control module is normal.
- If yes, find the fault cause from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.8 Normal start but unstable idling speed all the time

Possible causes:

1. Failure of the idling stepper motor
2. Failure resulting from bad fuel quality
3. Failure of the fuel injector
4. Failure of the spark plug
5. Failure of the air intake system
6. Failure of ignition timing
7. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.
- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Check if the failure occurs when the fuel is filled.
- If yes, clean the fuel system and replace the fuel. ■
- If not, go to step 3.

3. Disassemble the idling stepper motor and check if the idling stepper motor and the throttle are too dirty.
- If yes, clean the idling stepper motor. ■
- If not, go to step 4.

4. Check if the model and clearance of the spark plug of each cylinder are up to specifications.
- If yes, go to step 5.
- If not, adjust or replace the spark plug. ■

5. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.
- If yes, go to step 6.
- If not, the ignition system fails and please inspect it. ■

6. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal.
- If yes, go to step 7.

- If not, the fuel system fails and please inspect it. ■

7. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.
   - If yes, go to step 8.
   - If not, the injector fails and please replace it. ■

8. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 9.
   - If not, the coolant temperature sensor fails and please replace it. ■

9. Check if the reading of the "intake air pressure/temperature sensor data flow" is normal with a diagnostic device.
   - If yes, go to step 10.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

10. Disconnect the power supply fuse of the fuel pump, unscrew all spark plugs from the cylinders, connect an engine cylinder pressure gauge and check if the pressure of each cylinder is normal.
    - If yes, go to step 11.
    - If not, the mechanical part of the engine fails and please repair it. ■

11. Check if the failure occurs when the fuel is filled.
    - If yes, clean the fuel system and replace the fuel. ■
    - If not, go to step 12.

12. Check if the power supply and grounding of the engine control module is normal.
    - If yes, find the fault cause from other symptoms.
    - If not, inspect the corresponding lines of the engine control module. ■

5.4.9 Normal start but unstable idling speed during warming up

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the throttle
3. Failure of the coolant temperature sensor
4. Failure of the spark plug
5. Failure of the fuel injector
6. Failure of the air intake system
7. Failure of ignition timing
8. Failure resulting from bad fuel quality
9. Mechanical failure of the engine

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Remove the air filter assembly and check if the throttle panel is too dirty.

- If yes, clean the throttle. ■
- If not, go to step 3.

3. Disassemble the idling stepper motor and check if it is too dirty.

- If yes, clean the idling stepper motor. ■
- If not, go to step 4.

4. Check if the reading of the "coolant temperature sensor data flow" is normal with a diagnostic device.

- If yes, go to step 5.
- If not, the coolant temperature sensor fails and please replace it. ■

5. Check if the model and clearance of the spark plug of each cylinder are up to specifications.

- If yes, go to step 6.
- If not, adjust or replace the spark plug. ■

6. Pull out the ignition cable of each cylinder successively. Connect the spark plug, ground the spark plug housing, start the engine, and check if there is blue and white high-pressure fire.

- If yes, go to step 7.
- If not, the ignition system fails and please inspect it. ■

7. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.

- If yes, go to step 8.
- If not, the injector fails and please replace it. ■

8. Check the air intake system pipe for leakage.

- If yes, repair or replace the leaking pipe. ■
- If not, go to step 9.

9. Disassemble the timing belt upper guard and check if the timing belt is installed properly.

- If yes, go to step 10.
- If not, disassemble the timing belt and reinstall it. ■

10. Check if the failure occurs when the fuel is filled.

- If yes, clean the fuel system and replace the fuel. ■
- If not, go to step 11.

11. Check if the power supply and grounding of the engine control module is normal.

- If yes, find the fault cause from other symptoms.

- If not, inspect the corresponding lines of the engine control module. ■

5.4.10 Unstable engine idling speed or even flameout when the throttle is released after acceleration

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the air intake system
3. Failure of the spark plug
4. Failure of the ignition
5. Failure of the fuel injector
6. Failure of ignition timing
7. Failure resulting from bad fuel quality

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Check if the failure occurs when the fuel is filled.
   - If yes, clean the fuel system and replace the fuel. ■
   - If not, go to step 3.

3. Disassemble the idling stepper motor and check if it is too dirty.
   - If yes, clean or replace the idling stepper motor. ■
   - If not, go to step 4.

4. Disassemble the air filter and check the air filter element for blockage.
   - If yes, replace the air filter element. ■
   - If not, go to step 5.

5. Remove the air filter assembly and check if the throttle plate is too dirty.
   - If yes, clean the throttle. ■
   - If not, go to step 6.

6. Check the air intake system pipe for leakage.
   - If yes, repair or replace the leaking pipe. ■
   - If not, go to step 7.

7. Disassemble the timing belt upper guard and check if the timing belt is installed properly.
   - If yes, go to step 8.
   - If not, disassemble the timing belt and reinstall it. ■

8. Check if the power supply and grounding of the engine control module is normal.

- If yes, find the fault cause from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.11 Normal start but excessive idling speed

Possible causes:

1. Improper adjustment of the throttle cable
2. Failure of the idling stepper motor
3. Failure of the throttle
4. Failure of the air intake system
5. Failure of the coolant temperature sensor

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Check if the throttle cable is tight.

- If yes, readjust the throttle cable. ■
- If not, go to step 3.

3. Disassemble the idling stepper motor and check if it is too dirty or blocked.

- If yes, clean the idling stepper motor. ■
- If not, go to step 4.

4. Check if there is any carbon deposit in the throttle plate.

- If yes, clean the throttle. ■
- If not, go to step 5.

5. Start the engine and check the intake manifold for leakage at idling.

- If yes, repair or replace the leaking pipe. ■
- If not, go to step 6.

6. Start the engine and connect the diagnostic device to check if the reading of the "coolant temperature sensor data flow" is normal.

- If yes, go to step 7.
- If not, the coolant temperature sensor fails and please replace it. ■

7. Make sure that the A/C switch is in the OFF position, turn the ignition switch to the ON position and check if the reading of the "A/C switch" is in the ON position with a diagnostic device.

- If yes, the A/C circuit fails. ■

- If not, go to step 8.

8. Check if the power steering switch is connected without steering.

- If yes, the power steering switch fails and please replace it. ■
- If not, go to step 9.

9. Check if the power supply and grounding of the engine control module is normal.

- If yes, find the fault cause from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

5.4.12 Slow response in acceleration

Possible causes:

1. Improper adjustment of the throttle cable
2. Failure of the exhaust system
3. Failure of the air intake system
4. Failure of the coolant temperature sensor
5. Failure of the intake air pressure/temperature sensor
6. Failure of ignition timing
7. Failure of the fuel system

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.

- If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
- If not, go to step 2.

2. Check if the throttle cable is tight.

- If yes, readjust the throttle cable. ■
- If not, go to step 3.

3. Start the engine and check if the exhaust pipe is smooth.

- If yes, go to step 4.
- If not, the three-way catalytic converter is blocked and please replace it. Besides, check the fuel quality. ■

4. Disassemble the air filter and check the air filter element for blockage.

- If yes, replace the air filter element. ■
- If not, go to step 5.

5. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal in each condition.

- If yes, go to step 6.
- If not, the fuel system fails and please inspect it. ■

6. Start the engine, connect the diagnostic device and check if the reading of the "coolant temperature sensor data flow" is normal.
   - If yes, go to step 7.
   - If not, the coolant temperature sensor fails and please replace it. ■

7. Start the engine, connect the diagnostic device and check if the reading of the "intake air pressure/temperature sensor data flow" is normal.
   - If yes, go to step 8.
   - If not, the intake air pressure/temperature sensor fails and please replace it. ■

8. Disassemble the timing belt upper guard and check if the valve timing is correct.
   - If yes, go to step 9.
   - If not, reinstall the timing belt. ■

9. Check if the power supply and grounding of the engine control module is normal.
   - If yes, find the fault cause from other symptoms.
   - If not, inspect the corresponding lines of the engine control module. ■

5.4.13 Normal start but unstable idling speed after warming up

Possible causes:

1. Failure of the idling stepper motor
2. Failure of the air intake system
3. Failure of the fuel system
4. Failure of the coolant temperature sensor
5. Failure of the intake air pressure/temperature sensor

Diagnostic procedures

1. Turn the ignition switch to the ON position. Check if there is any fault record with the diagnostic device.
   - If yes, refer to the corresponding diagnostic procedures of the fault codes for troubleshooting based on the fault information. ■
   - If not, go to step 2.

2. Disassemble the air filter assembly and check if there is carbon deposit around the throttle plate.
   - If yes, clean the throttle. ■
   - If not, go to step 3.

3. Disassemble the idling stepper motor and check if it is too dirty or blocked.
   - If yes, clean the idling stepper motor. ■
   - If not, go to step 4.

4. Connect the fuel pressure gauge to the common rail, start the engine and check if the fuel system pressure is normal in each condition.
   - If yes, go to step 5.

- If not, the fuel system fails and please inspect it. ■

5. Disassemble the fuel injector, install it to the injector tester for pressure leak test, and check if the injector leaks.

- If yes, the injector fails and please replace it. ■
- If not, go to step 6.

6. Start the engine and connect the diagnostic device and check if the reading of the "coolant temperature sensor data flow" is normal.

- If yes, go to step 7.
- If not, the coolant temperature sensor fails and please replace it. ■

7. Start the engine, connect the diagnostic device and check if the reading of the "intake air pressure/temperature sensor data flow" is normal.

- If yes, go to step 8.
- If not, the intake air pressure/temperature sensor fails and please replace it. ■

8. Check if the power supply and grounding of the engine control module is normal.

- If yes, find the fault cause from other symptoms.
- If not, inspect the corresponding lines of the engine control module. ■

6 Ignition Control System

6.1 General Information

6.1.1 Overview

- The ignition system is used to ignite the flammable gas mixture of the corresponding cylinder sequentially as per the reasonable orders of ignition timing in order to maintain the normal operation of the engine.
- The ignition control system consists of the following components:

a. Engine control module (ECM)
b. Ignition coil
c. Spark plug
d. Ignition cable
e. Camshaft position (CMP) sensor
f. Crankshaft position (CKP) sensor

6.1.2 Product specifications

Torque specifications

Component	Tightening torque (N.m)
Spark plug	30±3
Ignition coil fixing bolt	6±1

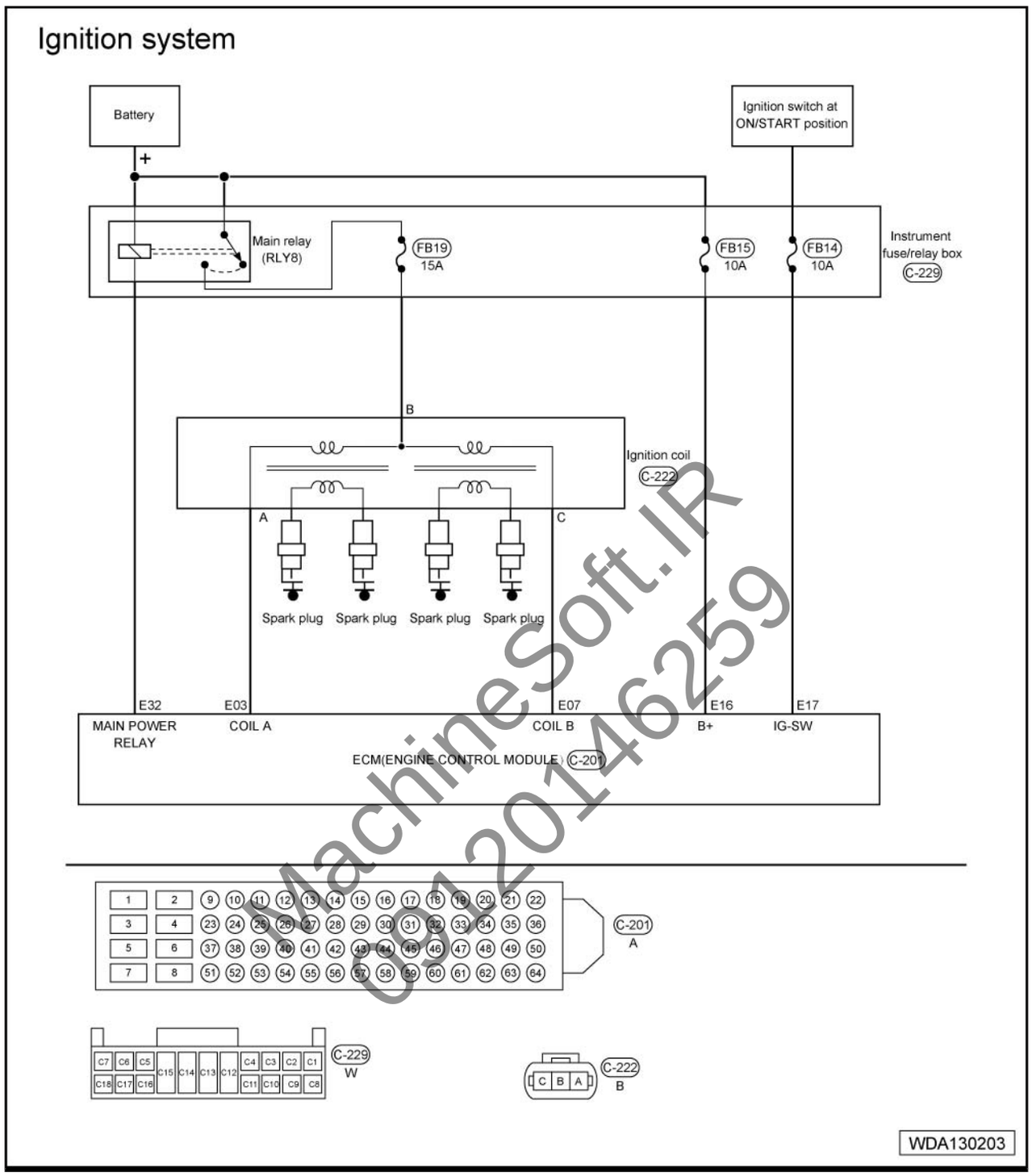
Spark plug

Item	Data
Model	FR7DTC
Standard electrode clearance	0.7±0.1 mm

Ignition cable resistance

Item	Resistance (KΩ)
No. 1 cylinder ignition cable	7.5～11.2
No. 2 cylinder ignition cable	5.8～9.3
No. 3 cylinder ignition cable	4.2～7.7
No. 4 cylinder ignition cable	4～7.5

6.1.3 Ignition system circuit diagram



6.2 Diagnosis and inspection

6.2.1 Ignition system troubleshooting

Symptoms	Possible causes	Maintenance recommendations
Engine idling vibration and disabled acceleration	Excessive spark plug electrode clearance	Replace the spark plug
	Failure of the spark plug	Replace the spark plug
	Weak ignition coil arcing	Replace the ignition coil
	Excessive ignition cable resistance	Replace the ignition cable
	Ignition cable open circuit	Replace the ignition cable

6.3 Spark plug

6.3.1 Removing and installing the spark plug

Caution

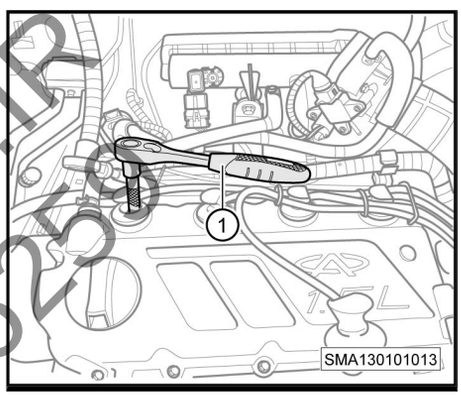
- Do not remove the spark plug when the engine is hot; otherwise, it may cause damage to the spark plug threaded hole on the cylinder head.

Note

- Remove the spark plug wires in sequence and mark their positions individually to avoid incorrect installation.
- Remove dust and impurities around the spark plug hole before removal to prevent them from falling into the cylinder.

Removal

1. Turn off the ignition switch and wait until the engine cools down.
2. Pull out the ignition cable.
3. Unscrew the spark plug with a special spark plug socket wrench (-1-).

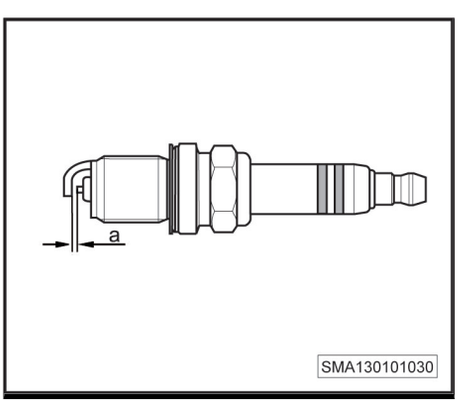


Installation

Note

- Check the spark plug type to see if it is applicable.
- During installation, use the special socket for installation to avoid the plug knocking against the cylinder wall and breaking the normal spark plug electrode clearance.

1. During installation, manually screw the spark plug into the cylinder head until it cannot be turned, and tighten it with a torque wrench with the specified torque.
   - Tightening torque of the spark plug: 30±3 N•m
2. Check the spark plug for clearance and the related data before installation.



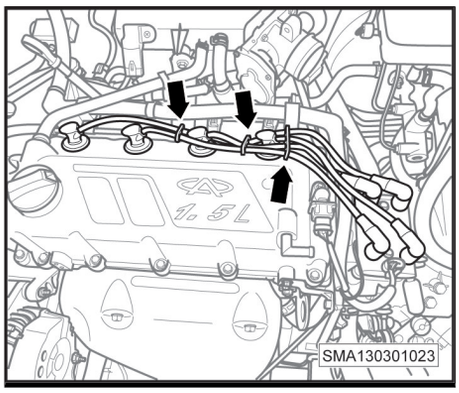
Spark plug	Value
Standard electrode clearance	0.7±0.1 mm
Type	FR7DTC

Spark plug	Value
Recommended replacement interval	Every 30000 Km or 18 months

6.4 Ignition cable

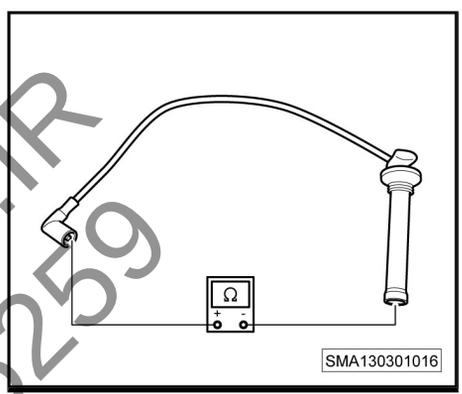
6.4.1 Removing and installing the ignition cable

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the retaining clips of the ignition cable (-arrow-) and pull out the big end of the ignition cable sequentially from the spark plug and the small end of the ignition cable sequentially from the ignition coil to remove the ignition cable.

Installation



Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

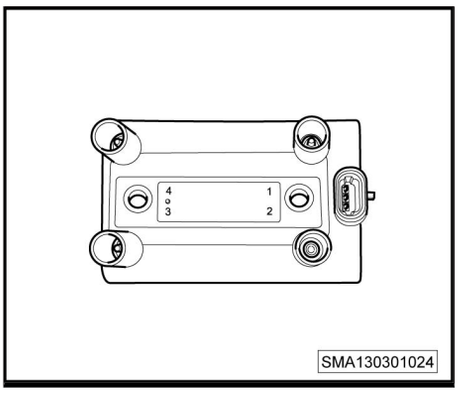
1. Note the location for installation of the ignition cable.
2. Check if the resistance of the ignition cable is normal. Measure the resistance of the ignition cable at both ends as shown in the diagram.

   - Standard resistance of No. 1 cylinder ignition cable: 7.5～11.2 (Ω)
   - Standard resistance of No. 2 cylinder ignition cable: 5.8～9.3 (KΩ)
   - Standard resistance of No. 3 cylinder ignition cable: 4.2～7.7 (KΩ)
   - Standard resistance of No. 4 cylinder ignition cable: 4～7.5 (KΩ)

6.5 Ignition coil

6.5.1 Overview

The ignition coil transforms low voltage of the primary winding to high voltage of the secondary winding, and the high voltage produces spark through the electrode discharge of the spark plug, to ignite the flammable gas mixture within the cylinder.

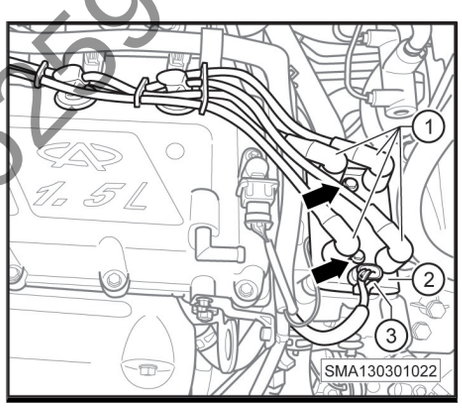


The ignition coil consists of two primary windings, two secondary windings and iron core, shell and so on. When a primary winding is connected to the ground, this primary winding is charged. Once the ECM cuts off the primary winding circuit, the charging stops, at this time the secondary winding induces a high voltage, to make the spark plug electrode discharge.

6.5.2 Removing and installing the ignition coil

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Pull out the ignition cable connector (-1-).
4. Disconnect the ignition coil connector (-3-).
5. Unscrew the bolts (-arrow-) and remove the ignition coil (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

a. The ignition cable shall be installed as per the "-1-3-4-2-" ignition sequence.

7 Fuel Vapor Emission Control System

7.1 General information

7.1.1 Overview

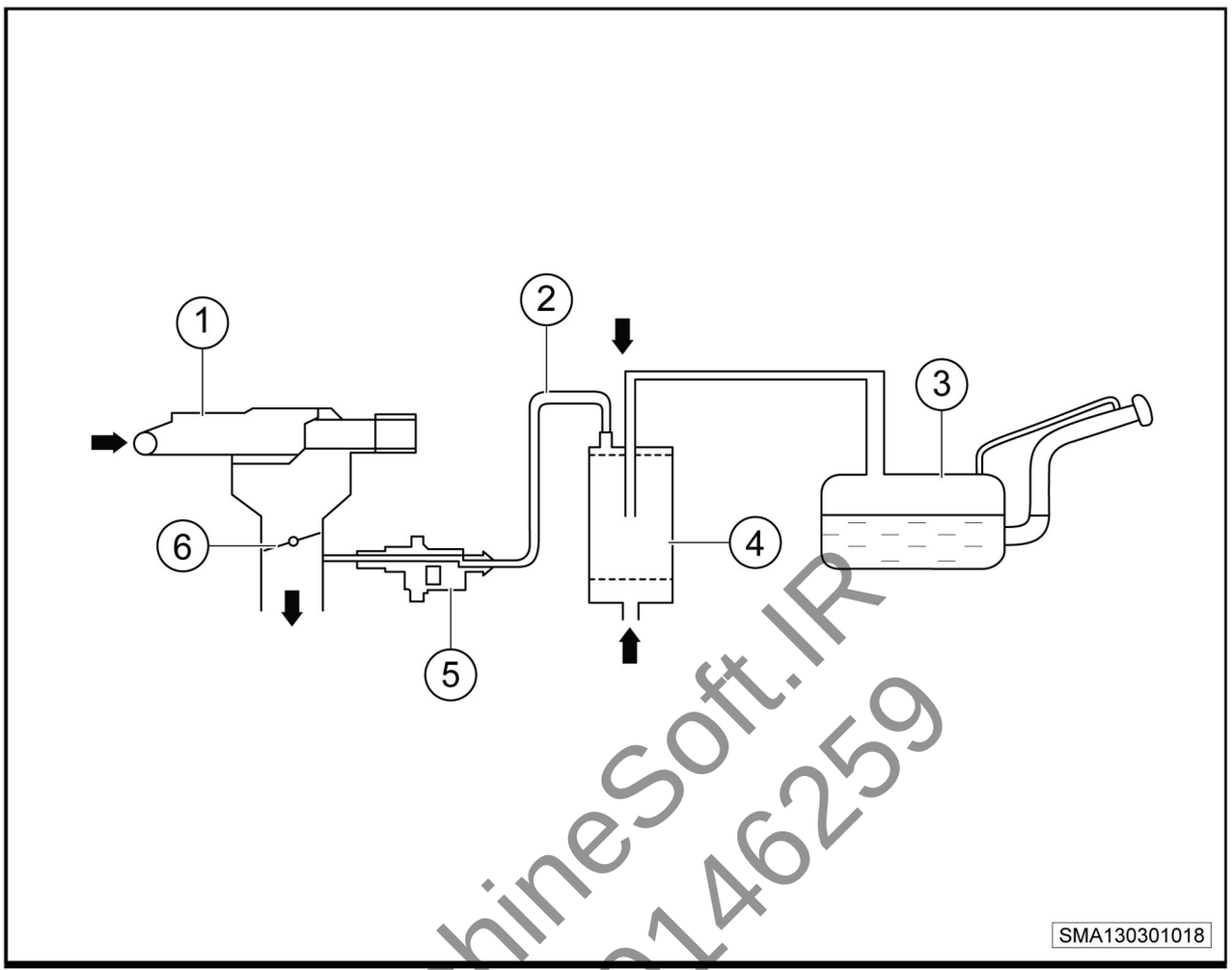
- The fuel vapor emission control system recovers and burns the fuel vapor so as to prevent the fuel vapor in the fuel tank from being discharged into the atmosphere.
- The activated carbon canister plays an important role in the fuel vapor emission control system. The activated carbon canister is used to absorb and filter the moisture and fuel vapor. The fuel vapor enters the top of the activated carbon canister through the pipe while fresh air goes to the bottom of the activated carbon canister. After engine flameout, the fuel vapor and fresh air are stored in the activated carbon canister and when the activated carbon canister solenoid valve opens, the fuel vapor will go to the intake manifold for combustion.

7.1.2 Product specifications

Torque specifications

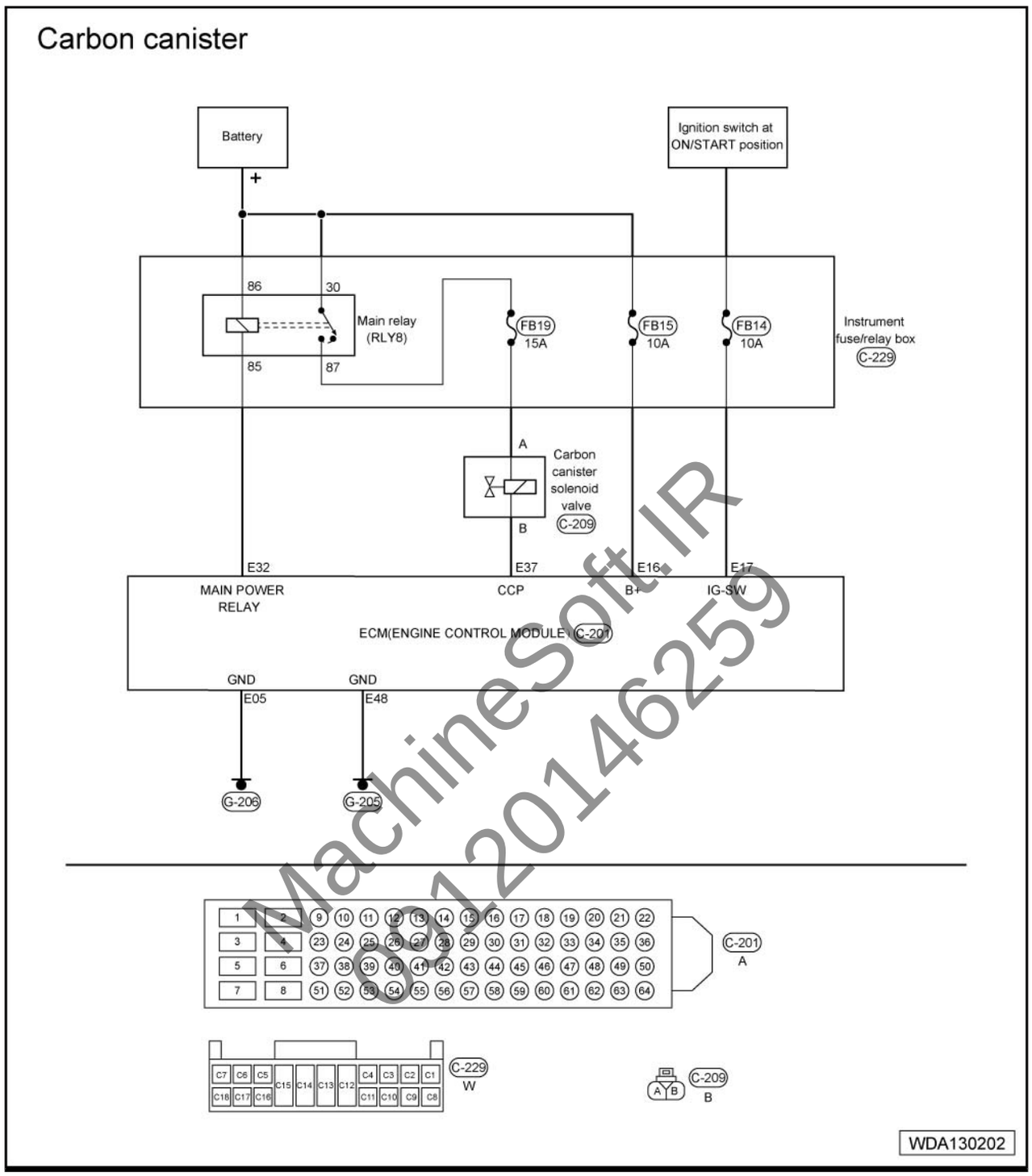
Item	Torque (N.m)
Activated carbon canister solenoid valve mounting bracket	18±2
Activated carbon canister assembly	7±2

7.1.3 The fuel vapor emission control system assembly drawing



1. Air filter	2. Activated carbon canister outlet hose
3. Fuel tank	4. Activated carbon canister
5. Activated carbon canister solenoid valve	6. Throttle

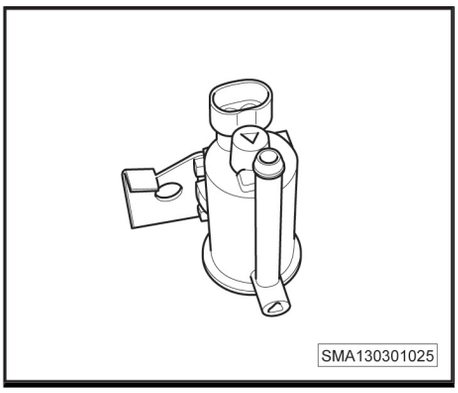
7.1.4 Fuel vapor emission control system circuit diagram



7.2 Activated carbon canister solenoid valve

7.2.1 Overview

The opening and closing of the activated carbon canister solenoid valve is controlled through electrical pulse duty cycle synthetically calculated by the ECM according to engine load, engine temperature, speed and a series of signals.



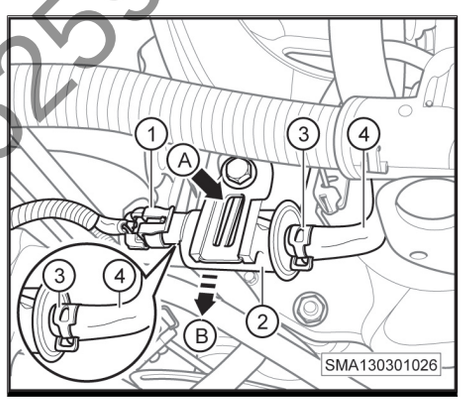
7.2.2 Removing and installing the activated carbon canister solenoid valve

Note

- Before removal, mark at the inlet and outlet pipes to avoid confusion.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Disconnect the carbon canister solenoid valve connector (-1-), loosen the clamp (-3-), and pull out the inlet and outlet hose (-4-).
4. Lever out the clip (-arrow A-) and remove the carbon canister solenoid valve (-2-) in the (-arrow B-) direction.

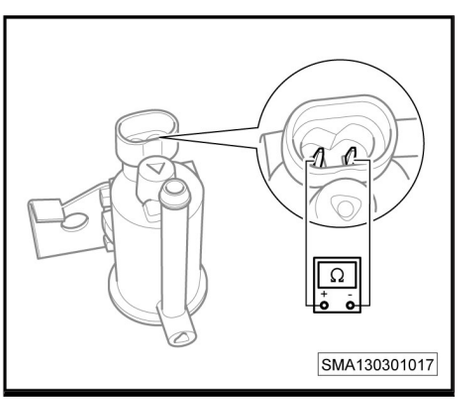


Installation

- Installation shall follow the reverse sequence of the removal procedure.

7.2.3 Checking the activated carbon canister solenoid valve

1. Remove the activated carbon canister solenoid valve.
2. Turn the digital multimeter to the "ohm" position, and respectively connect the two probes to the two pins of the activated carbon canister solenoid valve. The rated resistance is 21±1 Ω at 20℃.



7.3 Activated carbon canister

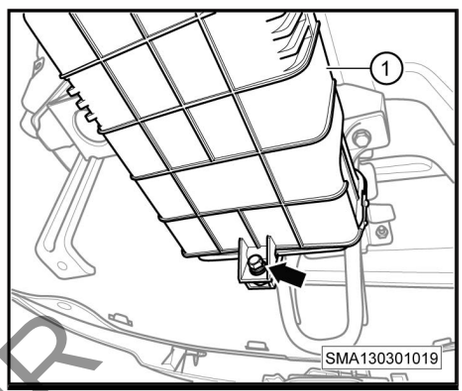
7.3.1 Overview

- The activated carbon canister is filled with the activated carbon which is used to absorb, filter and store the fuel vapor.

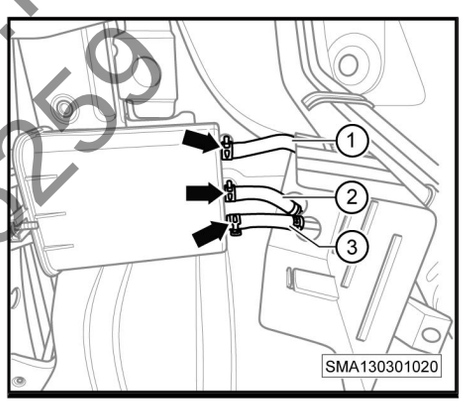
7.3.2 Removing and installing the activated carbon canister

Removal

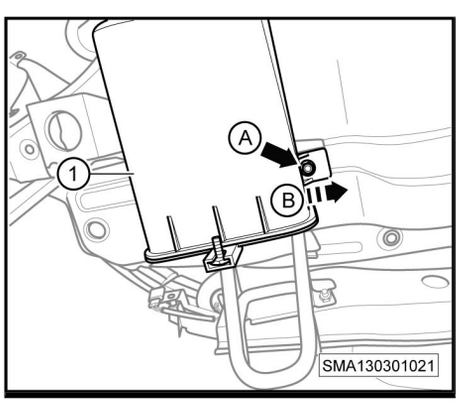
1. Unscrew the nut (-arrow-) and loosen the cover (-1-).



2. Loosen the clamps (-arrow-) and loosen the hoses (-1-, -2- and -3-).



3. Unscrew the bolt (-arrow A-), loosen the body clip in the (-arrow B-) direction, and take out the activated carbon canister (-1-).



Installation

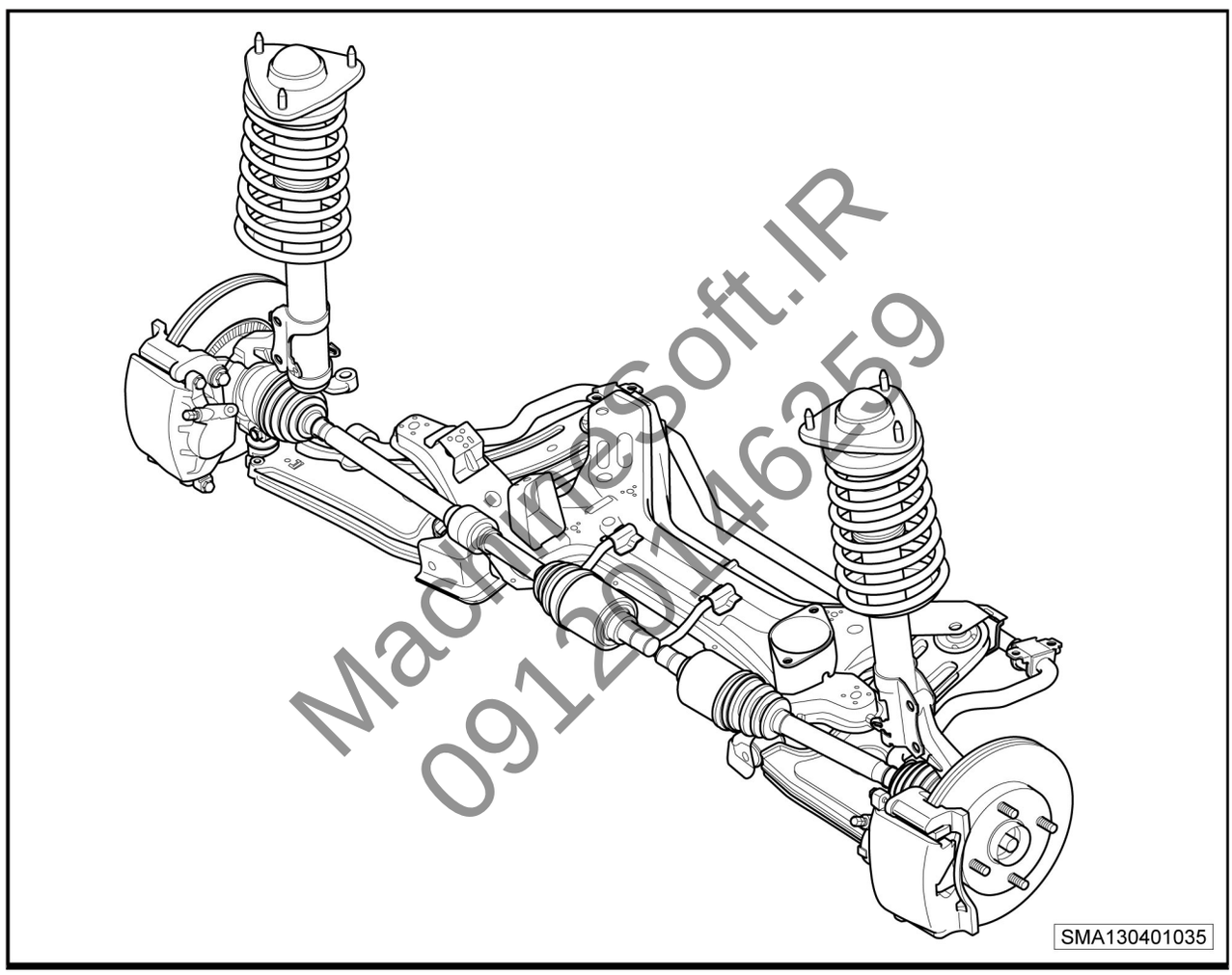
Installation shall follow the reverse sequence of the removal procedure.

0401 Suspension System

1 General Information

1.1 Overview

Front suspension

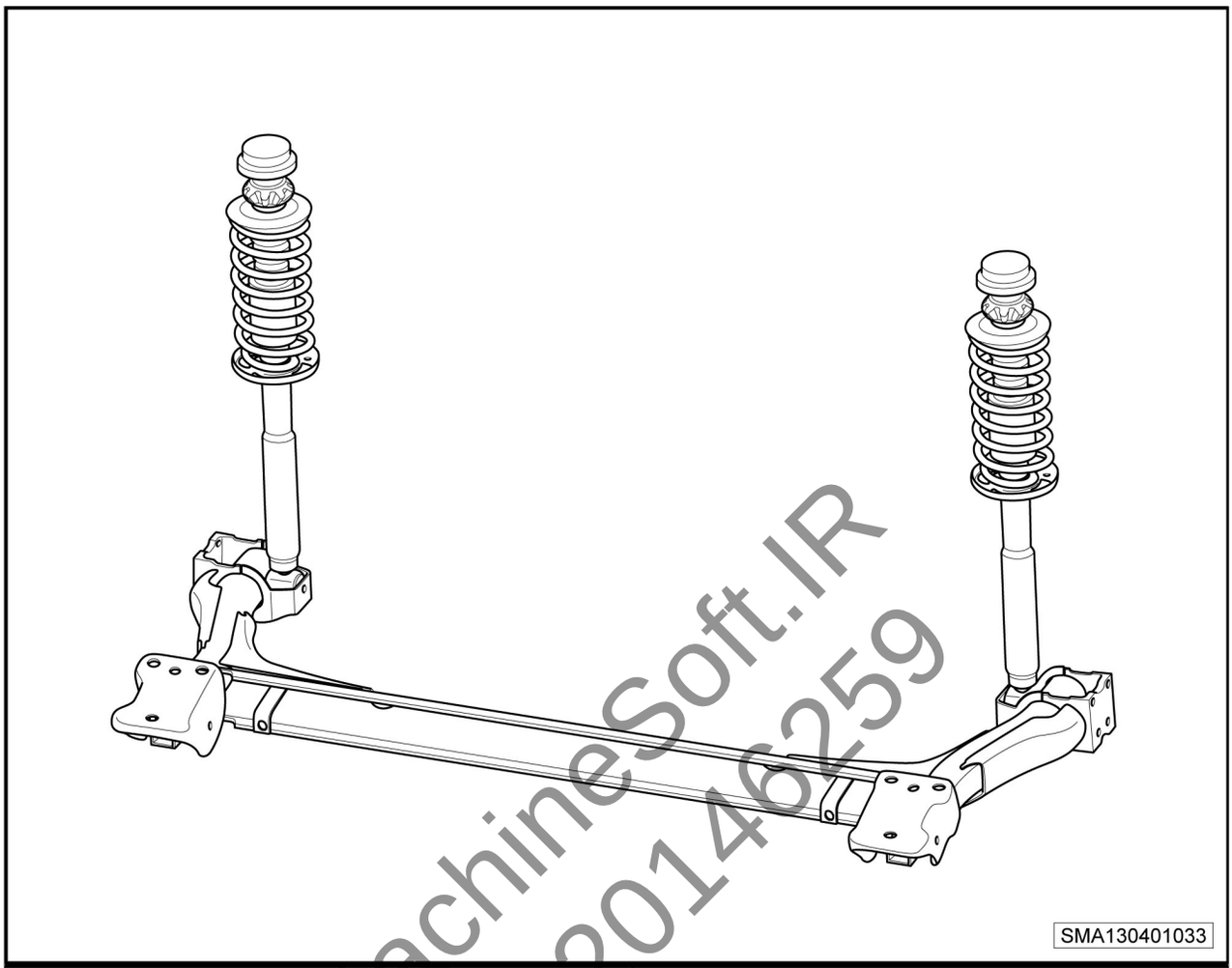


- In this model, the front suspension uses divided steering and power axle, McPherson suspension, cylindrical coil spring and double-acting telescopic shock absorber.
- The suspension upper part is connected with the vehicle body and the lower part touches the ground through wheels.
- The subframe, fixed on the vehicle body with four connecting points, mainly bears various forms of applied force transferred from the control arms and the engine weight.
- Front suspension consists of:

  a. Front shock absorber
  b. Knuckle
  c. Front lower control arm
  d. Front subframe
  e. Front stabilizer bar

f. Axle shaft

Rear suspension



- In this model, the rear suspension uses longitudinal trailing arm type rear axle, which is a semi-independent suspension and features comfort and stability of independent suspension.
- Rear suspension consists of:

  a. Rear shock absorber
  b. Rear axle
  c. Rear axle mounting bracket

⚠ Warning

- In service, be sure to wear necessary protective device to avoid accidents.
- When repairing chassis, be sure to check whether the safety lock of the lifting-jack hoist is locked up.
- When working on the shock absorber spring, prevent the spring unexpectedly bouncing out to injure persons.

1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Wheel nut	110±10
Front wheel axle shaft nut	270±20
Coupling bolt between the front shock absorber and the knuckle	100±10
Coupling bolt between the upper front shock absorber and the vehicle body	60±5
Lock bolt between the knuckle and the front lower control arm	120±10
Coupling bolt between the stabilizer bar and the front lower control arm	35±3
Coupling bolt between the front lower control arm and the vehicle body	130±10
Coupling bolt between the front lower control arm and the front subframe	130±10
Ball nut of the power steering gear link bar	35±3
Lock nut of the toe-in adjusting rod	35±3
Coupling bolt between the front subframe and the engine bracket	75±5
Coupling bolt between the front subframe and the vehicle body	130±10
Fixing nut of the rear wheel hub	230±10
Mounting bolt of the lower rear shock absorber	75±2.5
Coupling bolt between the rear shaft and the rear axle	63±1
Bolt between the rear axle and the mounting bracket	80±8

Inflation pressure of cold tire (kPa)

Vehicle model	Tire type	Inflation pressure (unladen) (Kpa)	Inflation pressure (full-load) (Kpa)	Inflation pressure (spare tire) (Kpa)
SQR7150J150	185/60R15 84H	230/210	240/250	250
SQR7150A137	195/55R15 85V	230/210	240/250	250

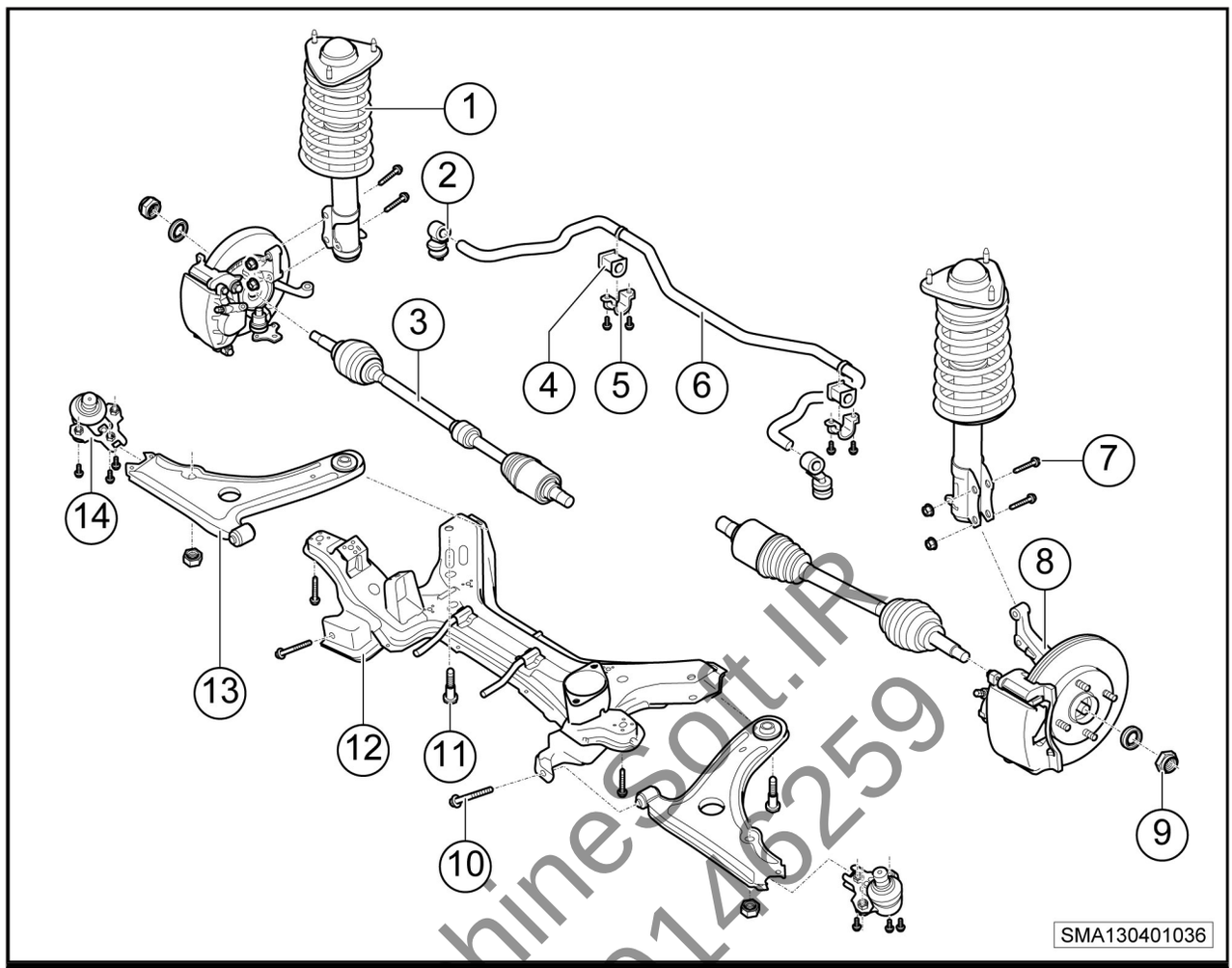
Standard value of front wheel alignment

Item	Standard value
Caster angle of the front wheel	3°18′ ±30′
Camber angle of the front wheel	-30′ ±30′
Front wheel toe-in	0°±10′
Kingpin angle of the front wheel	11°42′ ±30′

Standard value of rear wheel alignment

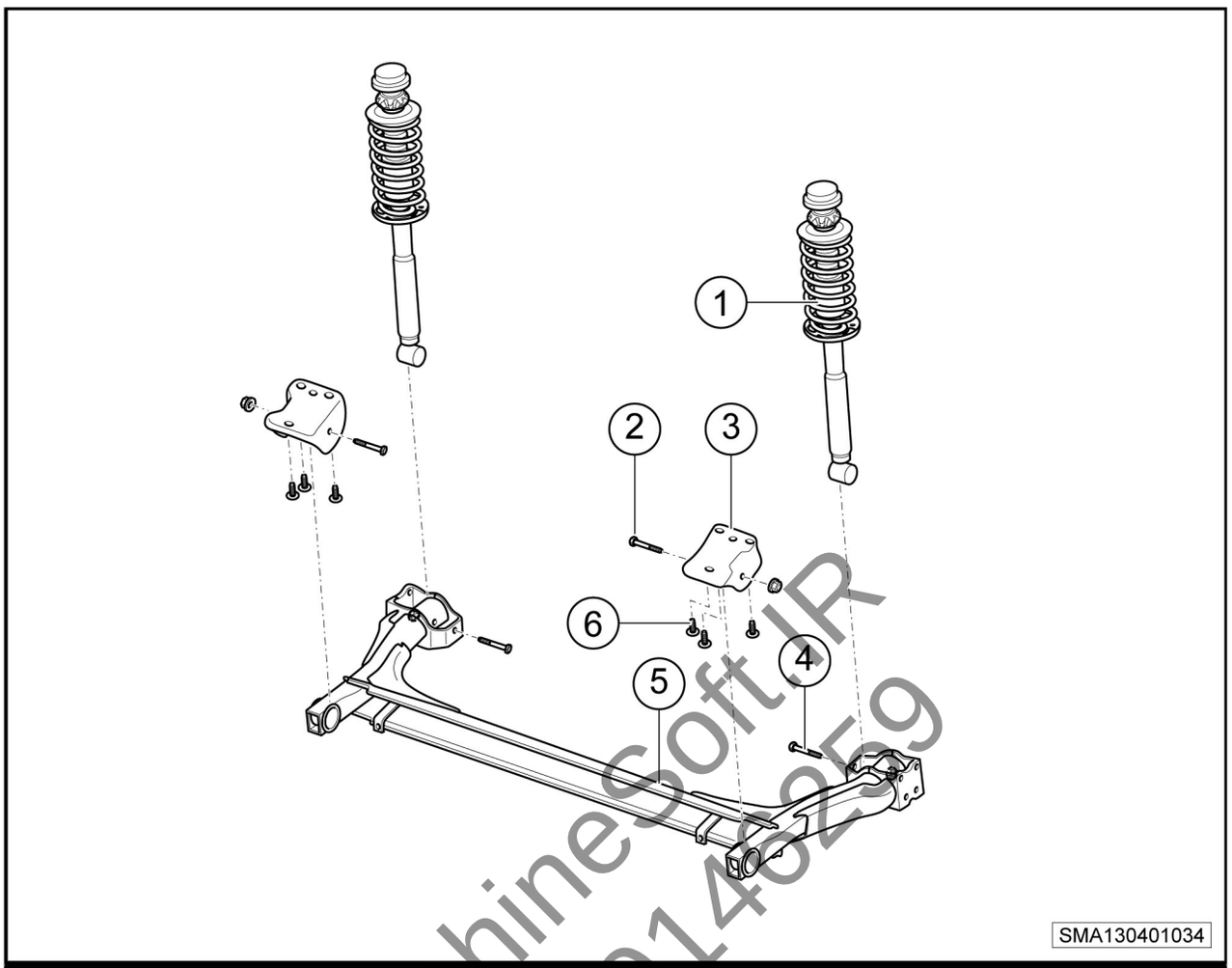
Item	Standard value
Camber angle of the rear wheel	-90′ ±20′
Rear wheel toe-in	10′ ±15′

1.3 The front suspension assembly drawing



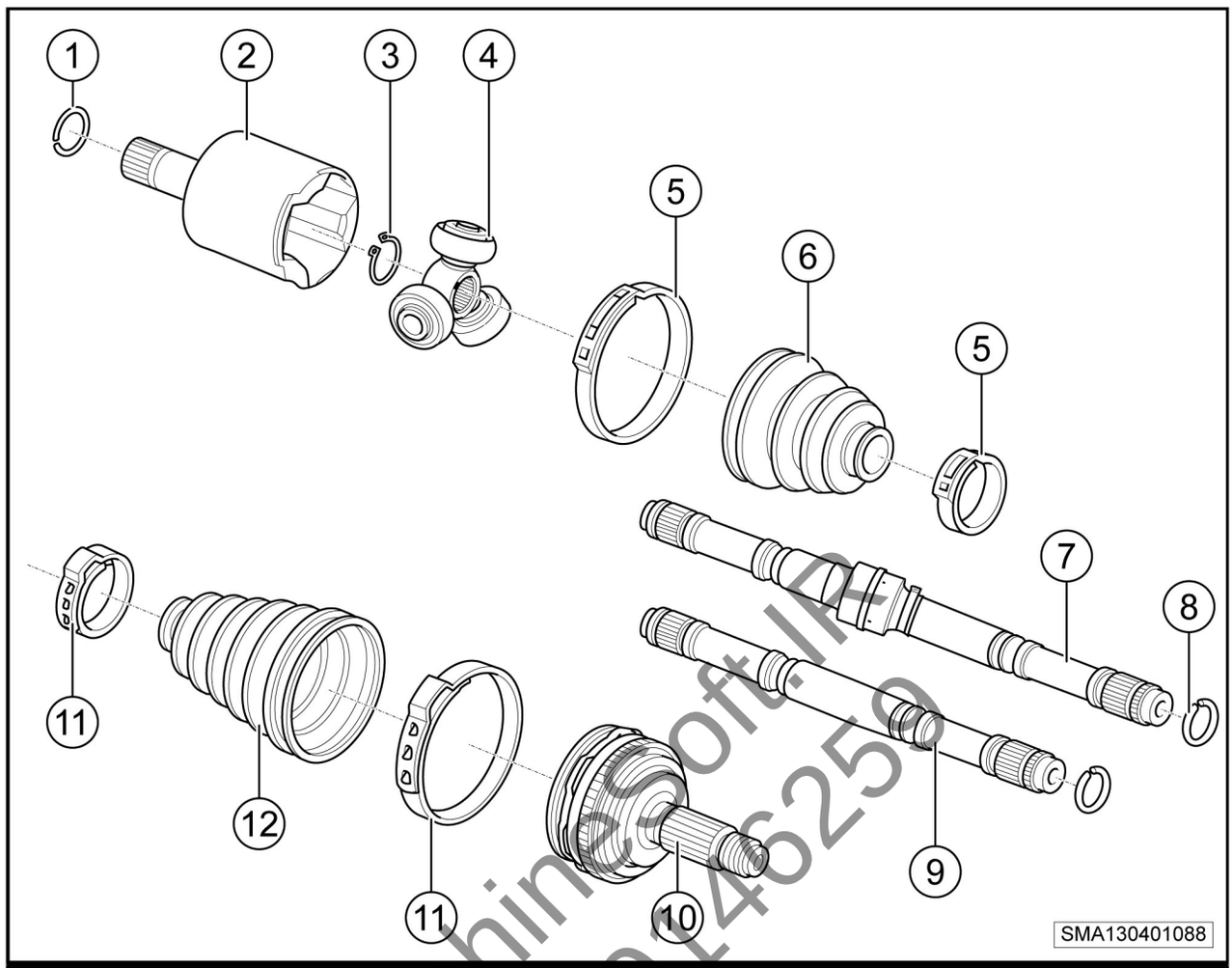
1. Front shock absorber	2. Front stabilizer bar link
3. Axle shaft	4. Front stabilizer bar rubber sleeve
5. Front stabilizer bar rubber sleeve clamp	6. Front stabilizer bar
7. Coupling bolt between the shock absorber and the knuckle	8. Knuckle
9. Axle shaft nut	10. Coupling bolt between the front lower control arm and the front subframe
11. Coupling bolt between the front subframe and the vehicle body	12. Front subframe
13. Front lower control arm	14. Front lower control arm ball joint

1.4 The rear suspension assembly drawing



1. Rear shock absorber	2. Coupling bolt between the rear axle and the rear axle mounting bracket
3. Rear axle mounting bracket	4. Coupling bolt between the rear axle and the rear shock absorber
5. Rear axle	6. Coupling bolt between the rear axle mounting bracket and the vehicle body

1.5 The axle shaft assembly drawing



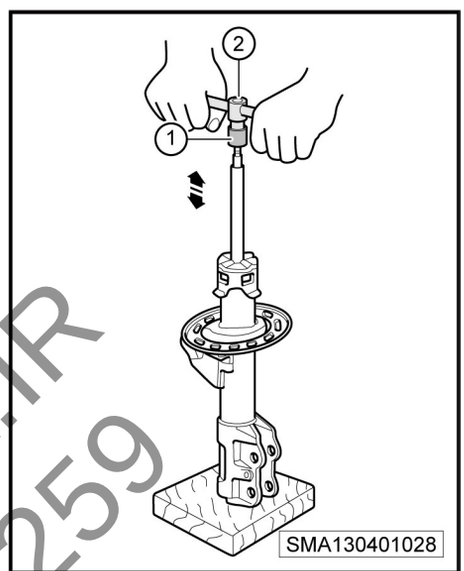
1. Setting ring	2. Inner CV joint
3. Cross shaft circlip	4. Cross shaft
5. Inner CV joint dust cover clamp	6. Inner CV joint dust cover
7. Right axle shaft	8. Stop ring
9. Left axle shaft	10. Outer CV joint
11. Outer CV joint dust cover clamp	12. Outer CV joint dust cover

2 Diagnosis and Inspection

2.1 Checking the front shock absorber

1. As shown in the figure, install a nut at the end of the shock absorber shaft and properly install the sleeve (-1-) and the T wrench (-2-).

2. Manually compress the shock absorber assembly in the (-arrow-) direction to check whether the shock absorber assembly is stably compressed and stretched.When releasing pressure, the shock absorber should be operated smoothly and continuously, otherwise the shock absorber is leaky and it should be replaced.

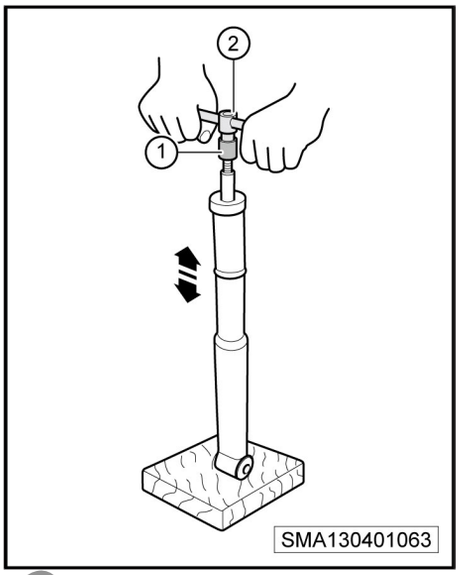


3. Check for oil leakage, abnormal noise and jamming.

2.2 Checking the rear shock absorber

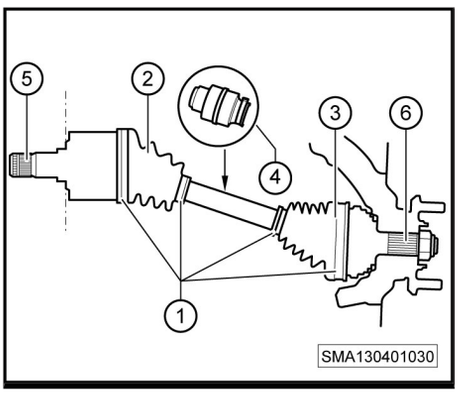
1. As shown in the figure, install a nut at the end of the rear shock absorber shaft and properly install the sleeve (-1-) and the T wrench (-2-).

2. Manually compress the shock absorber assembly in the (-arrow-) direction to check whether the shock absorber assembly is stably compressed and stretched.When releasing pressure, the shock absorber should be operated smoothly and continuously, otherwise the shock absorber is leaky and it should be replaced.



3. Check for oil leakage, abnormal noise and jamming.

2.3 Checking the axle shaft



1. Check for looseness of the dust cover clamping strap (-1-).Check for crack, damage and grease leakage of the axle shaft inner dust cover (-2-) and the outer dust cover (-3-).Check the right axle shaft shock absorber (-4-) for damage.
2. Check for crack and damage of the inner CV joint (-5-) and the outer CV joint (-6-).In case of any damage, replace the inner CV joint or the outer CV joint as an assembly if necessary.
3. Check for crack and damage of the axle shaft.In case of any damage, replace the axle shaft if necessary.
4. Hold the inner CV joint and manually rotate the front wheel to check for free clearance between the inner CV joint and the outer CV joint.Be sure to make the free clearance meet the specified value. If necessary, replace the axle shaft.

2.4 Checking before wheel alignment

- The vehicle should be in no load condition.
- The fuel tank should be fully-filled.
- The washer jar should be fully filled with washer fluid.
- Spare wheels and vehicle tools should be placed at their positions.
- Check for distortion or damage of the suspension system, the power steering gear link bar and the ball joint.
- Adjust the tire pressure to the specified value.
- Carry out wheel dynamic balance.
- Place the wheel right ahead. Press the brake pedal with the brake pedal loading system.

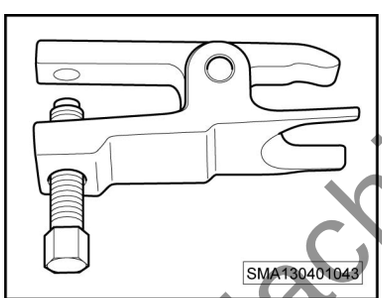
3 Front Wheel Suspension

3.1 Removing and installing the front wheel knuckle

⚠ Warning

- When repairing chassis, be sure to check whether the safety lock of the lifting-jack hoist is locked up.
- It is impermissible to weld or rectify the load-bearing parts of the wheel suspension.
- When removing chassis components, replace self-locking nuts and rusted nuts to assure vehicle safety.

Maintenance tools and common equipment

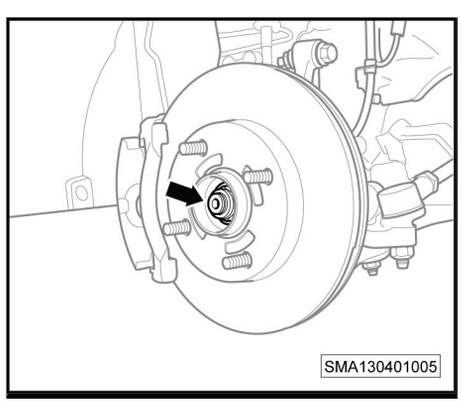
 SMA130401043	
Ball joint separator	

Removal

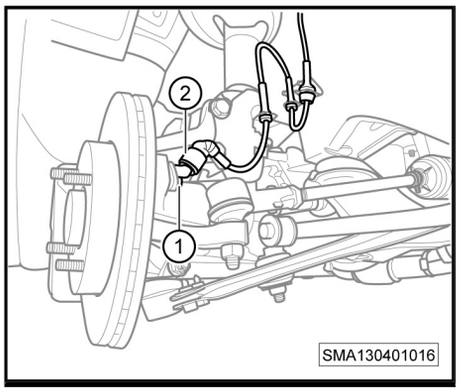
1. Remove the wheels .=> refer to page 760

2. Unscrew the axle shaft fixing nut (-arrow-).

- Tightening torque of the nut: 270±20 N•m

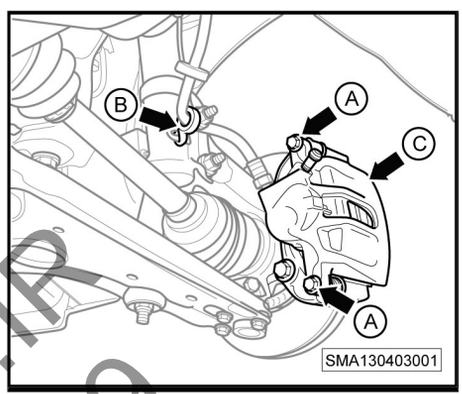

SMA130401005

3. Unscrew the fixing bolt of the wheel speed sensor (-1-) and remove the wheel speed sensor (-2-).



4. Disengage the brake hose clip (-arrow B-), unscrew the fixing bolt of the brake caliper (-arrow A-) and remove the front brake caliper (-arrow C-).

- Tightening torque of the bolt: 22±1 N•m

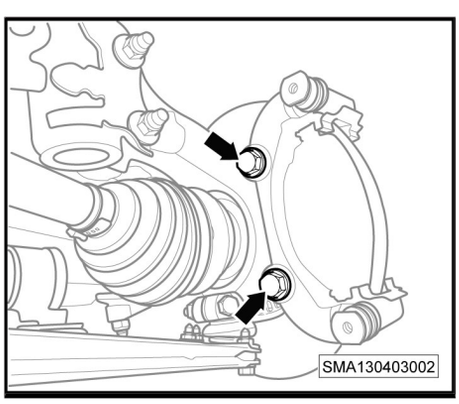


Caution

- It is impermissible to directly suspend the brake caliper, which should be secured with a strap to prevent brake hose damage.

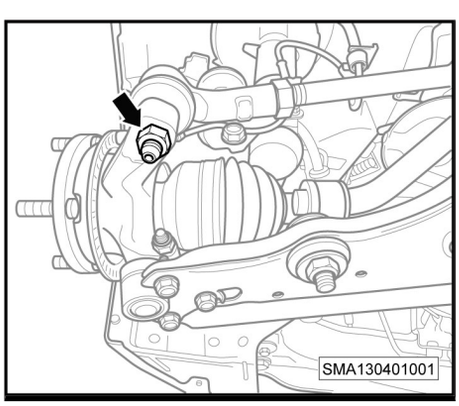
5. Unscrew the brake caliper stretcher bolt (-arrow-) and remove the brake caliper stretcher and the brake disc.

- Tightening torque of the bolt: 85±5 N•m

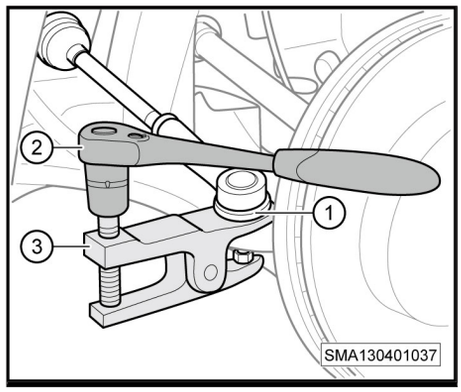


6. Loosen the ball nuts of the power steering gear link bar (-arrow-).

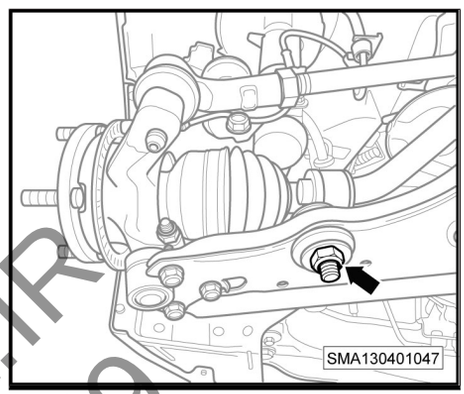
- Tightening torque of the nut: 35±3 N•m



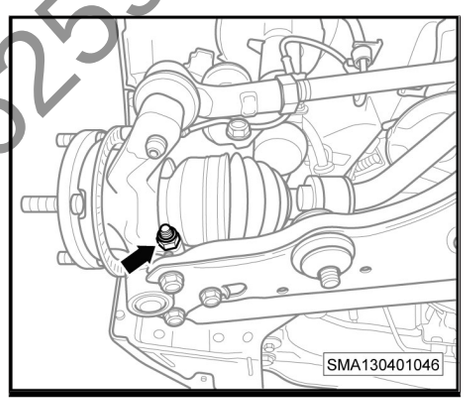
7. Install the ball joint separator (-3-). Tighten the screw of the ball joint separator with the wrench (-2-). Press out the power steering link bar ball joint (-1-) from the knuckle. Unscrew the ball nuts of the power steering gear link bar.



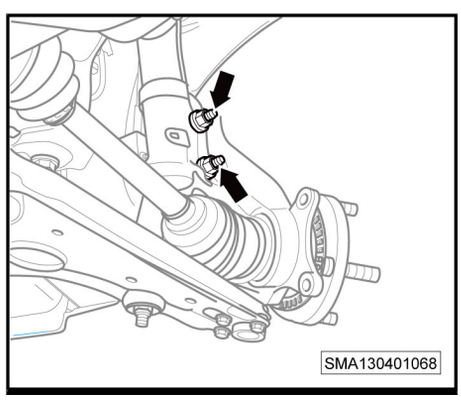
8. Unscrew the fixing nut of the stabilizer bar link (-arrow-).
   - Tightening torque of the nut: 35±3 N•m



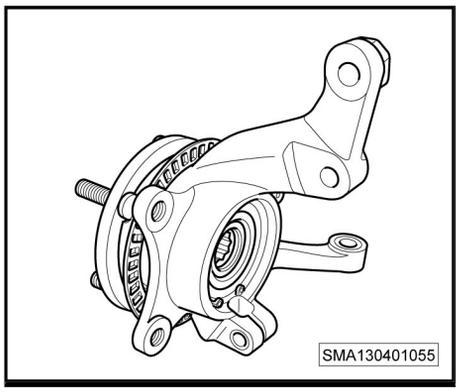
9. Unscrew the lock nut of the coupling bolt between the front lower control arm ball joint and the knuckle (-arrow-) to remove the bolt.
   - Tightening torque of the nut: 120±10 N•m



10. Unscrew the lock nut of the coupling bolt between the knuckle and the shock absorber (-arrow-) to remove the bolt.
   - Tightening torque of the nut: 100±10 N•m



11. Remove the knuckle.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

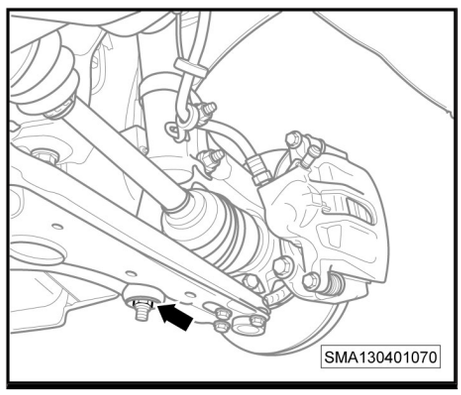
- Please wear a mask to avoid brake pad dust and keep healthy.
- Tighten the fixing bolts with the specified torque.
- After installing, check the wheel alignment. If necessary, adjust the wheel alignment.

3.2 Removing and installing the front lower control arm

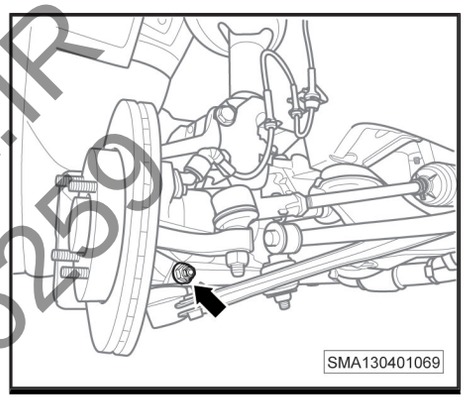
Removal

1. Remove the wheels .=> refer to page 760

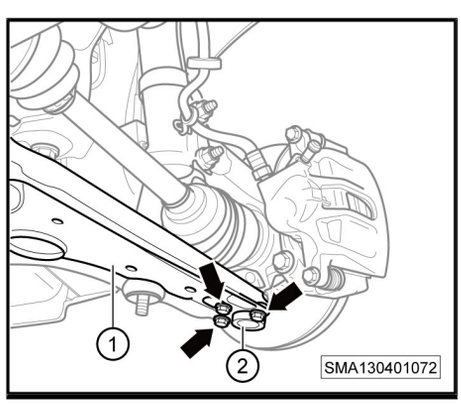
2. Unscrew the fixing nut of the stabilizer bar link (-arrow-).
   - Tightening torque of the nut: 35±3 N•m



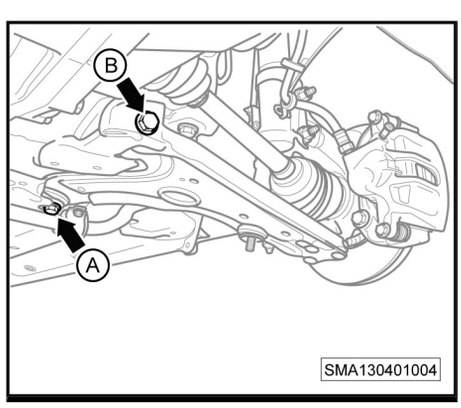
3. Unscrew the lock nut of the coupling bolt between the front lower control arm ball joint and the knuckle (-arrow-) to remove the bolt. Separate the front lower control arm ball joint from the front wheel knuckle.
   - Tightening torque of the nut: 120±10 N•m



4. Unscrew the ball joint fixing bolts (-arrow-) of the front lower control arm (-1-) to remove the front lower control arm ball joint (-2-).

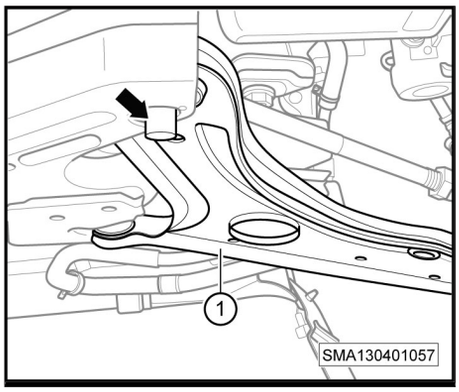


5. Unscrew the coupling bolt between the front lower control arm and the vehicle body (-arrow A-) and unscrew the coupling bolt between the front lower control arm and the subframe (-arrow B-).
   - Tightening torque of the bolts (-arrow A-) and (-arrow B-): 130±10 N•m



6. Pull out the coupling bolt sleeve between the front lower control arm and the vehicle body (-arrow-) to remove the front lower control arm (-1-).

- Tightening torque of the nut: 35±3 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Check the front lower control arm ball joint for damage, replace it if necessary.
- After installing, check the wheel alignment. If necessary, adjust the wheel alignment.

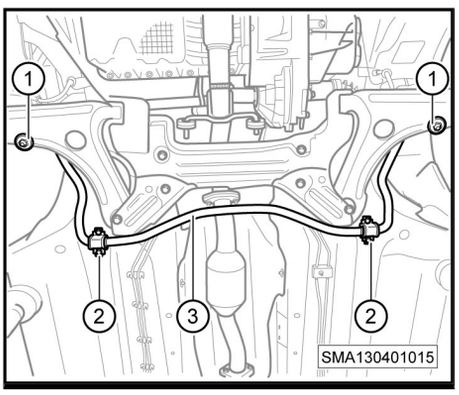
3.3 Removing and installing the stabilizer bar

Removal

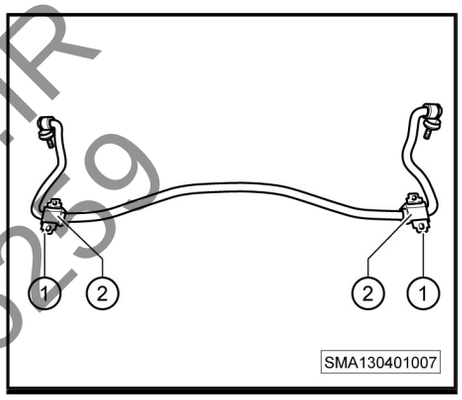
1. Lift the vehicle safely.

2. Unscrew the fixing nut of the stabilizer bar link (-1-) and the coupling bolt between the stabilizer bar rubber sleeve clamp and the vehicle body (-2-) to remove the stabilizer bar (-3-).

- Tightening torque of the nut (-1-): 35±3 N•m
- Tightening torque of the bolt (-2-): 25±3 N•m



3. Disengage the rubber sleeve clamp (-1-) to remove the rubber sleeve (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

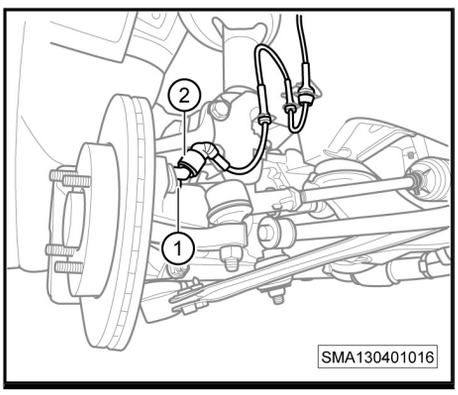
- Tighten the fixing bolts with the specified torque.
- Be sure to install the stabilizer bar rubber sleeve with the opening facing forward.

3.4 Removing and installing the front shock absorber

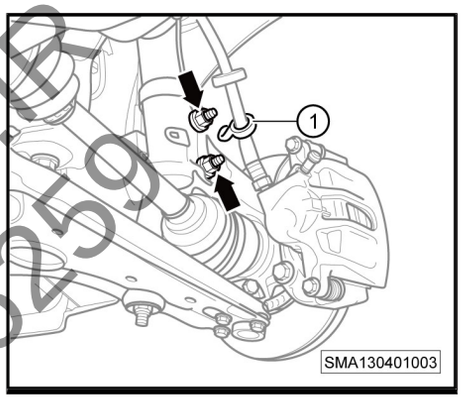
Removal

1. Remove the wheels .=> refer to page 760

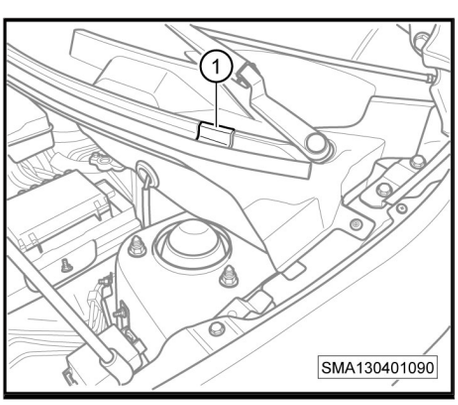
2. Unscrew the fixing bolt of the wheel speed sensor (-1-) and remove the wheel speed sensor (-2-).



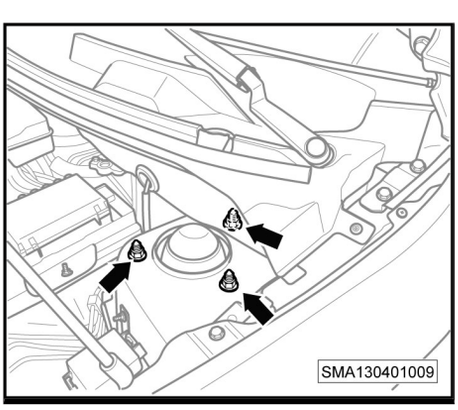
3. Disengage the brake hose clip (-1-), unscrew the assembly nuts of the shock absorber and the knuckle (-arrow-) to remove the bolts.
   - Tightening torque of the nut: 100±10 N•m



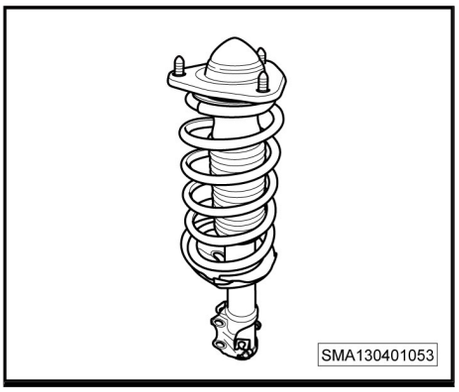
4. Remove the decorative cover of the shock absorber nut (-1-).



5. Unscrew three fixing nuts connecting the mounting bracket on the upper shock absorber with the vehicle body (-arrow-).
   - Tightening torque of the nut: 60±5 N•m



6. Remove the shock absorber assembly.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

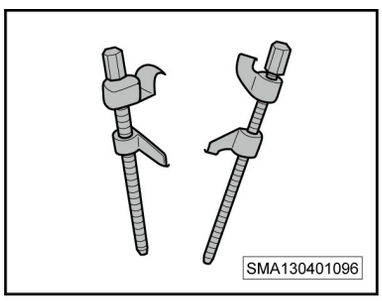
- Tighten fixing nuts with the specified torque.
- Before installing wheels, clean the joint surface between the brake disc and the wheel inner side.
- After installing, check the wheel alignment. If necessary, adjust the wheel alignment.

3.5 Disassembling and assembling the front shock absorber spring

Warning

- When working on the shock absorber spring, the spring should not be overly compressed. It is workable that the spring is compressed to the extent that the nut can be rotated. Avoid spring damage and body injuries.

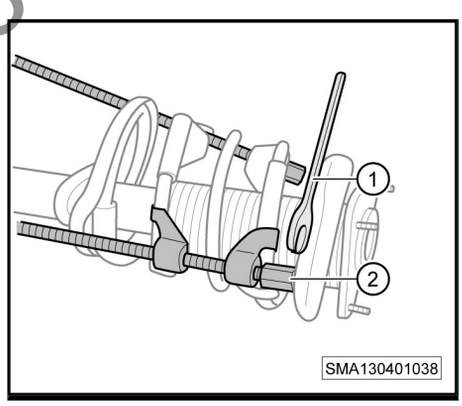
Maintenance tools and common equipment

	
Spring compressor	

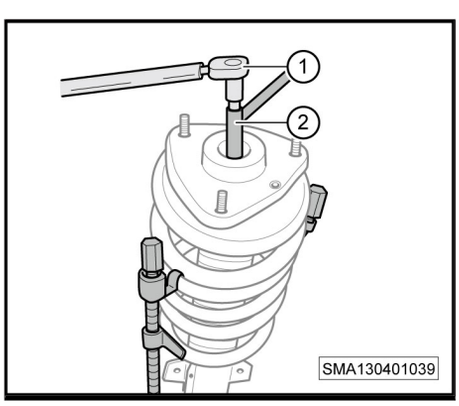
Disassembly

1. Remove the shock absorber.=> refer to page 613

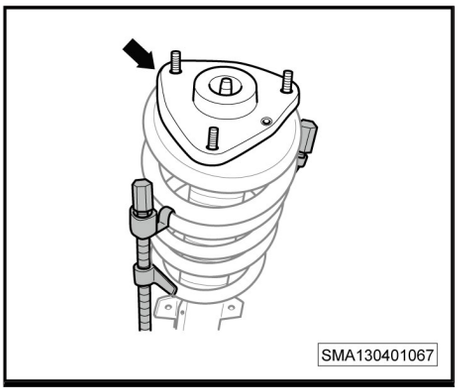
2. Install the spring compressor (-2-). Tighten the screw of the spring compressor with the wrench (-1-) to compress the spring.



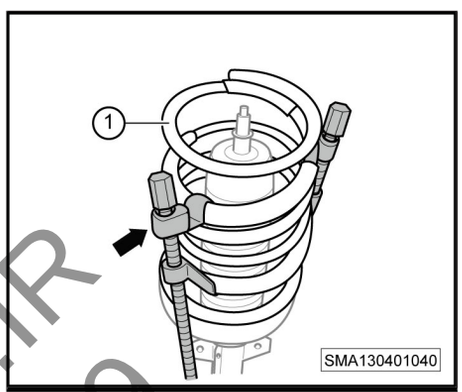
3. Fix the shock absorber shaft with the wrench (-1-). Unscrew the nuts on the shock absorber shaft with the wrench (-2-).
   - Tightening torque of the nut: 25±3 N•m



4. Remove the upper mounting bracket of the shock absorber spring (-arrow-).



5. Remove the shock absorber compressor (-arrow-) and the shock absorber spring (-1-) together.



6. Loosen the compressor screw to release the shock absorber spring force. Separate the compressor from the shock absorber spring.

Assembly

Assembly shall follow the reverse sequence of the disassembly procedure.

Caution

- Tighten fixing nuts with the specified torque.
- Check and confirm that assembling the shock absorber is completed.

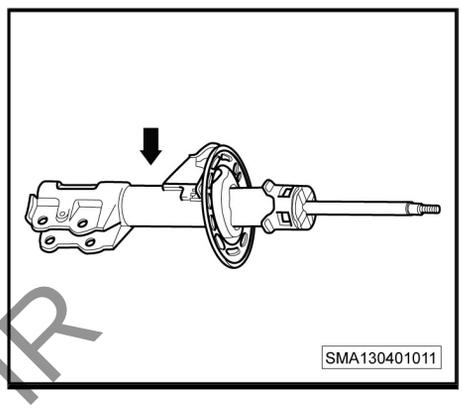
3.6 Processing the front shock absorber

⚠ Warning

- The shock absorber contains nitrogen and oil under negative pressure.
- Before processing, be sure to release the inside pressure of the shock absorber in case it explodes or injures people.
- Be sure to wear goggles to avoid body injuries when the shock absorber is releasing pressure.

Methods:

Place the shock absorber on a horizontal plane and stretch the shock absorber main shaft. Drill a hole with a diameter of 2-3 mm of the shock absorber shaft (-arrow-) to release gas inside the shock absorber.

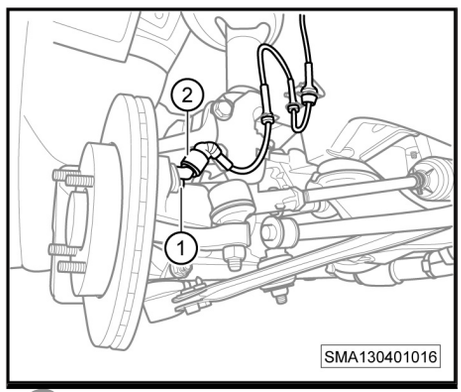


3.7 Removing and installing the axle shaft

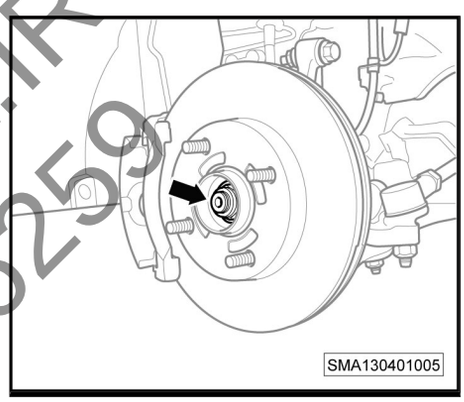
Removal

1. Remove the wheels.=> refer to page 760
2. Drain the transmission oil .=> refer to page 37

3. Unscrew the fixing bolt of the wheel speed sensor (-1-) and remove the wheel speed sensor (-2-).

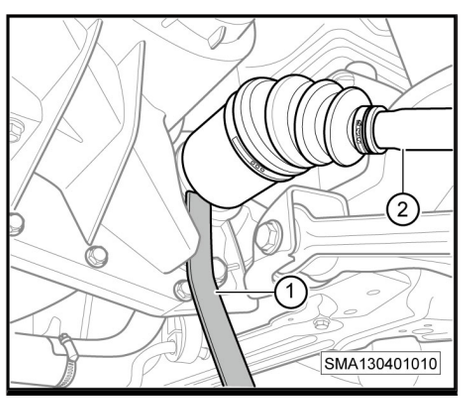


4. Unscrew the axle shaft fixing nut (-arrow-).
   - Tightening torque of the nut: 270±20 N•m

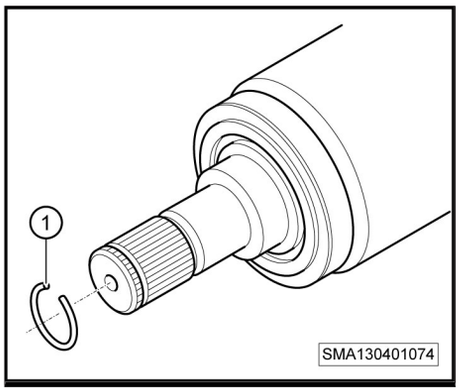


5. Remove the knuckle .

6. As shown in the figure, pry out the axle shaft (-2-) with the crowbar (-1-).



7. Remove the setting ring (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

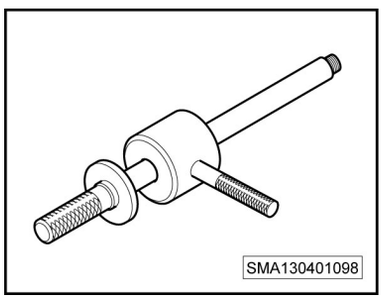
- Avoid damaging dust cover on the CV joint.
- It is impermissible to stretch the axle shaft with huge force to avoid the inner CV joint from falling out.
- Pull out the axle shaft straight to avoid oil seal damage.
- Carefully use the crowbar to avoid oil seal damage.
- Tighten the fixing bolts with the specified torque.
- After installing, check the wheel alignment. If necessary, adjust the wheel alignment.

3.8 Disassembling and assembling the axle shaft

Caution

- It is impermissible to mark on the rolling surface of the roller.

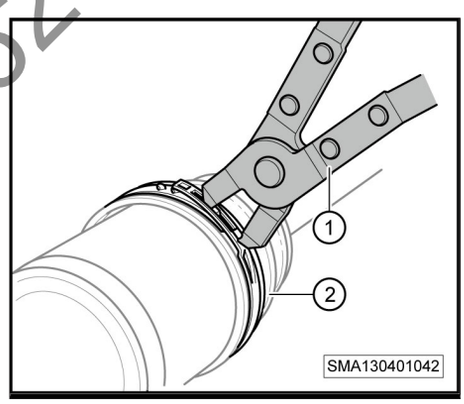
Maintenance tools and common equipment

	
Inertia hammer component	

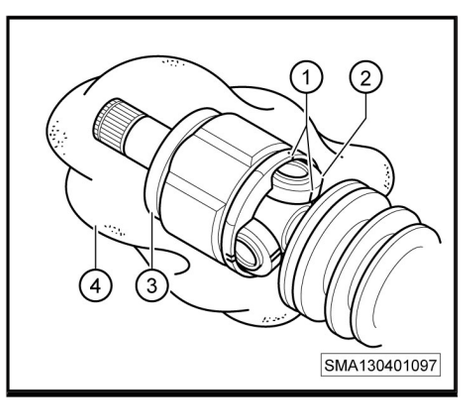
3.8.1 Inner CV joint

Disassembly

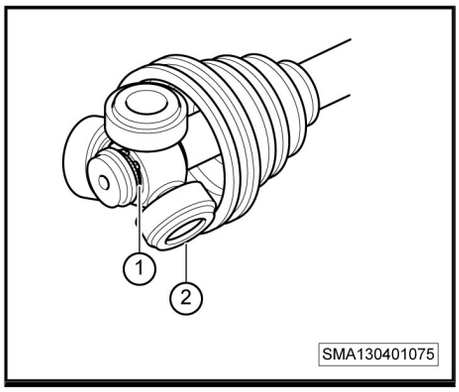
1. Loosen the lock catch of the dust cover clamp (-2-) with the general dust cover clamp pliers (-1-). Carefully operate to avoid damaging the dust cover.



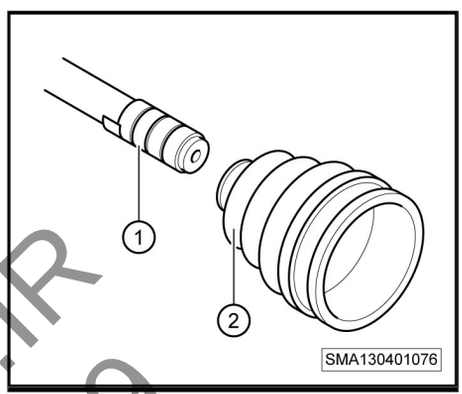
2. Make a mark (-1-) on the roller cover (-2-) and the inner CV joint (-3-) to identify the position of the inner CV joint from roller to groove.Remove the inner CV joint and place it on a clean cloth (-4-).



3. Pull out the cross shaft circlip (-1-) and remove the cross shaft (-2-).



4. Bind the spline on the axle shaft with the tape (-1-), and remove the dust cover (-2-).



5. Remove the tape.

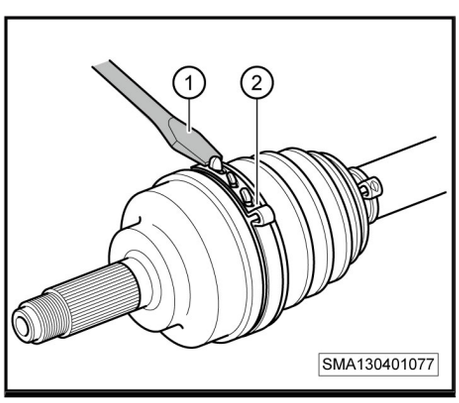
Assembly

Assembly shall follow the reverse sequence of the disassembly procedure.

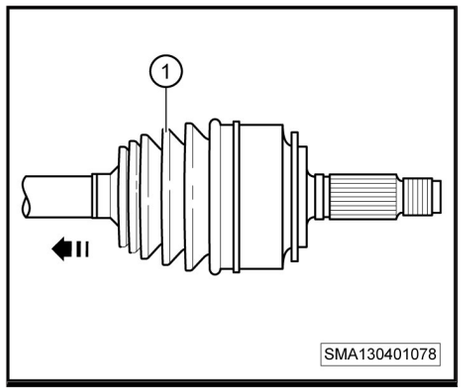
3.8.2 Outer CV joint

Disassembly

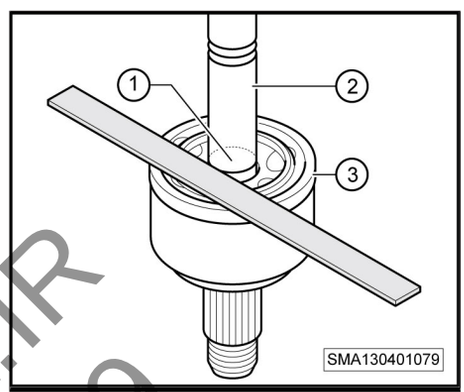
1. Pry out lock catches of three clamps with the screwdriver (-1-), and remove the dust cover clamp (-2-).Carefully operate to avoid damaging the dust cover.



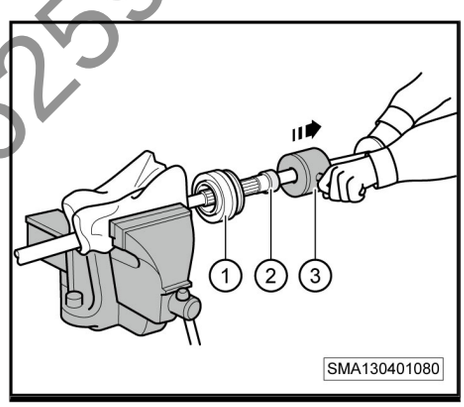
2. Carefully slide the outer dust cover (-1-) to the inner CV joint side in the (-arrow-) direction.



3. Make a mark (-1-) at the same height of the axle shaft (-2-) and the outer CV joint edge (-3-) to check with ease whether they are properly installed.

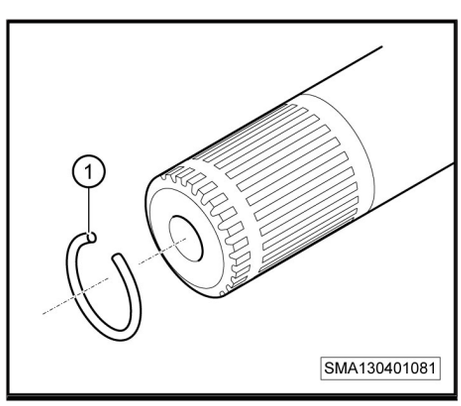


4. Wrap the axle shaft with a cloth and securely wedge it in the bench vice.Connect the axle shaft with the screwed connector (-2-). Pull the inertia hammer component (-3-) in the (-arrow-) direction and remove the outer CV joint (-1-).

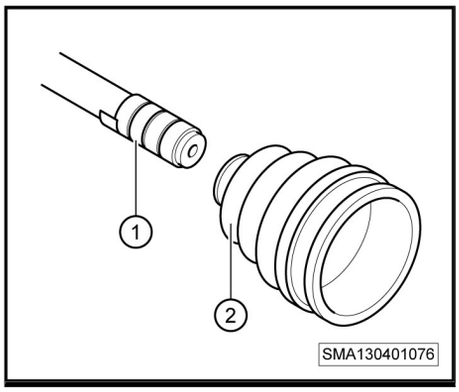


5. Remove the axle shaft from the bench vice.

6. Remove the stop ring (-1-) from the axle shaft.



7. Bind the spline on the axle shaft with the tape (-1-), and remove the dust cover (-2-).



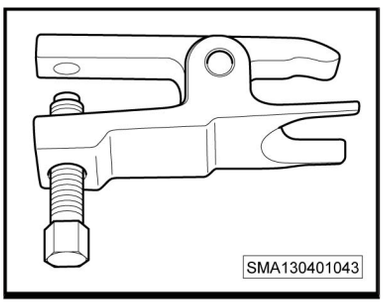
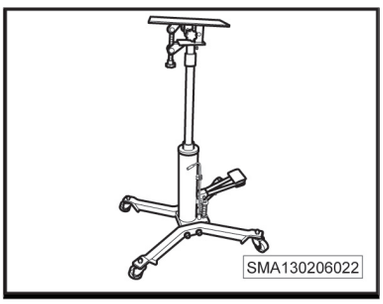
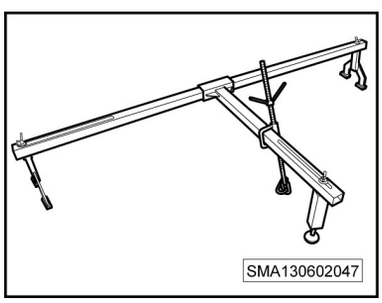
8. Remove the tape.

Assembly

Assembly shall follow the reverse sequence of the disassembly procedure.

3.9 Removing and installing the front subframe

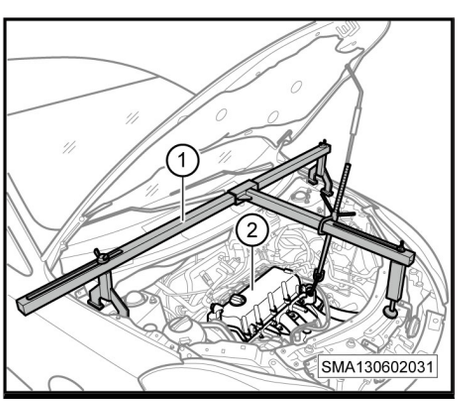
Maintenance tools and common equipment

	
Ball joint separator	Jack
	
Engine hanger	

Removal

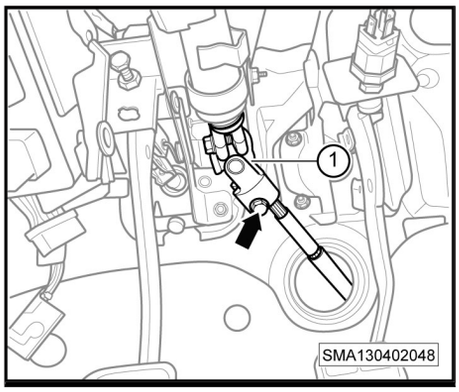
1. Switch off all current consumers and ignition switch.
2. Disconnect the battery negative cable.
3. Remove the battery and the battery tray .=> refer to page 976
4. Drain the power steering fluid .=> refer to page 40

5. As shown in the figure, fix the engine (-2-) with the engine hanger (-1-).

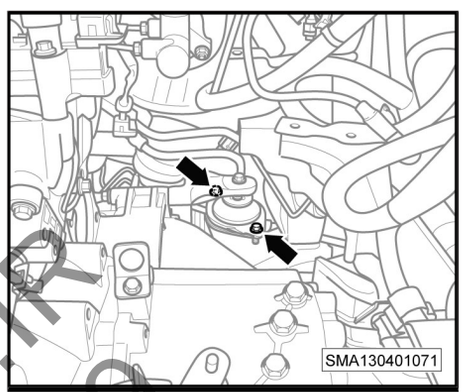


6. Unscrew the assembly bolt (-arrow-) of the steering universal joint (-1-).

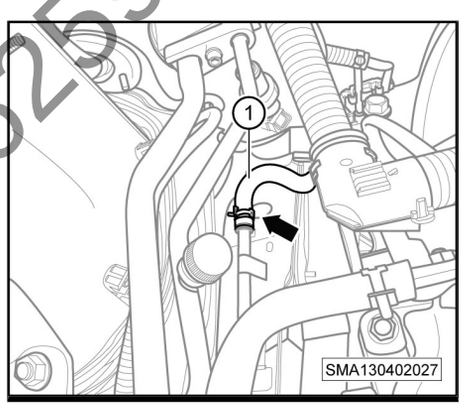
- Tightening torque of the bolt: 25±3 N•m



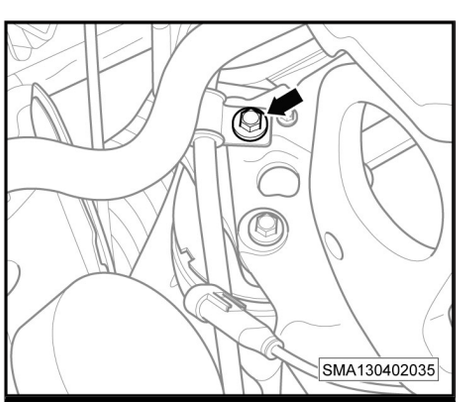
7. Unscrew the coupling bolts between the front subframe and the transaxle bracket (-arrow-).



8. Disengage the return pipe clamp of the power steering gear (-arrow-) to disconnect the power steering gear return pipe (-1-).

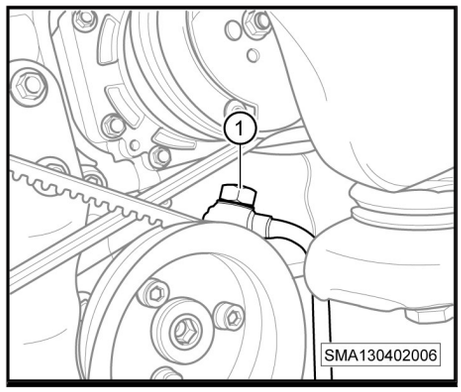


9. Unscrew the fixing bolt of the power steering pump high pressure pipe clamping fastener (-arrow-).



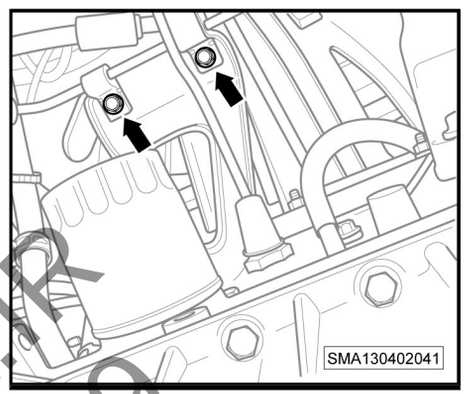
10. Unscrew the hollow bolt of the power steering pump (-1-).

- Tightening torque of the bolt: 45±3 N•m



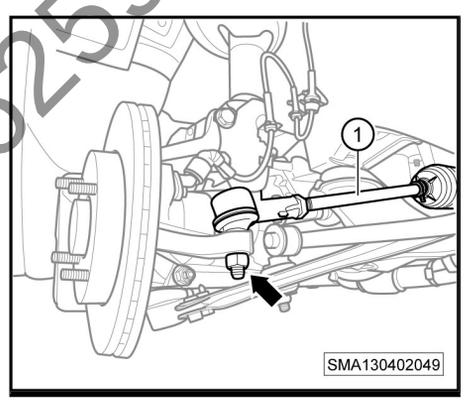
11. Unscrew the coupling bolts between the power steering pipe and the intake manifold (-arrow-).

- Tightening torque of the bolt: 18±3 N•m

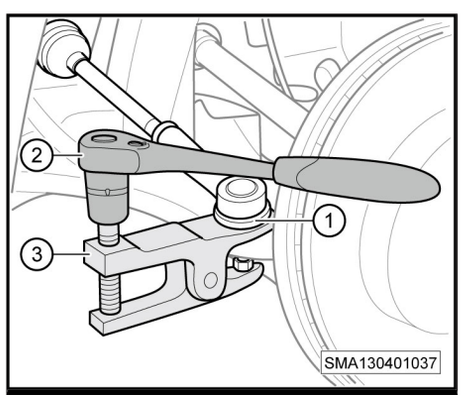


12. Loosen the ball joint lock bolt (-arrow-) of the power steering gear link bar (-1-).

- Tightening torque of the nut: 35±4 N•m

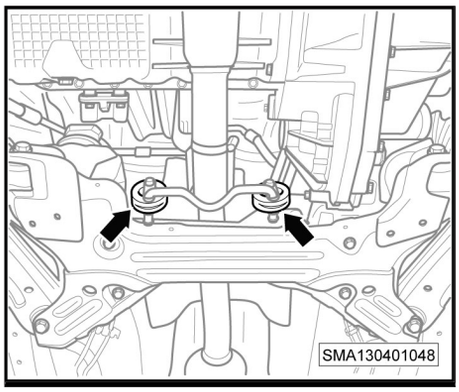


13. Install the ball joint separator (-3-). Tighten the screw of the ball joint separator with the wrench (-2-). Press out the power steering link bar ball joint (-1-) from the knuckle. Unscrew the ball nuts of the power steering gear link bar.



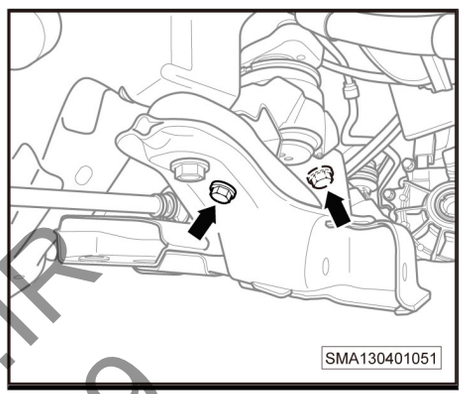
14. Remove the front lower control arm .=> refer to page 610

15. Disengage the joint hanger between exhaust pipe and front subframe (-arrow-).



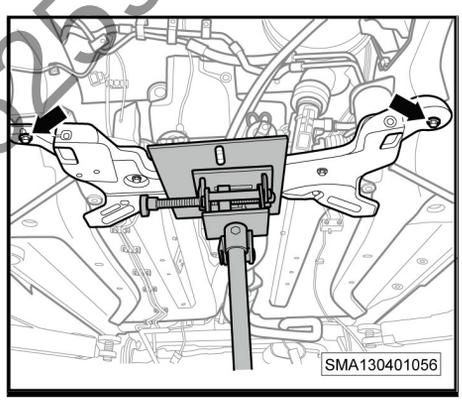
16. Unscrew the coupling bolts between the front subframe and the engine bracket (-arrow-).

- Tightening torque of the bolt: 75±5 N•m



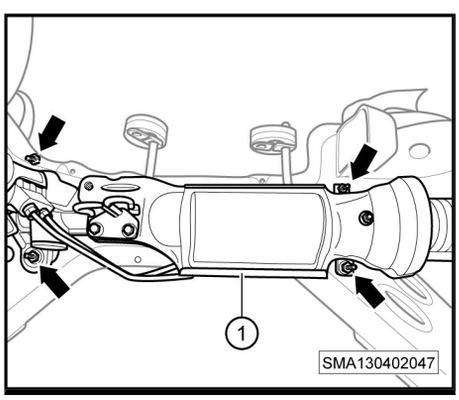
17. Jack up the front subframe. Unscrew the coupling bolts between the front subframe and the vehicle body (-arrow-) to remove the front subframe and the power steering gear together.

- Tightening torque of the bolt: 130±10 N•m



18. Unscrew the assembly nuts of the front subframe and the power steering gear (-arrow-) to separate the front subframe (-1-) from the power steering gear (-2-).

- Tightening torque of the nut: 30±3 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- After installing, check the wheel alignment. If necessary, adjust the wheel alignment.

4 Rear Wheel Suspension

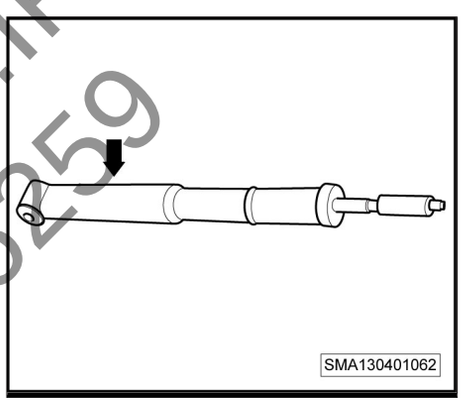
4.1 Processing the rear shock absorber

⚠ Warning

- The shock absorber contains nitrogen and oil under negative pressure.
- Before processing, be sure to release the inside pressure of the shock absorber in case it explodes or injures people.
- Be sure to wear goggles to avoid body injuries when the shock absorber is releasing pressure.

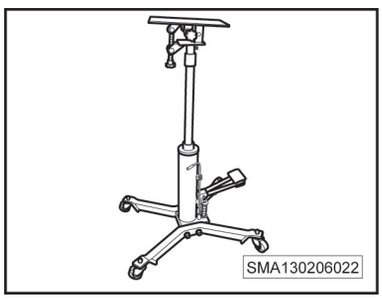
Methods:

Place the shock absorber on a horizontal plane and stretch the shock absorber main shaft. Drill a hole with a diameter of 2-3 mm of the shock absorber shaft (-arrow-) to release gas inside the shock absorber.



4.2 Removing and installing the rear shock absorber

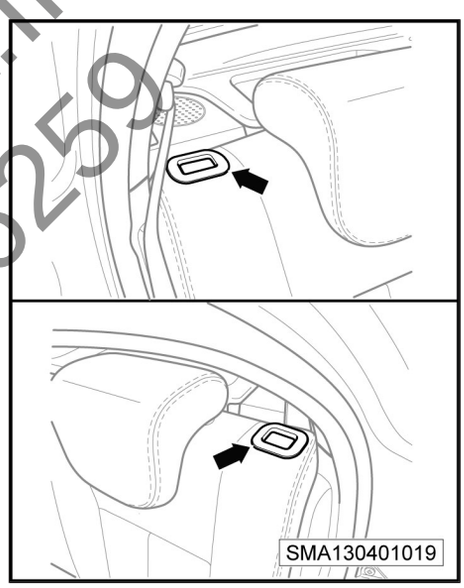
Maintenance tools and common equipment

	
Jack	

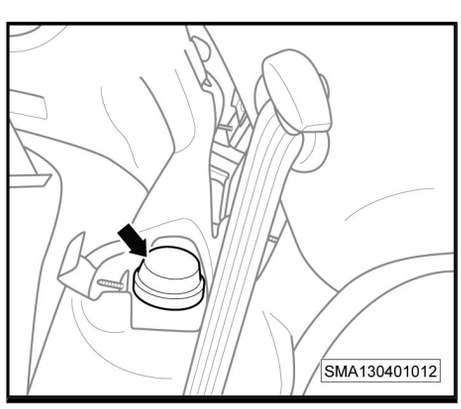
Removal

1. Be sure to prop the vehicle firmly and lift it.

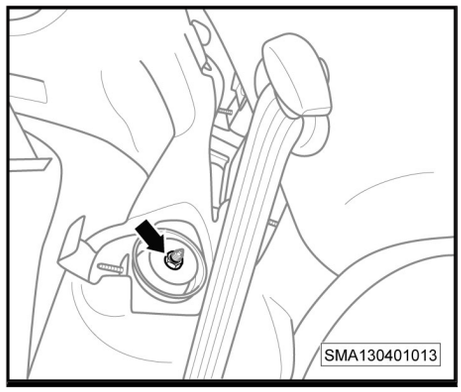
2. Press left and right locking buttons of the rear seat backrest (-arrow-) and pull up the rear seat backrest.



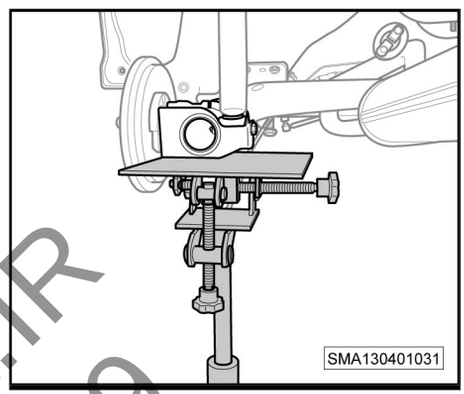
3. Remove the upper rubber cover of the rear shock absorber (-arrow-).



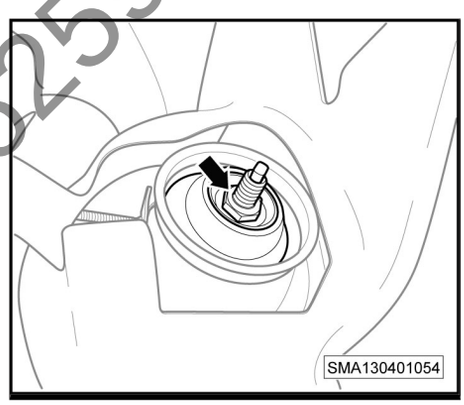
4. Unscrew the fixing nut of the rear shock absorber (-arrow-).
   - Tightening torque of the nut: 25±3 N•m



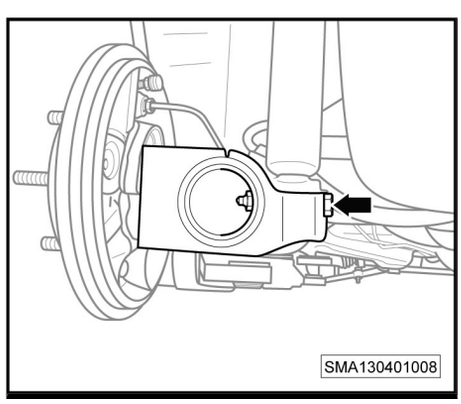
5. Jack up the rear axle.



6. Unscrew the assembly nuts of the rear shock absorber and the vehicle body (-arrow-) with special tools.
   - Tightening torque of the nut: 15±1 N.m



7. Unscrew the mounting bolts of the lower rear shock absorber (-arrow-).
   - Tightening torque of the bolt: 75±2.5 N•m



Note

- When removing the left rear shock absorber, remove the main silencer.

8. Remove the rear shock absorber.

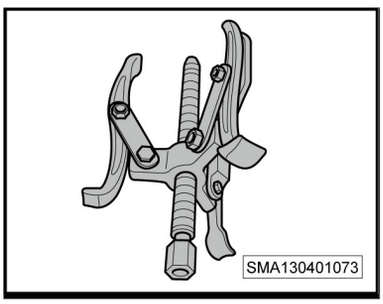
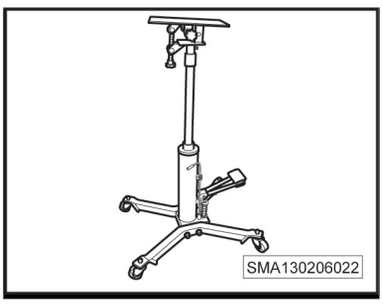
Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- After installing, check the wheel alignment. If necessary, adjust the wheel alignment.

4.3 Removing and installing the rear axle

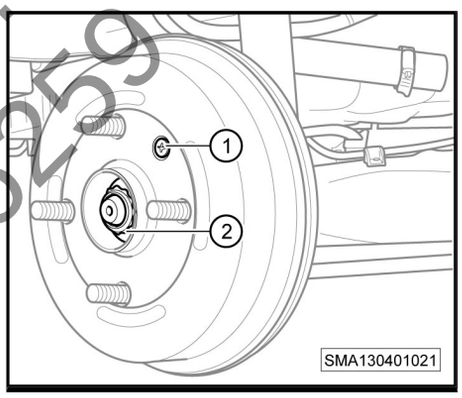
Maintenance tools and common equipment

	
Puller	Jack

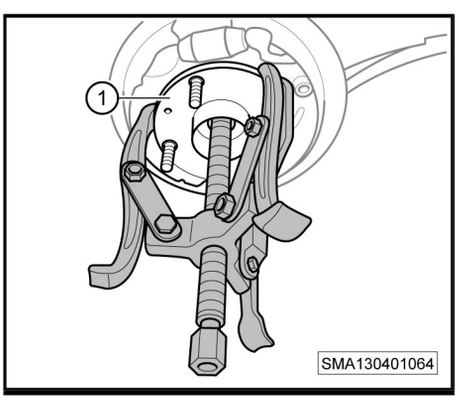
Removal

1. Be sure to prop the vehicle firmly and lift it.
2. Remove the wheels .=> refer to page 760

3. Unscrew the brake drum fixing bolt (-1-) and the rear wheel hub fixing nut (-2-) to remove the brake drum.
   - Tightening torque of the nut: 230±20 N•m

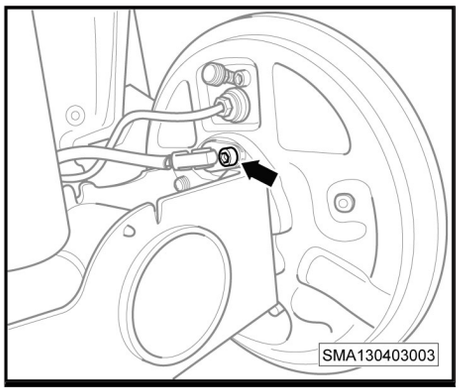


4. Pull out the rear wheel hub (-1-) with the puller.

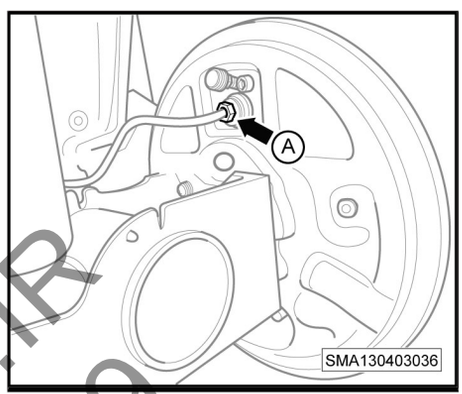


5. Remove the rear brake shoe .=> refer to page 727

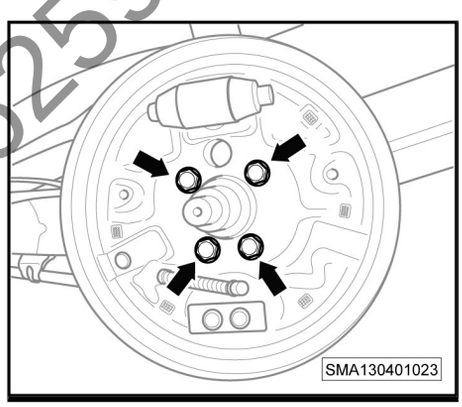
6. Unscrew the rear wheel speed sensor bolt (-arrow-) to remove the sensor.
   - Tightening torque of the bolt: 10±1 N•m



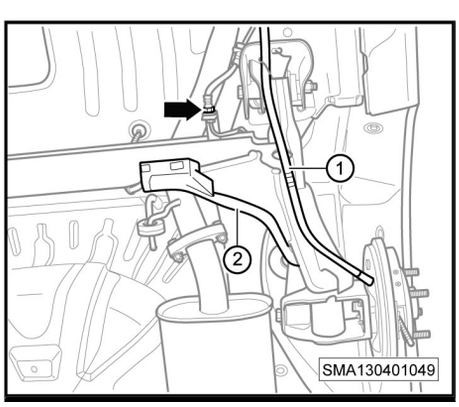
7. Unscrew the brake pipe bolt (-A-).
   - Tightening torque of the bolt: 16.5±2.5 N•m



8. Unscrew the rear main shaft fixing bolt (-arrow-) to remove the rear main shaft.
   - Tightening torque of the bolt: 63±1 N•m



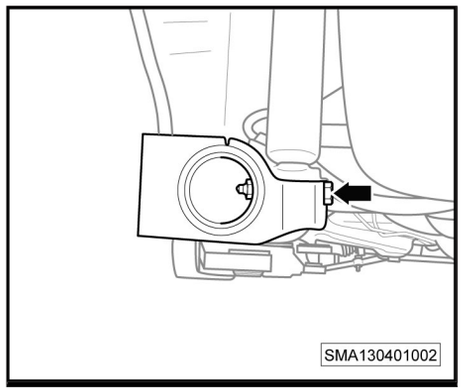
9. Remove the parking brake guy cable (-1-) to disengage the harness clamp on the rear axle (-2-). Unscrew the brake pipe nut (-arrow-) to disconnect the brake pipe.



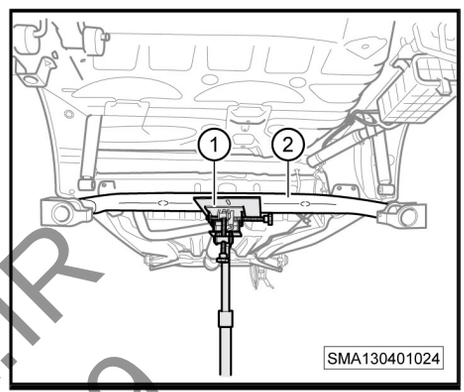
10. Remove the main silencer.=> refer to page 226

11. Unscrew the mounting bolts of the lower rear shock absorber (-arrow-).

- Tightening torque of the bolt: 75±2.5 N•m

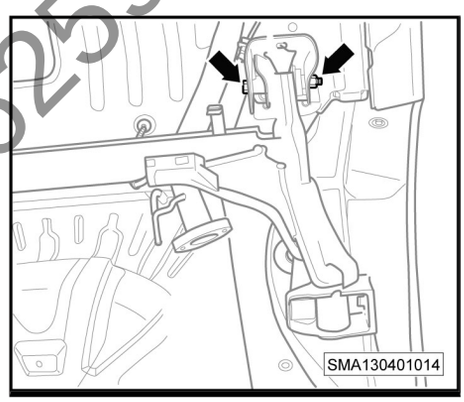


12. As shown in the figure, place the jack (-1-) in the middle of the rear axle (-2-).

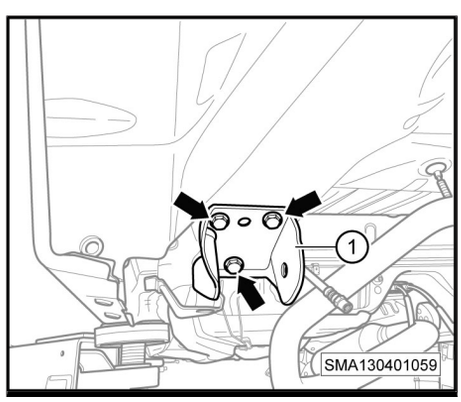


13. Unscrew the coupling bolts between the rear axle and the rear axle mounting bracket (-arrow-) to carefully remove the rear axle.

- Tightening torque of the bolt: 80±8 N•m



14. Unscrew the fixing bolt of the rear axle bracket (-arrow-) to remove the rear axle mounting bracket (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

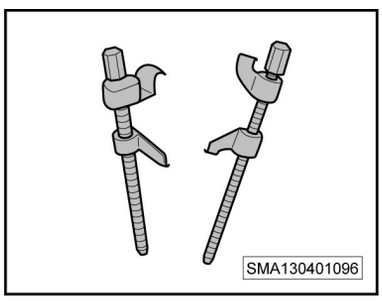
- Tighten the fixing bolts with the specified torque.
- After installing, drain the brake system.

4.4 Removing and installing the rear shock absorber spring

Warning

- When working on the shock absorber spring, the spring should not be overly compressed. It is workable that the spring is compressed to the extent that the nut can be rotated. Avoid spring damage and body injuries.

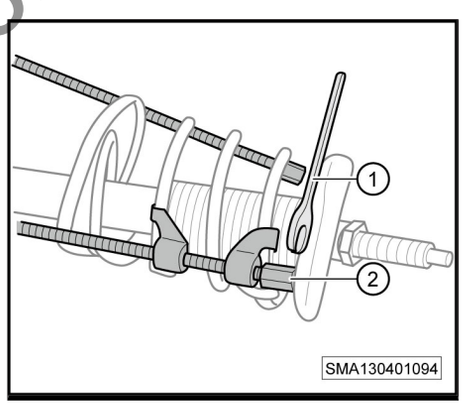
Maintenance tools and common equipment

	
Spring compressor	

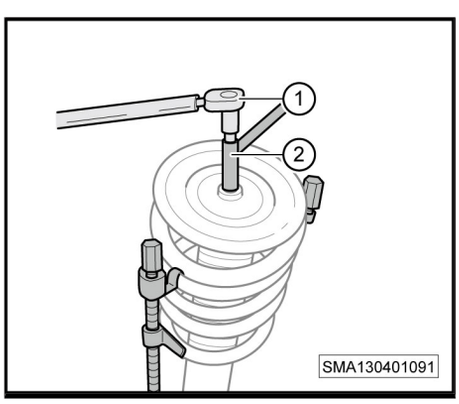
Disassembly

1. Remove the shock absorber .=> refer to page 629

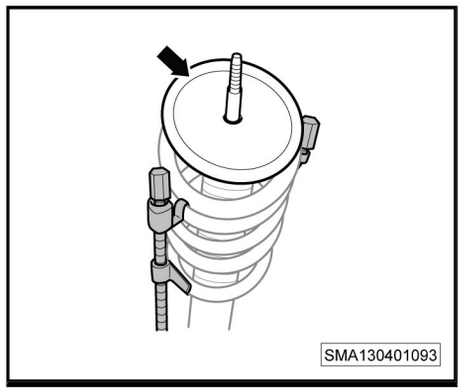
2. Install the spring compressor (-2-).Tighten the screw of the spring compressor with the wrench (-1-) to compress the spring.



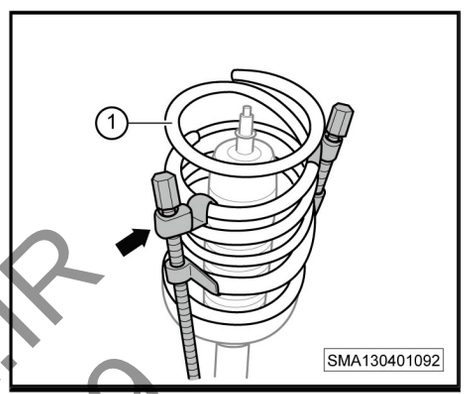
3. Fix the shock absorber shaft with the wrench (-1-). Unscrew the nuts on the shock absorber shaft with the wrench (-2-).
   - Tightening torque of the nut: 25±3 N•m



4. Remove the upper mounting bracket of the rear shock absorber spring (-arrow-).



5. Remove the compressor (-arrow-) and the shock absorber spring (-1-) together.

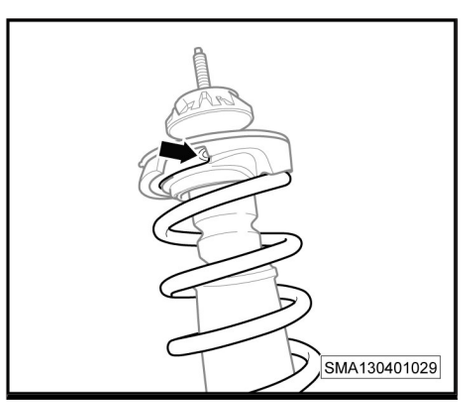


6. Loosen the compressor screw to release the shock absorber spring force. Separate the compressor from the shock absorber spring.

Assembly

Assembly shall follow the reverse sequence of the disassembly procedure.Please pay attention to the following notes:

- When assembling the shock absorber spring, be sure to properly install it (-arrow-).



- Tighten fixing nuts with the specified torque.
- Check and confirm that assembling the shock absorber is completed.

5 Wheel Alignment

5.1 Wheel alignment instructions

Note

- Install and align the measuring equipment as required. Be sure to operate according to the instructions provided by the equipment manufacturer.
- If necessary, the wheel alignment gauge manufacturer should instruct operation.
- Maintain the wheel alignment gauge on time.
- Carefully use the wheel alignment gauge.

Service technician must observe the following wheel alignment steps:

1. Check caster angle of the front wheel
2. Check camber angle of the front wheel
3. Check camber angle of the rear wheel
4. Check the rear wheel toe-in
5. Check the front wheel toe-in

Inspect wheel alignment before removing or replacing the following parts:

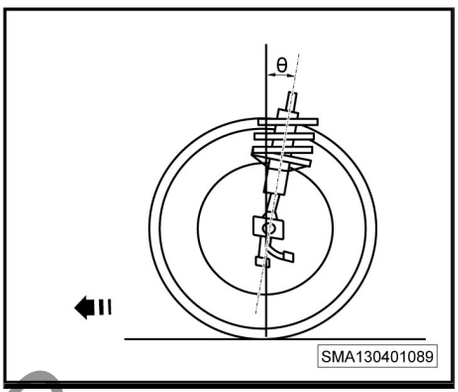
- Front lower control arm
- Front lower control arm ball joint
- Knuckle
- Front shock absorber
- Power steering gear
- Power steering gear link bar ball joint
- Front subframe

5.2 Checking the caster angle of the front wheel

Standard value of the caster angle of the front wheel

Item	Standard value
Caster angle of the front wheel	3°18′ ±30′

It is unnecessary to adjust the caster angle of the front wheel θ in driving the vehicle.The caster angle of the front wheel aims to keep the vehicle direction stable and provide the steering return capability.



5.3 Adjusting the camber angle of the front wheel

Note

- The camber angle of the front wheel can be adjusted through the diameter difference of coupling bolt bores between the shock absorber and the knuckle or through clearance fit between the lower control arm and the lower control arm ball joint.

Standard value of the camber angle of the front wheel

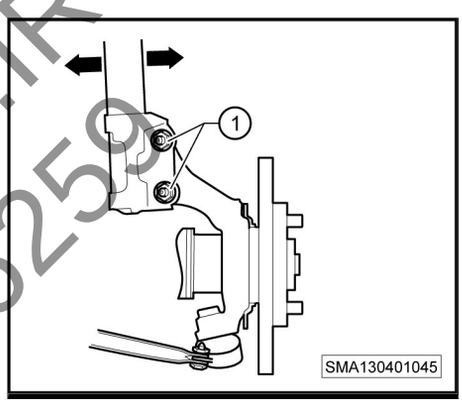
Item	Standard value
Camber angle of the front wheel	-30′ ±30′

Methods:

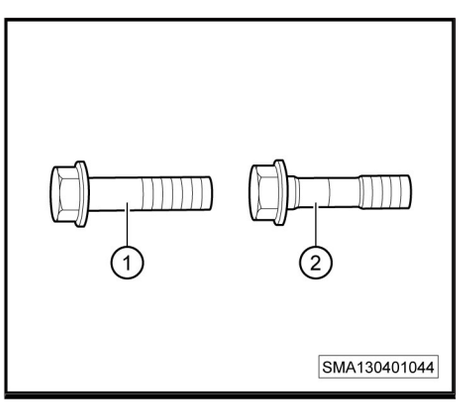
1. Lift the vehicle front. Be sure to prop the vehicle firmly. Remove the front wheel.

2. Loosen the coupling bolts between the shock absorber and the knuckle (-1-). Move from left to right in the (-arrow-) direction and adjust the camber angle.

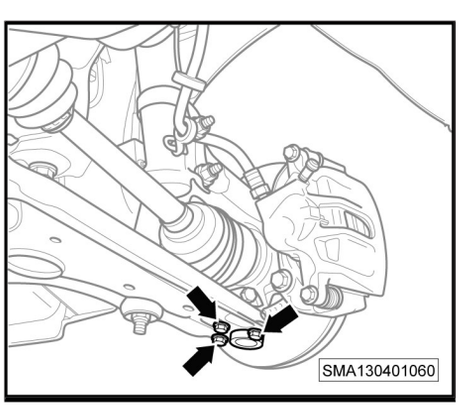
- Tightening torque of the bolt: 100±10 N•m



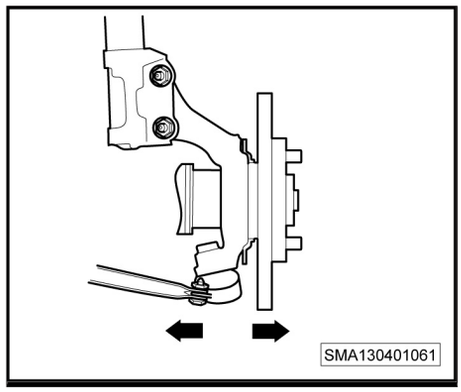
3. If further alignment is necessary, replacing the coupling bolts between the front shock absorber and the knuckle, adjust the camber angle of wheels. Replace M12 bolt (-1-) with M11 bolt (-2-). It is permissible to adjust the camber angle by about 1°.



4. Loosen the assembly bolts of the lower control arm ball joint (-arrow-).



5. Pull the knuckle from left and right in the (-arrow-) direction and adjust the camber angle.



6. Install the wheels.

5.4 Adjusting the front wheel toe-in

Standard value of the front wheel toe-in

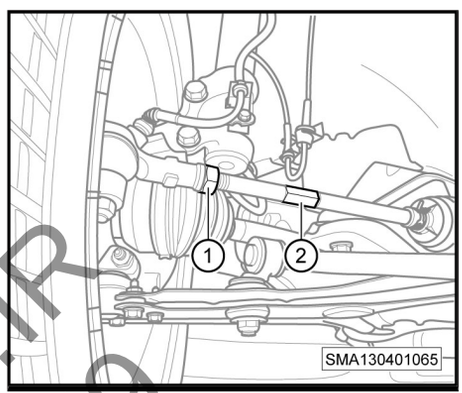
Item	Standard value
Front wheel toe-in	0°±10′

Adjustment:

1. Install the wheel alignment gauge as required.

2. Loosen the lock nut of the front wheel toe-in adjusting rod (-1-). If necessary, rotate the toe-in adjusting rod (-2-) until it meets the specified value.

- Tightening torque of the bolt: 55±5 N•m



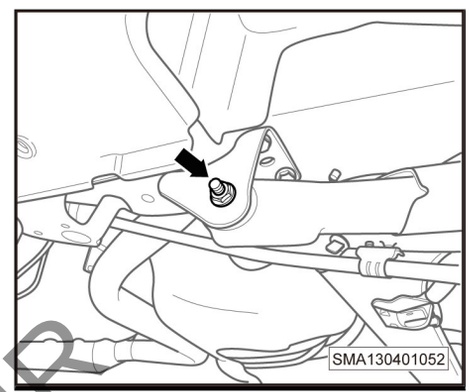
3. Fix the front wheel toe-in adjusting rod (-2-) with the tools. Tighten the lock nut of the front wheel toe-in adjusting rod (-1-).

5.5 Checking the rear wheel rake and the rear wheel toe-in

Standard values of the rear wheel rake and the rear wheel toe-in

Item	Standard value
Camber angle of the rear wheel	-90′ ±20′
Rear wheel toe-in	10′ ±15′

1. Measure the height of the center point of the coupling bolt between the rear axle and the vehicle body (-arrow-) to the left and right ground.

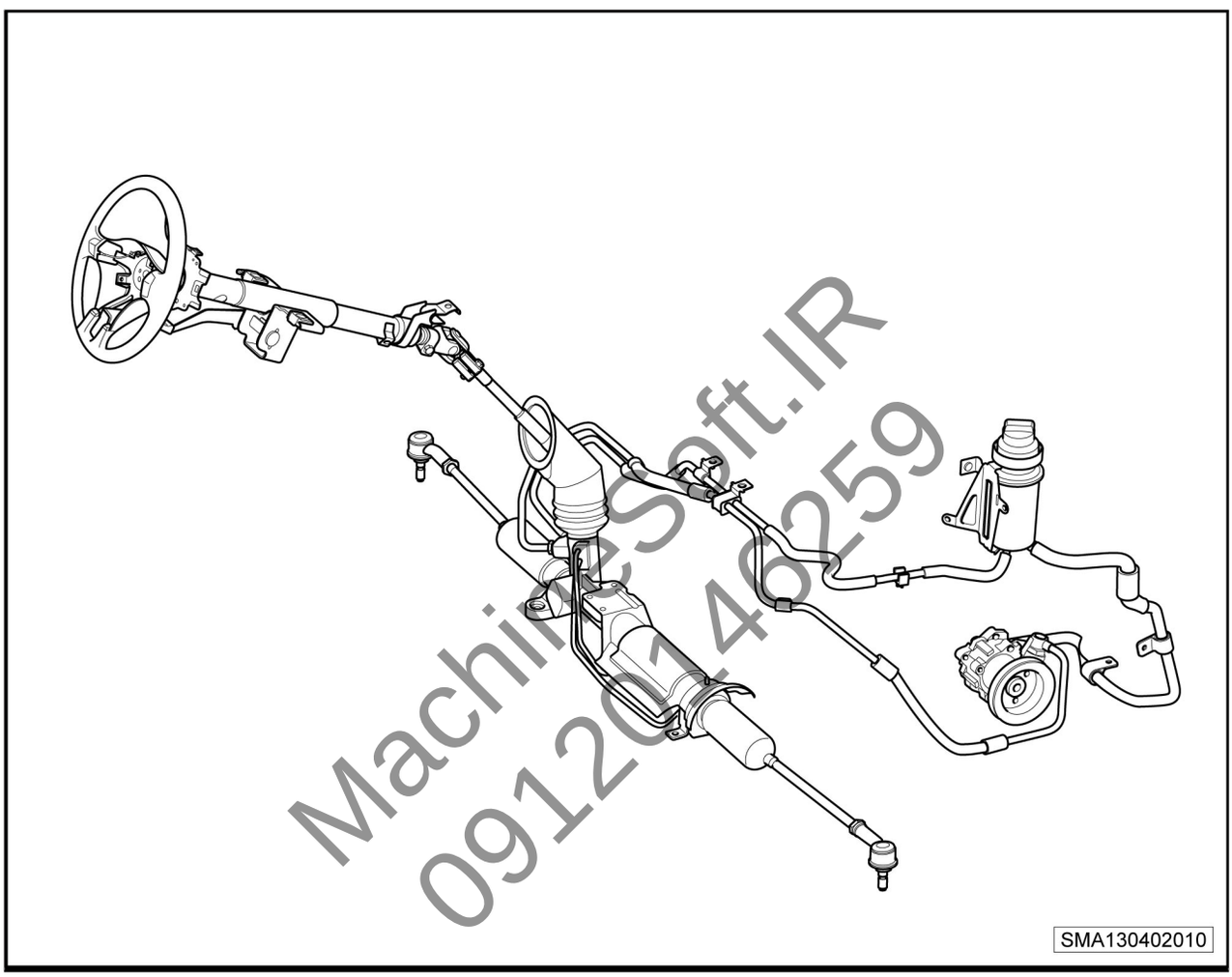


2. Different vehicle heights on the left and right imply damage or distortion on some parts of the front and rear suspension. If necessary, replace the damaged or distorted parts.
3. Check the rear wheel rake.If the rear wheel rake does not meet the specified value, check for damage or distortion of the rear suspension and wheels. If necessary, replace the damaged or distorted parts.
4. Check the rear wheel toe-in. If the rear wheel toe-in differs greatly on the left and right, check for damage or distortion of the rear suspension and wheels. If necessary, replace the damaged or distorted parts.

0402 Steering System

1 General Information

1.1 Overview



- This model features the hydraulic power steering system, which can reduce the work load when the driver operates the steering wheel and enhance the operating convenience and driving safety.
- The power steering gear comes with the hydraulic rack-and-pinion steering, a helical cylindrical gear structure with both ends linking to the tie rods. The structure features simple and compact construction and sensitive steering.
- The steering system consists of the following components:

  a. Steering wheel
  b. Steering column
  c. Steering universal joint
  d. Power steering gear assembly
  e. Power steering fluid reservoir
  f. Power steering pump
  g. Steering system high pressure pipe
  h. Steering system low pressure pipe

1.2 Important notes

- Please wear necessary protective articles during repair to avoid accidents.
- This vehicle is equipped with the driver airbag. Please follow the standard procedure to remove the steering wheel.
- When removing and installing parts around the thermal parts, you shall not operate until the thermal parts drop to normal temperature to avoid scald.
- Only use the power steering fluid approved by Chery Automobile Co., Ltd..
- The automatic transmission oil ATF-III is used as the power steering fluid.
- The power steering fluid pipe shall be sealed immediately after disconnection to prevent foreign matters from getting in.
- Human body shall avoid contacting with the power steering fluid when removing the steering system.
- The status shall last no longer than ten seconds when the steering wheel turns to its limit position.
- Never operate the power steering pump when lack of power steering fluid.

1.3 Product specifications

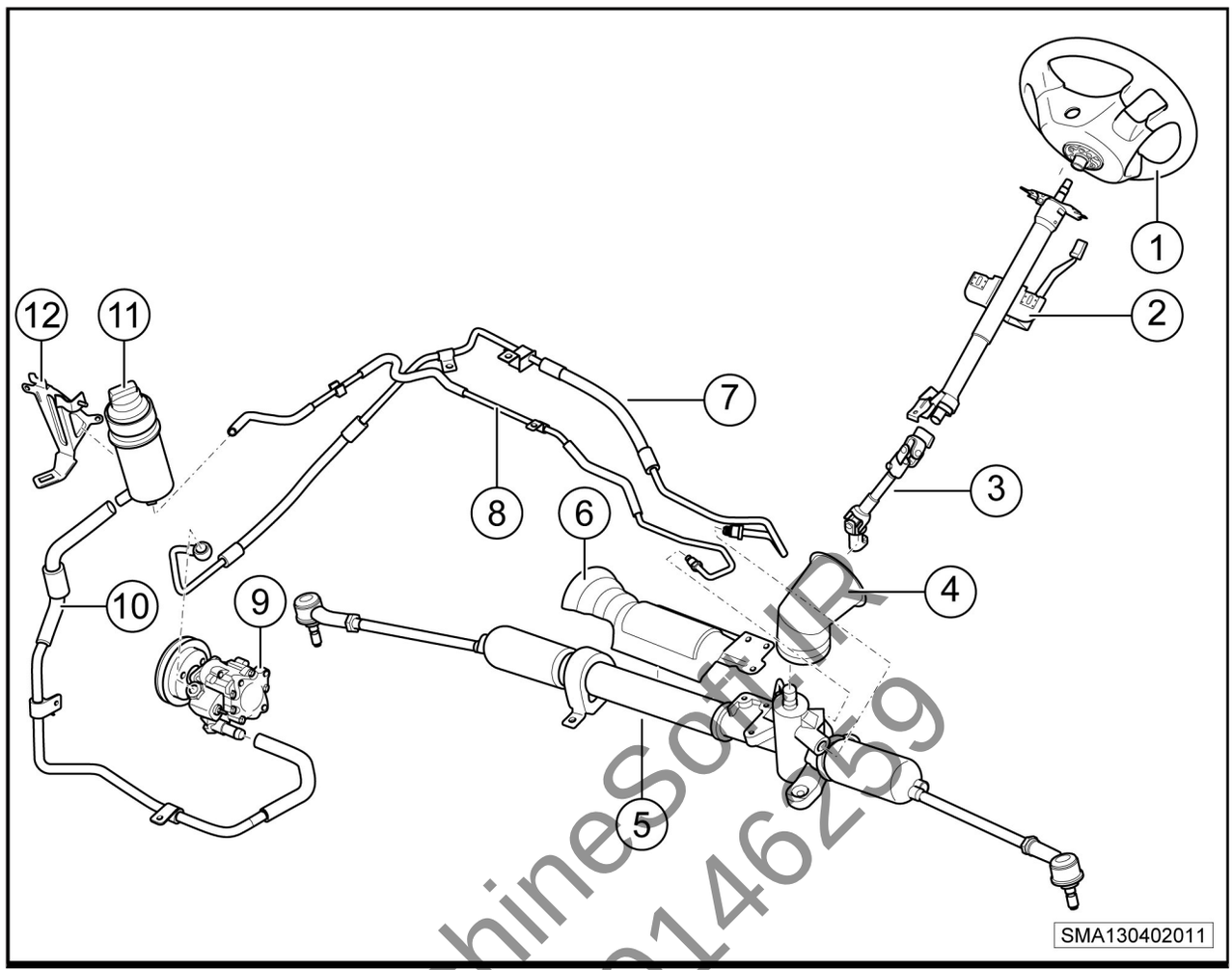
Torque specifications

Component	Torque (N·m)
Assembling bolt of the power steering gear assembly	30±3
Fixing bolt of the steering wheel	35±5
Fixing bolt of the power steering pump mounting bracket	50±5
Coupling nut between the steering column and the cross car beam	25±3
Hollow bolt of the power steering pump	45±5
Lock nut of the steering gear tie rod ball joint	35±4
Tension adjustment bolt of the power steering pump belt	25±2
Fixing bolt of the power steering pump bracket	25±2
Fixing bolt of the power steering gear heat shield	25±3
Fixing nut of the power steering gear heat shield	8±1

Power steering fluid specifications

Component	Model
Power steering fluid	ATF-III

1.4 The steering system assembly drawing



1. Steering wheel	2. Steering column
3. Universal joint assembly	4. Universal joint assembly shield
5. Power steering gear	6. Power steering gear heat shield
7. Power steering pump high pressure pipe	8. Power steering gear return pipe
9. Power steering pump	10. Power steering pump suction pipe
11. Power steering fluid reservoir	12. Mounting bracket of the power steering fluid reservoir

2 Diagnosis and Inspection

2.1 Steering system fault diagnosis list

Item	Possible causes	Troubleshooting
Heavy steering	Low steering gear tire pressure	Adjust the tire pressure to the standard value
	Misaligned front wheels	Check and adjust the front wheel alignment
	Lack of power steering fluid	Add power steering fluid
	Looseness of the power steering pump poly V-belt	Adjust the poly V-belt
	Severe wear of the power steering pump poly V-belt	Replace the poly V-belt
	Leakage or blockage of the power steering fluid pipe	Replace the power steering fluid pipe
	Failure of the power steering pump	Replace the power steering pump
	Failure of the power steering gear	Replace the power steering gear
Abnormal noise of the steering system	Looseness of the steering linkage	Tighten the steering system
	Damage to the power steering pump poly V-belt	Replace the poly V-belt
	Failure of the power steering gear	Replace the power steering gear
	Failure of the power steering pump	Replace the power steering pump
	Failure of the power steering gear universal joint assembly	Replace the power steering gear universal joint assembly
Poor wheel returnability	Low steering gear tire pressure	Adjust the tire pressure to the standard value
	Misaligned front wheels	Check and adjust the front wheel alignment
	Failure of the power steering gear	Replace the power steering gear
Excessive steering wheel clearance	Wear or looseness of the ball joint	Replace the ball joint
	Wear of the front wheel bearing	Replace the bearing
	Failure of the power steering gear universal joint assembly	Replace the power steering gear universal joint assembly
	Failure of the power steering gear	Replace the power steering gear

2.2 Checking the steering system

Basic items

1. Check all fixing bolts of the steering system for looseness. Tighten them if necessary.
2. Check the steering wheel for clearance. If there is, please check and adjust the steering wheel.

Checking the steering tie rods

1. Check the tie rod ball joint for looseness. If there is, please replace the ball joint.
2. Check the dust cover of the tie rod ball joint for damage. If there is, please replace the dust cover.

Checking the power steering gear

1. Check the power steering gear dust cover for breakage. If there is, please replace the dust cover; otherwise, water and dust is prone to get in and damage the parts earlier.
2. Check the power steering gear for damage. If there is, please replace the power steering gear.

Checking the power steering pump

1. Check the power steering pump for blockage. If there is, please replace the power steering pump.
2. Check the power steering pump bearing for abnormal noise. If there is, please replace the power steering pump bearing.
3. Check the steering system pipeline for leakage. If there is, please replace the steering system pipeline.

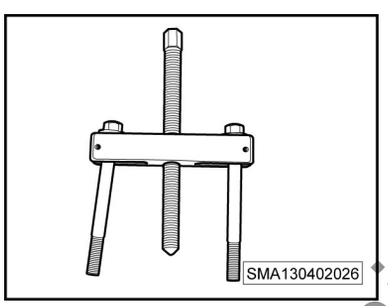
3 Steering Column

3.1 Removing and installing the steering wheel

Note

- This vehicle is equipped with the driver airbag. Please follow the standard procedure to remove the steering wheel.
- Before removing the steering wheel, use a marking pen to mark on the engaged teeth between the steering column and the steering wheel for match.
- When removing the steering wheel, never knock the steering wheel or the steering column shaft.

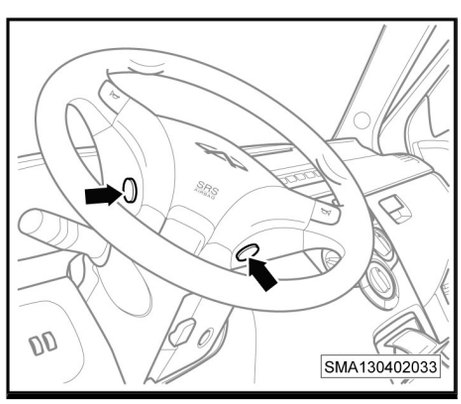
Maintenance tools and common equipment

	
Steering wheel puller	

Removal

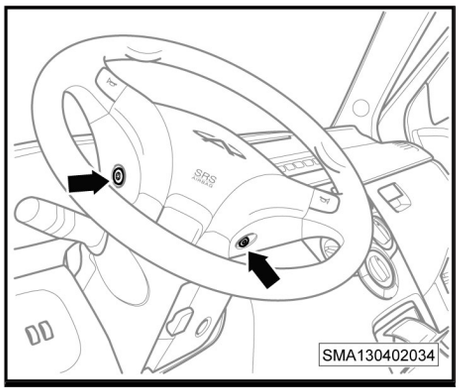
1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.

3. Remove the fixing bolt decorative caps of the driver airbag (-arrow-).

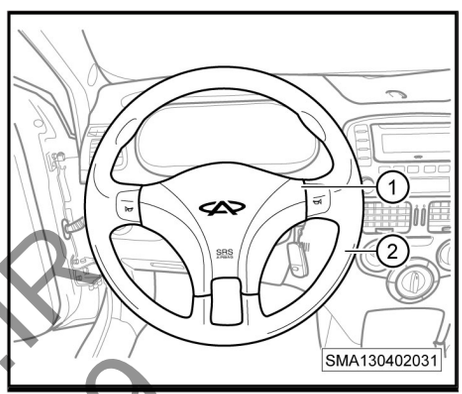


4. Unscrew the fixing bolts of the driver airbag (-arrow-).

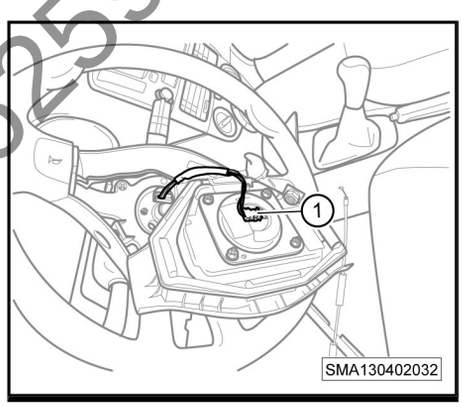
- Tightening torque of the bolt: 25±3 N•m



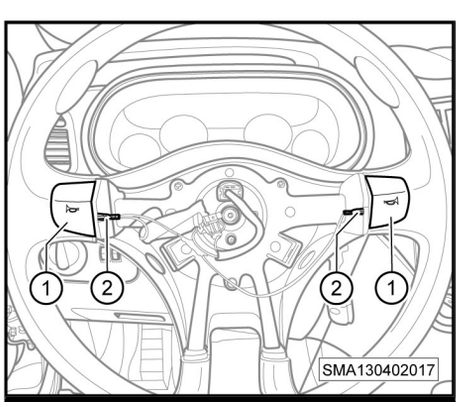
5. Remove the driver airbag (-1-) from the steering wheel (-2-).



6. Disconnect the driver airbag connector (-1-).



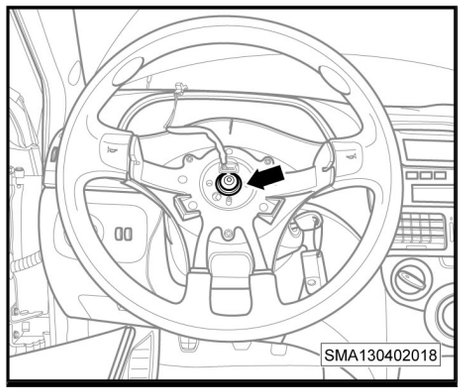
7. Disconnect the connectors (-2-) of the horn buttons (-1-).



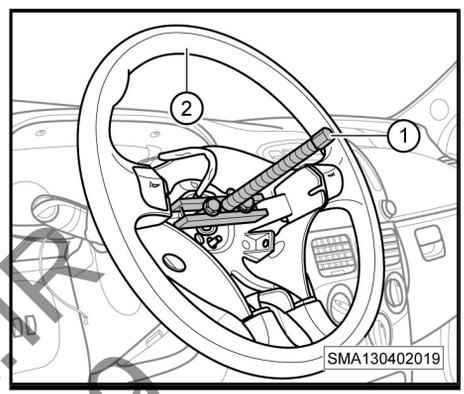
8. Turn the steering wheel to the mean position (the wheels are in the straight running position).

9. Unscrew the fixing nut of the steering wheel (-arrow-).

- Tightening torque of the nut: 35±5 N•m



10. Rotate the puller screw (-1-) and pull out the steering wheel (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Install the steering wheel according to the match marks on the engaged teeth between the steering column and the steering wheel.

3.2 Removing and installing the steering column cover

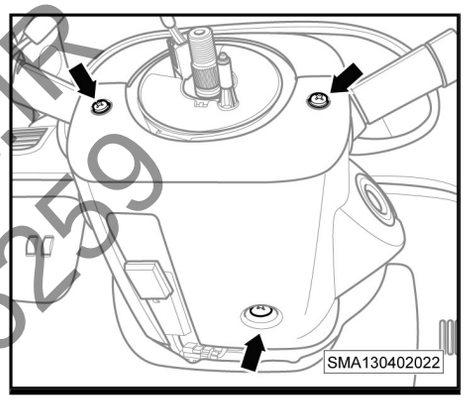
Note

- This vehicle is equipped with the driver airbag. Please follow the standard procedure to remove the steering wheel.
- Before removing the steering wheel, use a marking pen to mark on the engaged teeth between the steering column and the steering wheel for match.
- When removing the steering wheel, never knock the steering wheel or the steering column shaft.

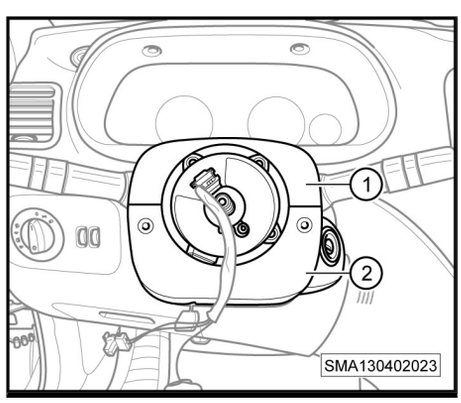
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the steering wheel.=> refer to page 650

4. Unscrew the assembling bolts of the steering wheel cover (-arrow-).



5. Separate the steering column cover (-1-) from (-2-) and remove them.



Installation

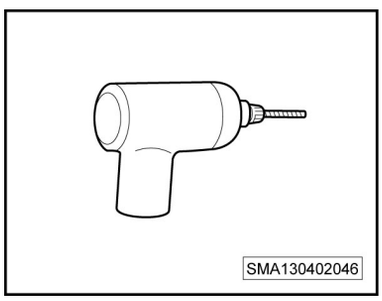
Installation shall follow the reverse sequence of the removal procedure.

3.3 Removing and installing the steering column

Note

- This vehicle is equipped with the driver airbag. Please follow the standard procedure to remove the steering wheel.
- Before removing the steering wheel, use a marking pen to mark on the engaged teeth between the steering column and the steering wheel for match.
- When removing the steering wheel, never knock the steering wheel or the steering column shaft.

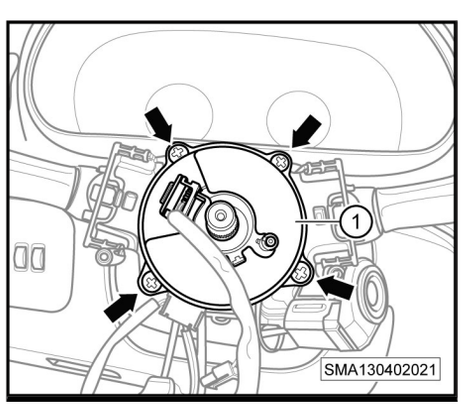
Maintenance tools and common equipment

	
Electric drill	

Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the steering wheel.=> refer to page 650
4. Remove the steering column cover .=> refer to page 653
5. Remove the lower dashboard on the driver's side.=> refer to page 832

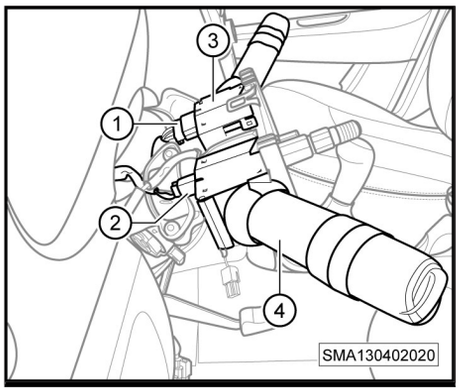
6. Unscrew the inner ring fixing bolts (-arrow-) and remove the inner ring (-1-).



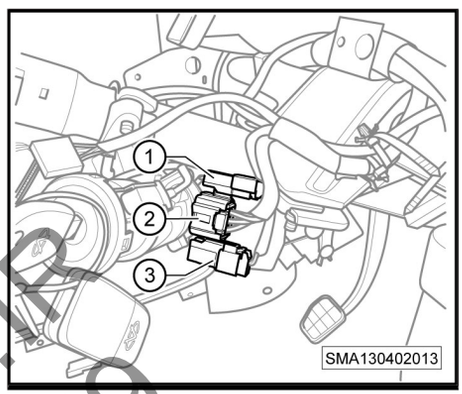
Note

- Never disassemble or repair the inner ring.

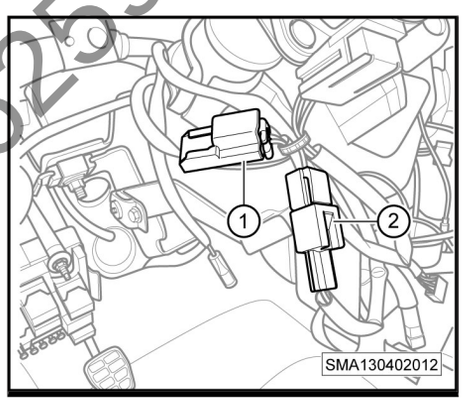
7. Disconnect the wiper combination switch connector (-1-) and the light combination switch (-2-), and remove the wiper combination switch (-3-) and the light combination switch (-4-).



8. Disconnect the ignition lock connectors (-1-), (-2-) and (-3-).

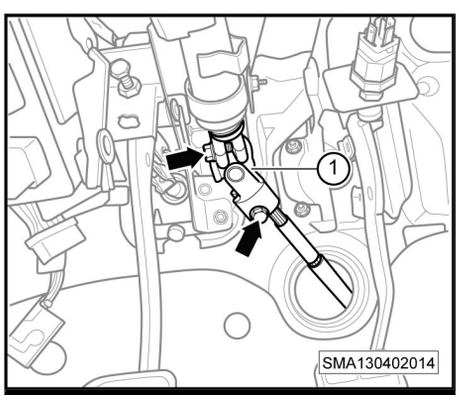


9. Disconnect the driver airbag wiring harness connector (-1-) and the horn wiring harness (-2-).



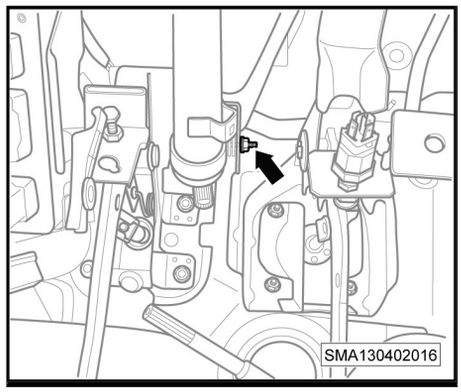
10. Unscrew the assembling bolts of the steering universal joint (-arrow-) and remove the steering universal joint (-1-).

- Tightening torque of the bolt: 25±3 N•m



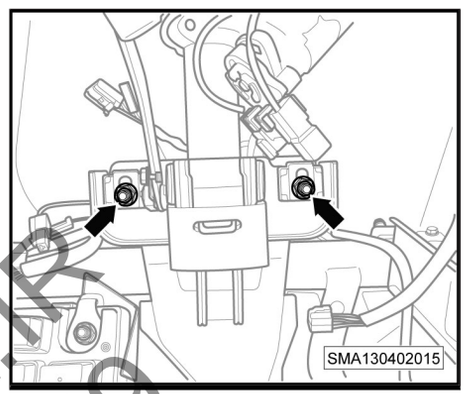
11. Unscrew the coupling nut between the steering column and the cross car beam (-arrow-).

- Tightening torque of the nut: 25±3 N•m

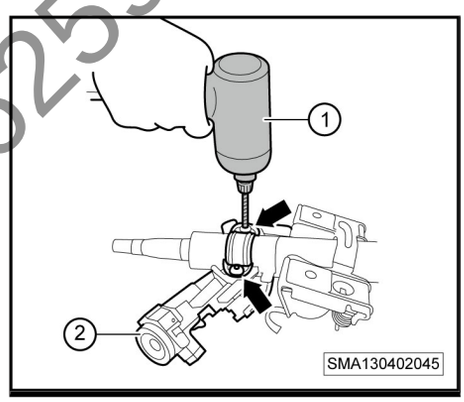


12. Unscrew the coupling nuts between the steering column and the cross car beam (-arrow-) and remove the steering column.

- Tightening torque of the nut: 25±3 N•m



13. Carefully drill out the fixing bolts (-arrow-) of the ignition lock (-2-) with an electric drill (-1-) and remove the ignition lock (-2-).



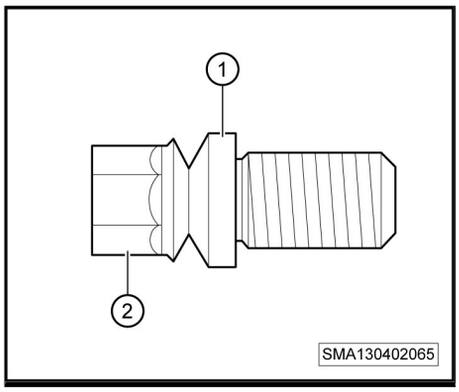
04

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Please follow the standard procedure to avoid damaging the ignition lock.
- Before installing the steering wheel, adjust the front wheel to the straight running position.
- When installing the inner ring, turn it to the limitposition clockwise and then turn it 3.2 circlesanticlockwise to make the arrow mark on the spiral cable aligning with the arrow mark on the inner ring housing .

- Install the fixing bolt of the ignition lock (-1-) and unscrew it until the hexagon head (-2-) falls off.



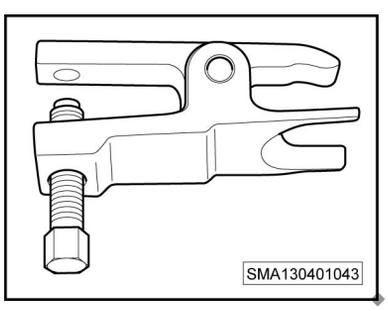
4 Power Steering Gear

4.1 Removing and installing the power steering gear

Note

- Block the disconnected power steering fluid pipe with a stopper to prevent foreign matters from getting in.
- When disconnecting the pipe, recover the fluid in the pipe with a collection vessel to avoid polluting the vehicle and environment.
- Only use the power steering fluid approved by Chery Automobile Co., Ltd..

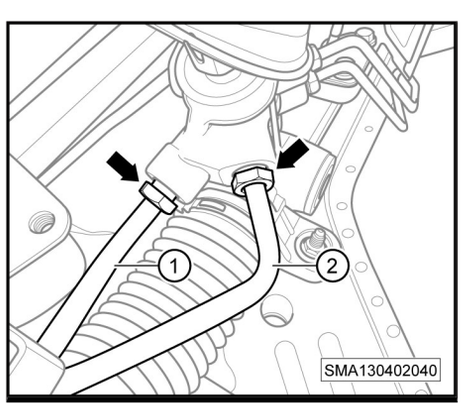
Maintenance tools and common equipment

	
Ball joint separator	

Removal

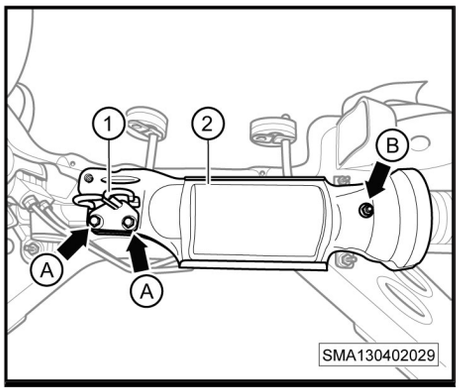
1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Discharge the power steering fluid .=> refer to page 40
4. Remove the front subframe .=> refer to page 624

5. Unscrew the fixing nuts (-arrow-) of the power steering fluid pipes (-1-) and (-2-).
   - Tightening torque of the nut: 35±3 N•m



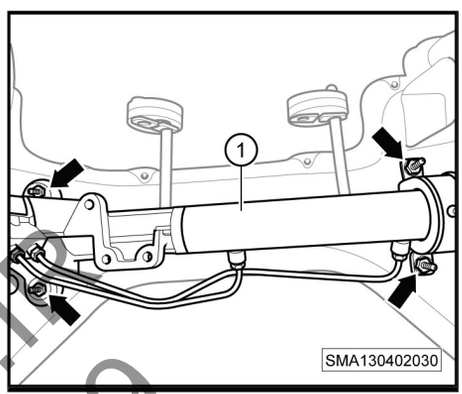
6. Unscrew the bolts (-arrow A-) and remove the hook (-1-). Unscrew the fixing nut (-arrow B-) of the power steering gear heat shield (-2-) and remove the heat shield (-2-).

- Tightening torque of the bolt (-arrow A-): 25±3 N•m
- Tightening torque of the bolt (-arrow B-): 8±1 N•m



7. Unscrew the nuts of the power steering gear fixing bolts (-arrow-) and remove the power steering gear (-1-).

- Tightening torque of the nut: 30±3 N•m



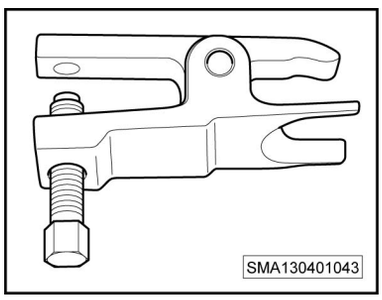
Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the steering oil=> refer to page 40.
- After installation, check the wheel alignment. Adjust it if necessary .

4.2 Removing and installing the power steering gear tie rod ball joint

Maintenance tools and common equipment

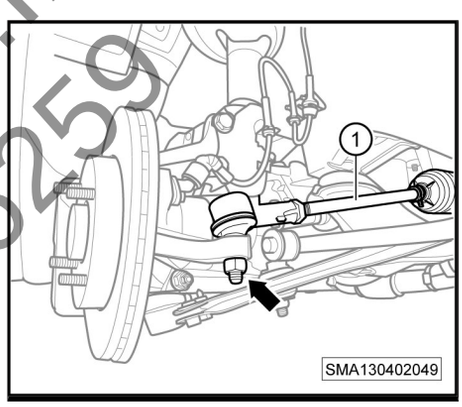
	
Ball joint separator	

Removal

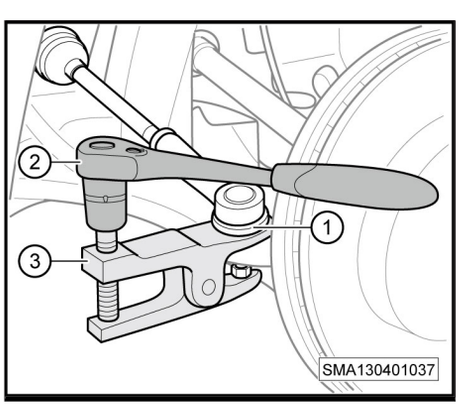
1. Remove the front wheels .=> refer to page 760

2. Loosen the lock nut (-arrow-) of the power steering gear tie rod (-1-).

- Tightening torque of the nut: 35±4 N•m

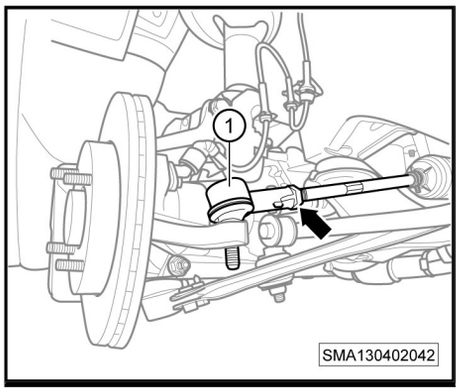


3. Install the ball joint separator (-3-) and tighten the screw of the ball joint separator with a wrench (-2-), and press out the tie rod ball (-1-) from the knuckle.



4. Unscrew the lock nut of the power steering gear tie rod (-arrow-) and remove the tie rod ball joint (-1-).

- Tightening torque of the nut: 55±5 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- After installation, check the wheel alignment. Adjust it if necessary .

5 Power Steering Pump

5.1 Removing and installing the power steering pump

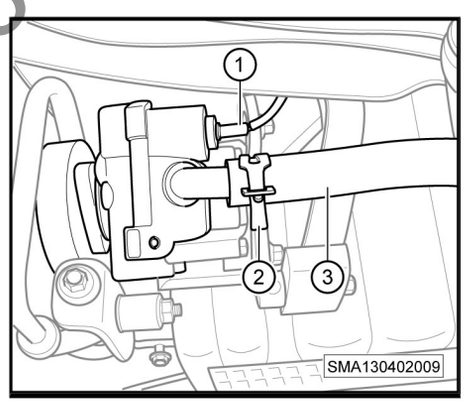
Note

- Block the disconnected steering system pipeline with a stopper to prevent foreign matters from getting in.
- When disconnecting the pipe, recover the fluid in the pipe with a collection vessel to avoid polluting the vehicle and environment.
- Only use the power steering fluid approved by Chery Automobile Co., Ltd..

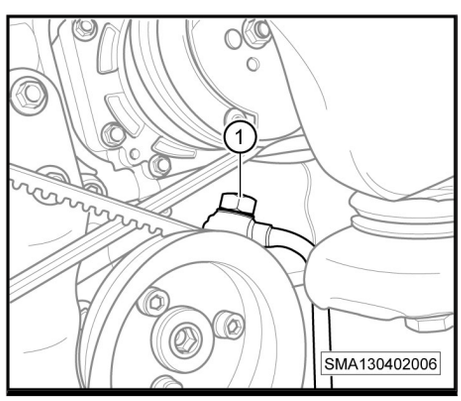
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Discharge the power steering fluid .=> refer to page 40

3. Disconnect the power steering pump pressure switch connector (-1-) and loosen the clamp of the power steering pump suction pipe (-2-), and then disconnect the suction pipe (-3-).

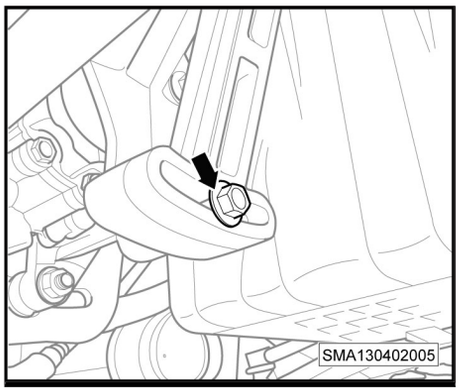


4. Unscrew the coupling bolt between the power steering pump high pressure pipe and the power steering pump (-1-).
   - Tightening torque of the bolt: 45±3 N•m



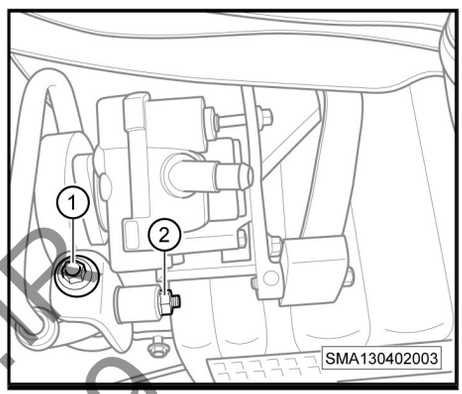
5. Unscrew the assembling bolt of the power steering pump (-arrow-).

- Tightening torque of the bolt: 20±2 N•m

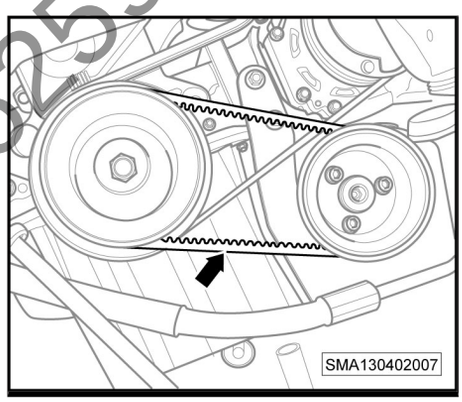


6. Loosen the fixing nut (-2-) and unscrew the tension adjustment bolt of the power steering pump poly V-belt (-1-); unscrew the fixing nut (-2-) and remove the coupling bolts between the tension adjustment bracket of the power steering pump poly V-belt and the power steering pump.

- Tightening torque of bolt (-1-): 25±2 N•m
- Tightening torque of nut (-2-): 20±2 N•m

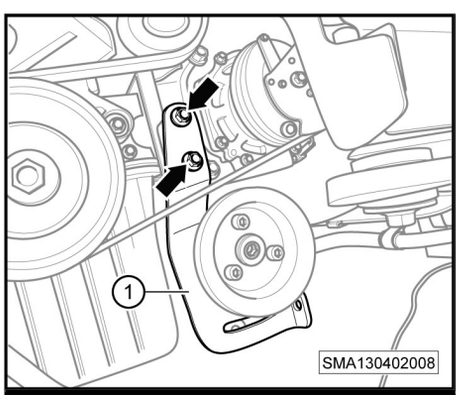


7. Remove the power steering pump poly V-belt (-arrow-).



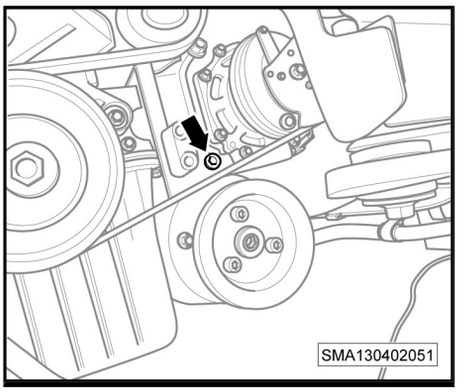
8. Unscrew the fixing bolts (-arrow-) of the power steering pump poly V-belt adjustment bracket and remove the adjustment bracket (-1-).

- Tightening torque of the bolt: 50±5 N•m



9. Unscrew the coupling bolt between the power steering pump and the compressor mounting bracket (-arrow-) and remove the power steering pump.

- Tightening torque of the bolt: 25±2 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the power steering fluid => refer to page 40.

5.2 Removing and installing the power steering fluid reservoir

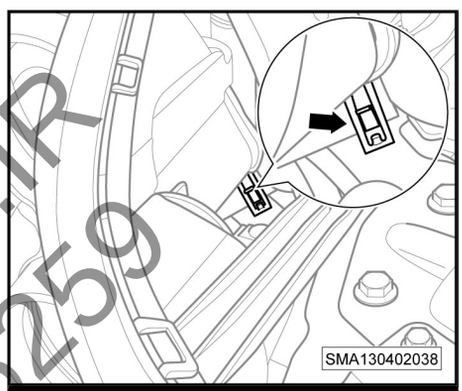
Note

- Block the disconnected steering system pipeline with a stopper to prevent foreign matters from getting in.
- When disconnecting the pipe, recover the fluid in the pipe with a collection vessel to avoid polluting the vehicle and environment.
- Only use the power steering fluid approved by Chery Automobile Co., Ltd..

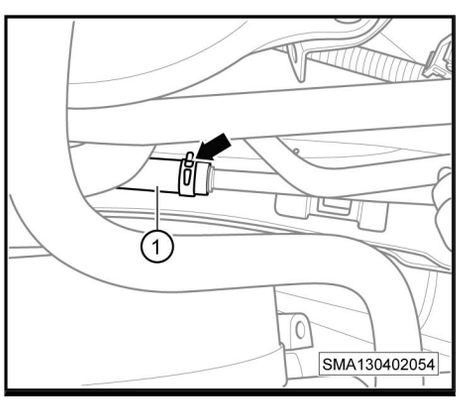
Removal

1. Discharge the power steering fluid => refer to page 40.

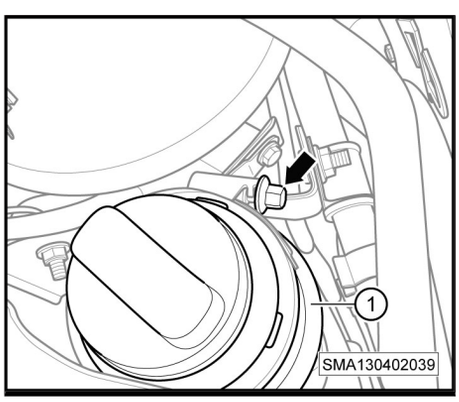
2. Loosen the clamp of the power steering pump suction pipe (-arrow-) and disconnect the power steering pump suction pipe from the power steering fluid reservoir.



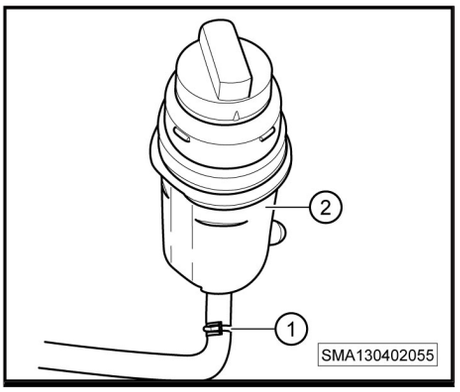
3. Loosen the clamp of the power steering pump return pipe (-arrow-) and disconnect the power steering gear return pipe (-1-).



4. Unscrew the fixing clamp bolt of the power steering reservoir (-arrow-) and remove the power steering fluid reservoir (-1-).



5. Loosen the oil pipe clamp (-1-) and remove the power steering fluid reservoir (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the power steering fluid => refer to page 40.

5.3 Removing and installing the steering system high pressure pipe

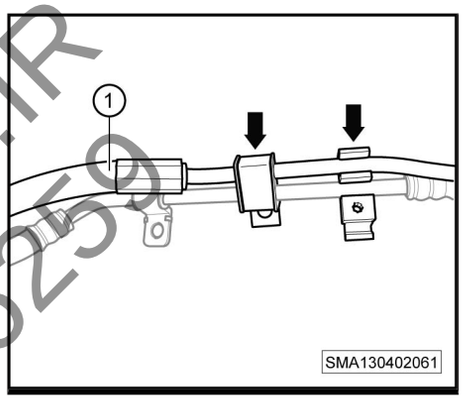
Note

- Block the disconnected steering system pipeline with a stopper to prevent foreign matters from getting in.
- When disconnecting the pipe, recover the fluid in the pipe with a collection vessel to avoid polluting the vehicle and environment.
- Only use the power steering fluid approved by Chery Automobile Co., Ltd..

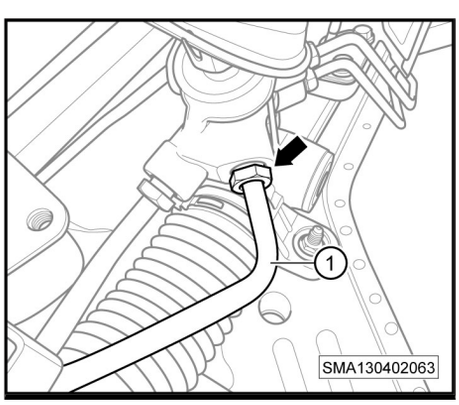
Removal

1. Discharge the power steering fluid.=> refer to page 40
2. Remove the front wheels .=> refer to page 760
3. Remove the front subframe .=> refer to page 624

4. Loosen the clips of the power steering gear high pressure pipe (-arrow-) and remove the high pressure pipe (-1-).



5. Unscrew the coupling nut (-arrow-) between the power steering gear high pressure pipe (-1-) and the power steering gear, and remove the high pressure pipe (-1-).
   - Tightening torque of the nut: 35±3 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the power steering fluid .
- After installation, check the wheel alignment. Adjust it if necessary.

5.4 Removing and installing the steering system low pressure pipe

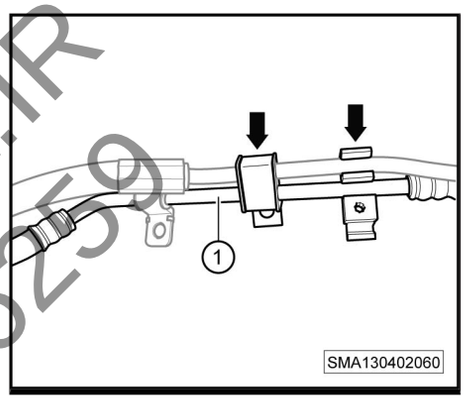
Note

- Block the disconnected steering system pipeline with a stopper to prevent foreign matters from getting in.
- When disconnecting the pipe, recover the fluid in the pipe with a collection vessel to avoid polluting the vehicle and environment.
- Only use the power steering fluid approved by Chery Automobile Co., Ltd..

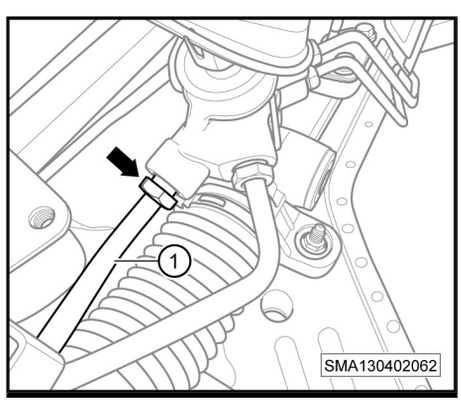
Removal

1. Discharge the power steering fluid.=> refer to page 40
2. Remove the front wheels .=> refer to page 760
3. Remove the front subframe .=> refer to page 624

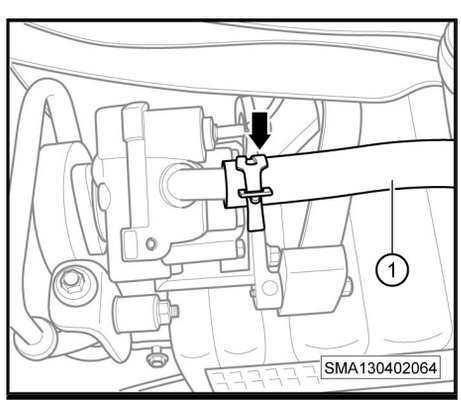
4. Loosen the clips of the power steering gear return pipe (-arrow-) and remove the return pipe (-1-).



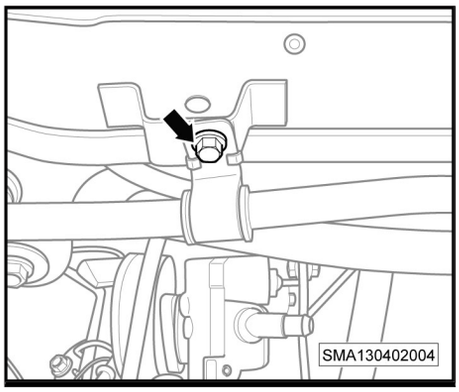
5. Unscrew the coupling nut (-arrow-) between the power steering gear return pipe (-1-) and the power steering gear, and remove the return pipe (-1-).
   - Tightening torque of the nut: 35±3 N•m



6. Loosen the clamp (-arrow-) and remove the power steering pump suction pipe (-1-).

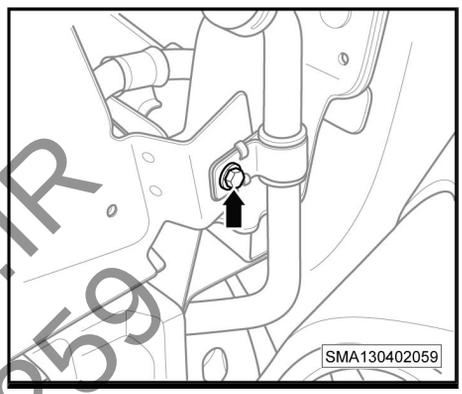


7. Unscrew the fixing bolt of the power steering pump suction pipe clip (-arrow-).

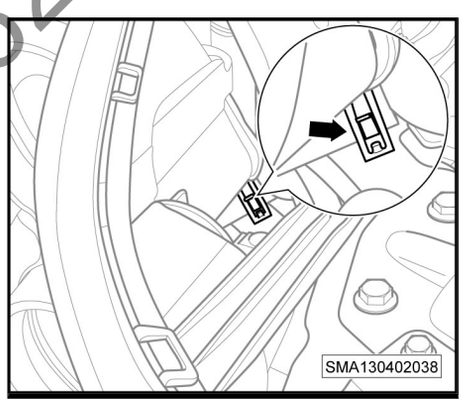


8. Remove the front bumper .=> refer to page 838

9. Unscrew the fixing bolt of the power steering pump suction pipe clip (-arrow-).

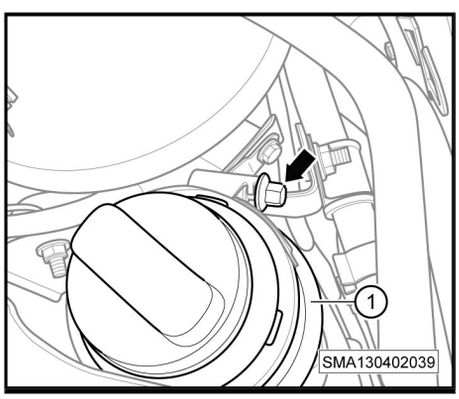


10. Loosen the coupling clamp between the power steering fluid reservoir and the power steering pump suction pipe (-arrow-), and remove the suction pipe.

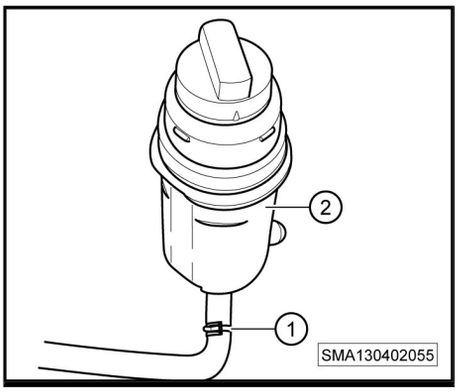


11. Unscrew the fixing clamp bolt of the power steering reservoir (-arrow-) and remove the reservoir (-1-).

- Tightening torque of the bolt: 5±1 N•m



12. Loosen the pipe clamp (-2-) and remove the return pipe (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the power steering fluid .
- After installation, check the wheel alignment. Adjust it if necessary .

5.5 Checking and replacing the power steering fluid

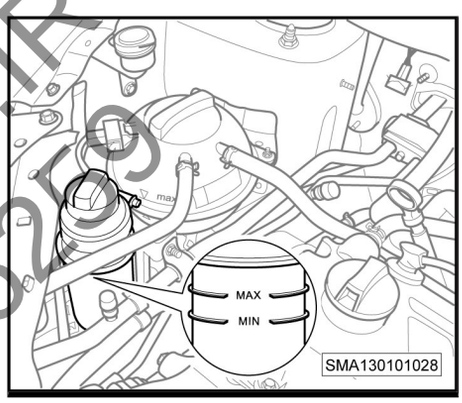
Note

- Block the disconnected steering system pipeline with a stopper to prevent foreign matters from getting in.
- When disconnecting the pipe, recover the fluid in the pipe with a collection vessel to avoid polluting the vehicle and environment.
- Only use the power steering fluid approved by Chery Automobile Co., Ltd..

Inspection

1. Park the vehicle on level ground.
2. Start the engine and turn the steering wheel to the left and right for several turns and then reset the steering wheel.
3. Switch off the ignition switch.

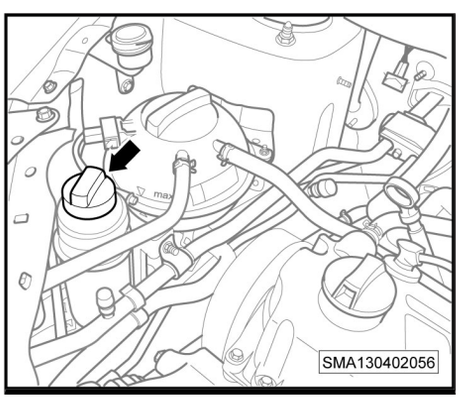
4. Check the power steering fluid level to assure it between the MAX (maximum) and MIN (minimun) marks.



5. When the power steering fluid level is higher than the MAX (maximum) mark, please discharge the power steering fluid. When the power steering fluid level is lower than the MIN (minimum) mark, please check the steering system pipe for leakage. If there is, repair it.

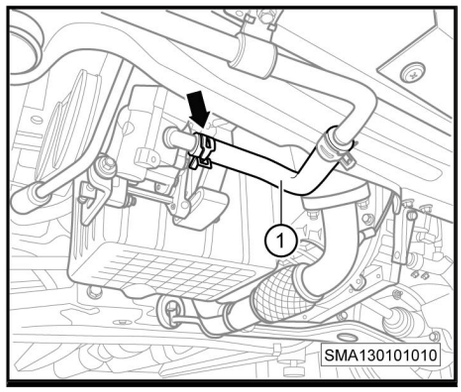
Discharge

1. Open the sealing cap of the power steering fluid reservoir (-arrow-).



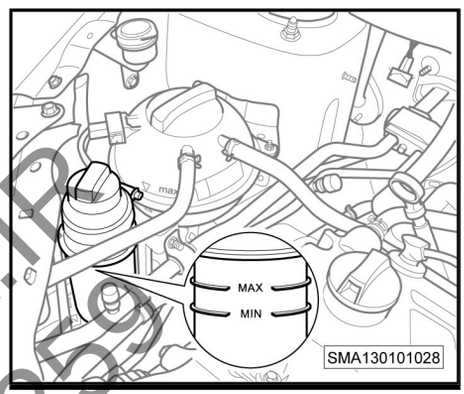
2. Lift the vehicle and place the collection vessel under the vehicle.

3. Loosen the clamp (-arrow-) and disconnect the pipe connection (-1-).
4. Turn the steering wheel to the left and right and discharge the power steering fluid completely.
5. Install the connection pipe (-1-) and the fixing clamp (-arrow-).



Filling

1. Add power steering fluid until the fluid level is between the MIN (minimum) and the MAX (maximum) marks.
2. When the engine runs at idle speed, turn the steering wheel from the left limit position to the right limit position repeatedly until no bubbles are seen in the oil reservoir. If the fluid level drops, please add the power steering fluid continuously until the fluid level reaches the specified MAX (maximum) mark.



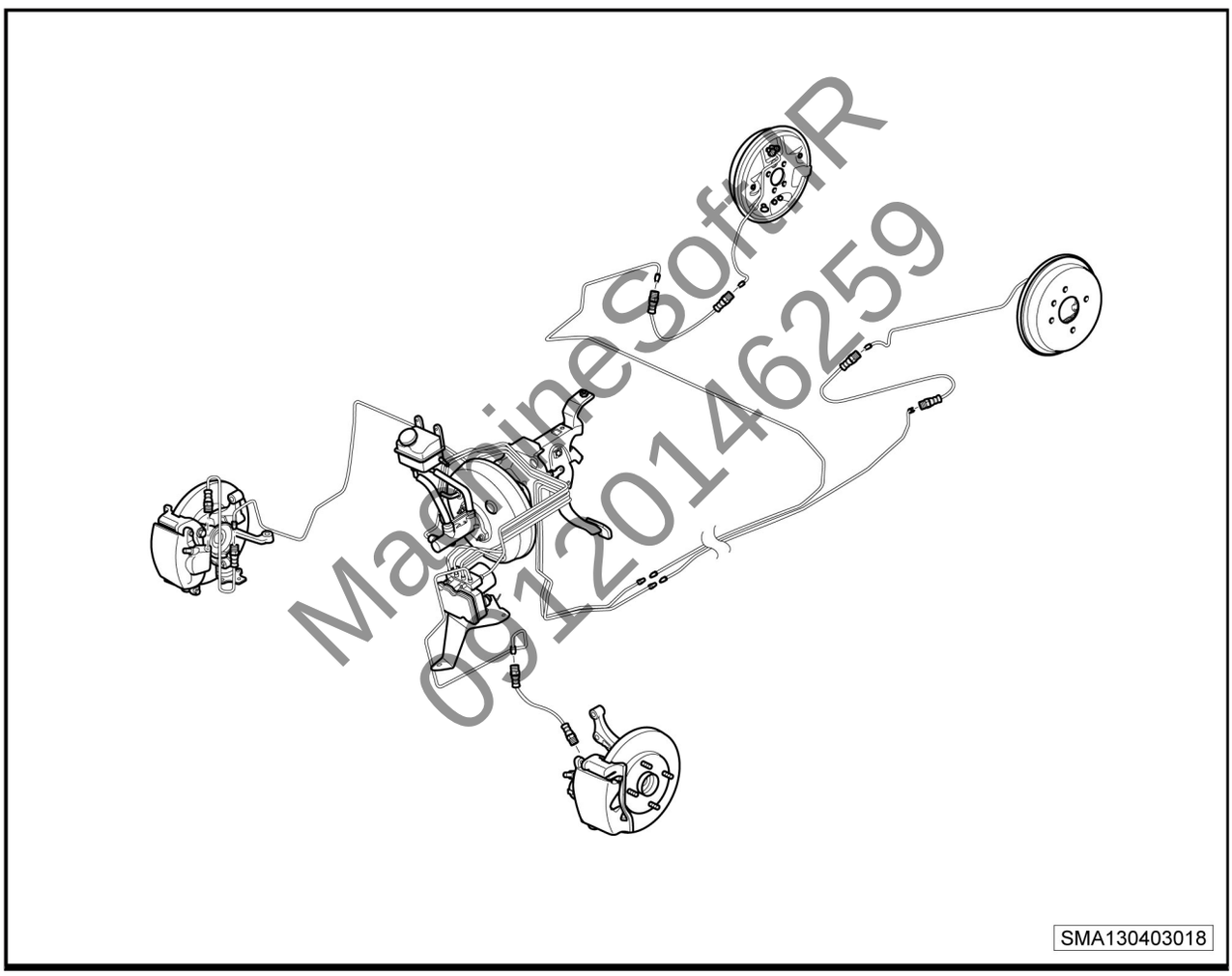
3. Switch off the engine and check the power steering fluid level. Add some if necessary.

0403 Brake System

1 General Information

1.1 Overview

1.1.1 Regular brake system

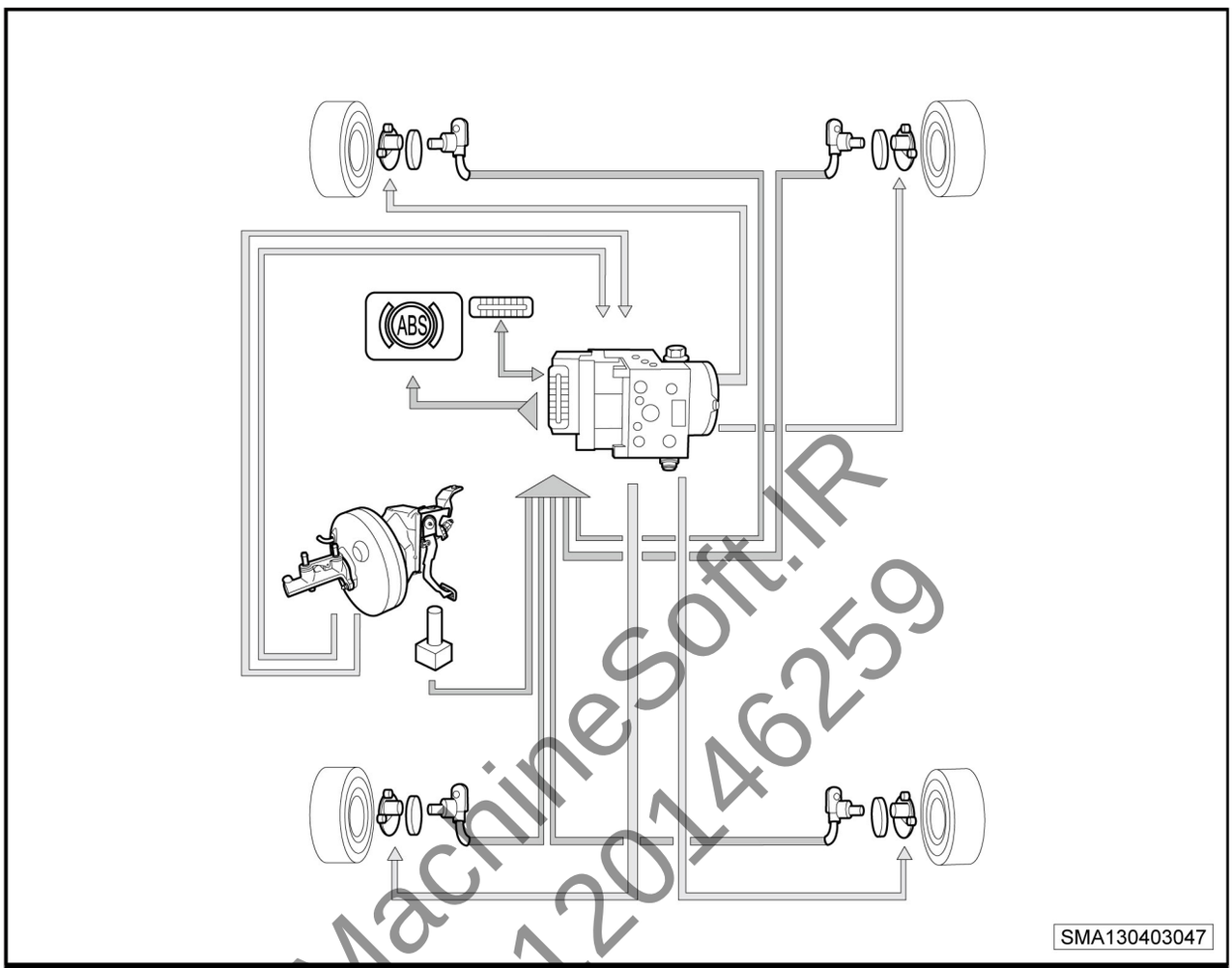


- The brake system of this model uses dual-line vacuum-assisted hydraulic brake system distributed diagonally.
- The brake system consists of driving brake and parking brake.
- Front-wheel brake uses disc brake and rear-wheel brake uses drum brake that can automatically adjust shoe clearance.
- Regular brake system consists of:

  a. Front brake assembly
  b. Rear brake assembly
  c. Brake pedal
  d. Brake master cylinder

e. Vacuum booster
f. Axle shaft

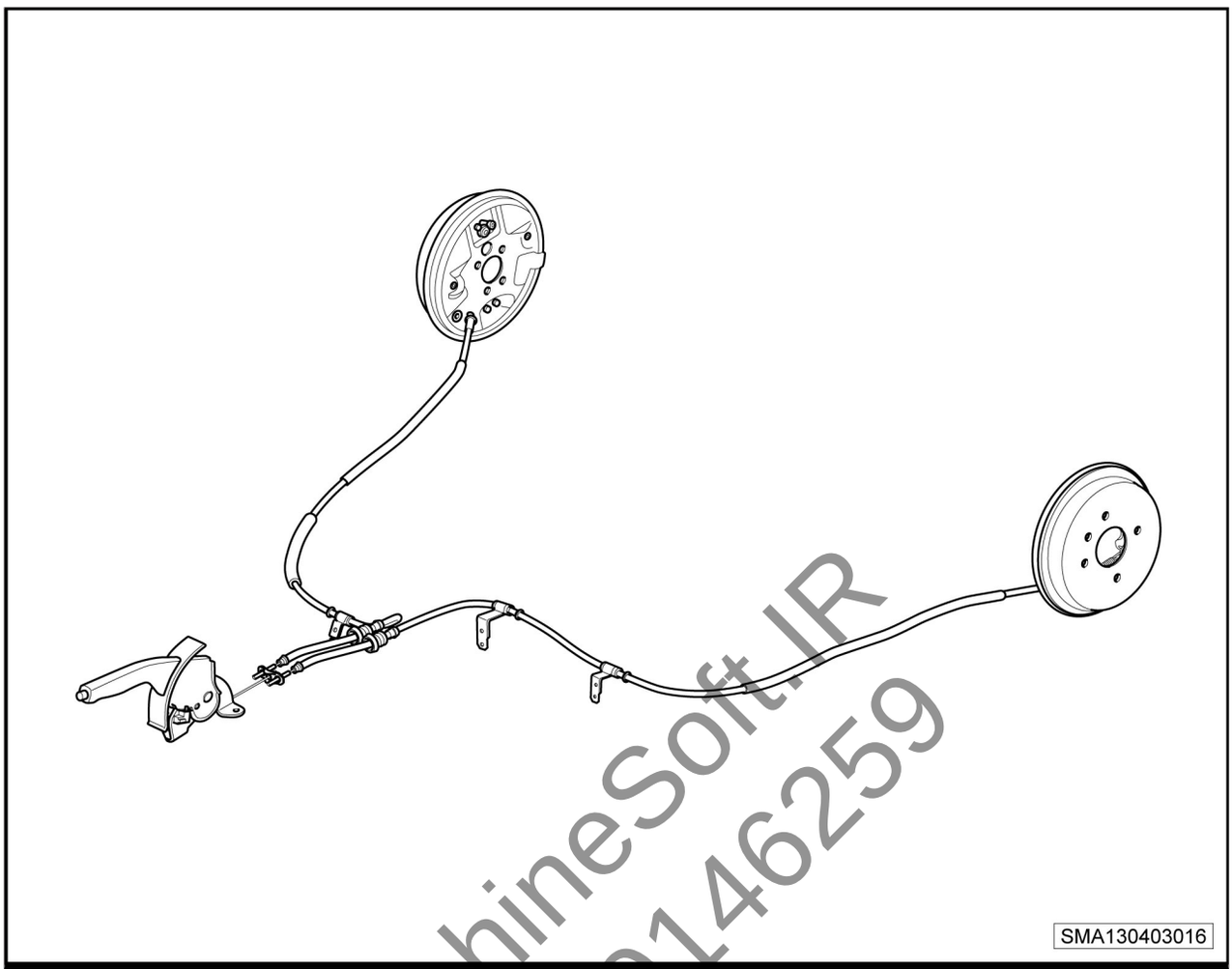
1.1.2 ABS (Anti-lock Brake System)



- The ABS of this model is arranged on the left side of the engine compartment.
- The basic working principle of ABS is as follows: when the vehicle is braking, the wheel speed sensor tests alternating voltage signal in proportion to the brake wheel speed and inputs the voltage signal to the electronic control module (ECM). The ECM arithmetic element figures out the wheel speed, slip rate, wheel acceleration and deceleration. Then the ECM control module analyzes and compares these signals and send brake pressure control command to the pressure regulator. The solenoid valve in the pressure regulator directly or indirectly controls brake pressure to adjust the brake torque and adapt it to ground adhesion to prevent the brake wheel from being locked.
- The function of ABS is to improve vehicle stability.
- ABS consists of:

a. ABS control unit
b. Wheel speed sensor
c. ABS indicator

1.1.3 Parking brake system



- Parking brake is used in parking vehicles.
- Parking brake is arranged between front seats. The cable with a sleeve featuring low friction resistance directly acts on the drum brake shoe lever of two rear wheels. The rear wheel brake concurrently acts as the parking brake, which features simple and practical structure and high efficiency.
- Parking brake system consists of:

  a. Parking brake
  b. Parking brake cable
  c. Rear brake assembly

1.2 Important notes

1. Please wear necessary protective facilities to avoid accidents.
2. Avoid inhaling brake pad dust because it is toxic.
3. Use a vacuum cleaner rather than compressed air or a brush to clean the brake assembly.
4. Never splash the brake fluid on the vehicle; otherwise, it may damage vehicle paintwork. If the brake fluid splashes on the paintwork, please rinse it with water immediately.
5. Wrap removed pipe connector with cloth or service fabric.
6. The brake disc and brake pad should abstain from grease or brake fluid.
7. After replacing the brake pad or brake shoe, check the brake fluid level.
8. Whenever the brake pad or brake shoe is replaced, the brake pad shall reach its corresponding positions at running state.
9. Check the pipe and pipe connector for leakage. Retighten them if necessary.
10. Only use the brake fluid approved by Chery Automobile Co., Ltd.; otherwise, it may lead to pipe corrosion and shorten the service life of the brake system.
11. When removing and installing elastic elements, prevent them from ejecting in case they hurt bodies.
12. When removing and installing parts around the exhaust pipe, you shall not operate until the exhaust pipe temperature drops to normal to avoid scald.
13. After replacing or removing the parking brake cable, adjust the parking brake.

1.3 Product specifications

Torque specifications

Component	Torque (N·m)
Tire nut	110±10
Front axle shaft nut	270±20
Front brake caliper fixing bolt	22±1
Front brake caliper bracket fixing bolt	85±5
Coupling bolt between the ABS control unit and the mounting bracket	10±1
Coupling bolt between the ABS control unit mounting bracket and the vehicle body	10±1
Coupling nut between the ABS control unit mounting bracket and the vehicle body	10±1
Brake pedal fixing nut	25±3
Fixing nut of the rear wheel hub bearing	230±10
Brake master cylinder fixing nut	23±1
Brake pipe coupling bolt	18±1
Wheel speed sensor fixing bolt	10±1
Parking brake fixing nut	22±2

Front wheel and rear wheel brake assemblies

Component	Specifications	Service limit value
Front brake pad	11 mm	2.5 mm
Front brake disc	22 mm	20 mm
Rear brake shoe	5 mm	3 mm

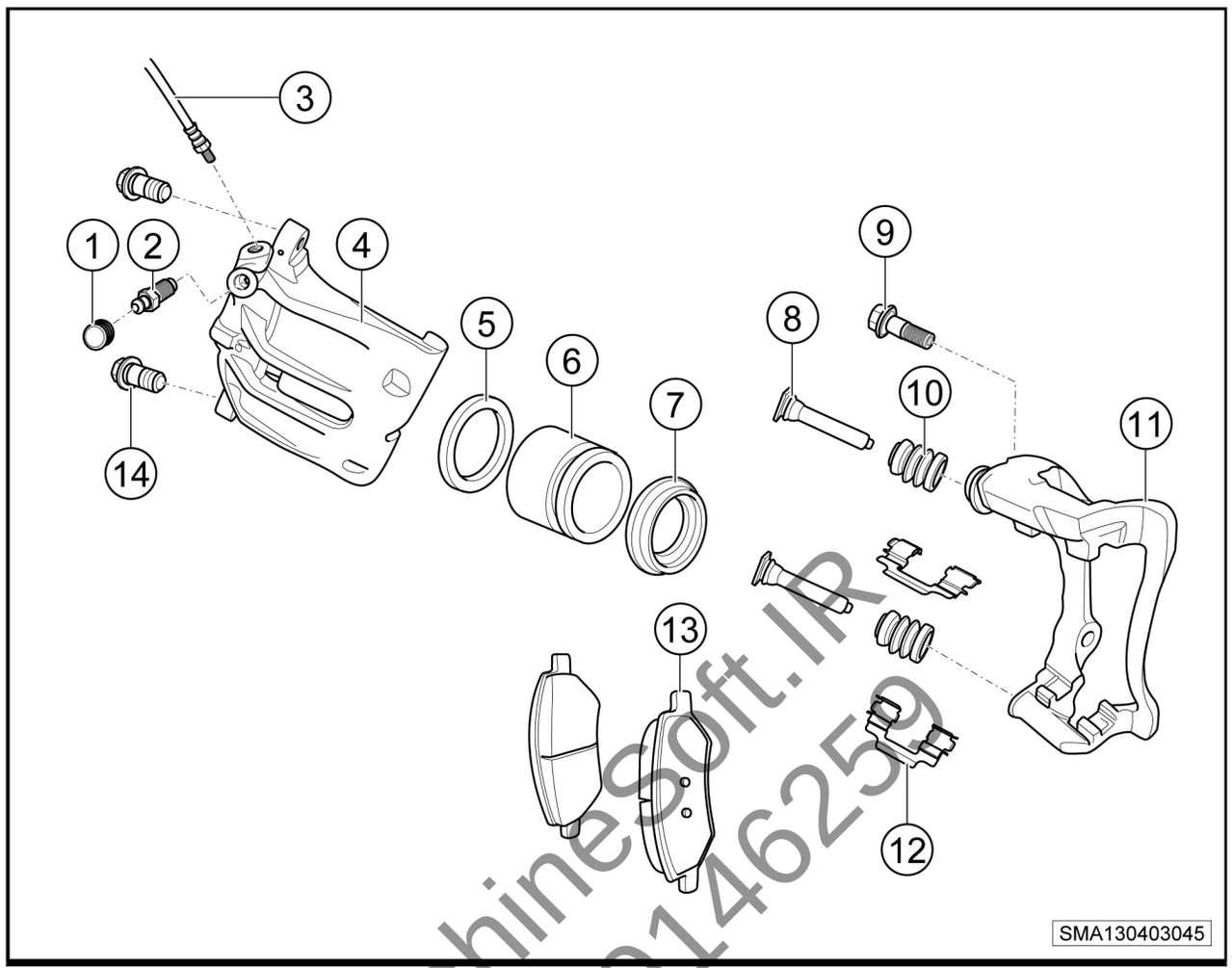
Brake fluid specifications

Item	Type
Brake fluid	DOT4

Standard value of parking brake lever travel

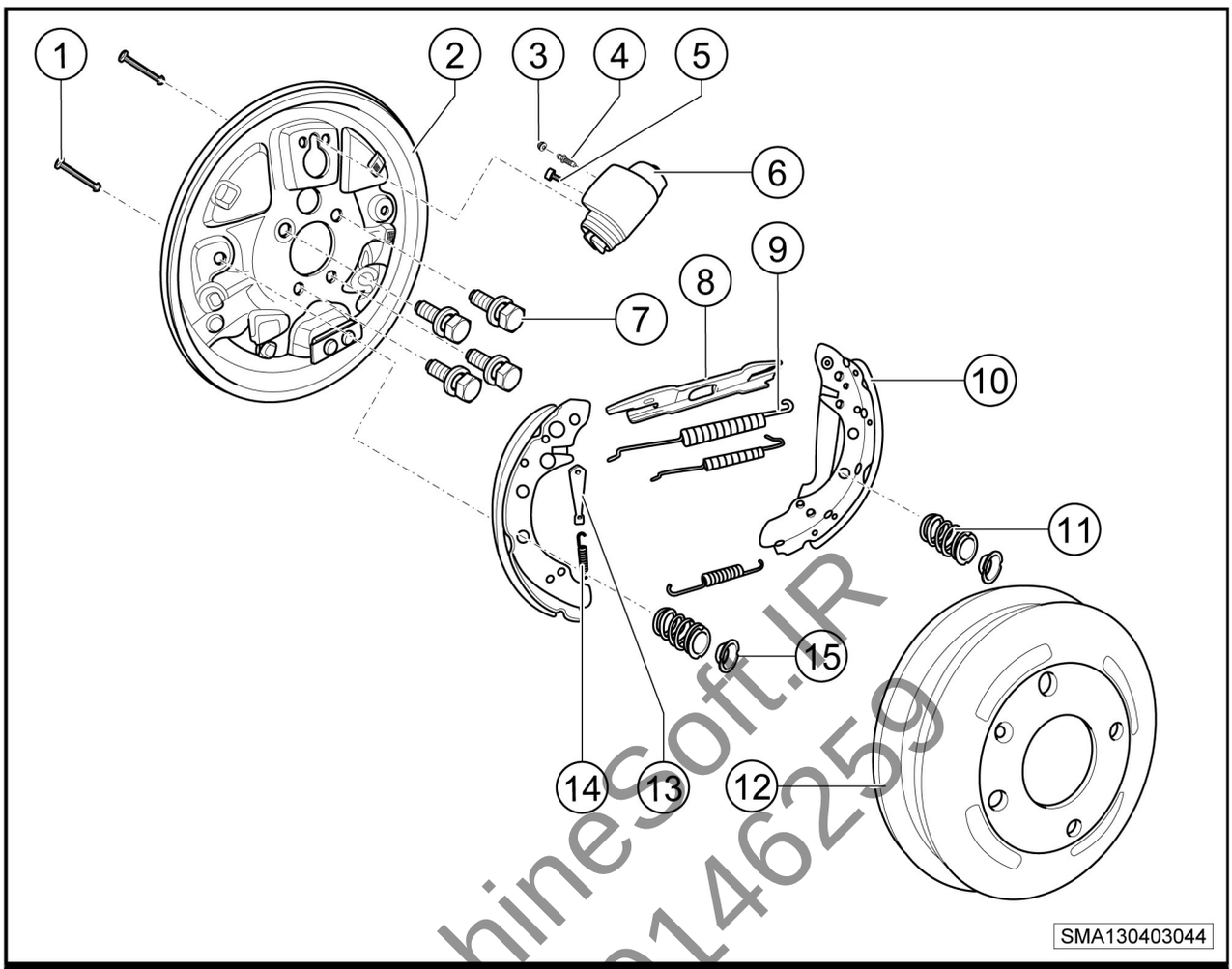
Condition	Travel
400 N	6 grids

1.4 The front wheel brake assembly drawing



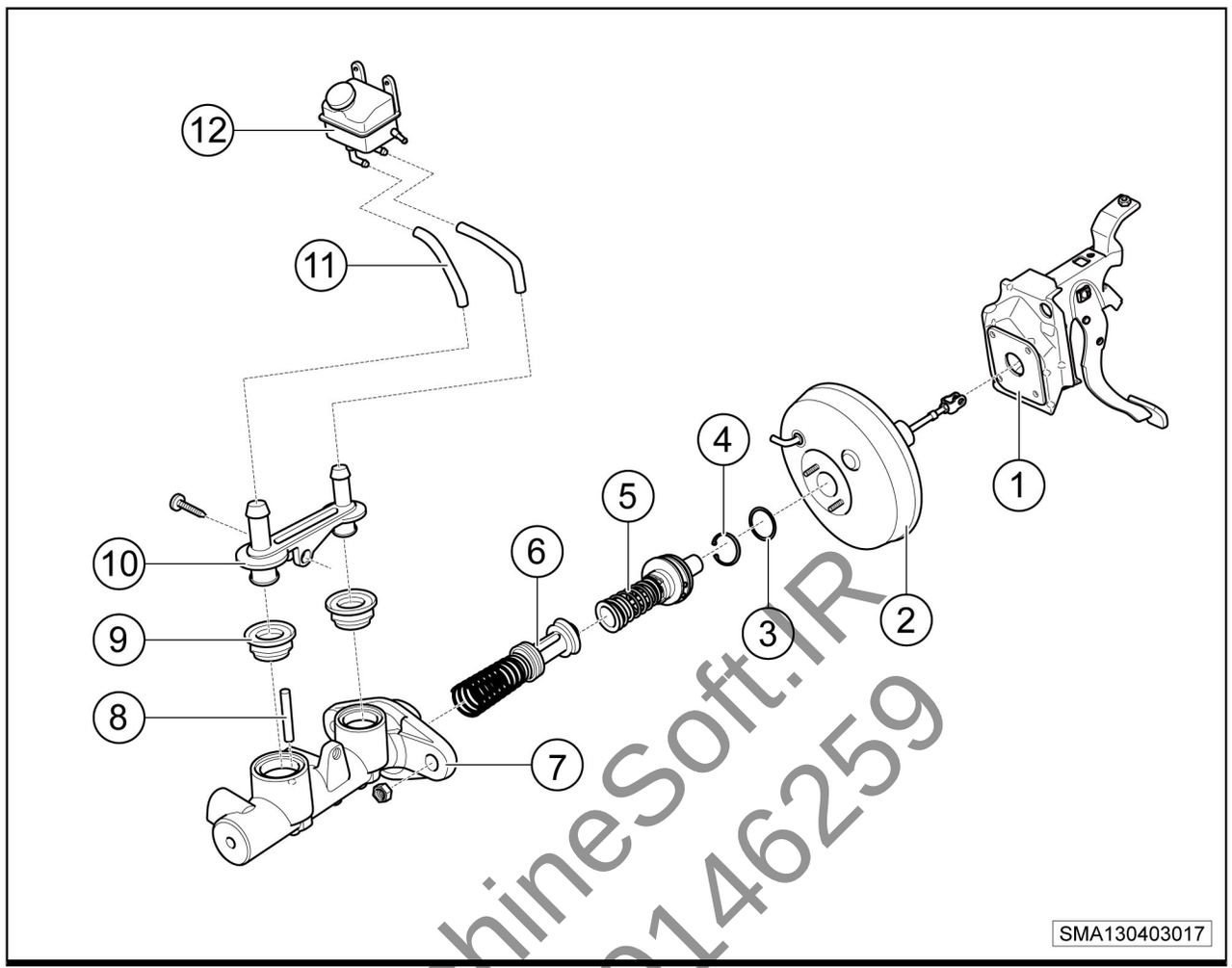
1. Front exhaust port cover	2. Front exhaust port screw
3. Front brake oil pipe	4. Front brake caliper
5. Front brake caliper piston oil seal	6. Front brake caliper piston
7. Front brake caliper piston dust cover	8. Front brake caliper pin
9. Front brake caliper bracket fixing bolt	10. Front brake caliper pin dust cover
11. Front brake caliper bracket	12. Front brake pad guard base
13. Front brake pad	14. Front brake caliper fixing bolt

1.5 The rear wheel brake assembly drawing



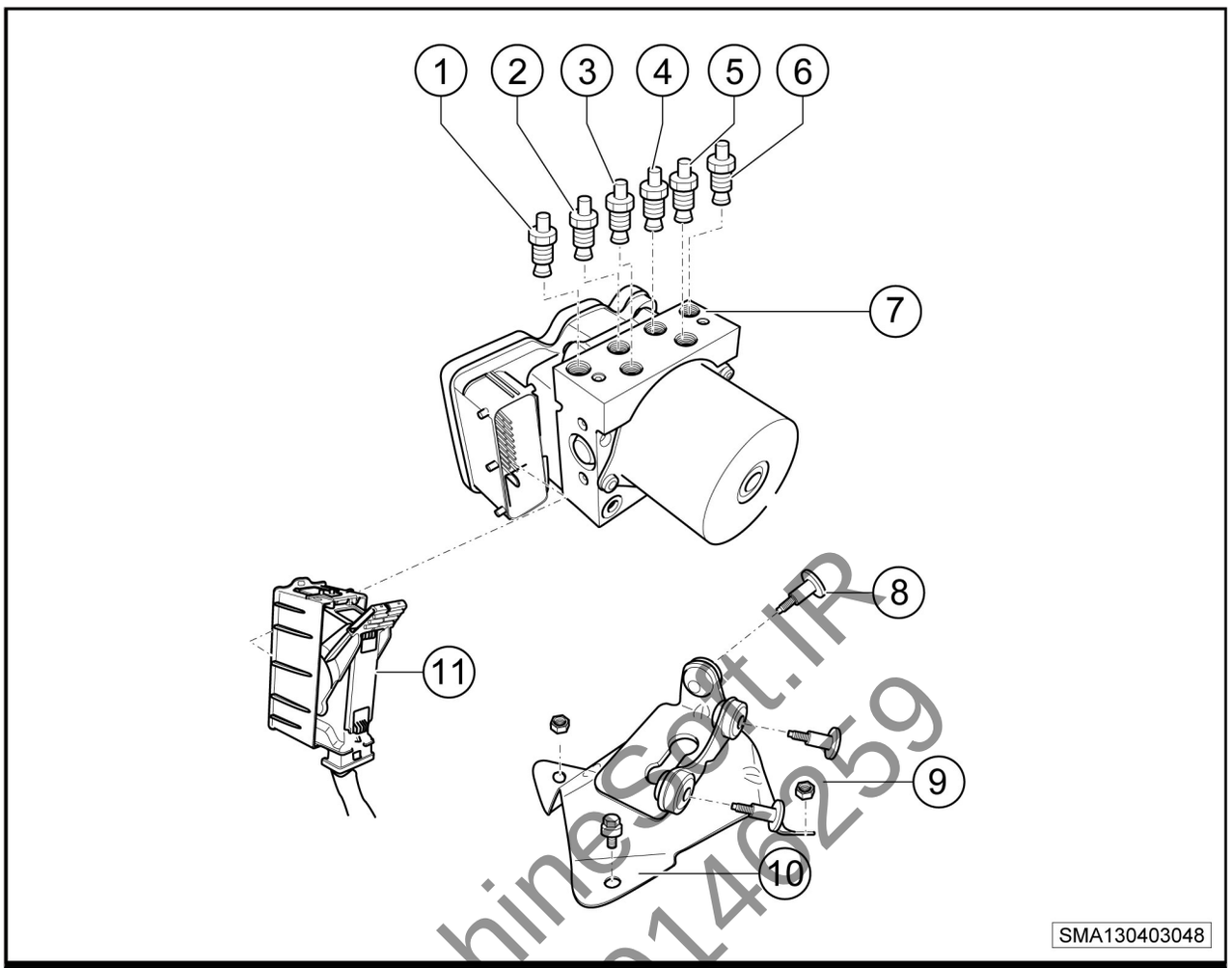
1. Retaining spring lock pin	2. Rear brake splash guard
3. Rear brake exhaust port cover	4. Rear brake exhaust port screw
5. Rear wheel cylinder fixing bolt	6. Rear wheel cylinder
7. Rear main shaft fixing bolt	8. Rear brake wedge
9. Coupling spring between the rear brake shoe and the rear brake wedge	10. Rear brake shoe
11. Rear brake shoe retaining spring	12. Rear brake drum
13. Automatic adjusting block	14. Automatic adjusting block spring
15. Retaining spring lock pin base	

1.6 The regular brake assembly drawing



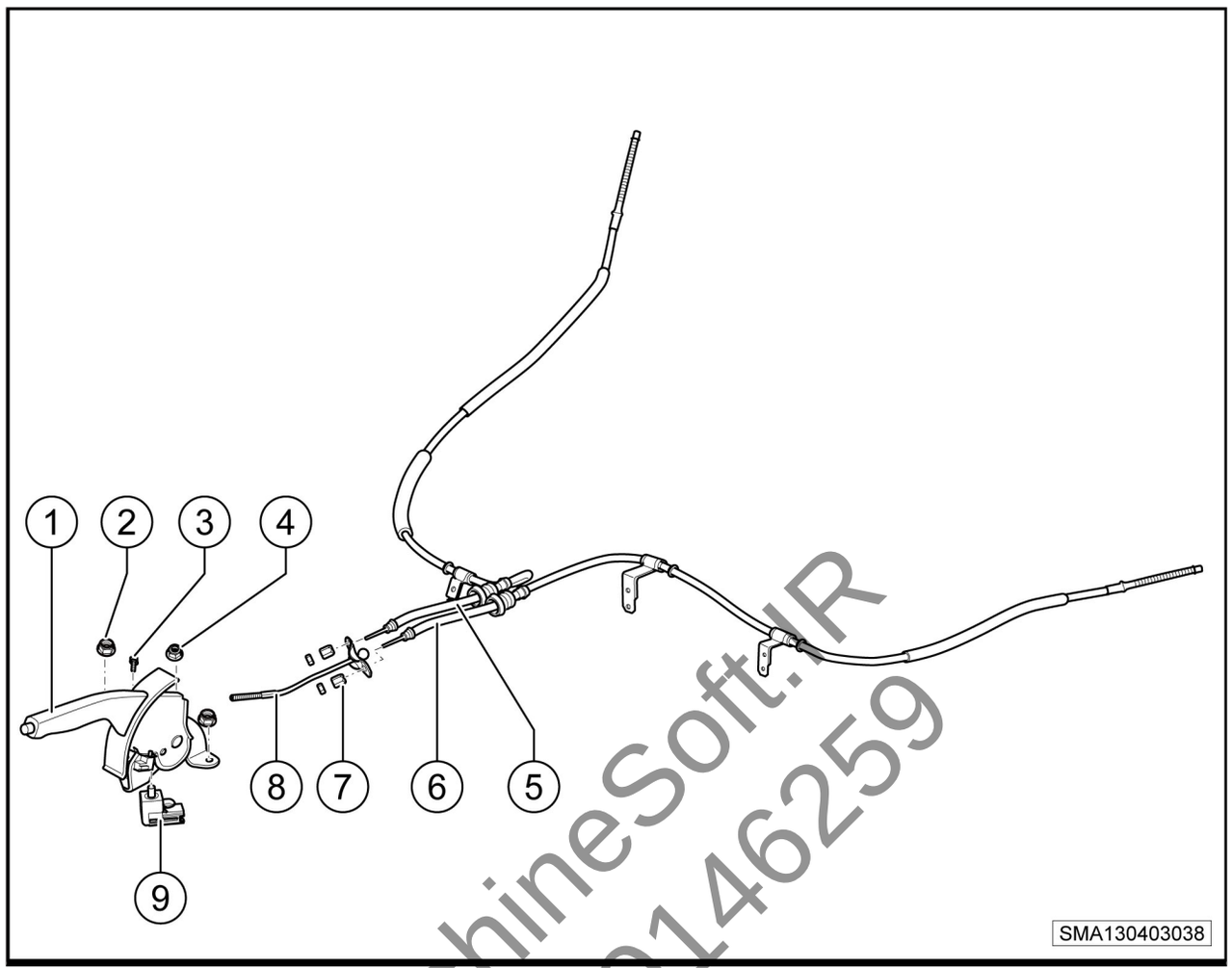
1. Brake pedal assembly	2. Vacuum booster
3. Brake master cylinder end face seal ring	4. Brake master cylinder secondary piston stop ring
5. Brake master cylinder secondary piston	6. Brake master cylinder primary piston
7. Brake master cylinder	8. Brake master cylinder primary piston lock pin
9. Seal ring between the brake master cylinder and the oil pipe adapter	10. Brake oil pipe adapter
11. Brake oil pipe	12. Brake fluid reservior

1.7 The ABS control unit assembly drawing



1. Connecting the front left wheel	2. Connecting the rear right wheel
3. Connecting the brake pump	4. Connecting the rear left wheel
5. Connecting the brake pump	6. Connecting the front right wheel
7. ABS control unit	8. Coupling bolt between the ABS control unit and the mounting bracket
9. Fixing nut of the ABS control unit mounting bracket	10. ABS control unit mounting bracket
11. ABS control unit connector	

1.8 The parking brake assembly drawing



1. Parking brake lever	2. Parking brake fixing nut
3. Parking brake switch fixing bolt	4. Parking brake parking adjustment nut
5. Right parking brake cable	6. Left parking brake cable
7. Parking brake cable adjustment nut	8. Parking brake parking adjustment cable
9. Parking brake switch	

2 Regular Brake Diagnosis and Inspection

2.1 Brake fault diagnosis list

Item	Possible causes	Troubleshooting
Braking deviation	Incorrect tire pressure	Adjust the tire pressure
	Abnormal tire wear	Replace the tires
	Abnormal brake pad wear	Replace the brake pad
	Abnormal brake disc wear	Replace the brake disc
	Abnormal brake shoe wear	Replace the brake shoe
	Blockage or leakage of the brake pipe	Replace the brake pipe
	Brake caliper piston jamming	Replace the brake caliper
	Failure of the ABS control unit	Rectify the fault according to the fault code
Poor parking brake	Excessive parking brake lever travel	Adjust parking brake lever travel
	Abnormal brake shoe wear	Replace the brake shoe
	Parking brake cable rupture	Replace the parking brake cable
	Parking brake cable disengagement	Reinstall the parking brake cable
Abnormal noise of brake	Abnormal brake pad wear	Replace the brake pad
	Brake pad worn to limit	Replace the brake pad
	Abnormal brake shoe wear	Replace the brake shoe
	Brake shoe worn to limit	Replace the brake shoe
	Foreign matters on the working surface of the brake pad	Remove the foreign matters
	Abnormal brake disc wear	Replace the brake disc
Inadequate brake force	Inadequate or contaminated brake fluid	Add or replace the brake fluid
	Brake pipe leakage	Replace the brake pipe
	Unwanted air in the brake system	Exhaust air in the brake system
	Failure of the brake vacuum booster	Check the brake vacuum booster
	Grease on the surface of the brake disc or brake shoe	Rinse the surface
	Overheated brake disc or brake drum due to braking drag	Check the brake system

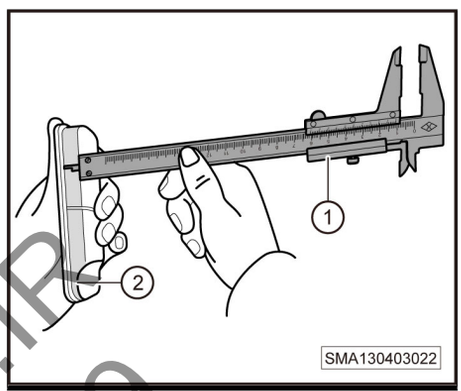
2.2 Checking the front brake pad and the rear brake shoe

Inspection

1. Check the front brake pad and the rear brake shoe for oil stains. If oil stains are present, remove them immediately.
2. Check the front brake pad and the rear brake shoe for cracks and disengagement. If cracks or disengagement are present, replace the brake pad or brake shoe.

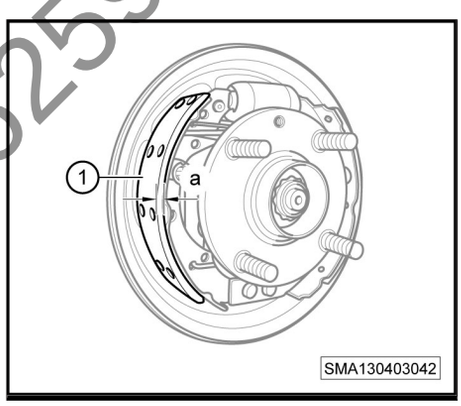
3. Check the thickness of the front brake pad (-2-) with the vernier (-1-). If the thickness is beyond the specified value, replace the brake pad.

   Brake pad wear limit: 2.5 mm



4. Check the thickness (-a-) of the rear wheel brake shoe (-1-). If the thickness is beyond the specified value, replace the brake shoe.

   Brake shoe wear limit: 3 mm



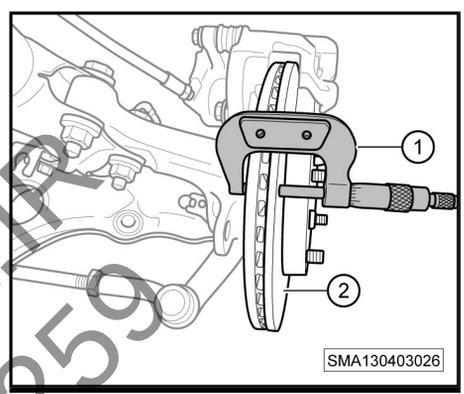
2.3 Checking the front brake disc and the rear brake drum

Inspection

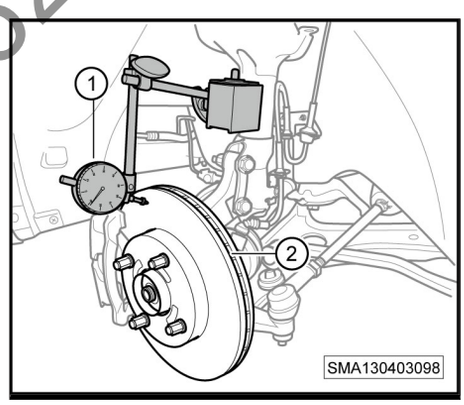
1. Check the brake disc and the brake drum for oil stains. If oil stains are present, remove them immediately.
2. Check the brake disc and the brake drum for cracks, corrosion and severe damage. If cracks, corrosion and severe damage are present, replace the brake disc or brake drum.
3. Check the working surface of the brake disc or brake drum for grooves. If grooves are present, replace the brake disc or brake drum.

4. Measure the thickness of the brake disc (-2-) with a micrometer (-1-). If the thickness is beyond the specified value, replace the brake disc.

   Use limit of the front wheel brake disc: 20 mm

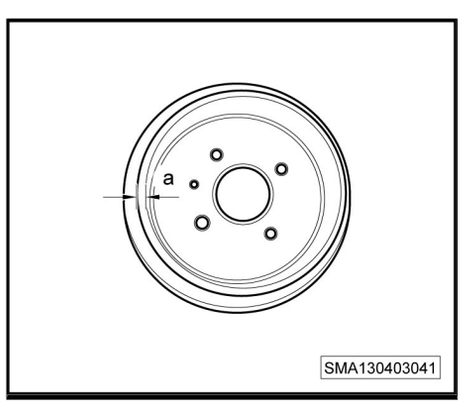


5. Measure the surface runout of the brake disc (-2-) with a micrometer (-1-). If the surface runout of the brake disc exceeds 0.025 mm, replace the brake disc.



6. Check the brake drum thickness (-a-). If the thickness is beyond the specified value, replace the brake drum.

   Use limit of the brake drum thickness: 5.5 mm



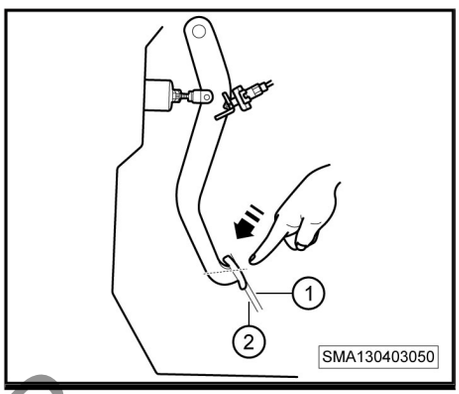
2.4 Checking and adjusting the brake pedal free travel

Checking the brake pedal free travel

1. Stall the engine and press the pedal for several times until vacuum is absent in the vacuum booster.

2. Manually press the brake pedal when it is at the natural position (-1-) to a position (-2-) where resistance begins to be felt. The brake pedal free travel is the distance from position (-1-) to position (-2-).

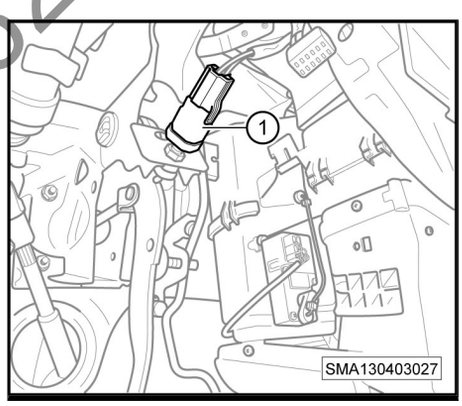
   Standard value of the brake pedal free travel: 3 mm – 5 mm



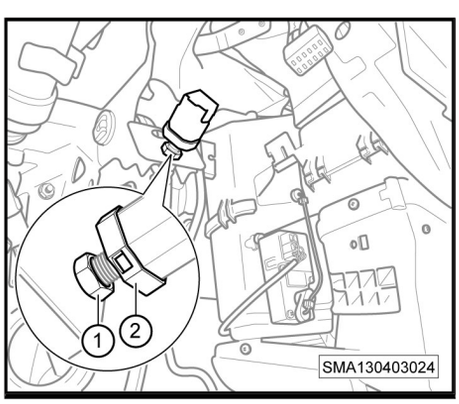
Adjusting the brake pedal free travel

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.

3. Disconnect the brake switch connector (-1-).



4. Loosen the brake switch lock nut (-1-) and rotate the brake switch nut (-2-) until the free travel meets the specified value.



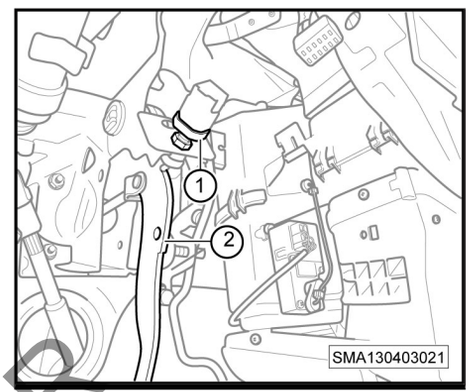
5. Installation shall follow the reverse sequence of the removal procedure.

2.5 Checking and adjusting the brake pedal height

Checking the brake pedal height

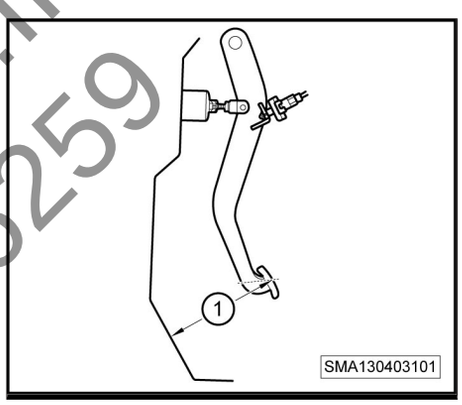
1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.

3. Unscrew the brake switch nut (-1-) to make it cease to contact the brake pedal (-2-).



4. Lift the carpet. The pedal height equals the distance from the cabin floor to the pedal center point (-1-).

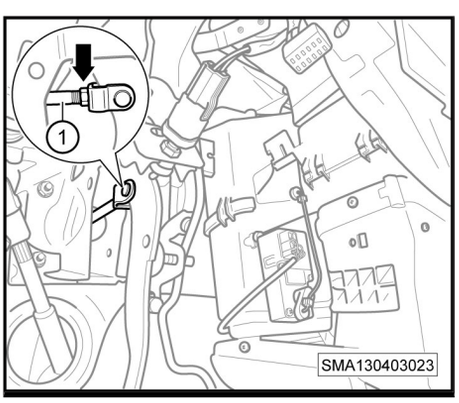
   Standard value of the brake pedal height: 129.3 mm



Adjusting the brake pedal height

1. Loosen the brake pushrod lock nut (-arrow-) and rotate the brake pushrod (-1-) to make the brake pedal height reach the standard value.

   Standard value of the brake pedal height: 129.3 mm

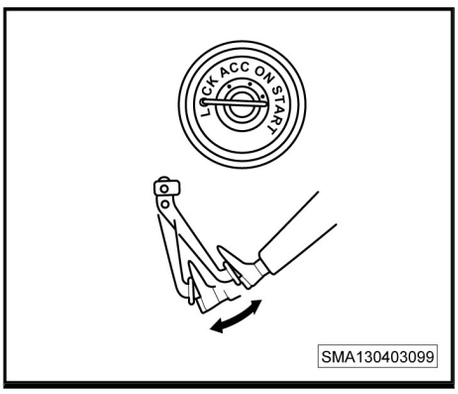


2. Tighten the brake pushrod lock nut.

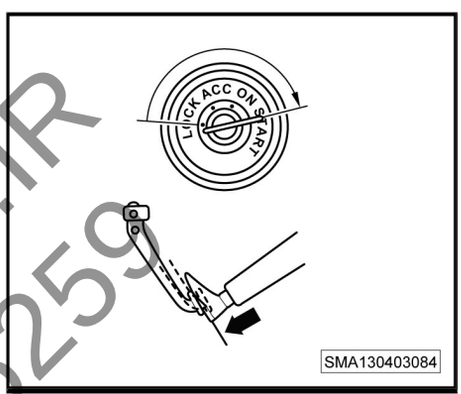
2.6 Checking the vacuum booster

Checking the functions

1. Before starting the engine, press the brake pedal for several times and check the pedal height, which should remain unchanged.

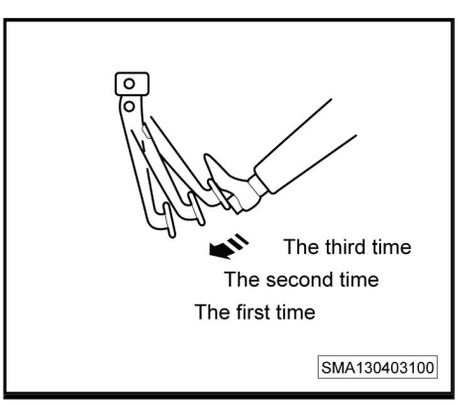


2. Press the brake pedal and start the engine. If the brake pedal sinks slightly, it indicates the vacuum booster works normally.

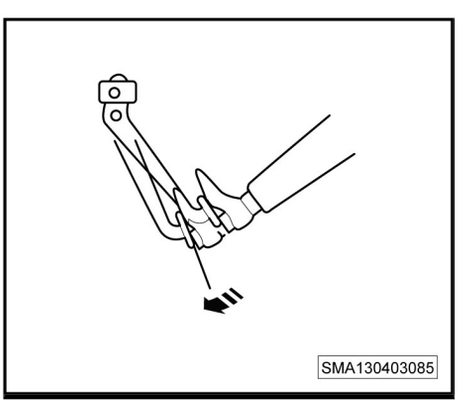


Checking the airtightness

1. Switch off the engine 1 to 2 minutes after starting the engine. Slowly press the brake pedal for several times (first, second and third time), and the brake pedal gradually rises, which indicates the vacuum booster has sound airtightness.



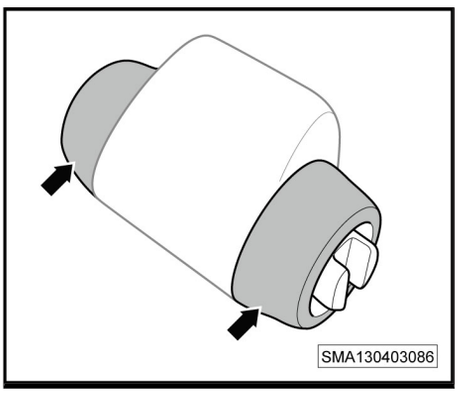
2. When the engine is running, press the brake pedal and then switch off the engine. If the pedal height remains unchanged within 30 seconds, it indicates the vacuum booster has sound airtightness. If it continues to sink, it indicates the vacuum booster has poor airtightness and needs repairing.



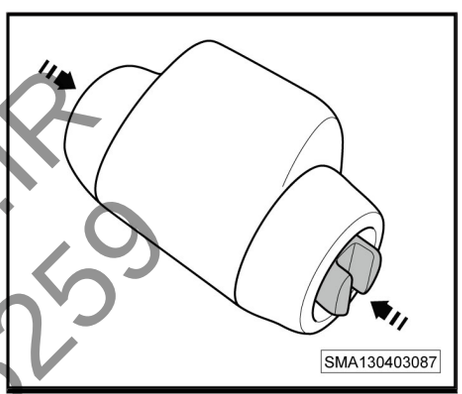
2.7 Checking the rear wheel cylinder

Inspection

1. Check the rear wheel cylinder for leakage and the dust cover (-arrow-) for damage.

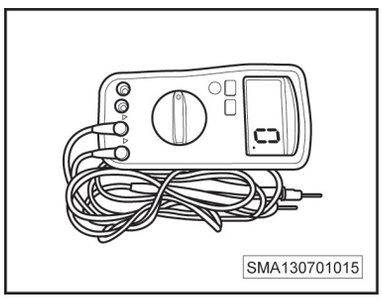


2. Manually compress both sides of the rear wheel cylinder in the (-arrow-) direction and check the functions of the rear wheel cylinder piston.



2.8 Checking the parking brake switch

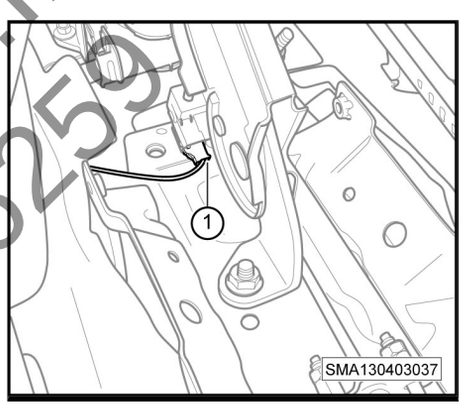
Maintenance tools and common equipment

	
Multimeter	

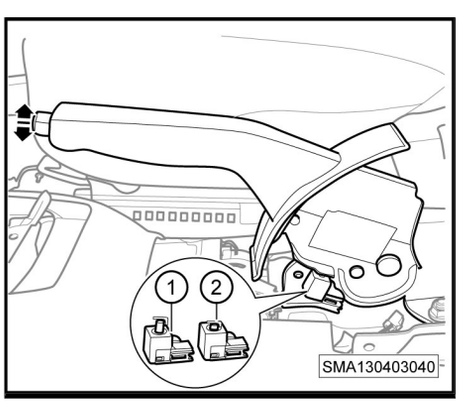
Inspection

1. Remove the console.=> refer to page 825

2. Disconnect the parking brake switch connector (-1-).



3. Operate the parking brake lever up and down in the (-arrow-) direction and check the conduction between the parking brake switch terminal and the body ground.
   - When the parking brake lever is raised, the parking brake switch (-1-) terminal and the body ground are conducted; otherwise, the parking brake switch malfunctions.
   - When the parking brake lever is lowered, the parking brake switch (-2-) terminal and the body ground are not conducted; otherwise, the parking brake switch malfunctions.



4. After checking, connect the parking brake switch connector.
5. Install the console .=> refer to page 825

2.9 Adjusting the parking brake

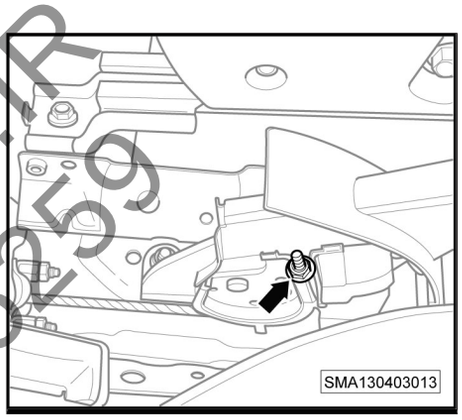
Caution

- Before adjusting the parking brake, loosen the parking brake adjustment nut, start the engine and press the brake pedal for several times so as to adjust the brake shoe free clearance.
- After adjusting the parking brake, check for braking drag.

Standard value of the parking brake lever travel

Condition	Travel
400 N	6 grids

1. Lift the vehicle safely.
2. Remove the console .=> refer to page 825
3. Raise the parking brake lever for one grid.
4. Rotate the parking brake adjustment nut (-arrow-). When rotating rear wheels, there is slight braking drag.

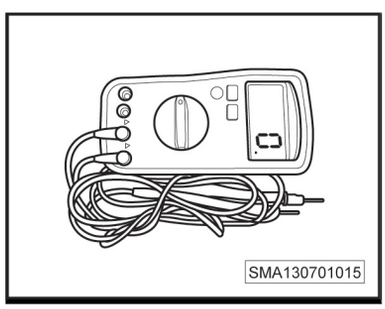
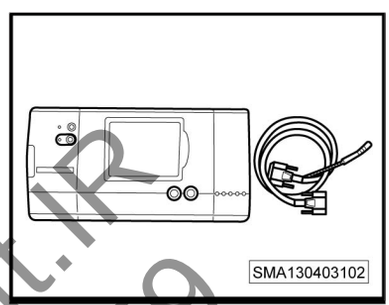


5. Completely loosen the parking brake lever and confirm there is not braking drag. Readjust it if necessary.
6. Make sure that the parking brake lever is within the specified travel and the parking brake works normally.
7. Install the console .=> refer to page 825

3 ABS Diagnosis and Inspection

3.1 Diagnostic tips

Maintenance tools and common equipment

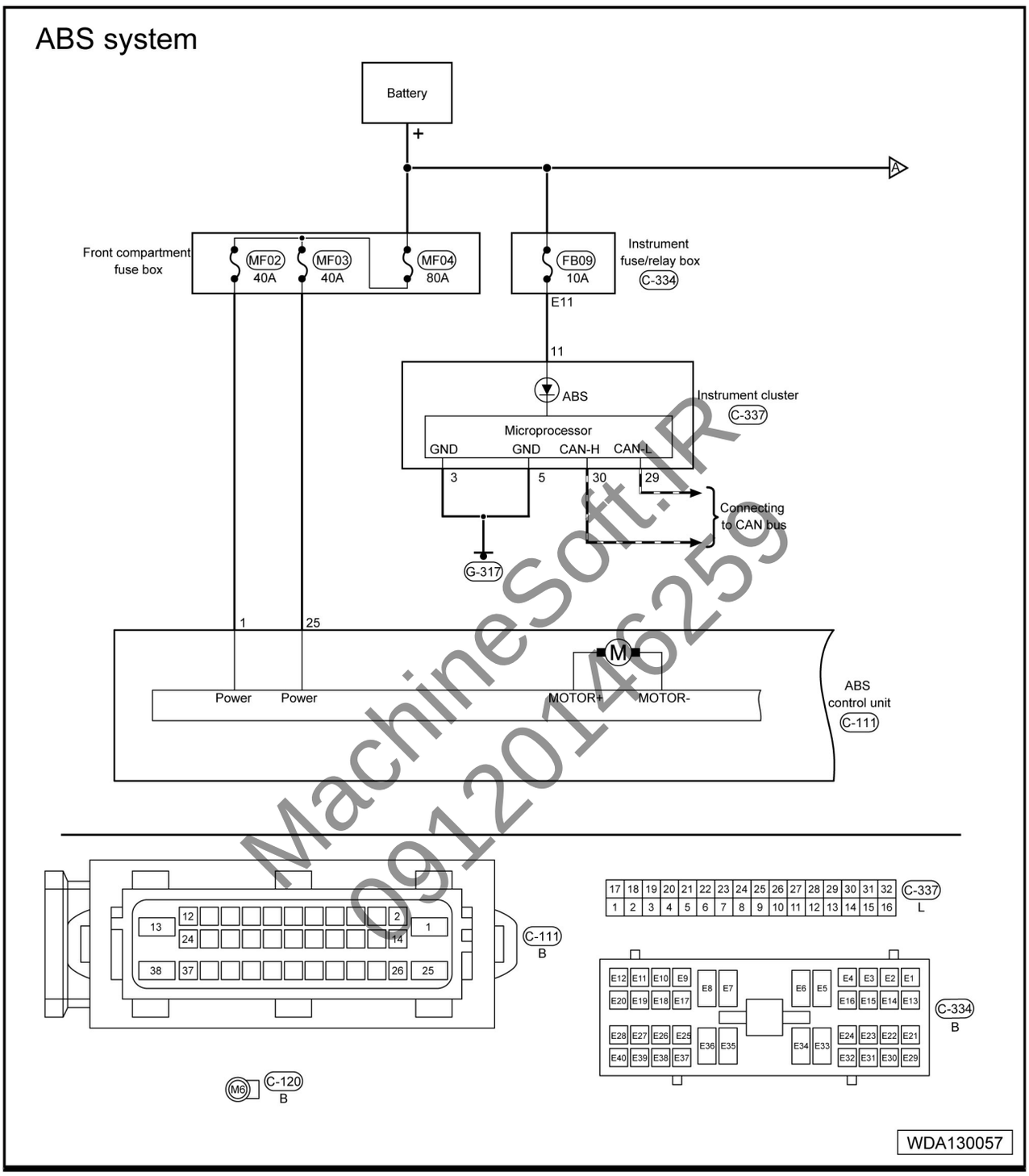
	
Multimeter	X-431 diagnostic device

Diagnostic procedures:

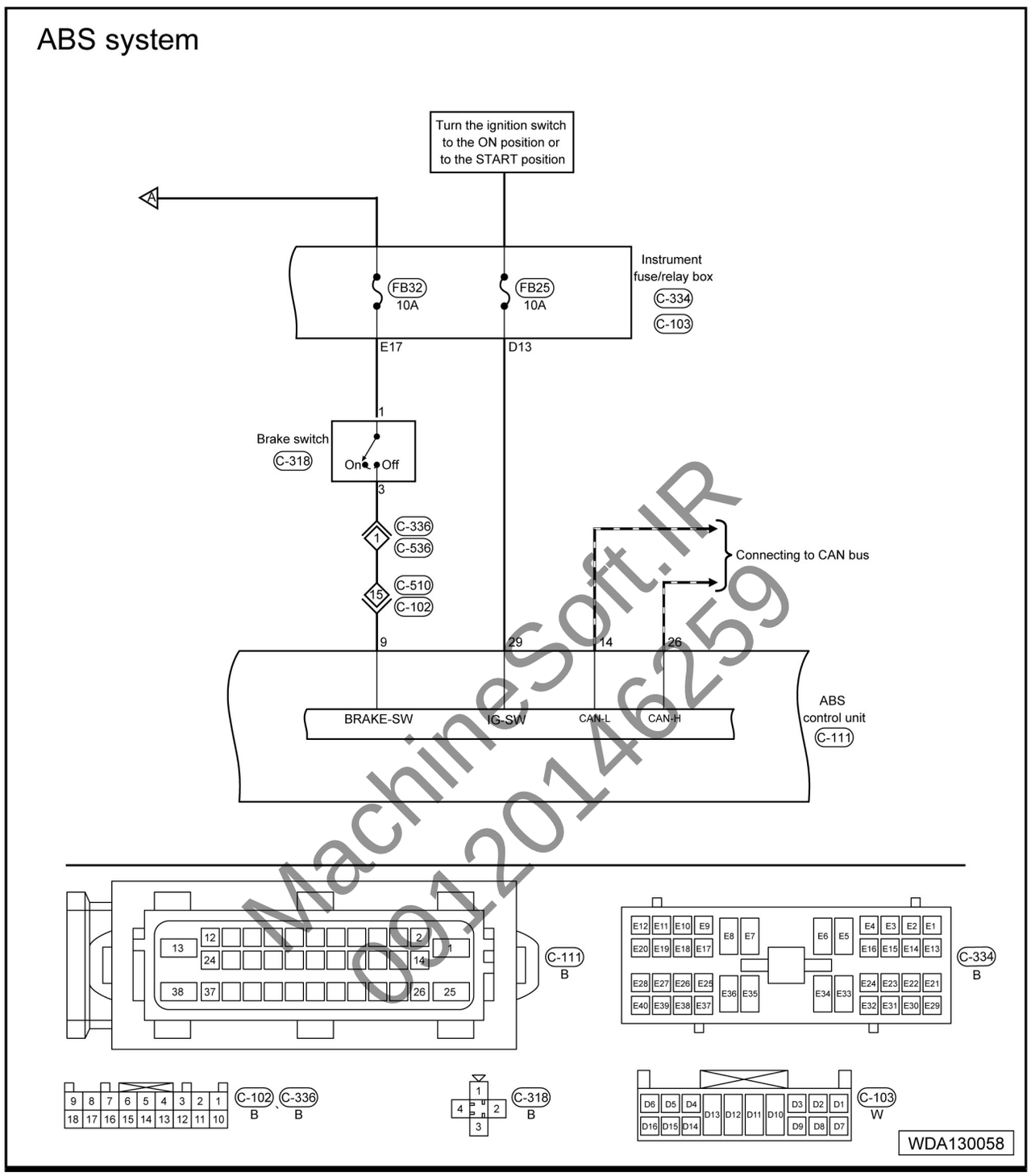
1. Confirm the battery voltage is normal.
2. Turn off the ignition switch.
3. Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
4. Turn on the ignition switch.
5. Measure and clear the DTC with the diagnostic device.
6. Turn off the ignition switch and turn it on again after 3 to 5 seconds.
7. Measure the DTC with the diagnostic device.
8. If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
9. If no DTC is detected, it indicates that the previously detected faults are sporadic .

3.2 ABS circuit diagram

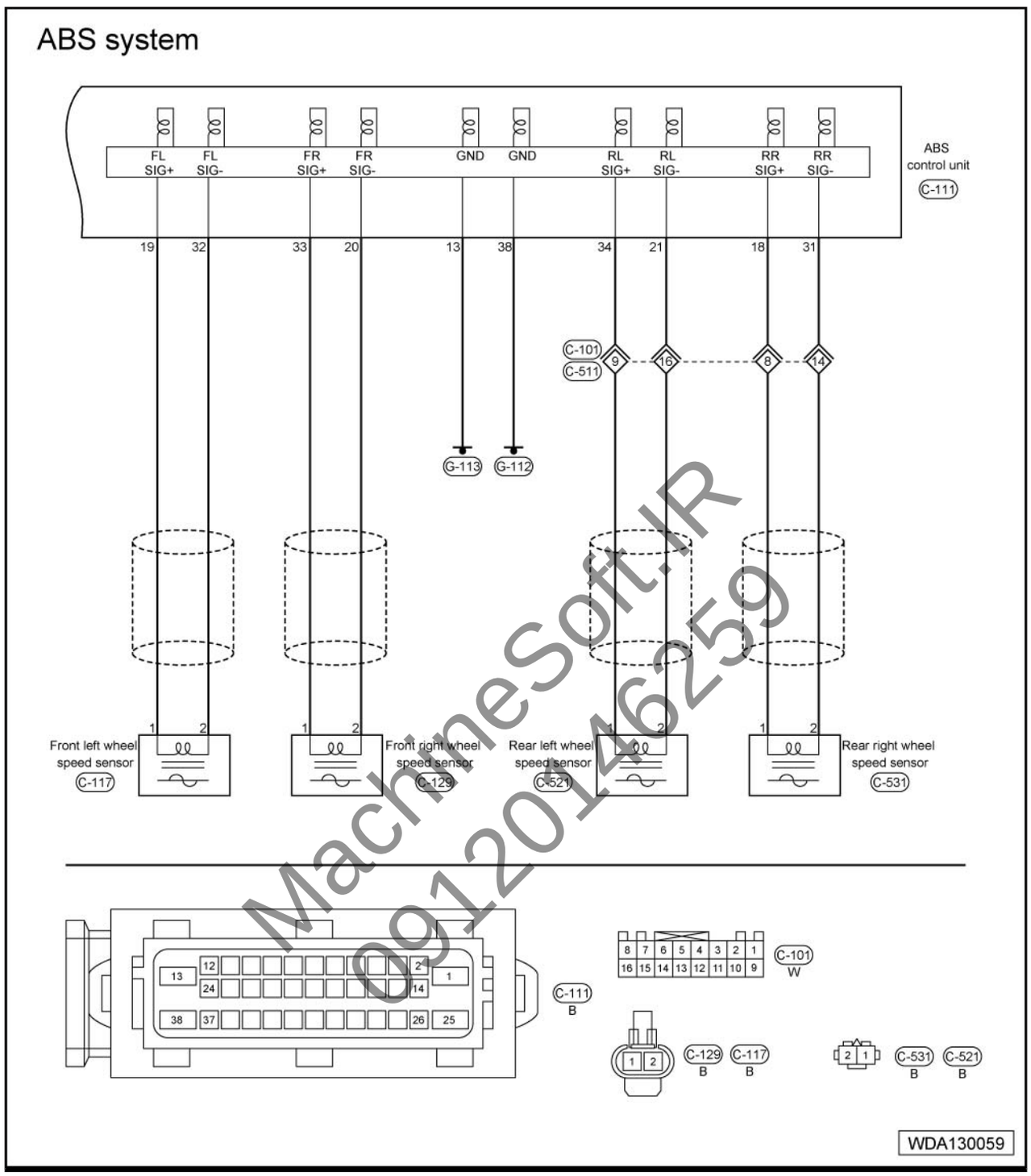
ABS circuit diagram (page 1)



ABS circuit diagram (page 2)



ABS circuit diagram (page 3)



3.3 Inspection of sporadic ABS faults

If the sporadic DTC faults occur, please check the following items:

- Check if the connector of the DTC-related actuator or sensor is properly installed.
- Check the connector pins of the actuator or sensor for leakage and corrosion.
- Check the leads for bending or squeezing.
- Check the sensor for dirt or damage.
- Check if the routing of wiring harness is correct and proper.

3.4 ABS fault list

Item	Possible causes	Troubleshooting
No signal in ABS	Failure of ABS	Replace the ABS control unit
	Melted ABS fuse	Replace the ABS fuse
	Failure of the circuit or connector	Replace the wiring harness or connector
The ABS indicator lights up after the engine starts	Failure of the ABS indicator circuit	Repair the circuit
	Failure of ABS	Replace the ABS control unit
	Failure of the wheel speed sensor wiring harness	Replace the wheel speed sensor wiring harness
	Improper installation of the wheel speed sensor	Adjust the wheel speed sensor
	Lower brake fluid level	Add the brake fluid
When the ignition switch is at the ON position, the ABS indicator does not light up	Failure of the power circuit or connector	Replace the wiring harness or connector
	Melted ABS fuse	Replace the ABS fuse
	Failure of ABS	Replace the ABS control unit
	Failure of the ABS indicator	Replace the ABS indicator
Failure to communicate with the diagnostic device	Melted ABS fuse	Replace the ABS fuse
	Failure of the diagnostic device connecting wiring harness or connector	Replace the connecting wiring harness or connector
	ABS control unit damage	Replace the ABS control unit
	Failure of the diagnostic device	Repair the diagnostic device
Abnormal working of ABS	Improper installation of the sensor	Reinstall the sensor
	Failure of the sensor wiring harness	Replace the sensor wiring harness
	Sensor damage	Replace the sensor
	Gear ring damage	Replace the gear ring
	Foreign matters on the sensor	Remove the foreign matters or replace the sensor
	Wheel bearing damage	Replace the wheel bearing
	ABS control unit damage	Replace the ABS control unit assembly

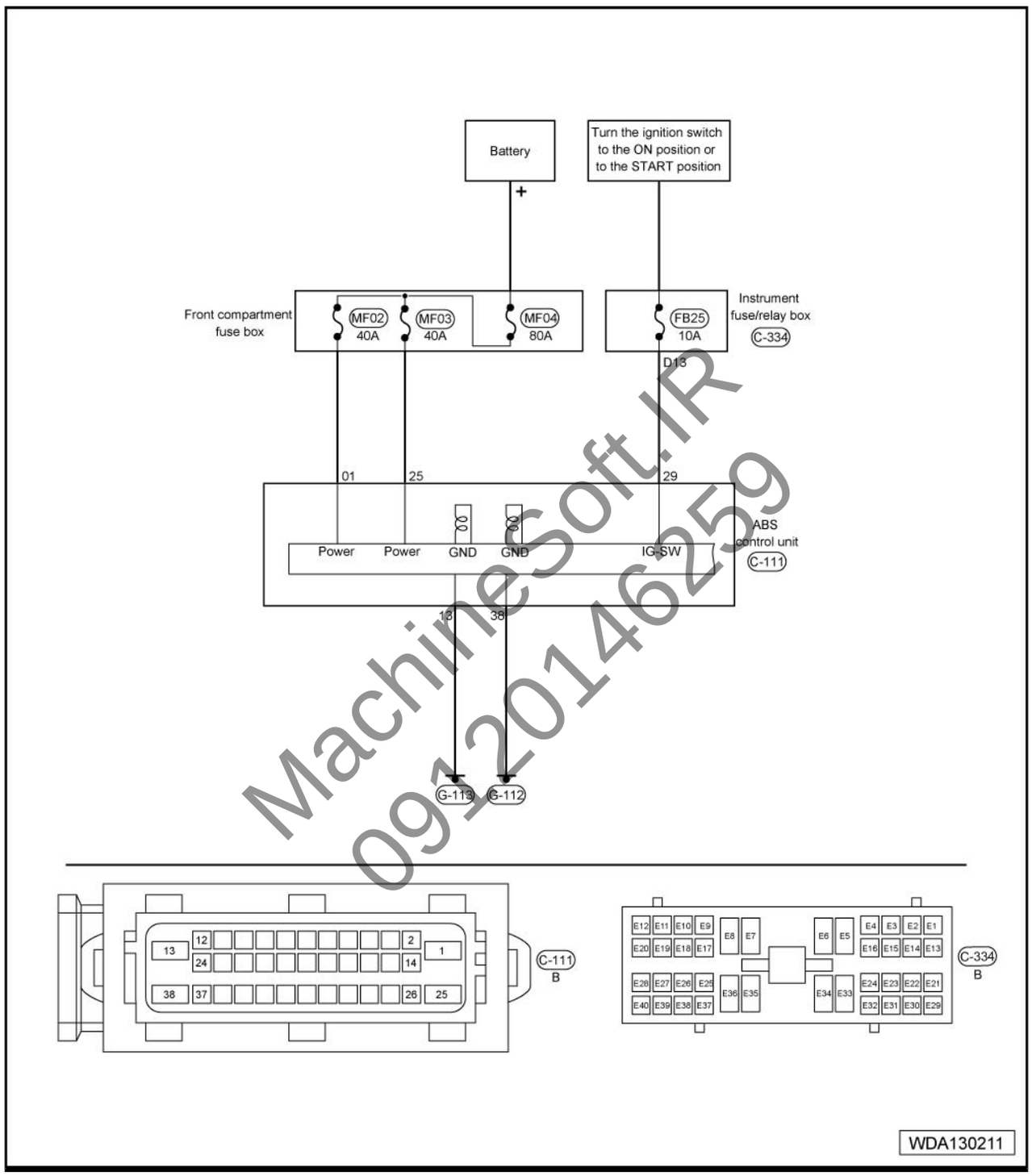
3.5 ABS diagnosis trouble code (DTC) list

DTC	Inspection items or symptoms
P1101	Excessive battery voltage
P1102	Low battery voltage
C1200	Front left wheel speed sensor open/short circuit
C1201	Front left wheel speed sensor circuit scope/function/sporadic faults
C1202	Failure/no signal in the front left wheel speed sensor
C1203	Front right wheel speed sensor open/short circuit
C1204	Front right wheel speed sensor circuit scope/function/sporadic faults
C1205	Failure/no signal in front right wheel speed sensor
C1206	Rear left wheel speed sensor open/short circuit
C1207	Rear left wheel speed sensor circuit scope/function/sporadic faults
C1208	Failure/no signal in rear left wheel speed sensor
C1209	Rear right wheel speed sensor open/short circuit
C1210	Rear right wheel speed sensor circuit scope/function/sporadic faults
C1211	Failure/no signal in rear right wheel speed sensor
P1513	Brake lamp switch failure

3.6 Testing the ABS diagnosis trouble code (DTC)

3.6.1 P1101 Excessive battery voltage

P1102 Low battery voltage



ABS control unit value

ABS control unit pin No.	Function	Condition	Value (DC voltage range)
1	ABS control unit power supply	The ignition switch in the ON/LOCK position	Battery voltage

ABS control unit pin No.	Function	Condition	Value (DC voltage range)
25	ABS control unit power supply	The ignition switch in the ON/LOCK position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P1101	Excessive battery voltage	The ignition switch in the ON position or the START position	The connecting wiring harness from the battery to the ABS control unit short circuit	• Failure of the wiring harness (short/open circuit) • Internal failure of the ABS control unit
P1102	Low battery voltage	The ignition switch in the ON position or the START position	The connecting wiring harness from the battery to the ABS control unit open circuit	• Failure of the wiring harness (short/open circuit) • Internal failure of the ABS control unit

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures. If no DTC is detected, it indicates that the previously detected faults are sporadic .

Diagnostic procedures:

Note

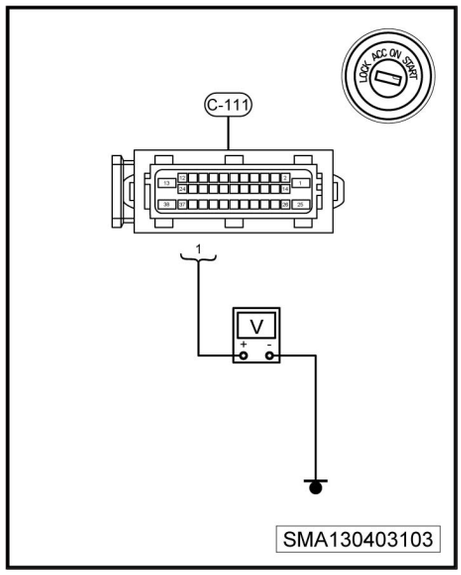
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check the ABS control module power supply fuse MF04\MF03\MF02 for faults.
   - If yes, the fuse fails and please replace it. ■
   - If not, go to step 2.

2. Check if the ABS control unit pins/connector are corrosive, tainted and loose.
   - If yes, the connector/pins fail and please repair or replace them. ■
   - If not, go to step 3.

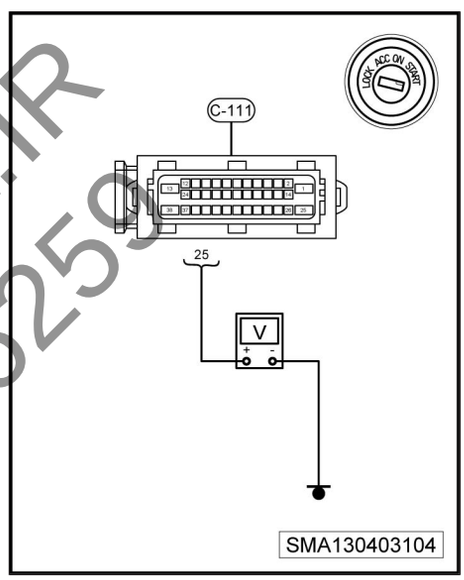
3. When turning the ignition switch to the LOCK position, disconnect the ABS control unit connector C-111 and check if the voltage between the ABS control unit connector pin 1 and the body ground reaches the battery voltage.

- If yes, go to step 4.
- If not, check if the lead between the ABS control unit connector pin 1 and the front compartment fuse box MF02 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



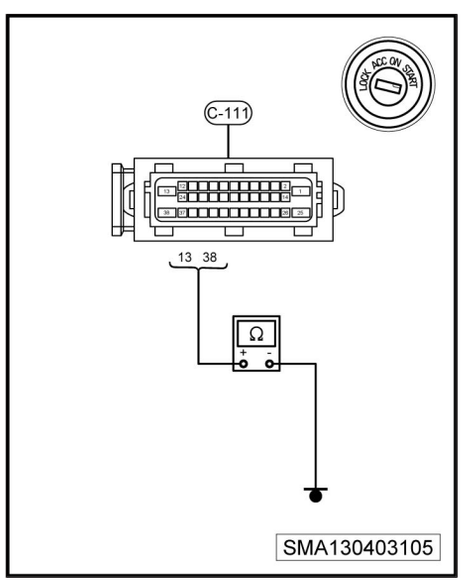
4. When turning the ignition switch to the LOCK position, check if the voltage between the ABS control unit connector pin 25 and the body ground reaches the battery voltage.

- If yes, go to step 5.
- If not, check if the lead between the ABS control unit connector pin 25 and the front compartment fuse box MF03 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



5. When turning the ignition switch to the LOCK position, measure if the ABS control unit pin and connector pin 13/38 are normally grounded.

- If yes, go to step 6.
- If not, check if the lead between the ABS control unit pin 13/38 and the earth terminals has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



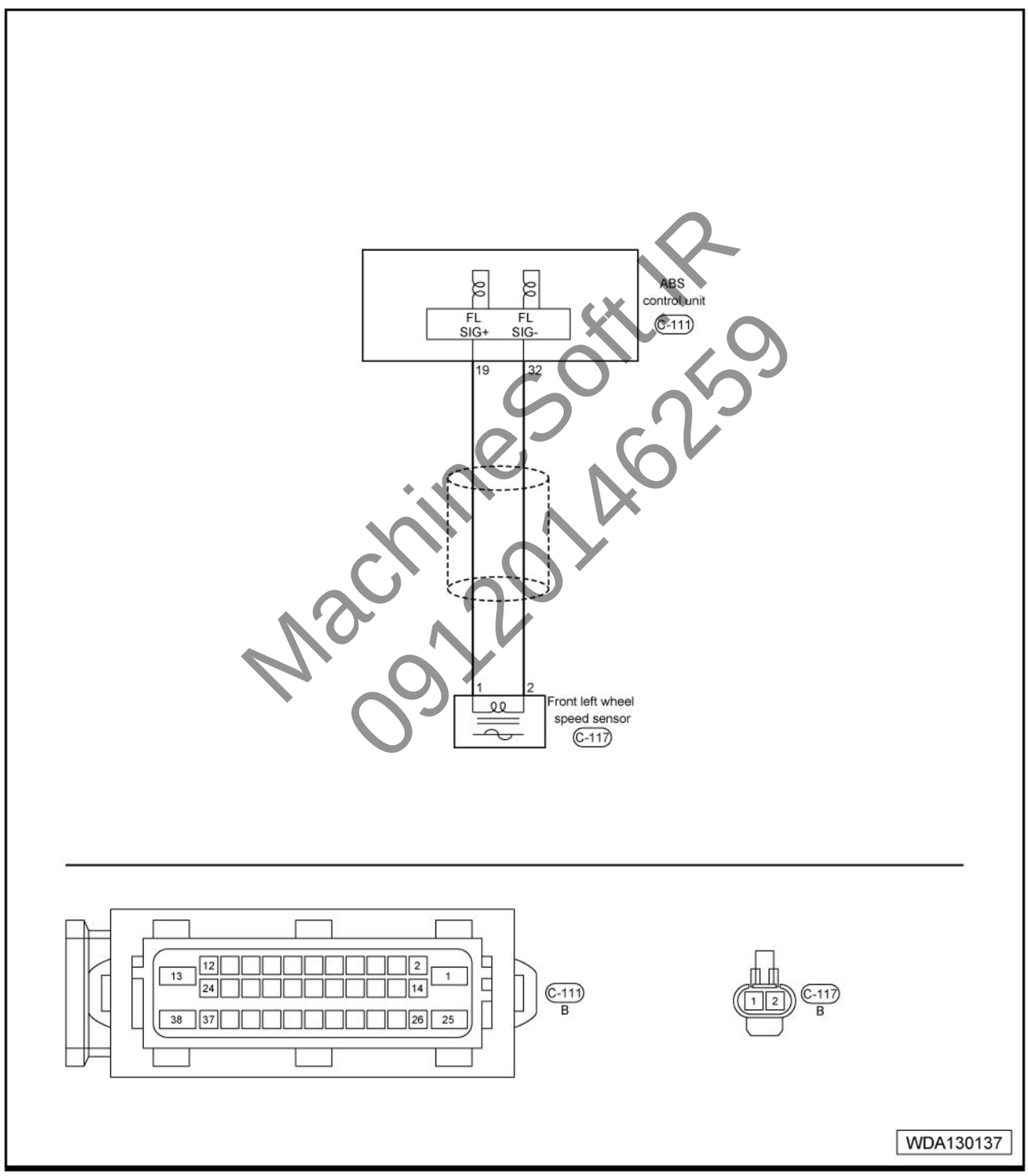
6. Replace the ABS control unit, retest it and read the fault code to verify if the code is present or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

3.6.2 C1200 Front left wheel speed sensor open/short circuit

C1201 Front left wheel speed sensor circuit scope/function/sporadic faults

C1202 Failure/no signal in front left wheel speed sensor



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
C1200	Front left wheel speed sensor open/short circuit	The ignition switch in the ON position	The connecting wiring harness from the ABS control unit to the front left wheel speed sensor short/open circuit	Failure of the wiring harness (open/short circuit)
C1201	Front left wheel speed sensor circuit scope/function/sporadic faults	The ignition switch in the ON position	Front left wheel speed sensor sporadic faults detected by the ABS control unit	Failure of the sensor
C1202	Failure/no signal in front left wheel speed sensor	The ignition switch in the ON position	Failure of the front left wheel speed sensor	Failure of the sensor

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures. If no DTC is detected, it indicates that the previously detected faults are sporadic .

Diagnostic procedures:

04

Note

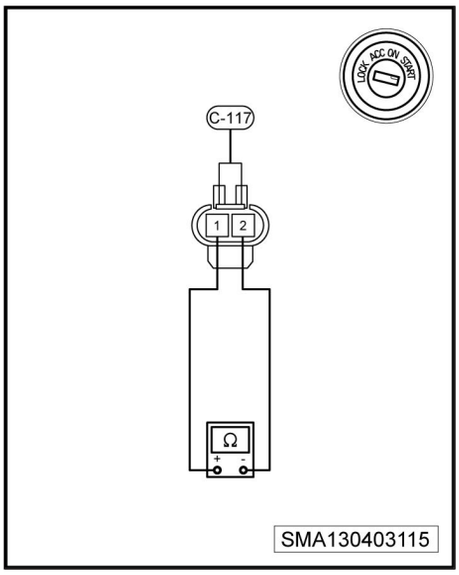
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the front left wheel speed sensor signal plate is distorted and attached with foreign matters.
   - If yes, the front left wheel signal plate fails and please replace it. ■
   - If not, go to step 2.

2. Check if the wheel speed sensor connector is tainted and corrosive.
   - If yes, the front left wheel speed sensor connector fails and please repair it. ■
   - If not, go to step 3.

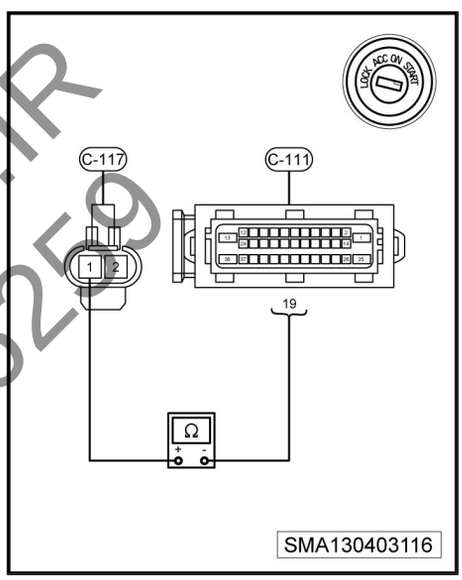
3. When turning the ignition switch to the LOCK position, disconnect the front left wheel speed sensor connector C-117 and measure if the resistance between the wheel speed sensor is normal.

- If yes, go to step 4.
- If not, the front left wheel speed sensor fails and please replace it. ■



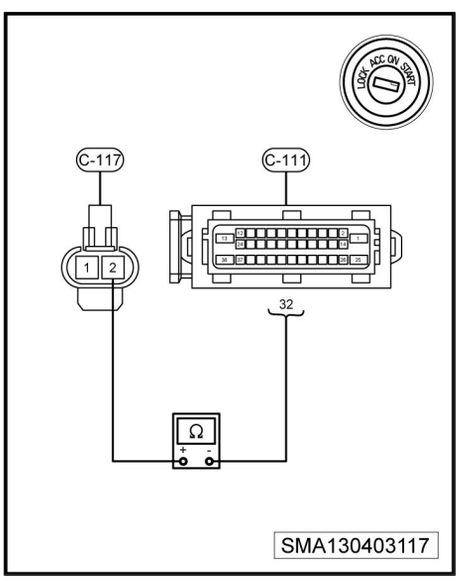
4. When turning the ignition switch to the LOCK position, check if the lead between the front left wheel speed sensor connector pin 1 and the ABS control unit pin 19 is conducted.

- If yes, go to step 5.
- If not, check if the lead between the front left wheel speed sensor connector pin 1 and the ABS control unit pin 19 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



5. When turning the ignition switch to the LOCK position, check if the lead between the front left wheel speed sensor connector pin 2 and the ABS control unit pin 32 is conducted.

- If yes, go to step 6.
- If not, check if the lead between the front left wheel speed sensor connector pin 2 and the ABS control unit pin 32 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



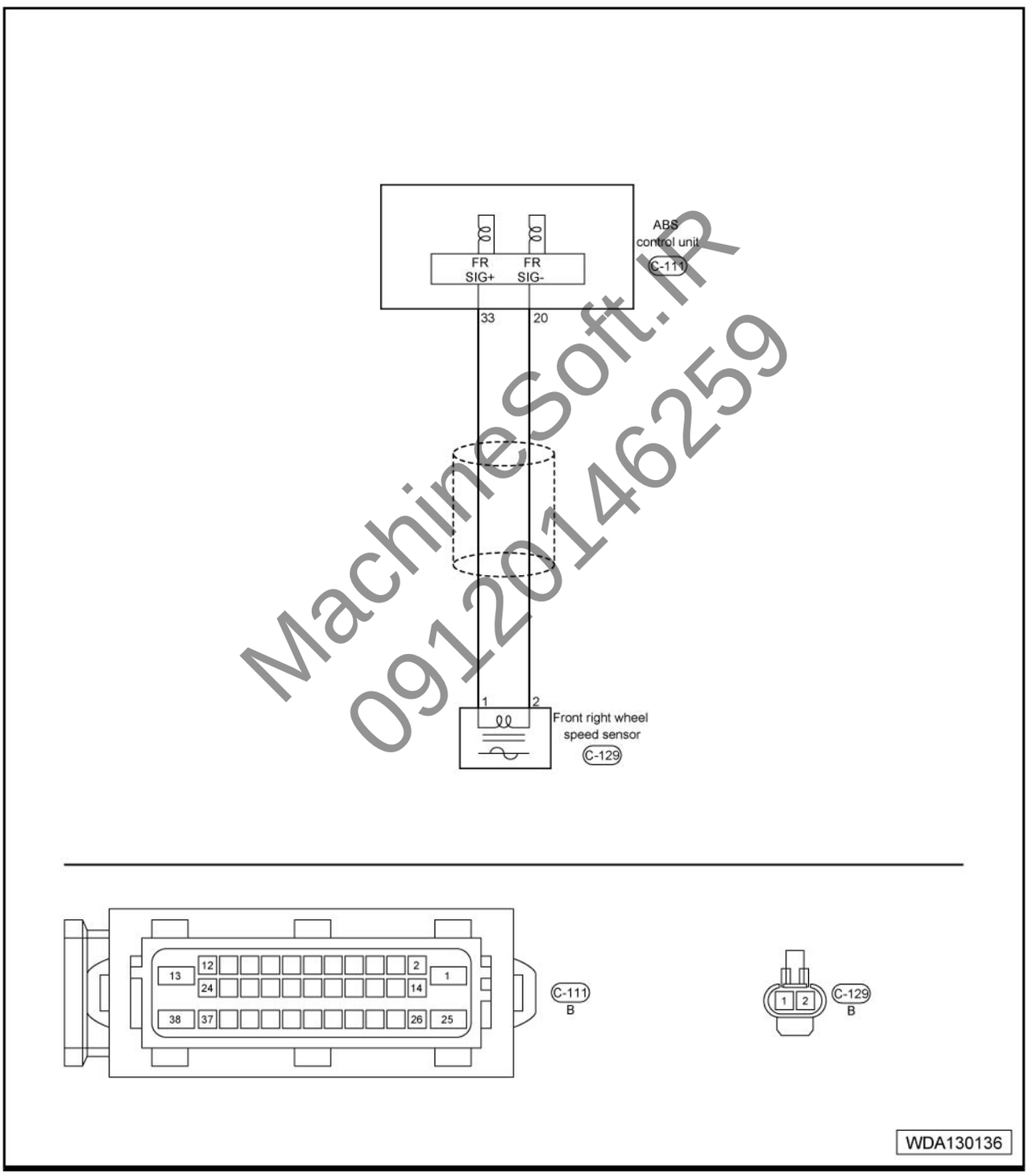
6. Replace the ABS control unit , retest it and read the fault code to verify if the code is present or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

3.6.3 C1203 Front right wheel speed sensor open/short circuit

C1204 Front right wheel speed sensor circuit scope/function/sporadic faults

C1205 Failure/no signal in front right wheel speed sensor



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
C1203	Front right wheel speed sensor open/short circuit	The ignition switch in the ON position	The connecting wiring harness from the ABS control unit to the front right wheel speed sensor short/open circuit	Failure of the wiring harness (open/short circuit)
C1204	Front right wheel speed sensor circuit scope/function/sporadic faults	The ignition switch in the ON position	Front right wheel speed sensor sporadic faults detected by the ABS control unit	Failure of the sensor
C1205	Failure/no signal in front right wheel speed sensor	The ignition switch in the ON position	Failure of the front right wheel speed sensor	Failure of the sensor

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures. If no DTC is detected, it indicates that the previously detected faults are sporadic .

Diagnostic procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the front right wheel speed sensor signal plate is distorted and attached with foreign matters.

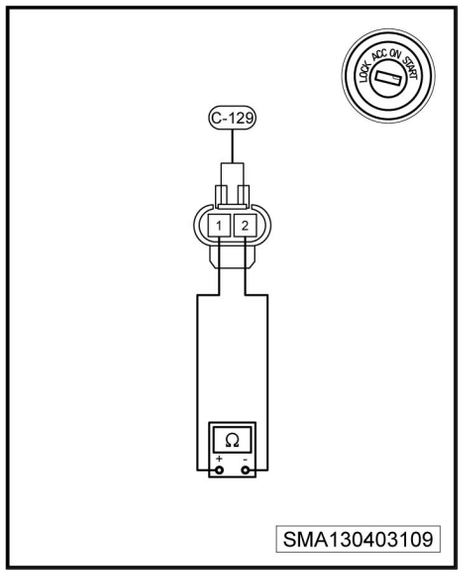
- If yes, the front right wheel signal plate fails and please replace it. ■
- If not, go to step 2.

2. Check if the wheel speed sensor connector is tainted and corrosive.

- If yes, the front right wheel speed sensor connector fails and please repair it. ■
- If not, go to step 3.

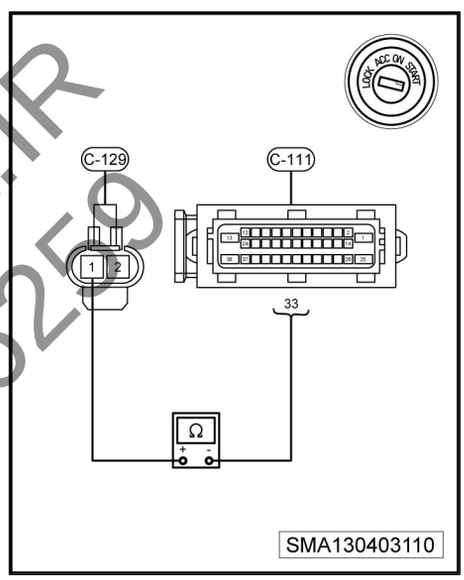
3. When turning the ignition switch to the LOCK position, disconnect the front right wheel speed sensor connector C-129 and measure if the resistance between the wheel speed sensor is normal.

- If yes, go to step 4.
- If not, the front right wheel speed sensor fails and please replace it. ■



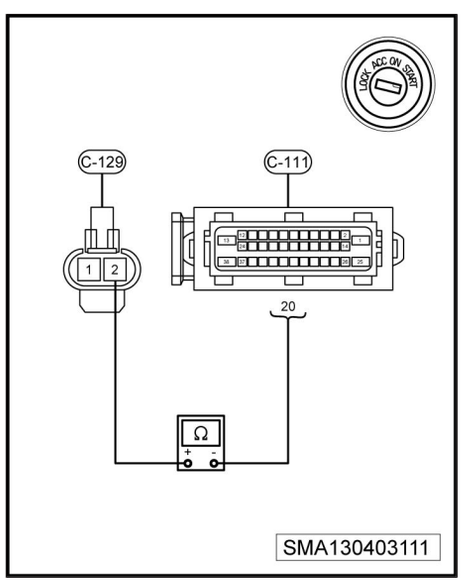
4. When turning the ignition switch to the LOCK position, check if the lead between the wheel speed sensor connector pin 1 and the ABS control unit pin 33 is conducted.

- If yes, go to step 5.
- If not, check if the lead between the wheel speed sensor connector pin 1 and the ABS control unit pin 33 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



5. When turning the ignition switch to the LOCK position, check if the lead between the wheel speed sensor connector pin 2 and the ABS control unit pin 20 is conducted.

- If yes, go to step 6.
- If not, check if the lead between the wheel speed sensor connector pin 2 and the ABS control unit pin 20 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■

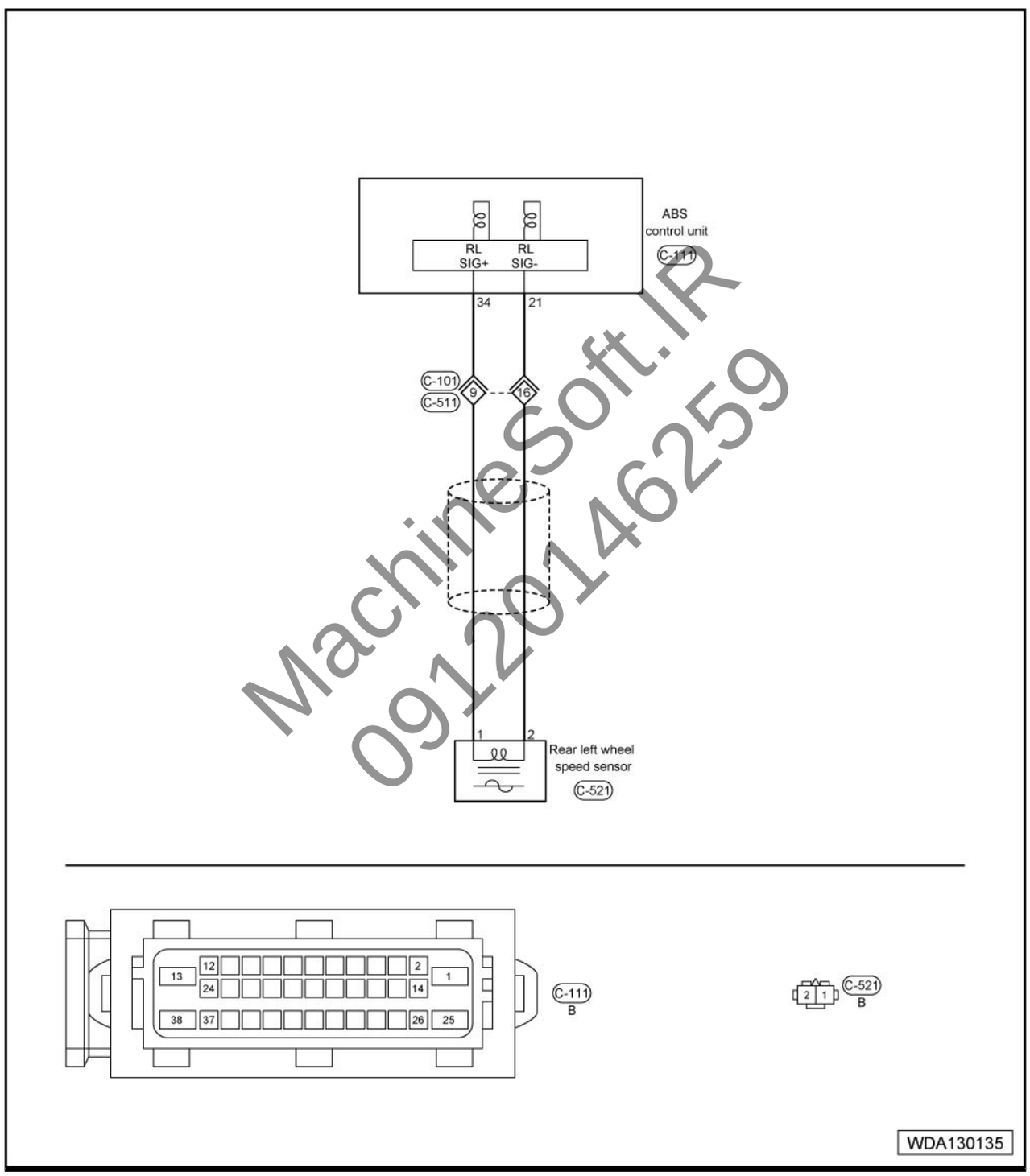


6. Replace the ABS control unit , retest it and read the fault code to verify if the code is present or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

3.6.4 C1206 Rear left wheel speed sensor open/short circuit

C1207 Rear left wheel speed sensor circuit scope/function/sporadic faults
C1208 Failure/no signal in rear left wheel speed sensor



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
C1206	Rear left wheel speed sensor open/short circuit	The ignition switch in the ON position	The connecting wiring harness from the ABS control unit to the rear left wheel speed sensor short/open circuit	Failure of the wiring harness (open/short circuit)
C1207	Rear left wheel speed sensor circuit scope/function/sporadic faults	The ignition switch in the ON position	Rear left wheel speed sensor sporadic faults detected by the ABS control unit	Failure of the sensor
C1208	Failure/no signal in rear left wheel speed sensor	The ignition switch in the ON position	Failure of the front left wheel speed sensor	Failure of the sensor

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures. If no DTC is detected, it indicates that the previously detected faults are sporadic .

Diagnostic procedures:

04

Note

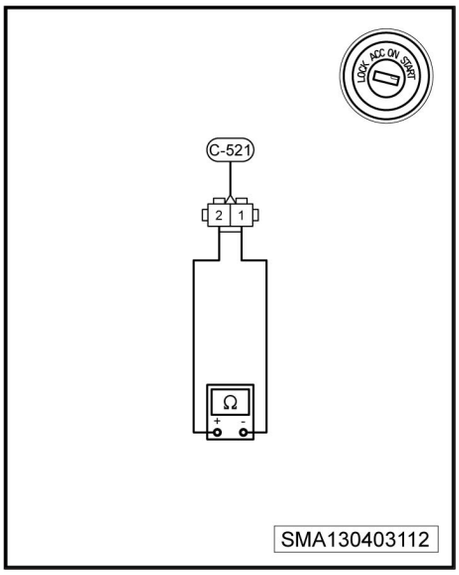
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the rear left wheel speed sensor signal plate is distorted and attached with foreign matters.
   - If yes, the rear left wheel signal plate fails and please replace it. ■
   - If not, go to step 2.

2. Check if the wheel speed sensor connector is tainted and corrosive.
   - If yes, the rear left wheel speed sensor connector fails and please repair it. ■
   - If not, go to step 3.

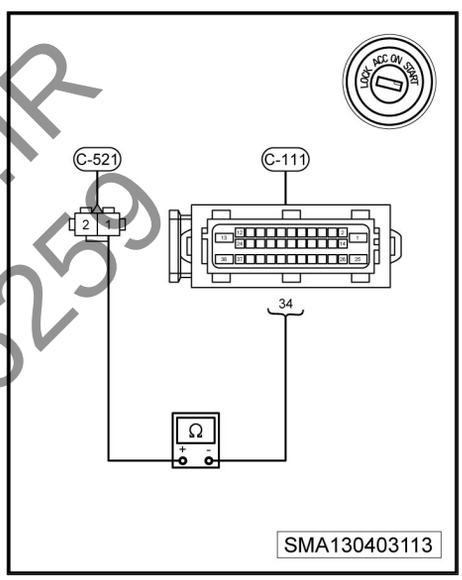
3. When turning the ignition switch to the LOCK position, disconnect the rear left wheel speed sensor connector C-521 and measure if the resistance between the wheel speed sensor is normal.

- If yes, go to step 4.
- If not, the rear left wheel speed sensor fails and please replace it. ■



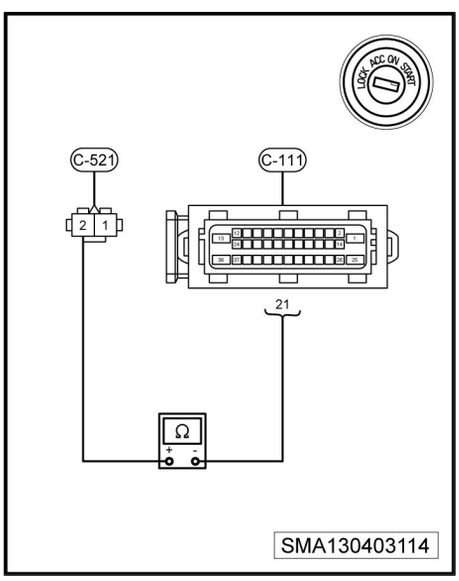
4. When turning the ignition switch to the LOCK position, check if the lead between the wheel speed sensor connector pin 1 and the ABS control unit pin 34 is conducted.

- If yes, go to step 5.
- If not, check if the lead between the wheel speed sensor connector pin 1 and the ABS control unit pin 34 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



5. When turning the ignition switch to the LOCK position, check if the lead between the wheel speed sensor connector pin 2 and the ABS control unit pin 21 is conducted.

- If yes, go to step 6.
- If not, check if the lead between the wheel speed sensor connector pin 2 and the ABS control unit pin 21 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



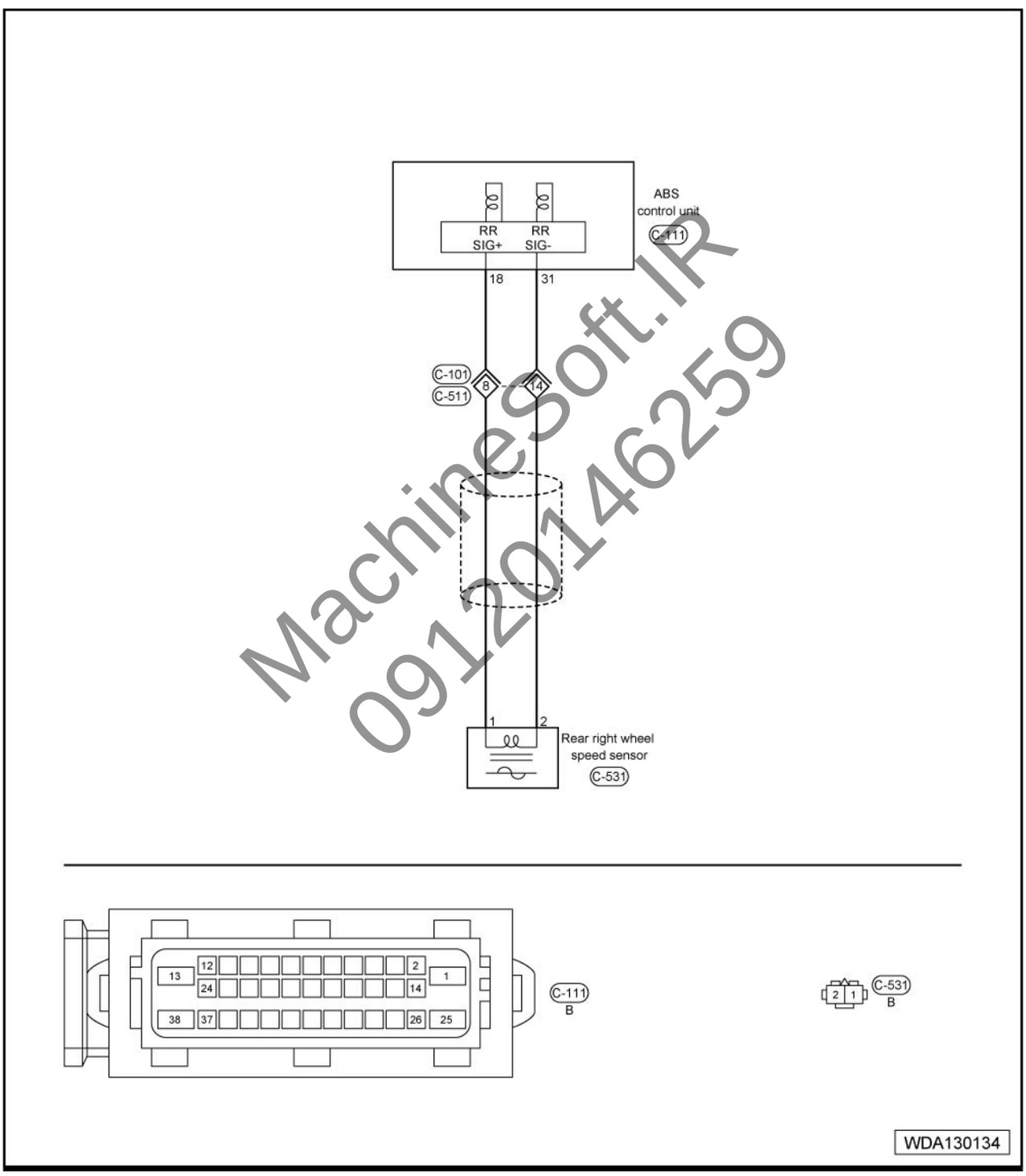
6. Replace the ABS control unit , retest it and read the fault code to verify if the code is present or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

3.6.5 C1209 Rear right wheel speed sensor open/short circuit

C1210 Rear right wheel speed sensor circuit scope/function/sporadic faults

C1211 Failure/no signal in rear right wheel speed sensor



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
C1209	Rear right wheel speed sensor open/short circuit	The ignition switch in the ON position	The connecting wiring harness from the ABS control unit to the rear right wheel speed sensor short/open circuit	Failure of the wiring harness (open/short circuit)
C1210	Rear right wheel speed sensor circuit scope/function/sporadic faults	The ignition switch in the ON position	Rear right wheel speed sensor sporadic faults detected by the ABS control unit	Failure of the sensor
C1211	Failure/no signal in rear right wheel speed sensor	The ignition switch in the ON position	Failure of the rear right wheel speed sensor	Failure of the sensor

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures. If no DTC is detected, it indicates that the previously detected faults are sporadic .

Diagnostic procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the rear right wheel speed sensor signal plate is distorted and attached with foreign matters.

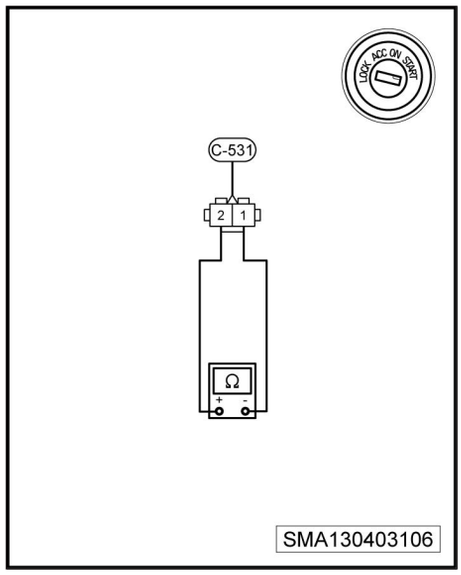
- If yes, the rear right wheel signal plate fails and please replace it. ■
- If not, go to step 2.

2. Check if the wheel speed sensor connector is tainted and corrosive.

- If yes, the rear right wheel speed sensor connector fails and please repair it. ■
- If not, go to step 3.

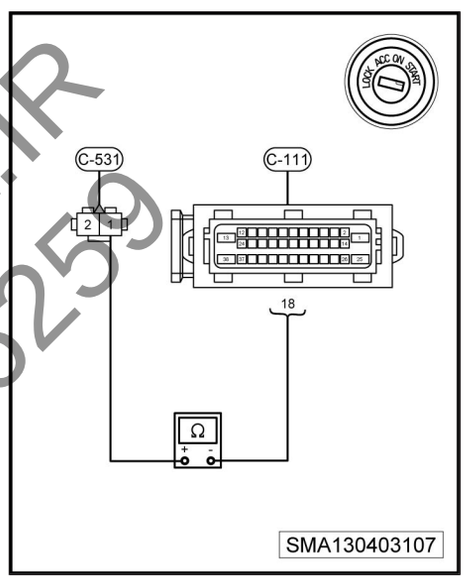
3. When turning the ignition switch to the LOCK position, disconnect the rear right wheel speed sensor connector C-531 and measure if the resistance between the wheel speed sensor is normal.

- If yes, go to step 4.
- If not, the rear right wheel speed sensor fails and please replace it. ■



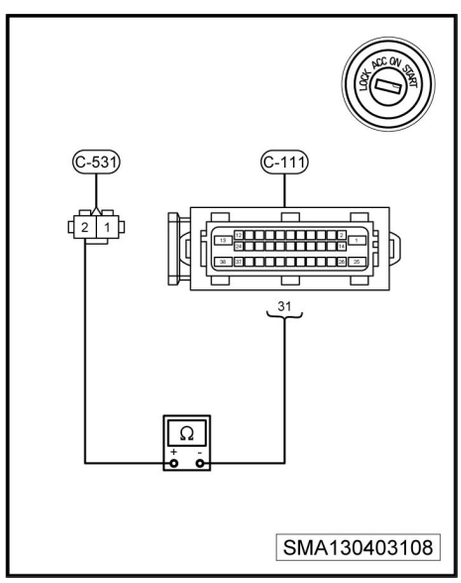
4. When turning the ignition switch to the LOCK position, check if the lead between the wheel speed sensor connector pin 1 and the ABS control unit pin 18 is conducted.

- If yes, go to step 5.
- If not, check if the lead between the wheel speed sensor connector pin 1 and the ABS control unit pin 18 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



5. When turning the ignition switch to the LOCK position, check if the lead between the wheel speed sensor connector pin 2 and the ABS control unit pin 31 is conducted.

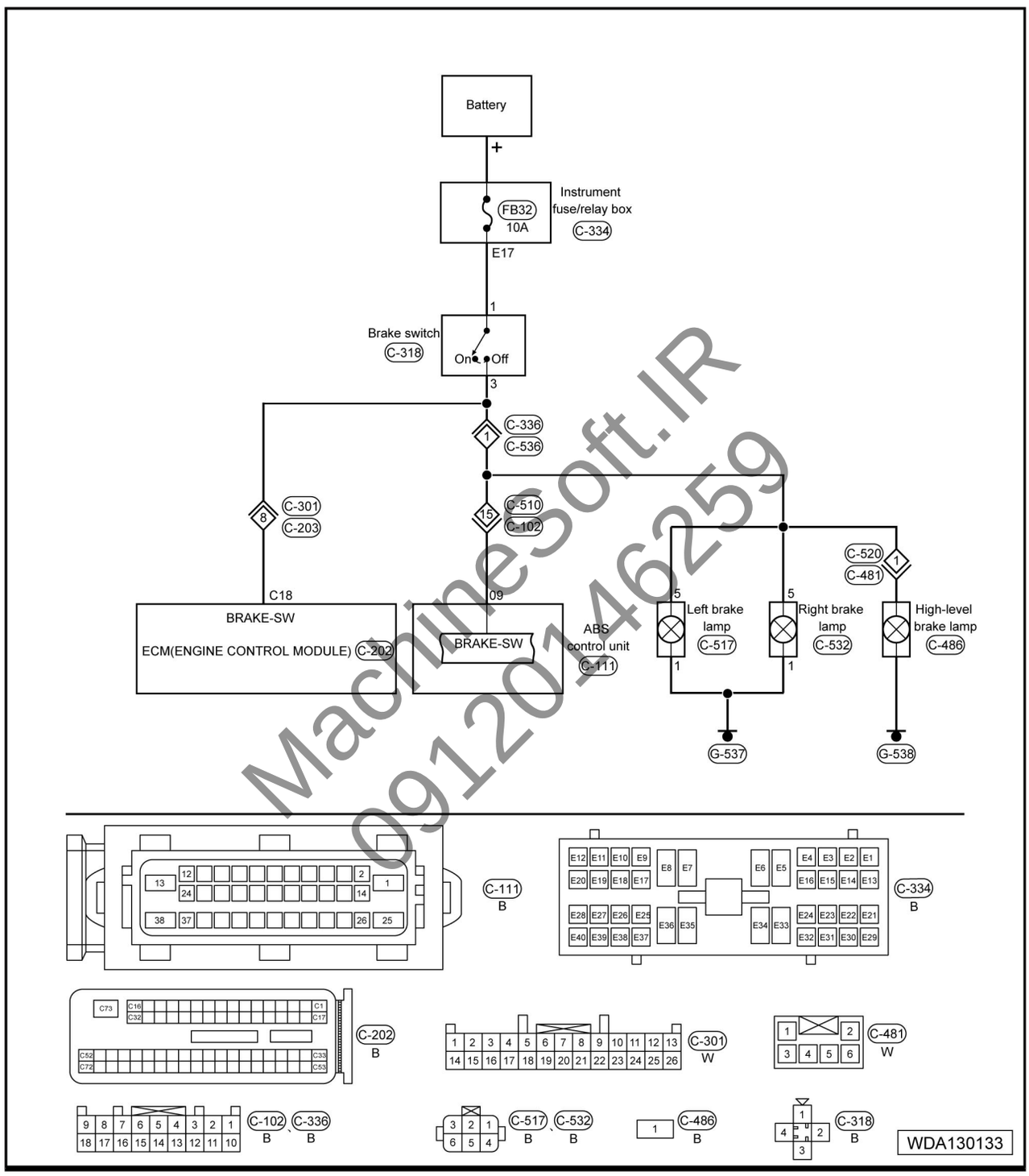
- If yes, go to step 6.
- If not, check if the lead between the wheel speed sensor connector pin 2 and the ABS control unit pin 31 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



6. Replace the ABS control unit , retest it and read the fault code to verify if the code is present or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

3.6.6 P1513 Brake switch failure



Brake switch value

Brake switch pin No.	Function	Condition	Value (DC voltage range)
1	Brake switch power supply	The ignition switch in the LOCK position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
P1513	Brake switch failure	The ignition switch in the LOCK/ON position	Brake switch failure detected by the ABS control unit	• Failure of the wiring harness (short/open circuit) • Failure of the brake switch

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures. If no DTC is detected, it indicates that the previously detected faults are sporadic .

Diagnostic procedures:

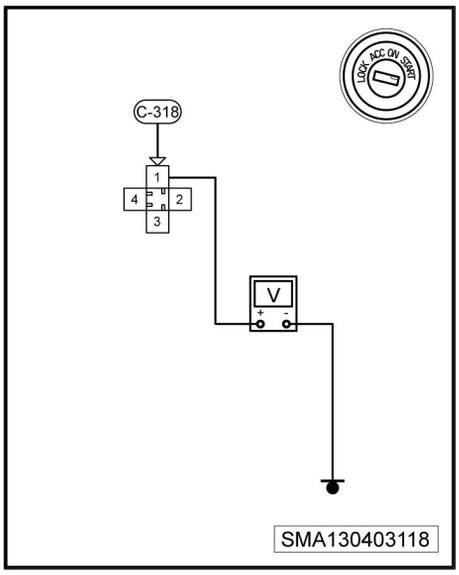
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the brake switch power supply fuse FB32 is faulty.
   - If yes, the fuse fails and please replace it. ■
   - If not, go to step 2.
2. Check the brake switch for damage.
   - If yes, the brake switch fails and please replace it. ■
   - If not, go to step 3.

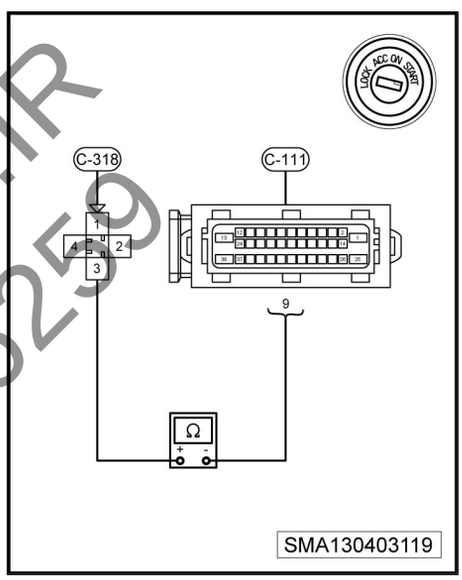
3. When turning the ignition switch to the LOCK position, disconnect the brake switch connector C-318 and check if the voltage between the connector pin 1 and the body ground reaches the battery voltage.

- If yes, go to step 4.
- If not, check if the wiring harness has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



4. When turning the ignition switch to the LOCK position, check if the lead between the brake switch connector pin 3 and the ABS control unit pin 9 is conducted.

- If yes, go to step 5.
- If not, check if the lead between the brake switch connector pin 3 and the ABS control unit pin 9 has grounding, short circuit, open circuit, excessive resistance value and fake connection, and repair defective lead. ■



5. Replace the ECM control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

4 Regular Brake Assemblies

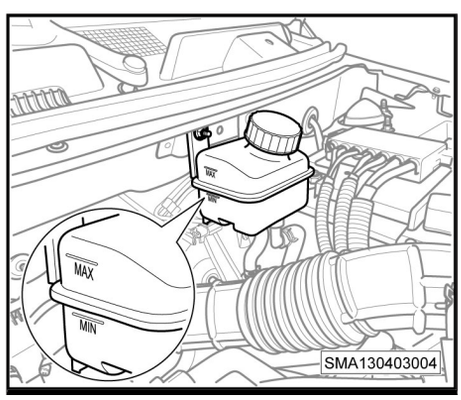
4.1 Regular brake system exhaust

Caution

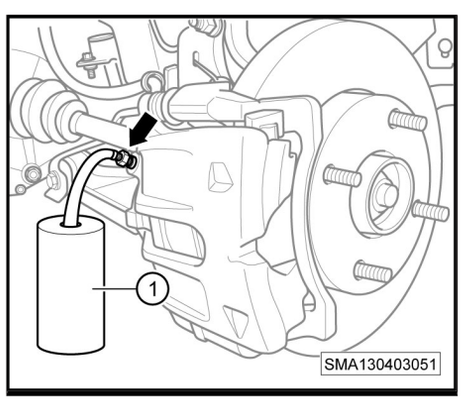
- Discharged brake fluid cannot be reused.
- Only use the brake fluid approved by Chery Automobile Co., Ltd.; otherwise, it may lead to pipeline corrosion.
- Make sure that the brake fluid is free of contamination.
- Never splash brake fluid on the vehicle; otherwise, it may damage the vehicle paintwork. If the brake fluid splashes on the paintwork, please rinse it with water immediately.
- After air discharge, you shall check the brake oil pipe and the connector for leakage. The brake fluid level in reservior shall be at the MAX mark.

Exhaust

1. Confirm the brake fluid level in reservior at the MAX mark.

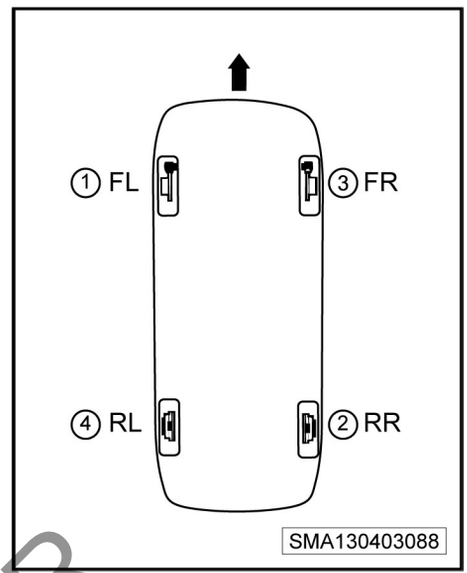


2. Connect the oil drain port to the vessel (-1-) with a transparent plastic hose.
3. After another technician slowly presses the brake pedal repeatedly and exerts an invariable pressure. Loosen the exhaust screw of the brake caliper (-arrow-) until some brake fluid is discharged.
4. Tighten the exhaust screw (-arrow-).

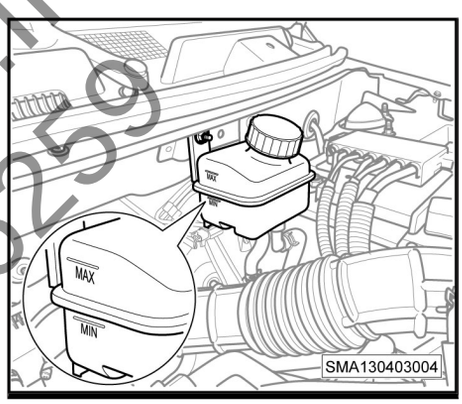


5. Repeat the above steps until the air in the system is all discharged.

6. Discharge air in each wheel in the sequence shown in the figure until air in the brake fluid is all discharged.



7. Refill brake fluid to raise the brake fluid level at the MAX mark.



4.2 Disassembling and assembling the front wheel brake caliper

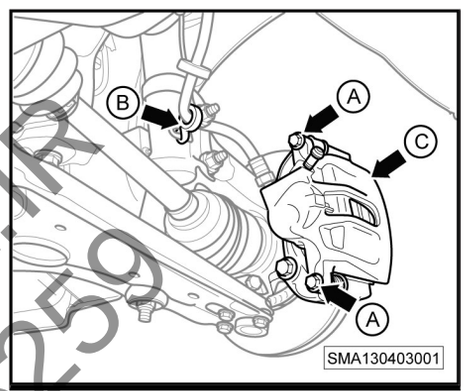
Note

- Do not carry out mechanical working on the brake caliper cylinder block and the piston.
- Seal the disconnected pipe to prevent the outflow of oil and inflow of foreign matters.
- When pressing out the brake piston, do not grip it to prevent body injury.
- Avoid inhaling brake pad dust because it is toxic.

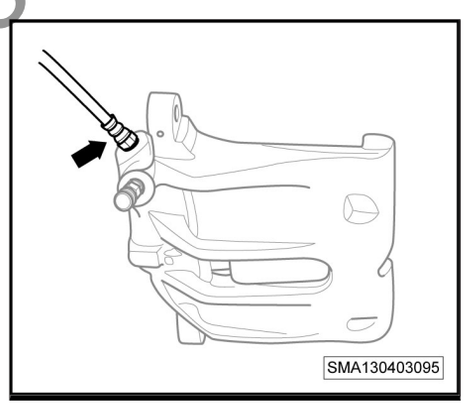
Disassembly

1. Drain the brake fluid in reservior.
2. Remove the wheels .=> refer to page 760

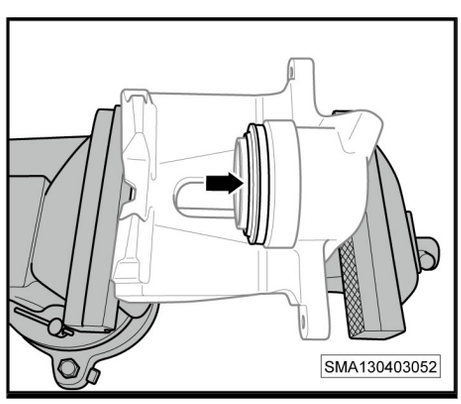
3. Unscrew the brake caliper fixing bolts (-arrow A-), loosen the brake hose clip (-arrow B-) to remove the brake caliper (-arrow C-).
   - Tightening torque of the bolt: 22±1 N•m



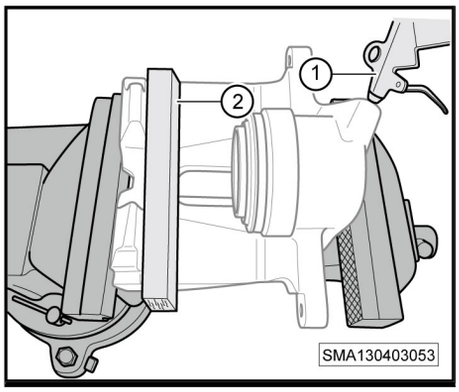
4. Unscrew the brake oil pipe bolt (-arrow-).
   - Tightening torque of the bolt: 18±1 N•m



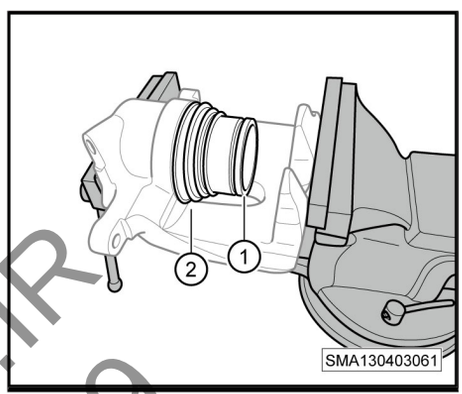
5. Remove the rubber dust cover from the piston groove in the (-arrow-) direction.



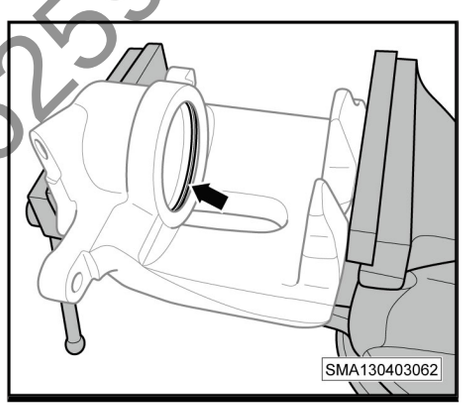
6. The wooden plate (-2-) is placed between the brake caliper piston and the brake caliper wall. Carefully press out the brake caliper piston with the compressed air (-1-).



7. Remove the brake caliper piston (-1-) and the rubber dust cover (-2-).



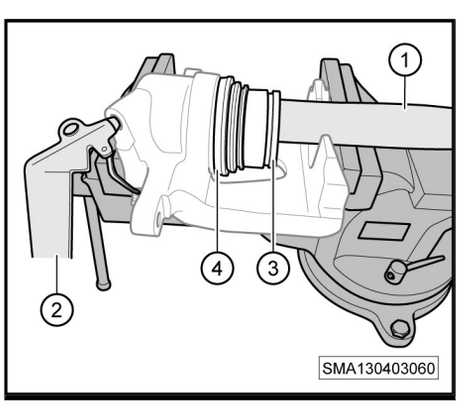
8. Carefully remove the brake caliper piston oil seal (-arrow-).
9. Rinse the brake caliper cylinder block and the brake caliper piston with alcohol and dry them.



Assembly

1. Install the brake caliper piston oil seal and the brake caliper piston dust cover.

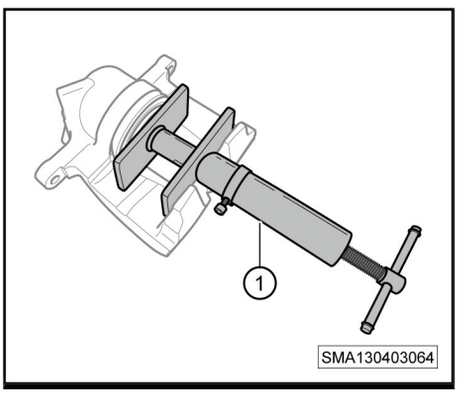
2. Jack up the brake caliper piston (-3-) with the tool (-1-), blow up the dust cover (-4-) with the compressed air (-2-), and install the brake caliper piston in the dust cover.



Note

- Apply brake fluid on the brake caliper surface so that the brake caliper piston can be more easily installed in the dust cover.

3. Reset the brake caliper piston with the tool (-1-).



4. Assembly shall follow the reverse sequence of the disassembly procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Check the brake caliper for cracks and distortion. Replace it if necessary.
- Check the piston movement for blockage and the piston return for smoothness. Replace it if necessary.
- Check the piston and the cylinder wall for damage and corrosion. Replace the brake caliper assembly if necessary.
- Check the brake fluid level. Add brake fluid if necessary .
- After assembling the brake caliper, exhaust the brake system.

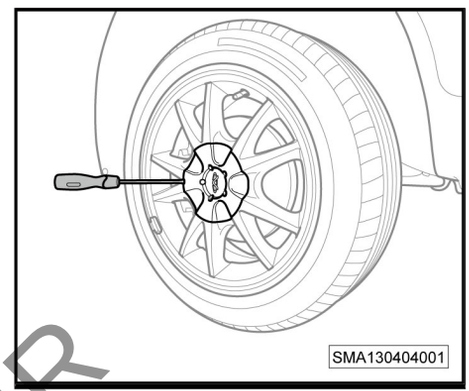
4.3 Removing and installing the front brake pad

Note

- Please wear necessary protective facilities to avoid accidents.

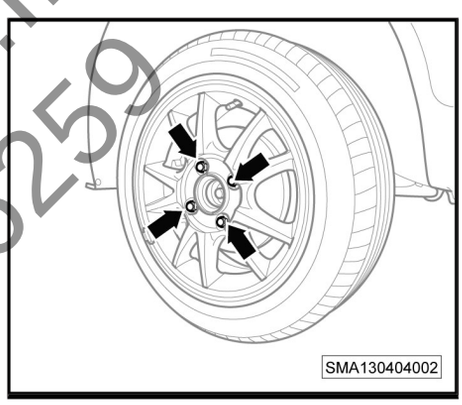
Removal

1. Pry out the decorative covers for wheel nuts with a screwdriver.



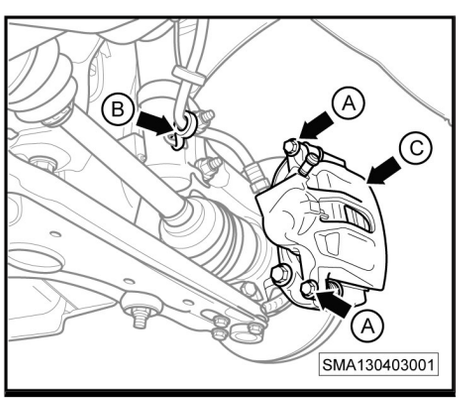
2. Loosen the wheel fixing nuts (-arrow-). Lift the vehicle safely. Unscrew the wheel fixing nuts and remove the wheel.

- Tightening torque of the nut: 110±10 N•m



3. Unscrew the brake caliper fixing bolts (-arrow A-) and loosen the brake hose clip (-arrow B-) to remove the brake caliper (-arrow C-).

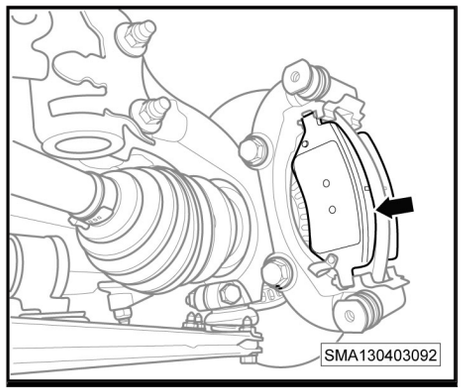
- Tightening torque of the bolt: 22±1 N•m



Note

- It is impermissible to directly suspend the brake caliper, which should be secured with a strap to prevent brake hose damage.

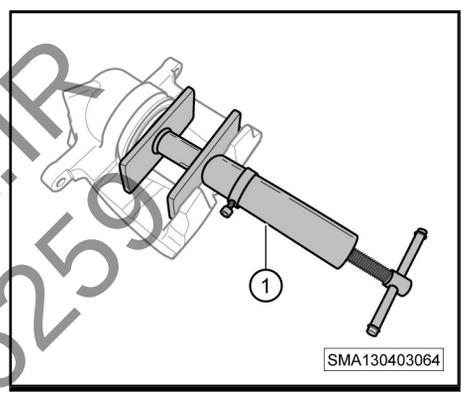
4. Remove the front brake pad (-arrow-).



Installation

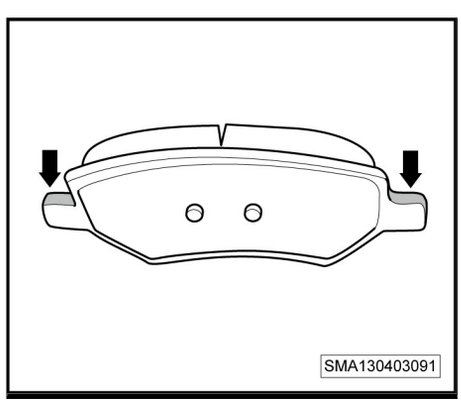
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Reset the brake caliper piston with the tool (-1-).



- Tighten the fixing bolts with the specified torque.
- Avoid inhaling brake pad dust because it is toxic.

- When installing the brake pad, apply grease in the position shown by the (-arrow-) on the brake pad to reduce brake pad noise.



4.4 Removing and installing the front brake disc

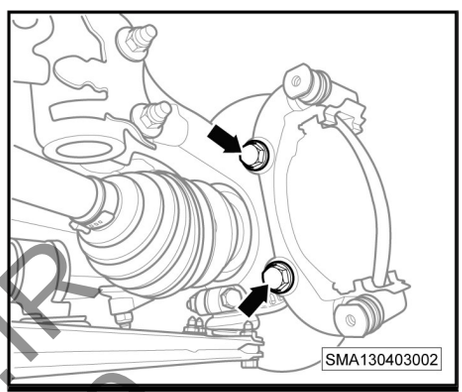
Note

- Please wear necessary protective facilities to avoid accidents.

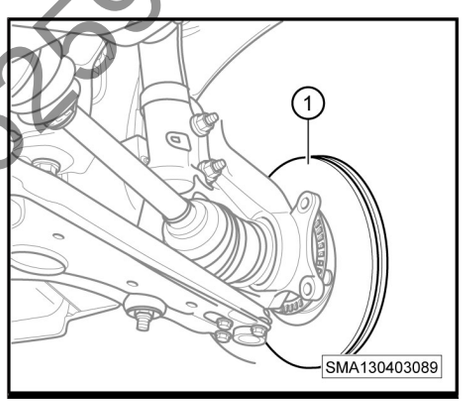
Removal

1. Remove the front brake pad .=> refer to page 723

2. Unscrew the brake caliper bracket fixing bolts (-arrow-) to remove the brake caliper bracket.
   - Tightening torque of the bolt: 85±5 N•m



3. Remove the brake disc (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- It is impermissible to directly suspend the brake caliper, which should be secured with a strap to prevent brake hose damage.
- Avoid inhaling brake pad dust because it is toxic.
- Clean oil stains on the brake disc.

4.5 Removing and installing the rear wheel brake drum

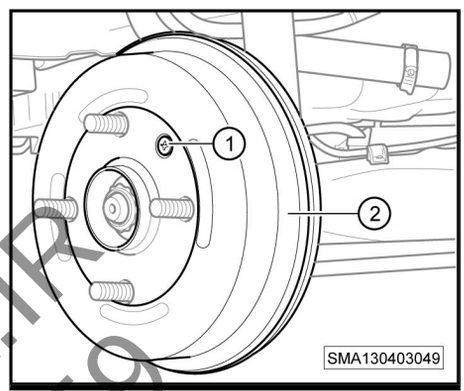
Note

- Please wear necessary protective facilities to avoid accidents.

Removal

1. Remove the rear wheels .=> refer to page 760
2. Place the parking brake lever at the lowest position.

3. Unscrew the fixing bolt of the rear brake drum (-1-) to remove the rear brake drum (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

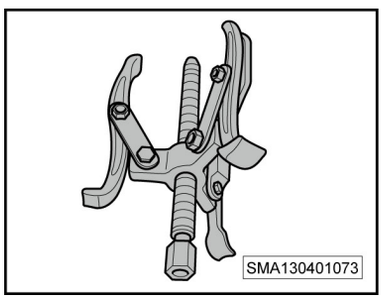
- Tighten the fixing bolts with the specified torque.
- Avoid inhaling brake pad dust because it is toxic.

4.6 Removing and installing the rear wheel brake shoe

Note

- Please wear necessary protective facilities to avoid accidents.

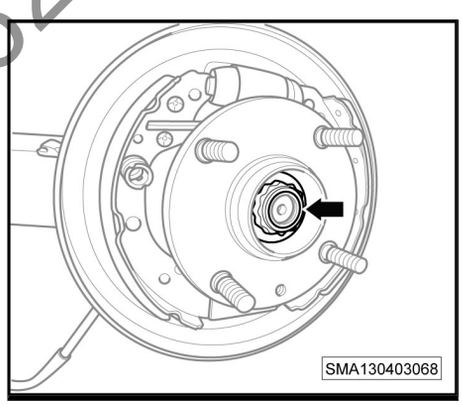
Maintenance tools and common equipment

	
Puller	

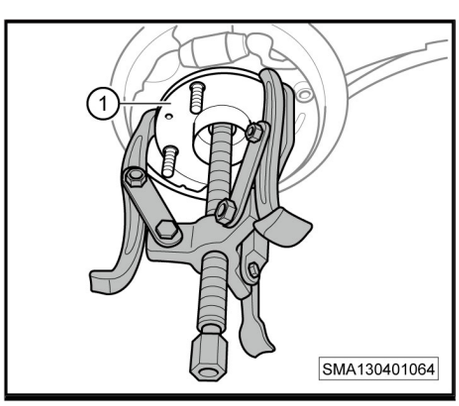
Removal

1. Remove the rear wheel brake drum .=> refer to page 726

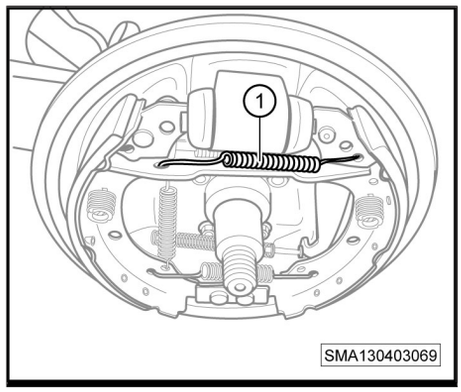
2. Unscrew the fixing nut of the rear wheel hub bearing (-arrow-).
   - Tightening torque of the nut: 230±10 N•m



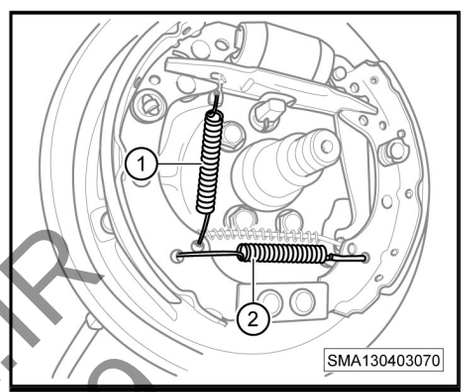
3. Pull out the rear wheel hub (-1-) with the puller.



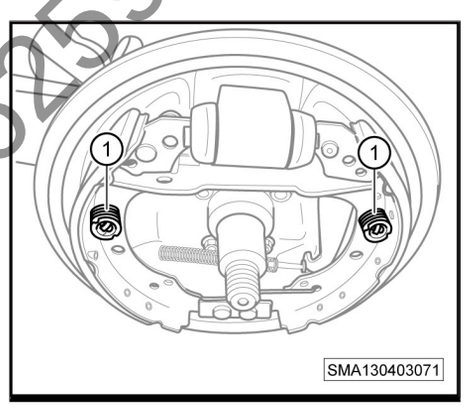
4. Remove the upper return spring (-1-).



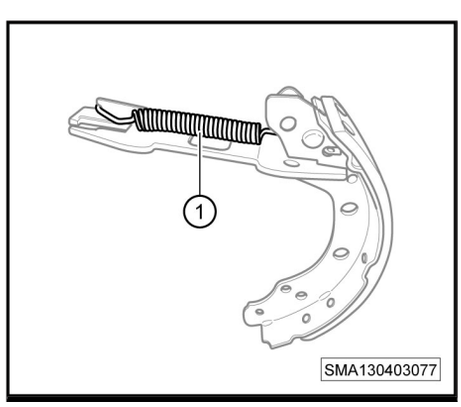
5. Remove the adjusting spring (-1-) and the lower return spring (-2-).



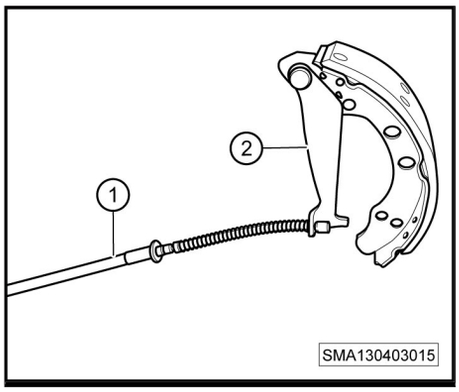
6. Push the retaining springs (-1-) and rotate the spring lock pin to pull out the retaining springs and remove the rear brake shoes.



7. Remove the coupling spring (-1-) between the wedge and the brake shoe to separate the wedge from the brake shoe.



8. Disconnect the parking brake cable (-1-) from the brake shoe pushrod (-2-) to remove the brake shoe.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Avoid inhaling brake pad dust because it is toxic.

4.7 Removing and installing the brake pedal

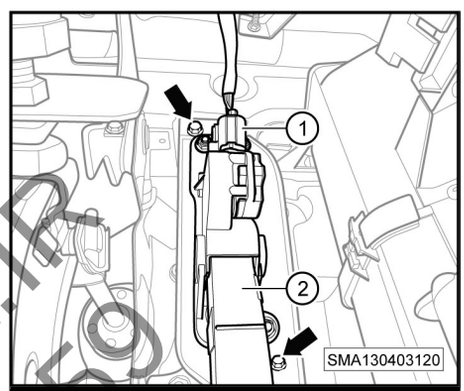
Note

- Please wear necessary protective facilities to avoid accidents.

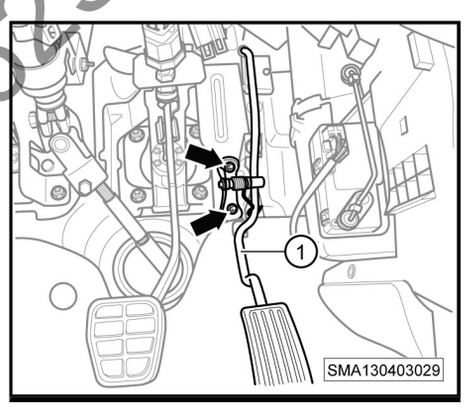
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.

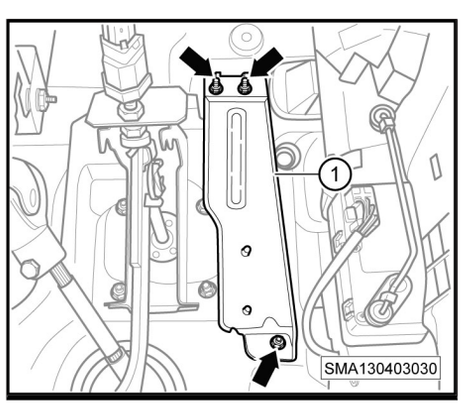
3. Disconnect the electronic accelerator pedal position sensor connector (-1-) and unscrew the electronic accelerator pedal mounting bracket nuts (-arrow-) to remove the electronic accelerator pedal (-2-). (Applicable to removal of electronic accelerator pedal)



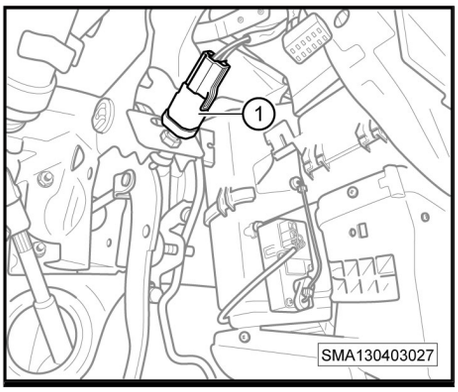
4. Unscrew the accelerator pedal fixing nuts (-arrow-) to remove the accelerator pedal (-1-). (Applicable to removal of mechanical accelerator pedal)



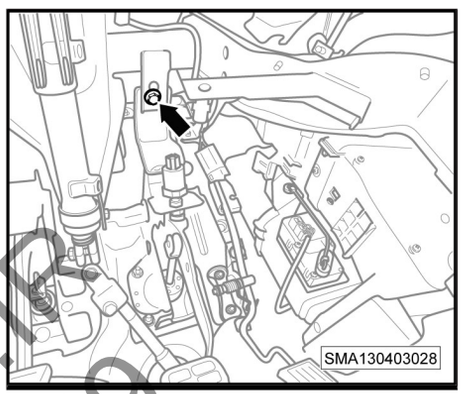
5. Unscrew the mechanical accelerator pedal fixing nuts (-arrow-) to remove the accelerator pedal mounting bracket (-1-). (Applicable to removal of mechanical accelerator pedal)



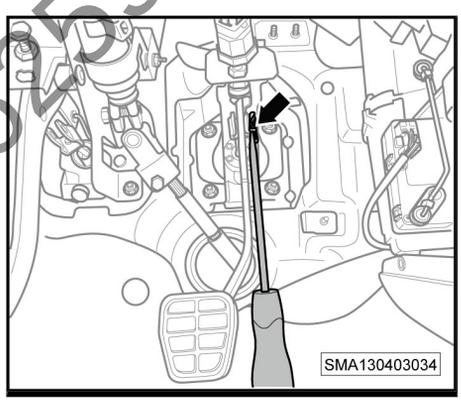
6. Disconnect the brake switch connector (-1-).



7. Unscrew the coupling bolt between the brake pedal and the cross car beam (-arrow-).

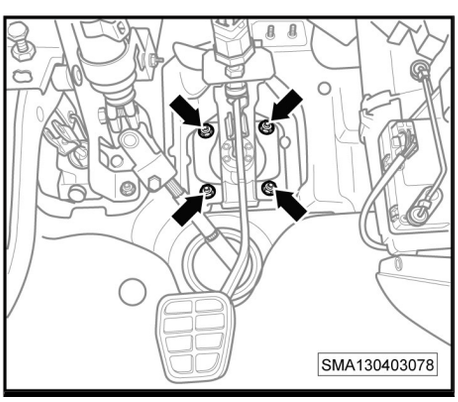


8. Pry out the fixing clamp spring of the vacuum booster pushrod lock pin (-arrow-) with a screwdriver and remove the pushrod lock pin.

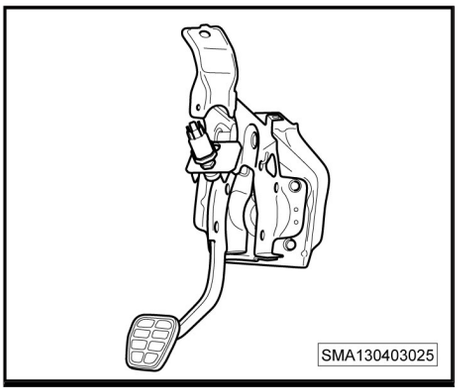


9. Unscrew the coupling nuts between the brake pedal and the vacuum booster (-arrow-).

- Tightening torque of the nut: 25±3 N•m



10. Remove the brake pedal assembly.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- After installation, check the brake pedal height. Adjust it if necessary .=> refer to page 688

4.8 Removing and installing the brake master cylinder

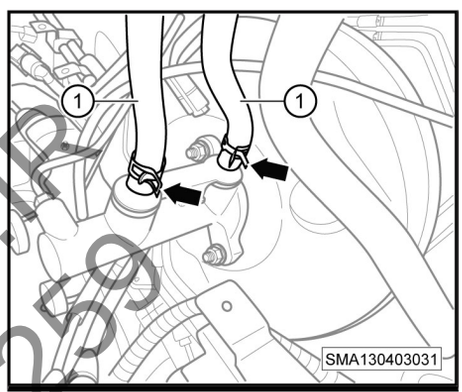
Note

- Please wear necessary protective facilities to avoid accidents.
- Before operating, drain the brake fluid reservior with a fluid suction device.
- Block the brake fluid oil pipe with a stopper to prevent the outflow of the brake fluid.

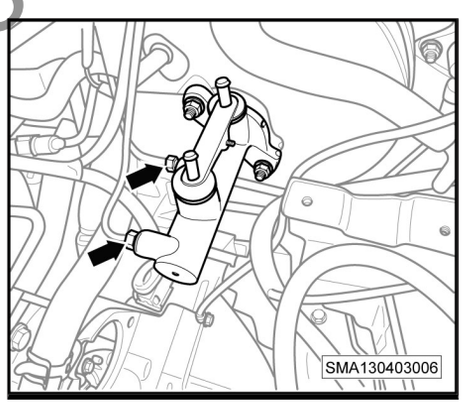
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Remove the battery and the battery tray.

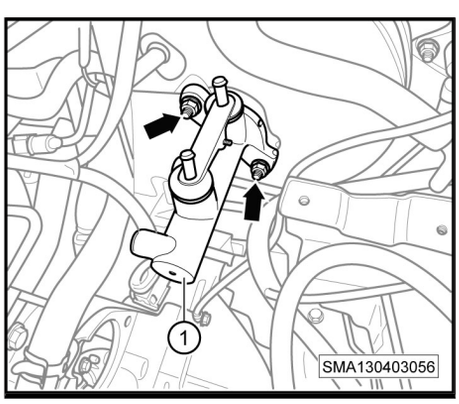
3. Loosen the clamps (-arrow-) and disconnect the brake fluid pipe connecting to the brake master cylinder (-1-).



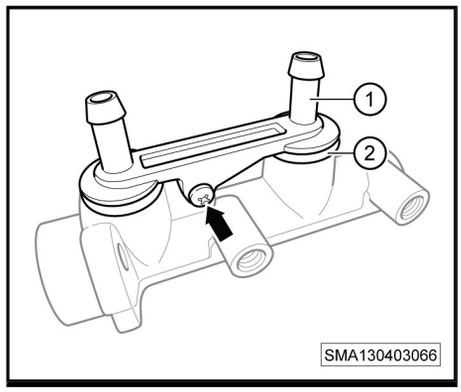
4. Unscrew the brake hard pipe bolts on the brake master cylinder (-arrow-) and seal the brake hard pipe with a stopper.
   - Tightening torque of the bolt: 18±1 N•m



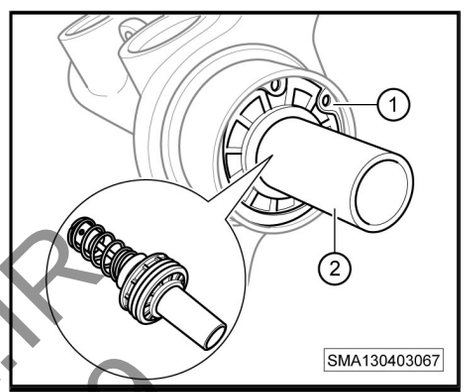
5. Unscrew the fixing nuts of the brake master cylinder (-arrow-) to carefully remove the brake master cylinder (-1-).
   - Tightening torque of the nut: 23±1 N•m



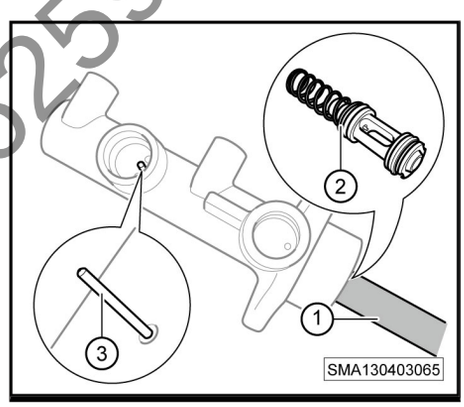
6. Unscrew the adapter fixing bolt (-arrow-) to remove the adapter (-1-) and the seal ring (-2-).



7. Pull out the stop ring (-1-) and remove the brake master cylinder secondary piston (-2-).



8. Hold down the brake master cylinder primary piston (-2-) with the tool (-1-) to pull out the limit pin (-3-) and remove the brake master cylinder primary piston (-2-).



04

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Seal ring shall not be reused.
- After installation, exhaust the brake system .=> refer to page 718

4.9 Removing and installing the brake booster

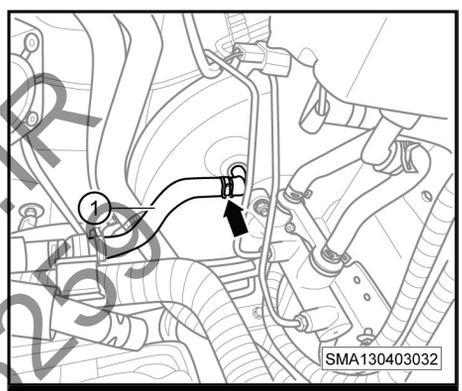
Note

- Please wear necessary protective facilities to avoid accidents.
- Before operating, drain the brake fluid reservior with a fluid suction device.
- Block the brake fluid oil pipe with a stopper to prevent the outflow of the brake fluid.

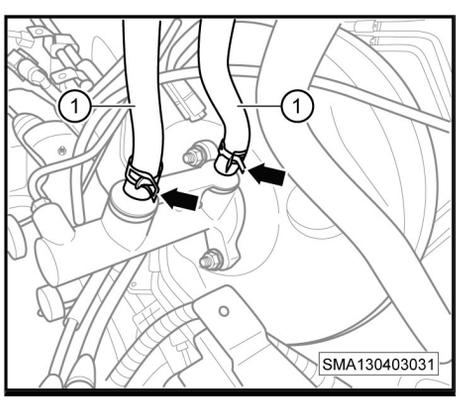
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Remove the battery and the battery tray .=> refer to page 976

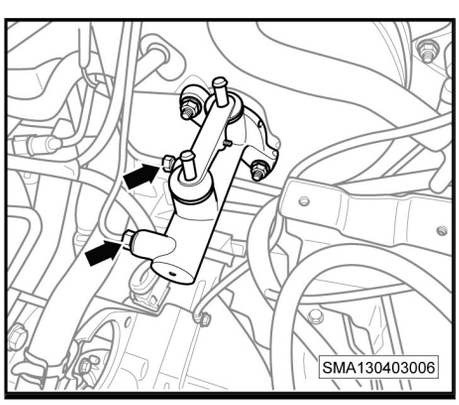
3. Loosen the clamps (-arrow-) to disconnect the vacuum booster vacuum tube (-1-).



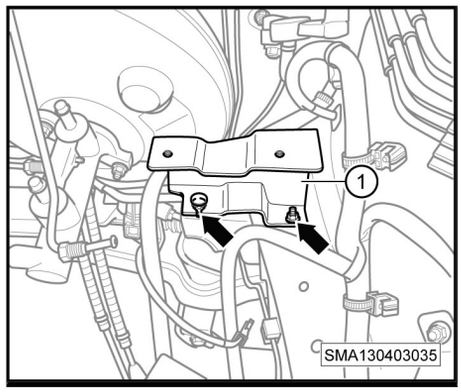
4. Loosen the clamps (-arrow-) and disconnect the brake fluid pipe connecting to the brake master cylinder (-1-).



5. Unscrew the brake hard pipe bolts on the brake master cylinder (-arrow-) and seal the brake hard pipe with a stopper.
   - Tightening torque of the bolt: 18±1 N•m

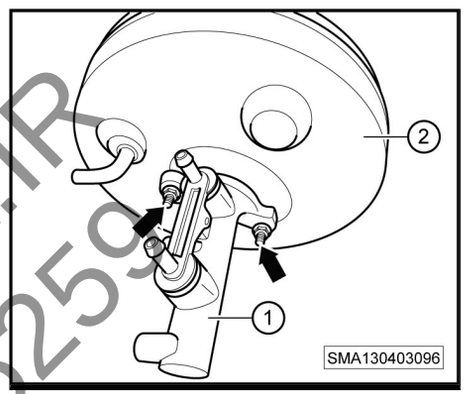


6. Unscrew the fixing bolts of the battery tray bracket (-arrow-) to remove the battery tray bracket (-1-).



7. Remove the brake pedal .=> refer to page 730
8. Remove the brake master cylinder together with the brake booster.

9. Unscrew the brake master cylinder nuts (-arrow-) to separate the brake booster (-2-) from the brake master cylinder (-1-).
   - Tightening torque of the nut: 23±1 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

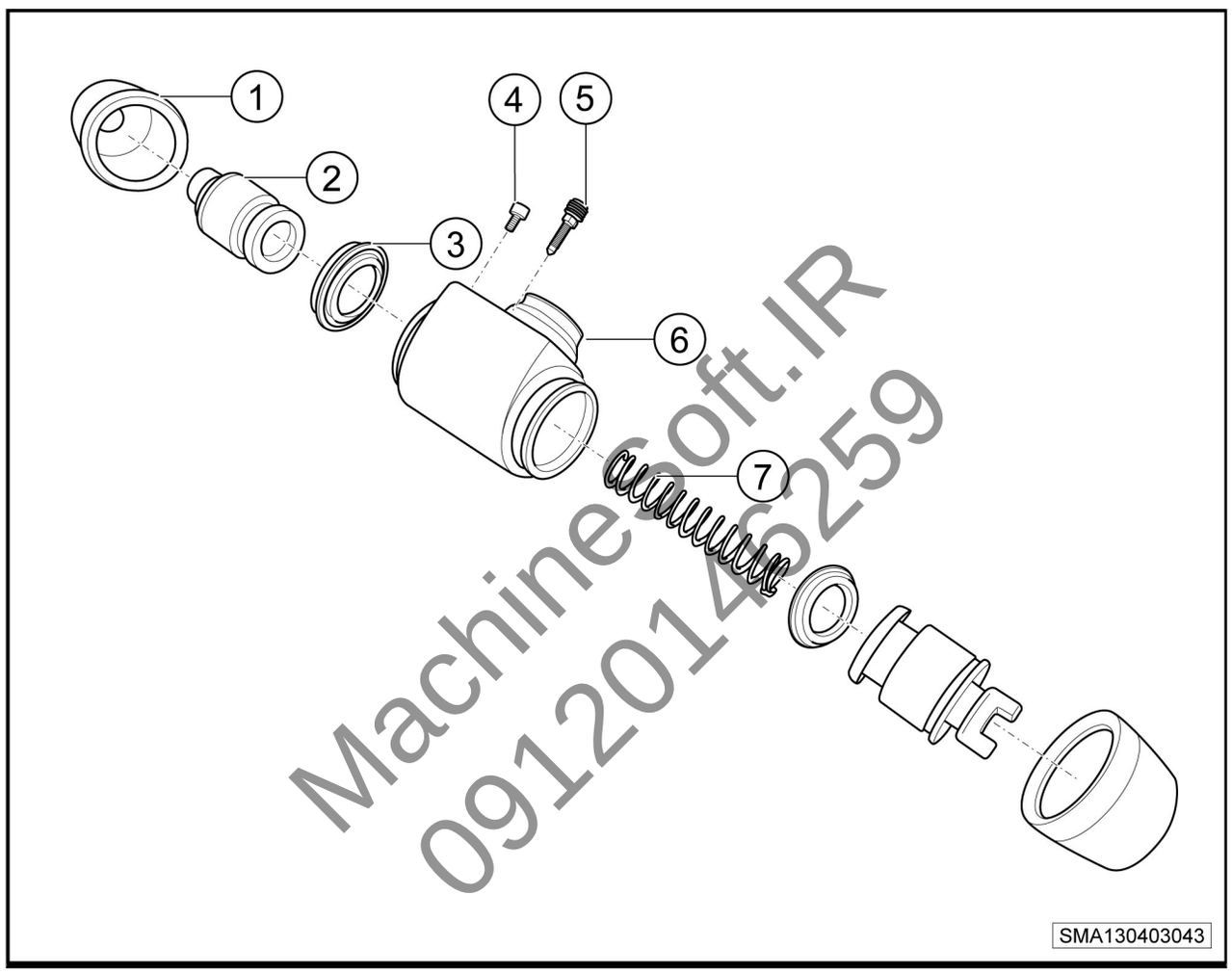
- Tighten the fixing bolts with the specified torque.
- Seal ring shall not be reused.
- After installation, exhaust the brake system.=> refer to page 718
- After installation, check the brake pedal height. Adjust it if necessary. => refer to page 688

4.10 Removing and installing the rear wheel cylinder

Note

- Please wear necessary protective facilities to avoid accidents.
- Before operating, drain the brake fluid reservior with a fluid suction device.
- Block the brake fluid oil pipe with a stopper to prevent the outflow of the brake fluid.

The rear wheel cylinder assembly drawing



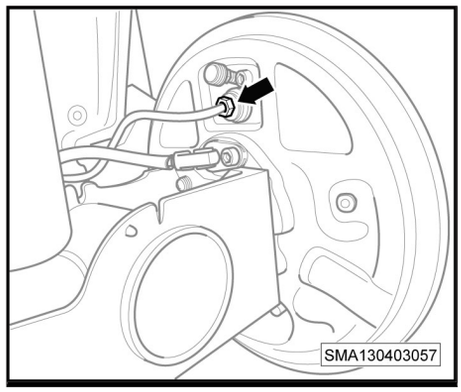
1. Rear wheel cylinder piston dust cover	2. Rear wheel cylinder piston
3. Rear wheel cylinder cup	4. Rear wheel cylinder fixing bolt
5. Rear brake exhaust port	6. Rear wheel cylinder block
7. Rear wheel cylinder piston spring	

Removal

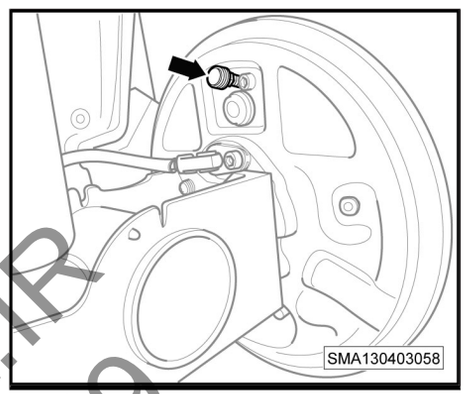
1. Remove the rear brake shoe . => refer to page 727

2. Unscrew the brake fluid oil pipe port bolt (-arrow-) to disengage the brake pipe.

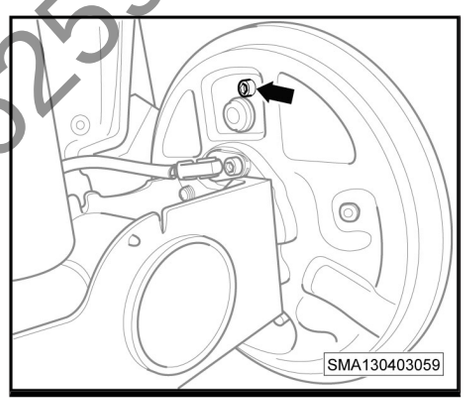
- Tightening torque of the bolt: 18±1 N•m



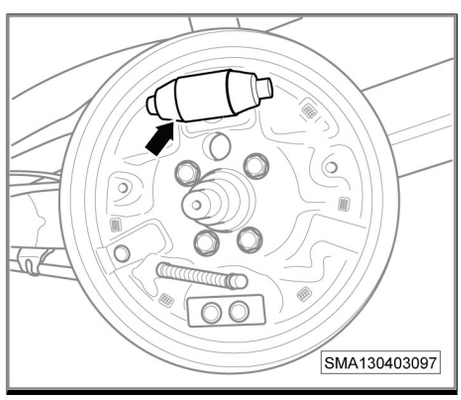
3. Unscrew the exhaust port bolt (-arrow-).



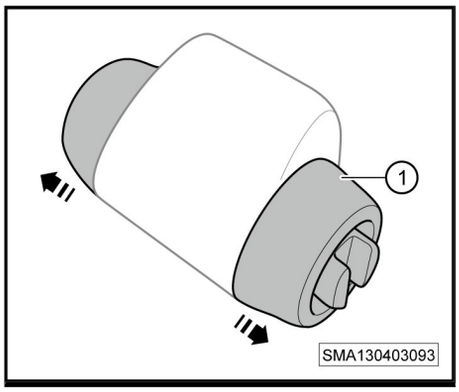
4. Unscrew the rear wheel cylinder fixing bolt (-arrow-).



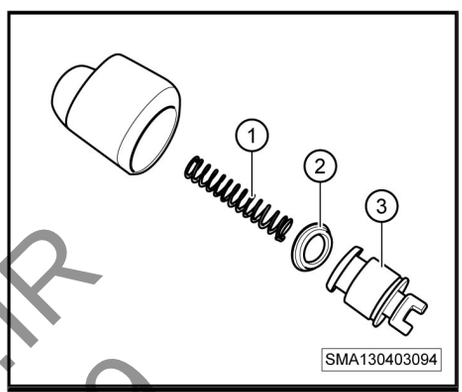
5. Remove the rear wheel cylinder (-arrow-).



6. Pull out the dust cover (-1-) in the (-arrow-) direction and remove the rear wheel cylinder piston.



7. Separate the rear wheel cylinder spring (-1-), rear wheel cylinder piston cup (-2-) and the rear wheel cylinder piston (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Seal ring shall not be reused.
- Avoid inhaling brake pad dust because it is toxic.
- After installation, exhaust the brake system .=> refer to page 718

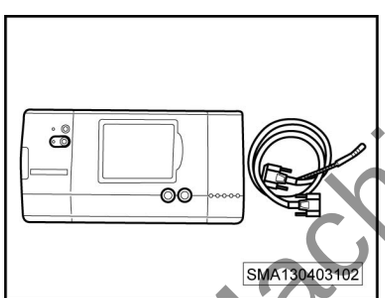
5 ABS (Anti-lock Brake System)

5.1 ABS exhaust

Caution

- Discharged brake fluid cannot be reused.
- Only use the brake fluid approved by Chery Automobile Co., Ltd.; otherwise, it may lead to pipeline corrosion.
- Make sure that the brake fluid is free of contamination.
- Never splash brake fluid on the vehicle; otherwise, it may damage the vehicle paintwork. If the brake fluid splashes on the paintwork, please rinse it with water immediately.
- After air discharge, you shall check the brake oil pipe and the connector for leakage. The brake fluid level in reservior shall be at the MAX mark.

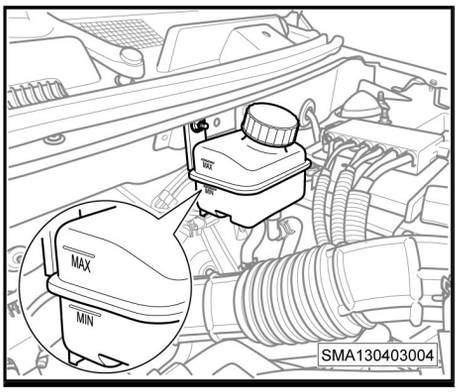
Maintenance tools and common equipment

	
X-431 diagnostic device	

Exhaust

1. Confirm that all brake oil pipes are installed.
2. Use the X-431 diagnostic device to confirm if there is any fault code stored in the ABS control unit. If there is, rectify the fault according to the fault code.
3. Read the fault code again to confirm that any fault code is absent in the ABS control unit.
4. Discharge the air in the regular brake system for the first time .=> refer to page 718
5. Discharge the air in the ABS control unit according to the X-431 diagnostic device. Confirm the discharge of the ABS control unit and disconnect the X-431 diagnostic device.
6. Discharge the air in the regular brake system for the second time .=> refer to page 718

7. Confirm the brake fluid level in reservior at the MAX mark.



8. Take a test drive and confirm air in the pipe has been discharged.

5.2 Removing and installing the ABS control unit

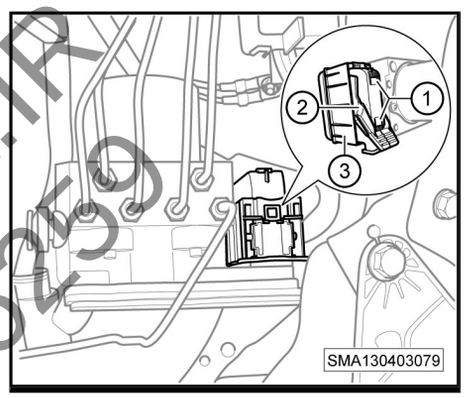
Caution

- When removing the brake pipe, make sure that the pipe is free of contamination.
- Use an oil can to recover the brake fluid draining out of the disconnected pipe to avoid polluting the vehicle and environment.

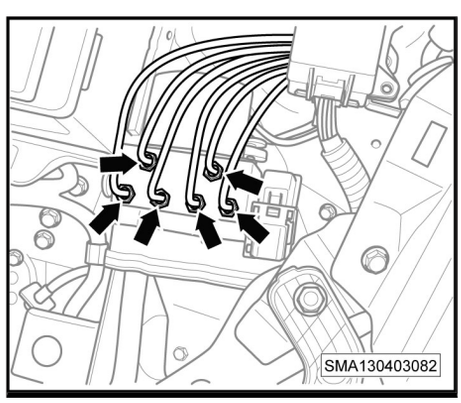
Removal

1. Suction brake fluid from the reservoir with a fluid suction device.
2. Switch off all electrical equipment and the ignition switch .
3. Remove the battery .=> refer to page 975
4. Remove the air filter assembly .=> refer to page 238

5. Press the connector lock button of the ABS control unit (-1-) and then unfold the connector lock bracket (-2-) to disconnect the connector (-3-).

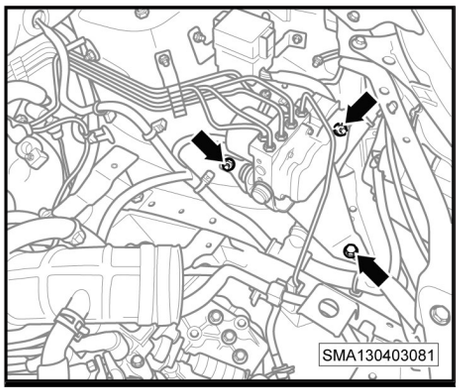


6. Unscrew the brake pipe bolt of the ABS control unit (-arrow-).
   - Tightening torque of the bolt: 18±1 N•m

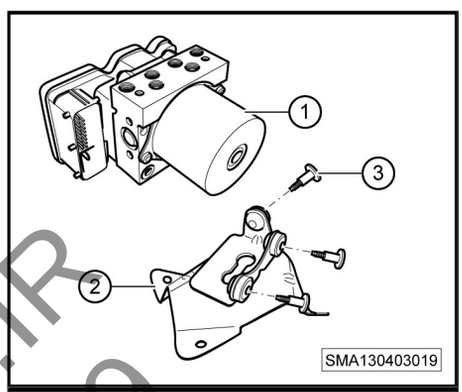


7. Seal the brake pipe and the threaded hole with the seal plug.

8. Unscrew the fixing bolts of the ABS mounting bracket (-arrow-) and remove the ABS control unit together with the mounting bracket.
   - Tightening torque of the bolt: 13±2 N•m



9. Unscrew the coupling bolts (-3-) between the ABS control unit (-1-) and the mounting bracket (-2-) to remove the ABS control unit.
   - Tightening torque of the bolt: 13±2 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

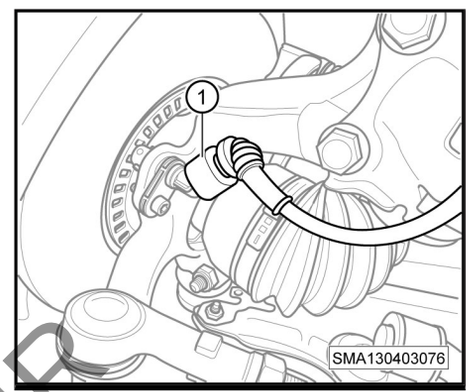
- Only when a brake pipe is installed, can new seal plug on the control unit be removed so as to avoid pollution.
- Check the brake fluid level. Add brake fluid if necessary .
- After installation, power on. Measure the fault code with the diagnostic device and remove it. Test again after completion.
- After installation, exhaust the brake system .=> refer to page 718

5.3 Removing and installing the front wheel speed sensor

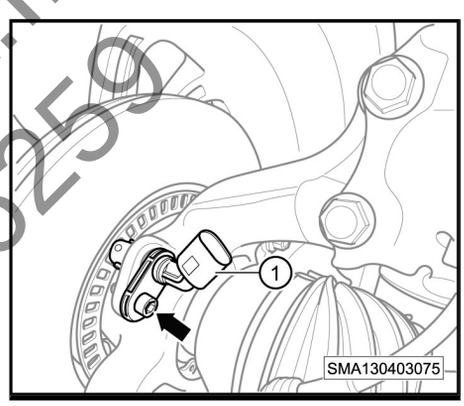
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Lift the vehicle.

4. Disconnect the front wheel speed sensor connector (-1-).



5. Unscrew the fixing bolt of the front wheel speed sensor (-arrow-) to carefully remove the front wheel speed sensor (-1-).
   - Tightening torque of the bolt: 13±2 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

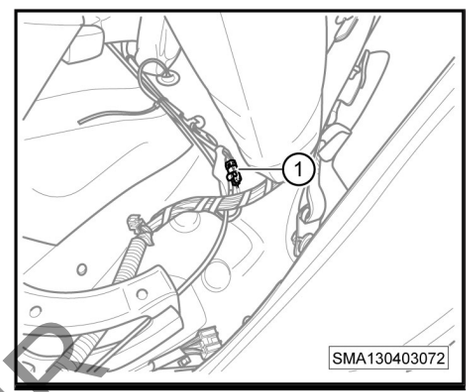
- Clean the internal surface of the installation hole before installing the front wheel speed sensor.
- Tighten the sensor fixing bolts with the specified torque.

5.4 Removing and installing the rear wheel speed sensor

Removal

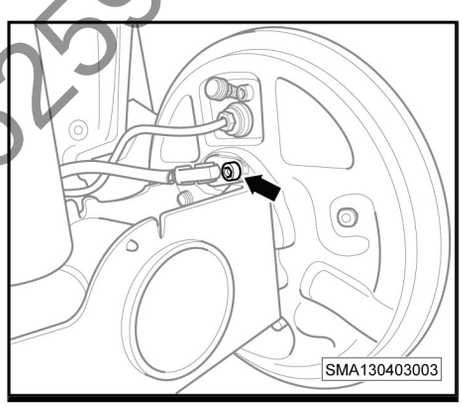
1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the rear seat .=> refer to page 833

4. Disconnect the rear wheel speed sensor connector (-1-).

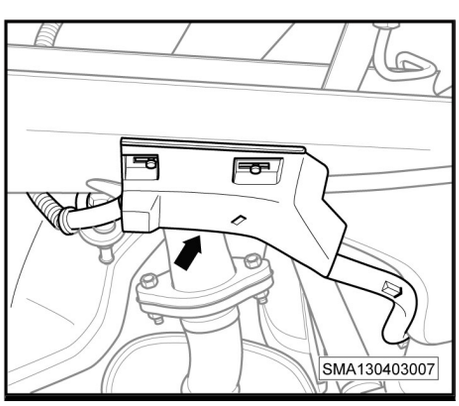


5. Lift the vehicle.

6. Unscrew the fixing bolt of the rear wheel speed sensor (-arrow-).
   - Tightening torque of the bolt: 13±2 N•m



7. Release the rear wheel speed sensor clip from the suspension (-arrow-) to carefully remove the rear wheel speed sensor.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Clean the internal surface of the installation hole before installing the rear wheel speed sensor.
- Tighten the sensor fixing bolts with the specified torque.

6 Parking Brake System

6.1 Removing and installing the parking brake

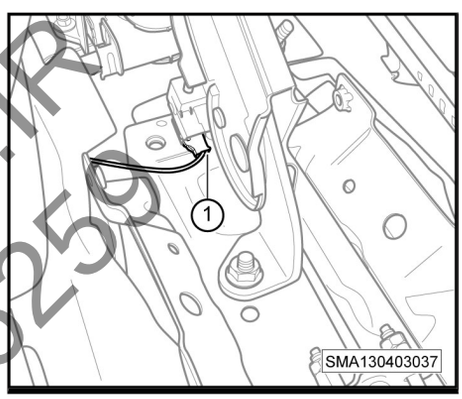
Note

- Please wear necessary protective facilities to avoid accidents.

Removal

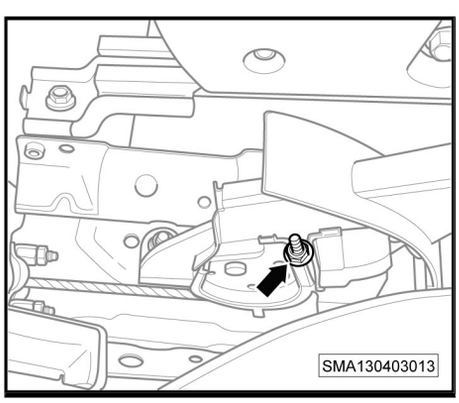
1. Remove the console .=> refer to page 825

2. Disconnect the parking brake switch connector (-1-).

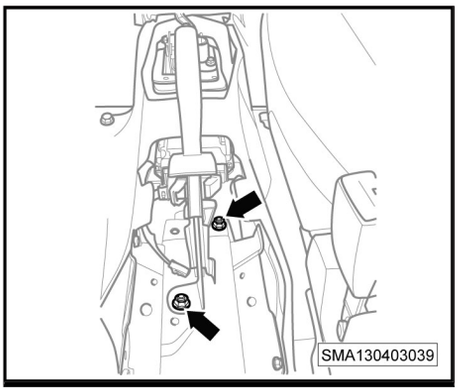


3. Place the parking brake lever at the lowest position.

4. Unscrew the parking brake adjustment bolt (-arrow-).



5. Unscrew the parking brake fixing nut (-arrow-).



6. Remove the parking brake.

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

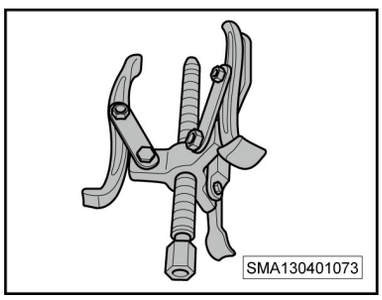
- Check the parking brake lever travel. Adjust it if necessary . => refer to page 692
- Check the parking brake for braking drag.
- Check if the parking brake indicator works normally.

6.2 Removing and installing the parking brake cable

Note

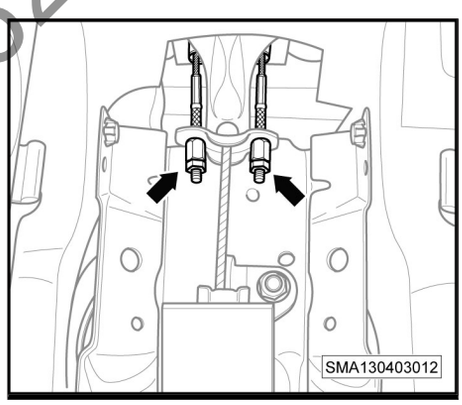
- Please wear necessary protective facilities to avoid accidents.

Maintenance tools and common equipment

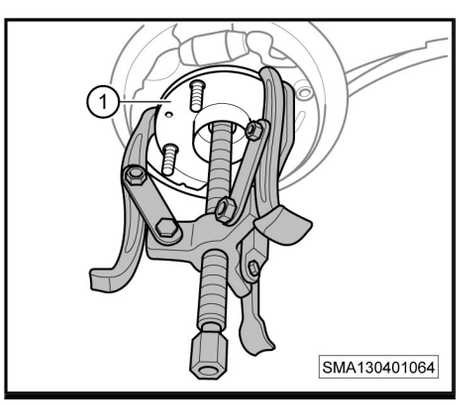
	
Puller	

Removal

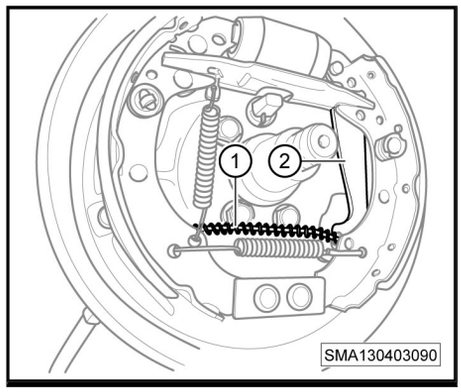
1. Remove the console .=> refer to page 825
2. Place the parking brake lever at the lowest position.
3. Unscrew the parking brake cable bolt (-arrow-).



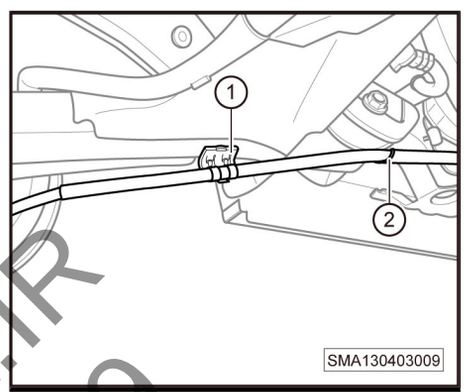
4. Remove the rear brake drum .=> refer to page 726
5. Pull out the rear wheel hub (-1-) with the puller.



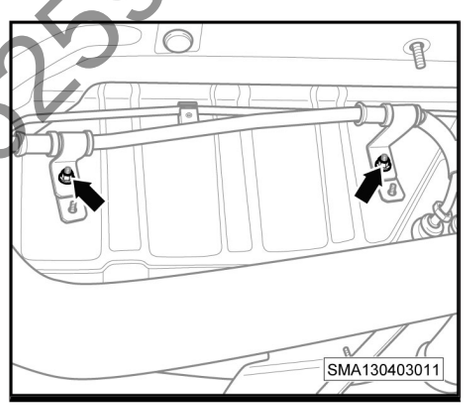
6. Decouple the parking brake cable (-1-) from the brake shoe pushrod (-2-).



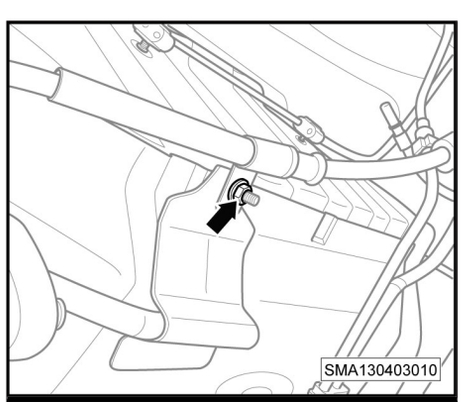
7. Remove the parking brake cable from the clip (-1-) and the hook (-2-) of the rear suspension.



8. Unscrew the left cable fixing nuts of the parking brake (-arrow-).



9. Unscrew the right cable fixing nuts of the parking brake (-arrow-).

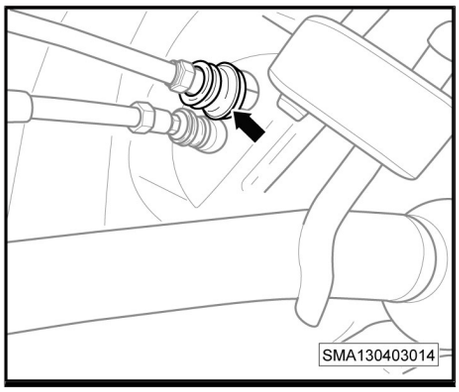


10. Remove the parking brake cable.

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- When installing the cable, properly install the rubber cover (-arrow-).



- Check the parking brake lever travel. Adjust it if necessary . => refer to page 692
- Check the parking brake for braking drag.

0404 Wheel

1 General Information

1.1 Important notes

- Tires suitable for vehile performance are used because they feature sound reliability and skid resistance.
- Hard acceleration, drastic brake, excessive tire pressure will shorten the service life of tires.
- The contact area between the rim and the tire should be cleaned before instaling a new tire.
- First manually drive in the nuts and then use a wrench to tighten them to the specified torque before installing the wheel nuts.
- It is impermissible to apply grease on the wheel nuts.

1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Wheel nut	110±10

Inflation pressure of cold tire (kPa)

Vehicle model	Tire type	Inflation pressure (unladen) (Kpa)	Inflation pressure (full-load) (Kpa)	Inflation pressure (spare tire) (Kpa)
SQR7150J150	185/60R15 84H	230/210	240/250	250
SQR7150A137	195/55R15 85V	230/210	240/250	250

Tire and rim type

Tire type	Rim type
185/60R15 84H	15×6J
195/55R15 85V	15×6J

Permissible maximum rim distortion

Aluminum alloy rim	3 mm

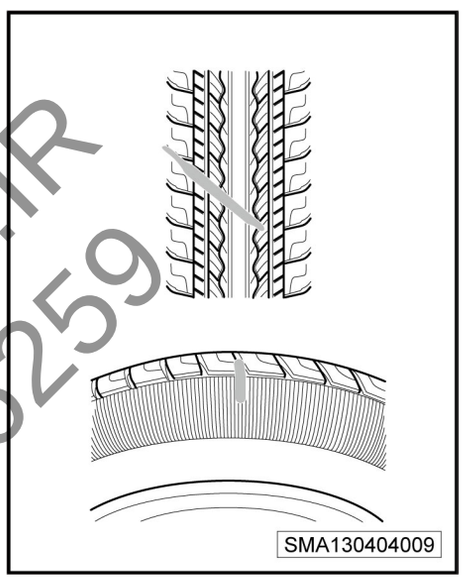
2 Diagnosis and Inspection

2.1 Checking the wheels

Caution

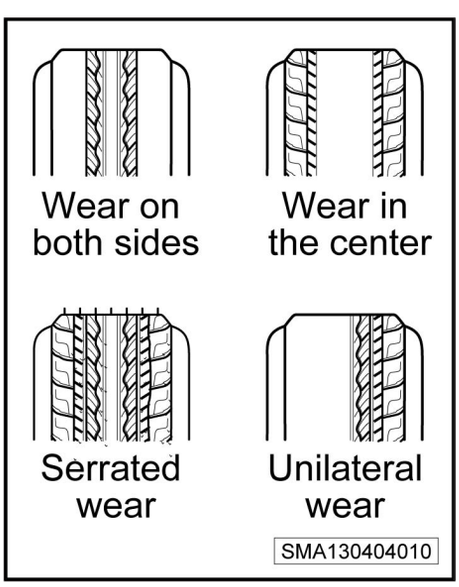
- Be sure to refer to the instructions when installing non-standard tires or rims.
- Standard tires of the same size and type should be used.

1. Check if tires are damaged or scratched, and replace them if necessary.

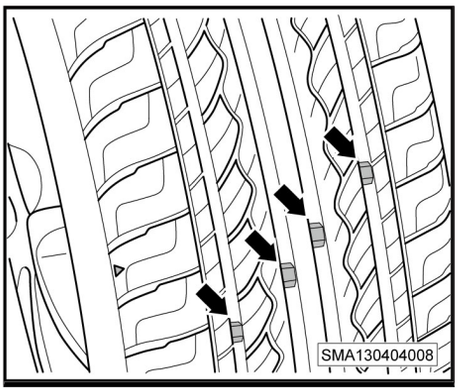


2. Check if rims are distorted or damaged, and replace them if necessary.

3. Check for abnormal wear on tires.If wear is found on both sides or in the center of the tires, adjust the tire pressure; If unilateral wear or serrated wear is found on the tires, check the wheel alignment, and adjust them if necessary.



4. Check the tire indicating belt (-arrow-).When tires are worn to the indicating belt, replace them.

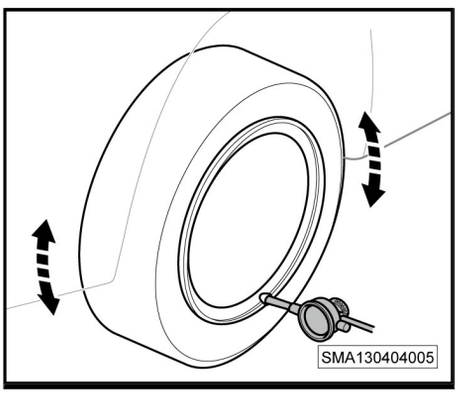


2.2 Checking the wheel oscillation

1. Prop the vehicle at a suitable positon and lift it.
2. Check for wheel distortion.

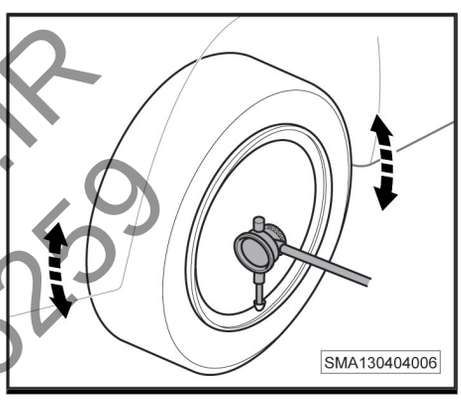
3. As shown in the figure, place a dial gauge, and rotate the wheels in the (-arrow-) direction and measure the axial oscillation.

   Service limit: 1.2 mm



4. As shown in the figure, place a dial gauge, and rotate the wheels in the (-arrow-) direction and measure the radial oscillation.

   Service limit: 1.2 mm



5. If the wheel oscillation does not meet the technical requirements, check the axial clearance of the wheel bearings and replace them if necessary.
6. If the axial clearance of the bearings meets the technical requirements, but the wheel oscillation is outside the service limit, then replace the wheels.

2.3 Common tire fault and maintenance list

Symptoms	Possible causes	Maintenance recommendations
Uneven tire wear	Improper toe-in and camber angle	Adjust the toe-in and camber angle
Tread center wear	Excessive tire pressure	Adjust the tire pressure
Serrated tread wear	Improper toe-in and camber angle	Adjust the toe-in and camber angle
Premature wear of some area of the tire	Drastic brake	Avoid a drastic brake
Scratches on the tire side wall	Resulting from the sharp objects on road	Replace the tires
Excessive tire noise	Incorrect tire pressure Tire deterioration	• Adjust the tire pressure • Replace the tires
Departure from the right direction	Incorrect tire pressure Abnormal tire wear Steering system failure Brake system failure Suspension system failure	• Adjust the tire pressure • Replace the tires • Remove steering system failure • Remove brake system failure • Remove suspension system failure
Hard steering	Incorrect tire pressure Steering system failure Suspension system failure	• Adjust the tire pressure • Remove steering system failure • Remove suspension system failure
Braking deviation	Incorrect tire pressure Brake system failure	• Adjust the tire pressure • Remove brake system failure

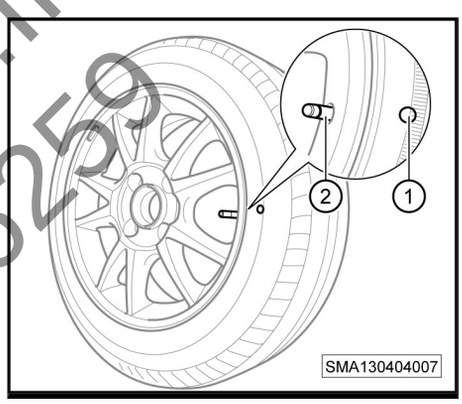
3 Standard Operation

3.1 Replacing the tires

Warning

- The speed grade of new exchange tire must meet with the prescribed values for safe operation; otherwise, a sudden tire burst may occur.

1. Remove the wheels.=> refer to page 760
2. Use a tire removing device to remove the tires according to the instructions.
3. The white dot (-1-) on tire edge must be aligned with the nozzele (-2-) on the rim when installing the tires.



4. Adjust the tire pressure to the prescribed value.
5. Check for leakage of the contact area between the nozzle, tire and rim.
6. Use a dynamic balancer to carry out wheel balancing.
7. Install the wheels=> refer to page 760.
   - Tightening torque of the nuts: 110±10 N•m

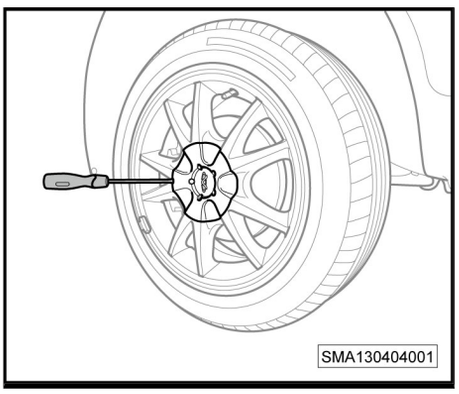
Note

- You should avoid scratching the tires or rims when a tool is used to remove the tires.
- The contact area between the tire and rim should be cleaned when installing the tire.
- Please replace a suitable tire for vehicle.

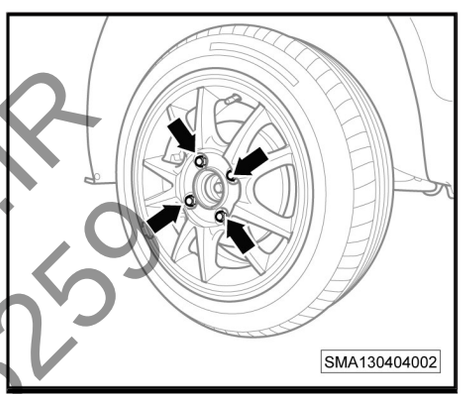
3.2 Removing and installing the wheels

Removal

1. Use a screwdriver to pry out the decorative covers for wheel fixing nuts.



2. Loosen the wheel fixing nuts (-arrow-).



3. Prop the vehicle firmly and lift it.
4. Unscrew the wheel fixing nuts.
5. Remove the wheels.

Installation

1. Anticorrosion treatment is conducted on the contact area between the wheel and the brake disc.
2. First manually drive in the wheel nuts before installing the wheels.
3. Use a tool to tighten the wheel nuts in a diagonally opposite direction.
4. Lower the vehicle and use a torque wrench to tighten the wheel nuts to the specified torque.

- Tightening torque of the nut: 110±10 N•m

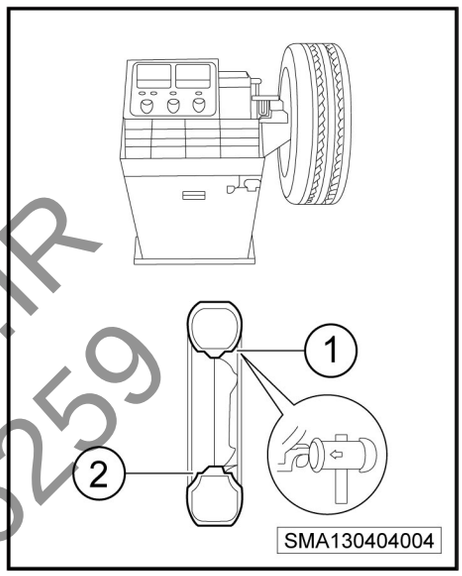
3.3 Wheel balancing

Note

- The dynamic balancer must be calibrated before carrying out wheel balance.
- Remove impurities inside the tire pattern to ensure the tire balance effect.

1. Remove the wheels .=> refer to page 760
2. Install the wheels on a dynamic balancer to carry out dynamic balance tests.

3. If the results of the dynamic balance tests do not meet the prescribed values, balance blocks should be installed at positions (-1-) and (-2-) until the dynamic balance data meet the prescribed values.



Caution

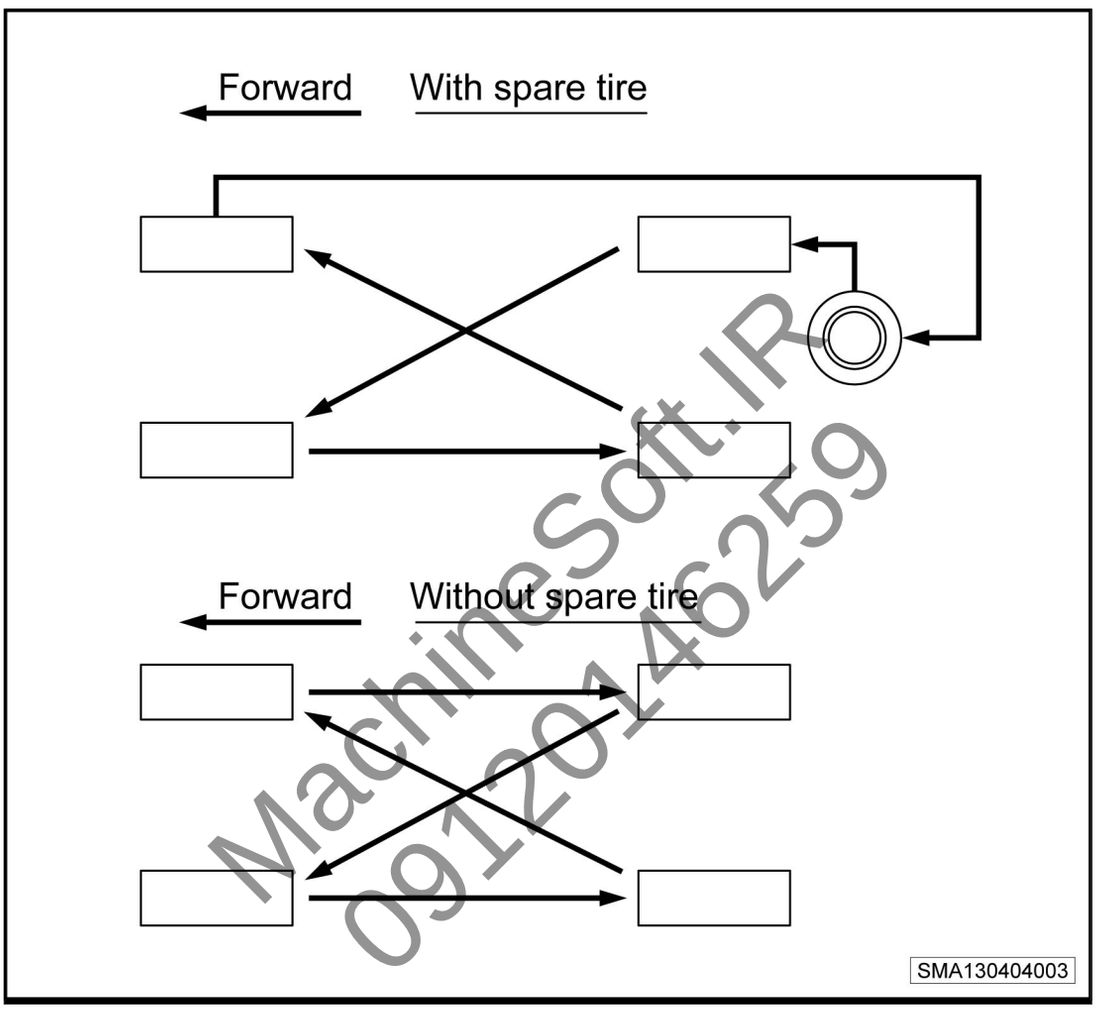
- Take care to use tools and avoid damaging rims when installing the balance blocks.
- It is impermissible to reuse the used balance blocks.

3.4 Wheel rotation

Note

- It is recommended that the first wheel rotation for new cars is performed at a mileage of 5000 km and the next wheel rotation should be carried out at a mileage of 10,000 km.

Non-directional wheel rotation method:



0501 Interior Trim

1 Trim and Sound Baffle

1.1 Door interior trim

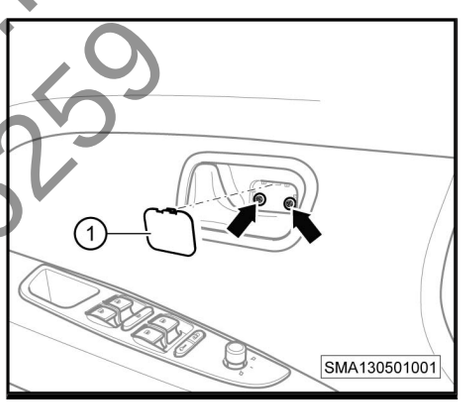
1.1.1 Removing and installing the driver's side door trim

Caution

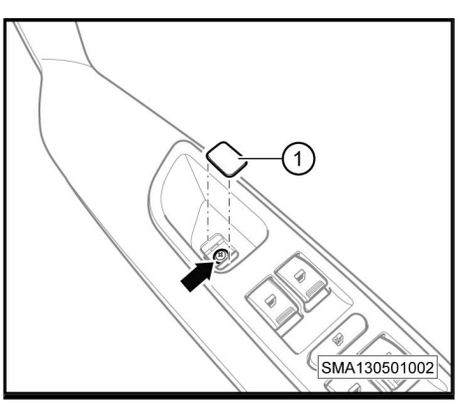
- Please wear protective gloves during repair.
- Remove the door interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal

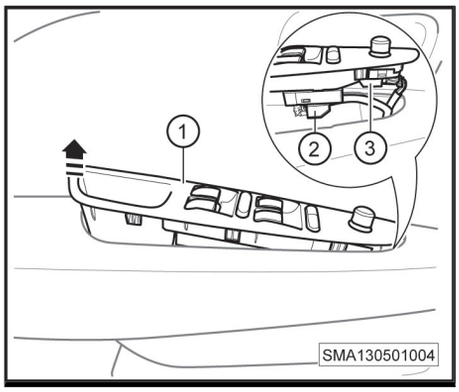
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lever out the driver's side inner pull handle lid (-1-) and unscrew the inner pull handle fixing screws (-arrow-).



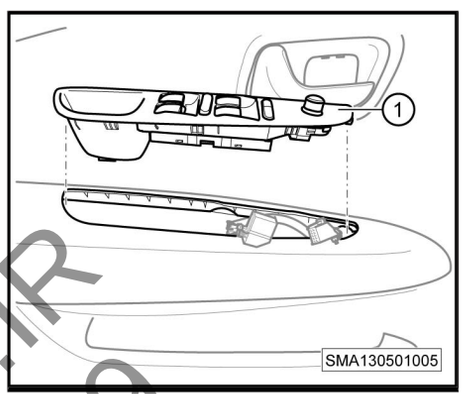
3. Lever out the power window main switch lid (-1-) and unscrew the fixing screw of the power window main switch (-arrow-).



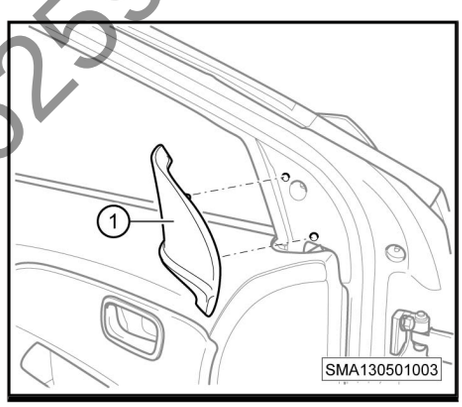
4. Lever out the power window main switch (-1-) in the (-arrow-) direction.
5. Disconnect the power window main switch connectors (-2-) and (-3-).



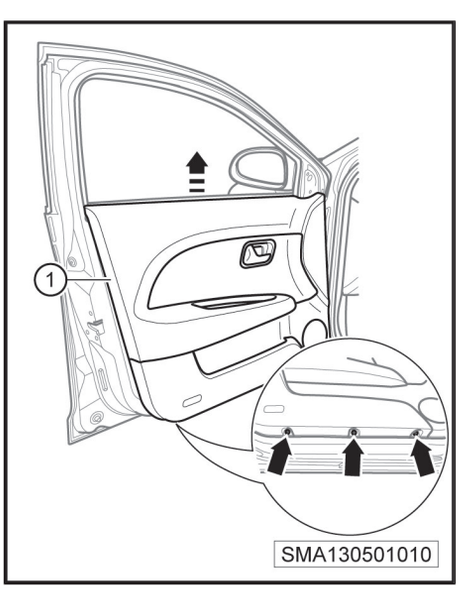
6. Remove the power window main switch (-1-).



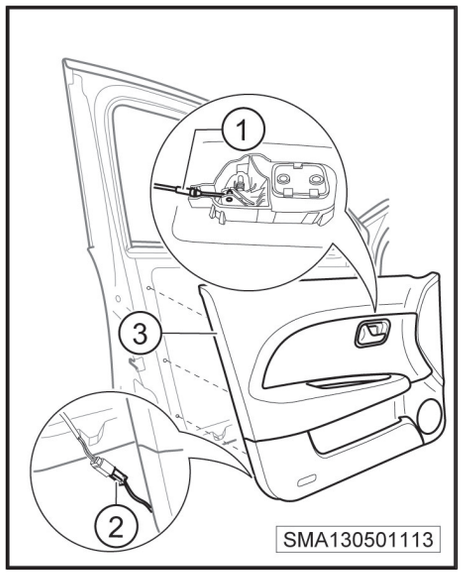
7. Remove the triangle block (-1-) inside the driver's side door.



8. Unscrew the lower fixing screws (-arrow-) from the driver's side door trim.
9. Remove the driver's side door trim (-1-) in the (-arrow-) direction.



10. Disengage the front door inner pull handle guy cable (-1-).
11. Disconnect the courtesy light connector (-2-).
12. Remove the driver's side door trim (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

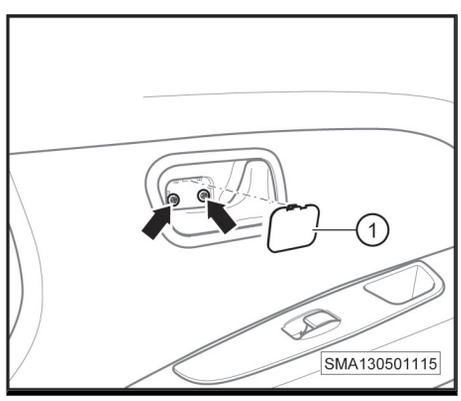
1.1.2 Removing and installing the front passenger's side door trim

Caution

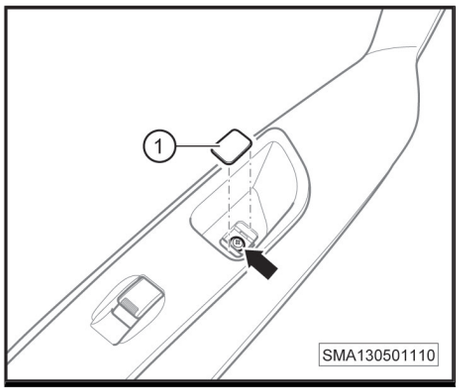
- Please wear protective gloves during repair.
- Remove the door interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal

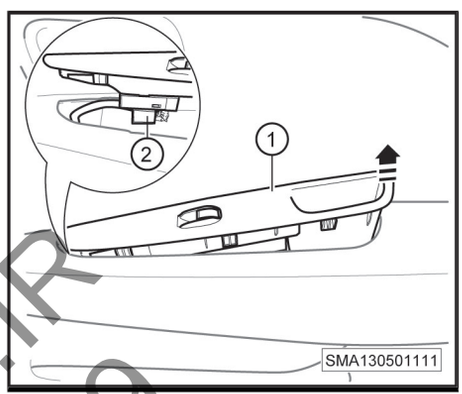
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lever out the front passenger's side inner pull handle lid (-1-) and unscrew the inner pull handle fixing screws (-arrow-).



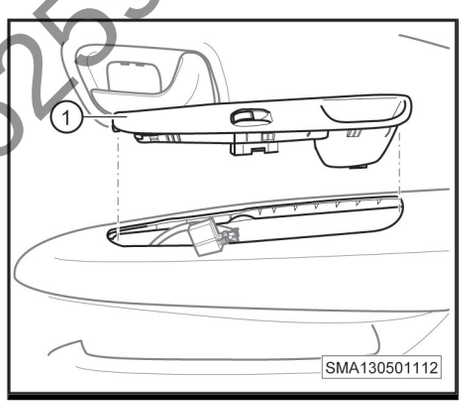
3. Lever out the front passenger's side window switch panel lid (-1-) and unscrew the fixing screw of the front passenger's side window switch panel (-arrow-).



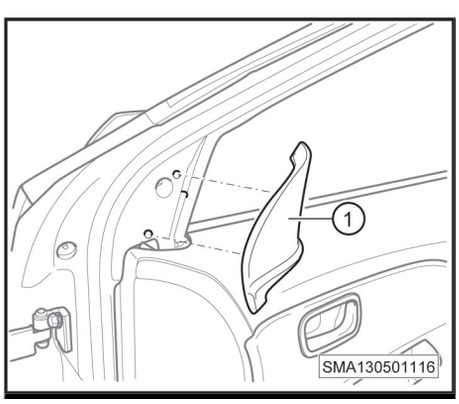
4. Lever out the central switch panel (-1-) in the (-arrow-) direction.
5. Disconnect the front passenger's side window switch panel connector (-2-).



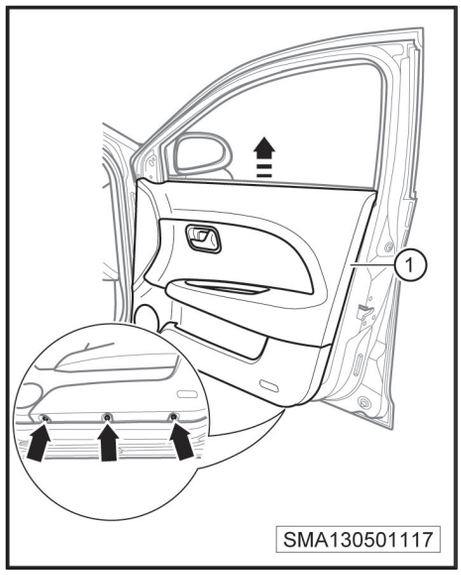
6. Remove the front passenger's side window switch panel (-1-).



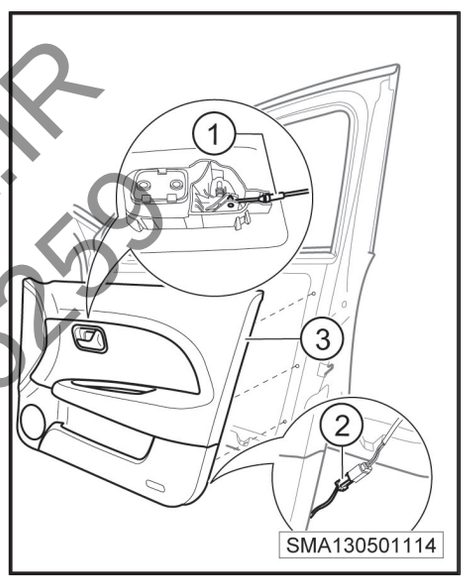
7. Remove the triangle block (-1-) inside the front passenger's side door.



8. Unscrew the lower fixing screws of the front passenger's side door trim (-arrow-).
9. Remove the front passenger's side door trim (-1-) in the (-arrow-) direction.



10. Disengage the inner pull handle guy cable (-1-) of the front passenger's side door.
11. Disconnect the courtesy light connector (-2-).
12. Remove the front passenger's side door trim (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

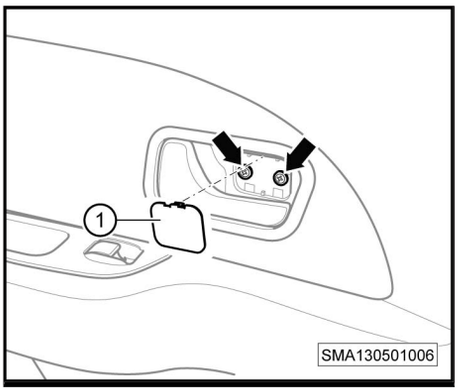
1.1.3 Removing and installing the rear door trim

Caution

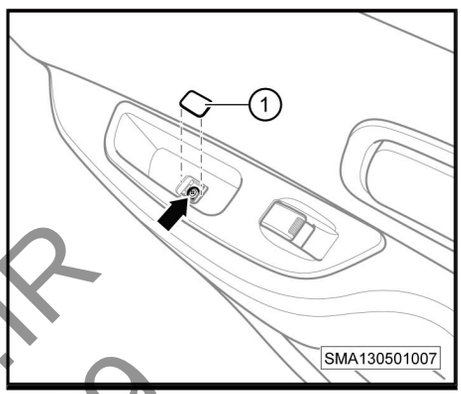
- Please wear protective gloves during repair.
- Remove the door interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.
- The removal and installation procedures of the rear left door trim are the same as that of the rear right one.

Removal

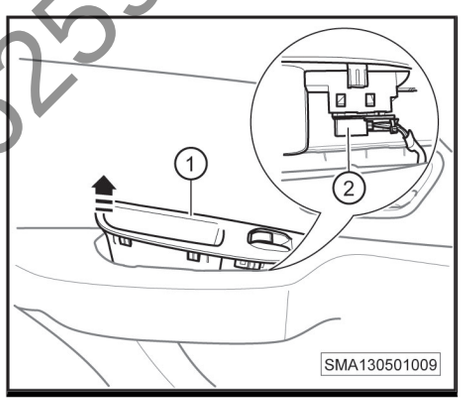
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Lever out the rear door inner pull handle lid (-1-) and unscrew the inner pull handle fixing screws (-arrow-).



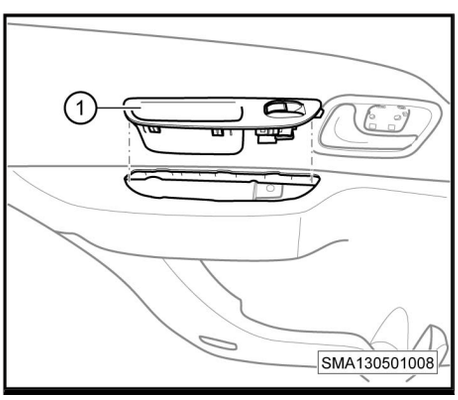
3. Lever out the rear window switch panel lid (-1-) and unscrew the fixing screws of the rear window switch panel (-arrow-).



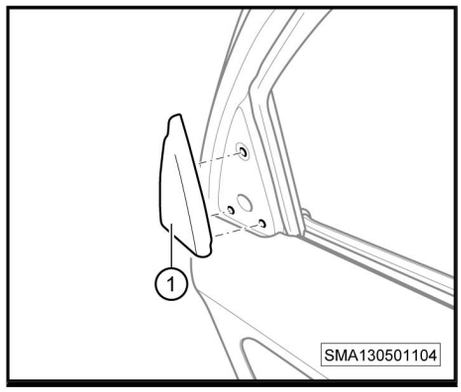
4. Lever out the central switch panel (-1-) in the (-arrow-) direction.
5. Disconnect the rear window switch panel connector (-2-).



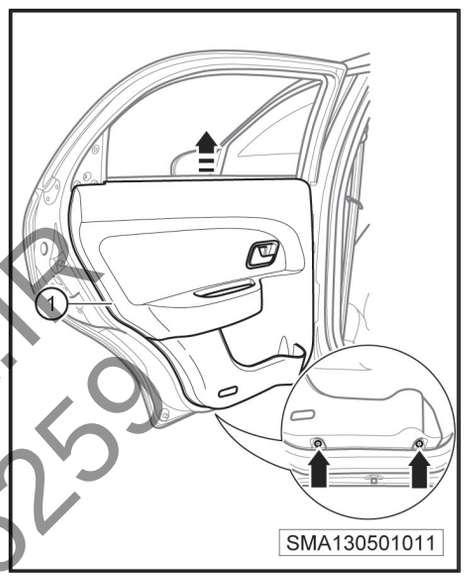
6. Remove the rear window switch panel (-1-).



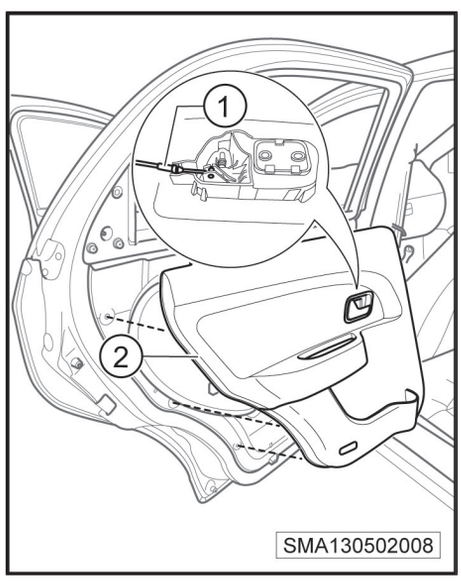
7. Remove the triangle block (-1-) inside the rear door.



8. Unscrew the lower fixing screws of the rear door trim (-arrow-).
9. Remove the rear door trim (-1-) in the (-arrow-) direction.



10. Disengage the rear door inner pull handle guy cable (-1-).
11. Remove the rear door trim (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

1.2 Pillar trim

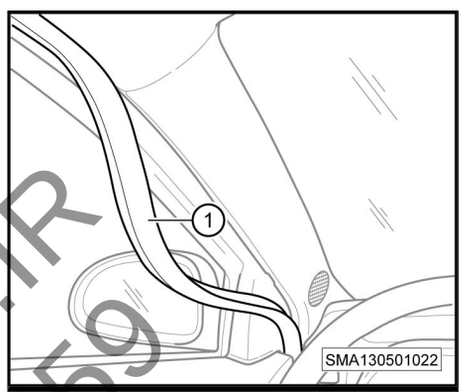
1.2.1 Removing and installing the A pillar trim

Caution

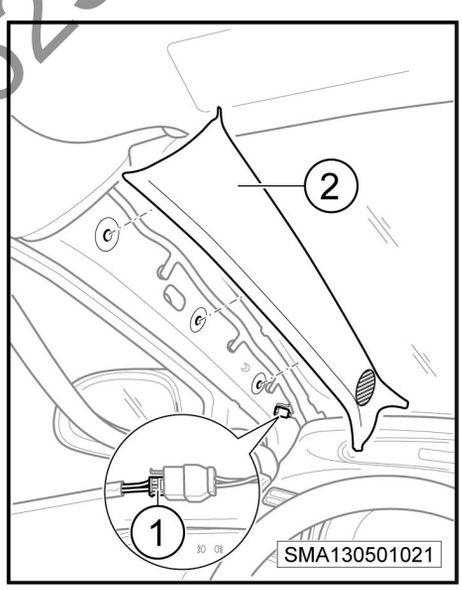
- Please wear protective gloves during repair.
- Remove the A pillar trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.
- The removal and installation procedures of the left A pillar trim are the same as that of the right one.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the door seal (-1-).



3. Remove the A pillar trim (-2-) and disconnect the treble horn connector (-1-).
4. Remove the A pillar trim.



Installation

Installation shall follow the reverse sequence of the removal procedure.

1.2.2 Removing and installing the B pillar trim

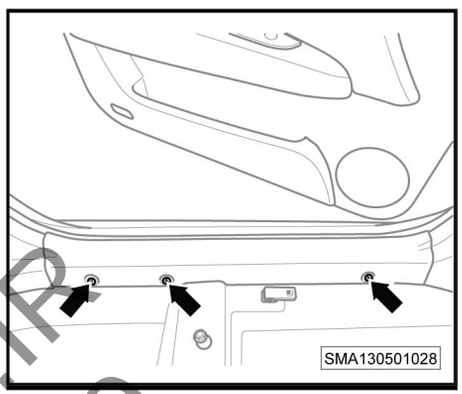
Caution

- Please wear protective gloves during repair.
- Remove the B pillar trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace the damaged trim fixing clips.
- The removal and installation procedures of the left B pillar trim are the same as that of the right one.

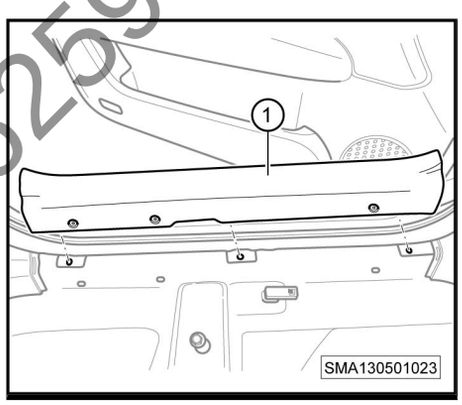
Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.

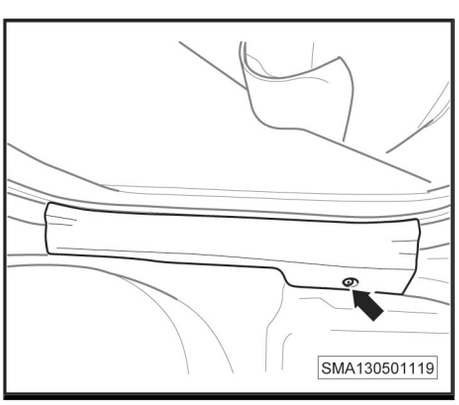
2. Unscrew the fixing screws of the front door sill guard plate (-arrow-).



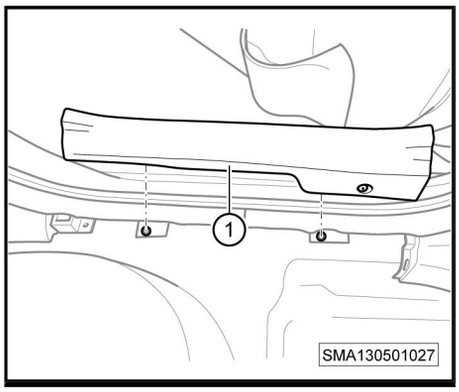
3. Remove the front door sill guard plate (-1-).



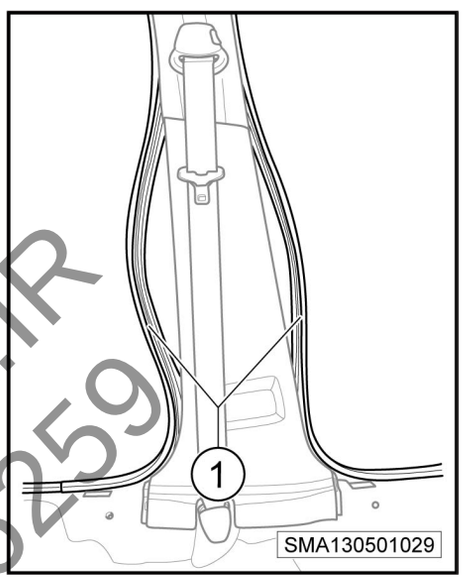
4. Unscrew the fixing screws of the rear door sill guard plate (-arrow-).



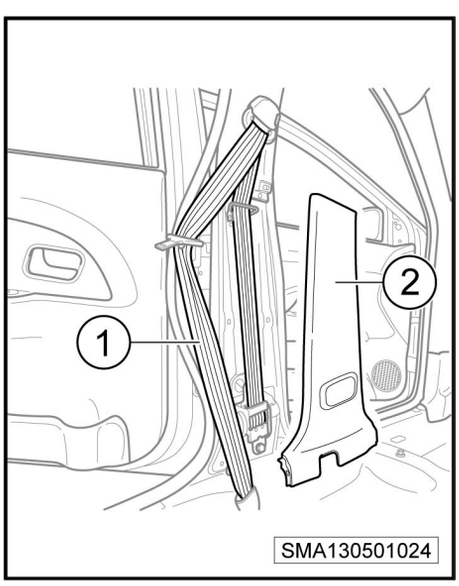
5. Remove the rear door sill guard plate (-1-).



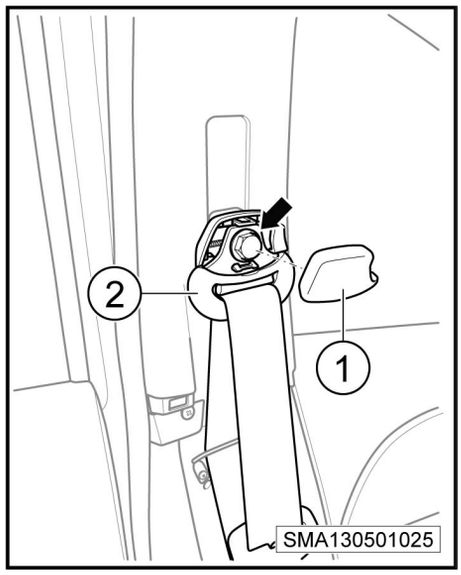
6. Remove the door seal (-1-).



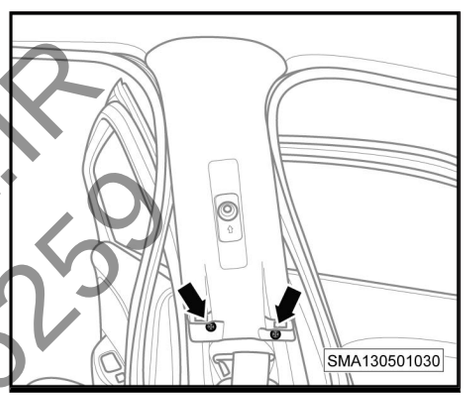
7. Move away the seat belt (-1-) and remove the B pillar lower trim (-2-).



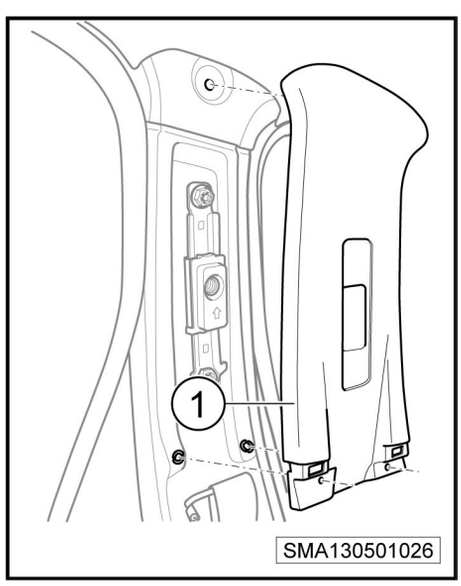
8. Remove the seat belt upper bolt cap (-1-).
9. Unscrew the seat belt upper bolt (-arrow-) and remove the seat belt upper retainer (-2-).



10. Unscrew the fixing screws of the B pillar upper trim (-arrow).



11. Remove the B pillar upper trim (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

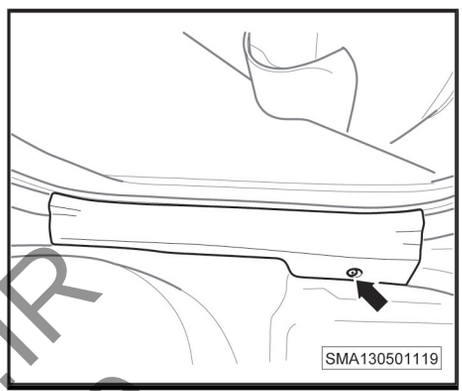
1.2.3 Removing and installing the C pillar trim (Model A13)

Caution

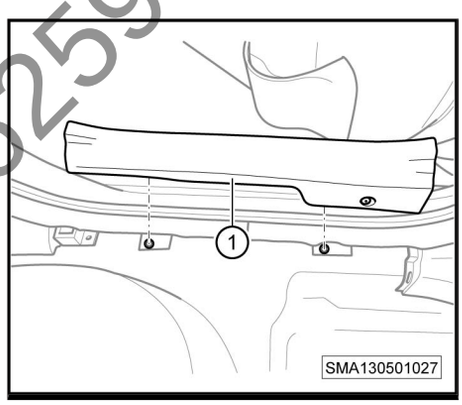
- Please wear protective gloves during repair.
- Remove the C pillar trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.
- The removal and installation procedures of the left C pillar trim are the same as that of the right one.

Removal

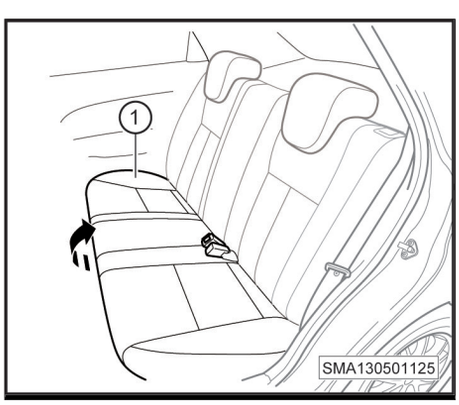
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the rear window shelf .
3. Unscrew the fixing screws of the rear door sill guard plate (-arrow-).



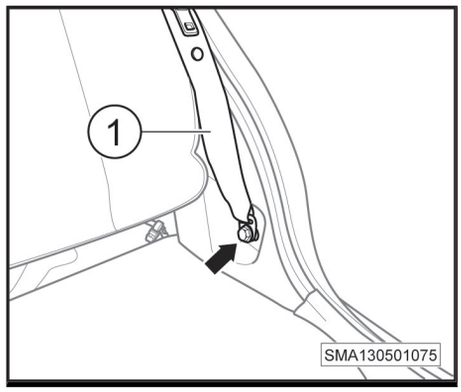
4. Remove the rear door sill guard plate (-1-).



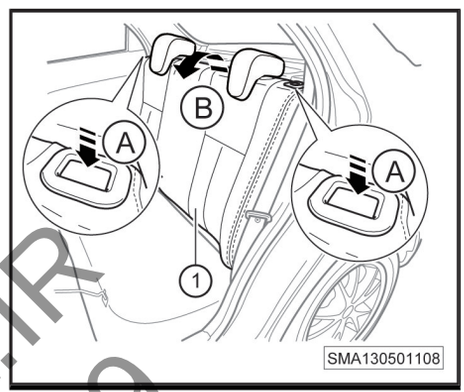
5. Uncover the rear seat cushion (-1-) in the (-arrow-) direction.



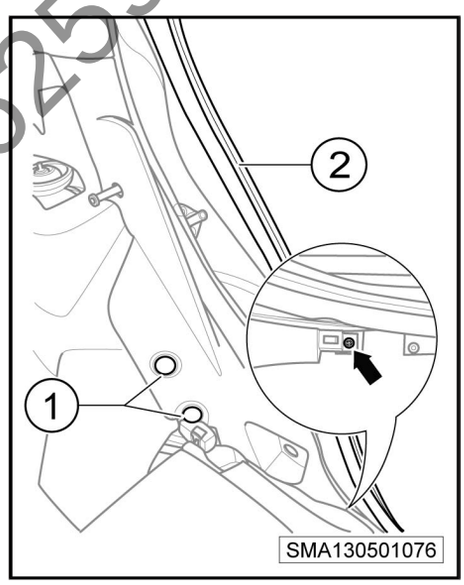
6. Unscrew the lower fixing bolts of the rear seat belt (-arrow-).
7. Remove the rear seat belt (-1-).



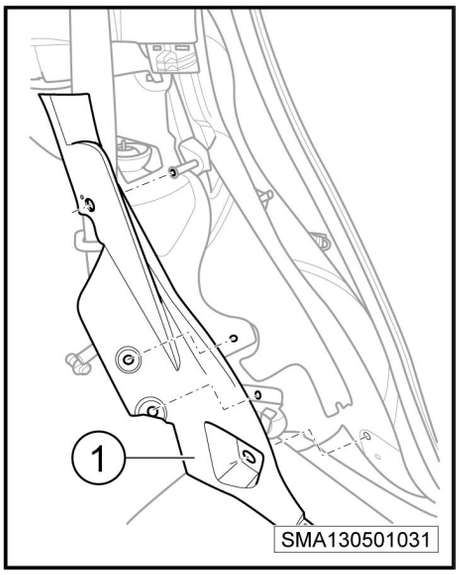
8. Press the rear seat backrest buttons in the (-arrow A-) direction.
9. Fold down the rear seat backrest (-1-) in the (-arrow B-) direction.



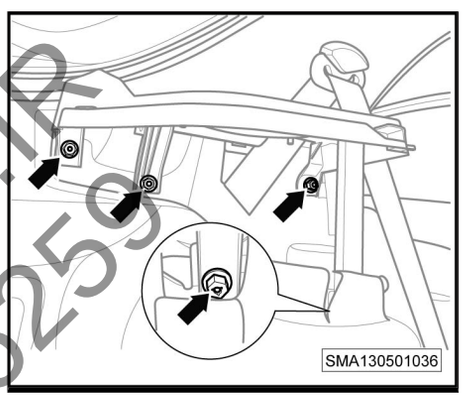
10. Remove the fixing cover of the C pillar lower trim (-1-).
11. Unscrew the fixing screws of the C pillar lower trim (-arrow-).
12. Remove the rear door seal (-2-).



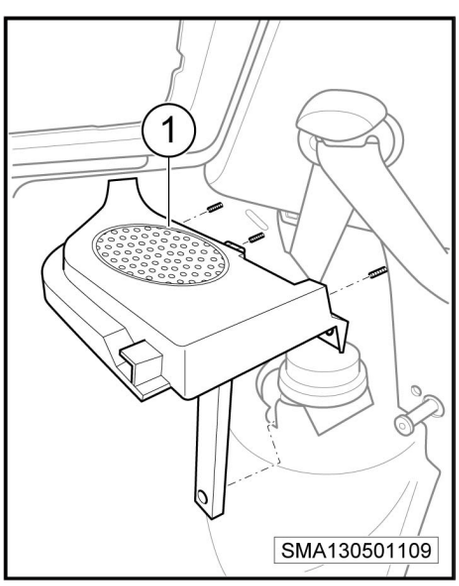
13. Remove the C pillar lower trim (-1-).



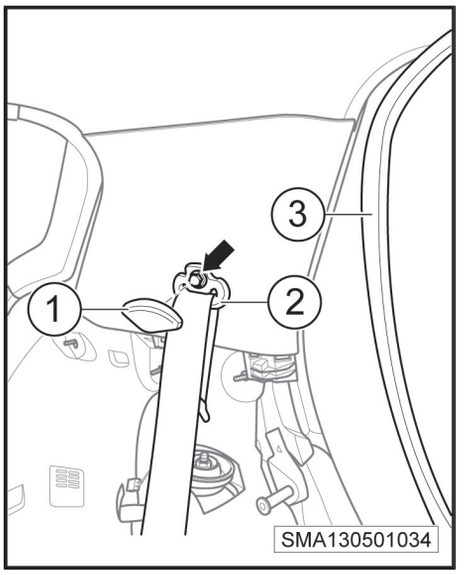
14. Unscrew the fixing bolts of the rear window shelf trim (-arrow-).



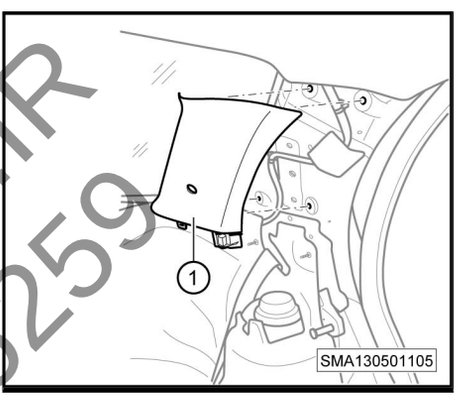
15. Remove the rear window shelf trim (-1-).



16. Remove the rear seat belt fixing bolt cap (-1-).
17. Unscrew the rear seat belt fixing bolts (-arrow-) and remove the rear seat belt (-2-).
18. Remove the rear door seal (-3-).



19. Remove the C pillar trim (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

05

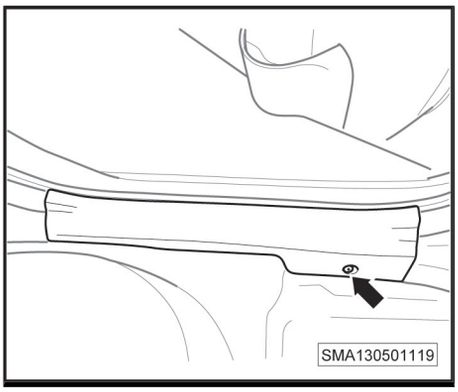
1.2.4 Removing and installing the C pillar trim (Model A13A)

Caution

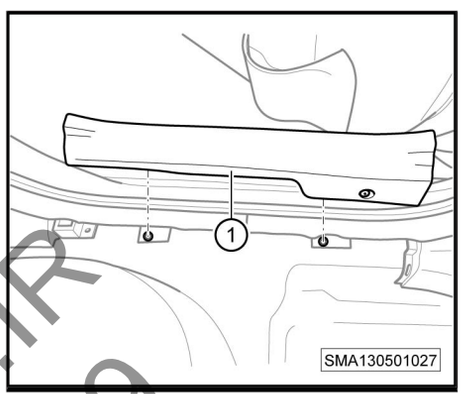
- Please wear protective gloves during repair.
- Remove the C pillar trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.
- The removal and installation procedures of the left C pillar trim are the same as that of the right one.

Removal

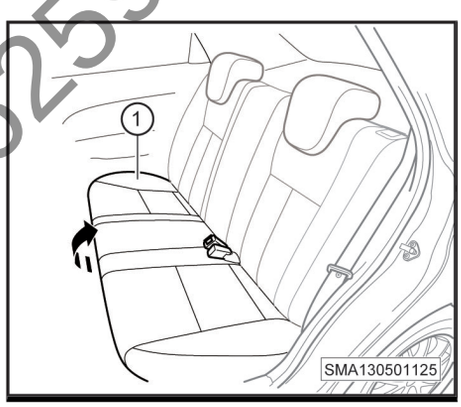
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the rear window shelf .
3. Unscrew the fixing screws of the rear door sill guard plate (-arrow-).



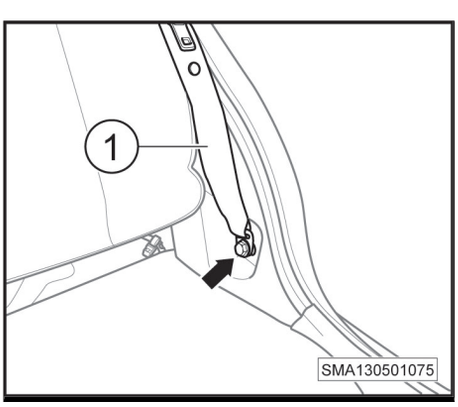
4. Remove the rear door sill guard plate (-1-).



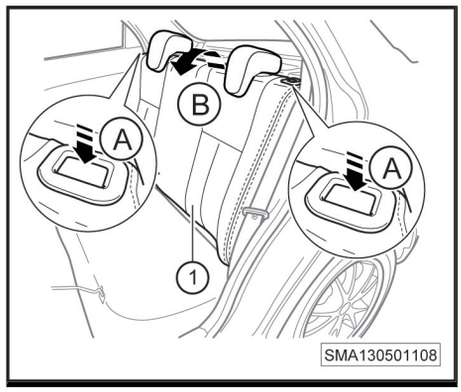
5. Uncover the rear seat cushion (-1-) in the (-arrow-) direction.



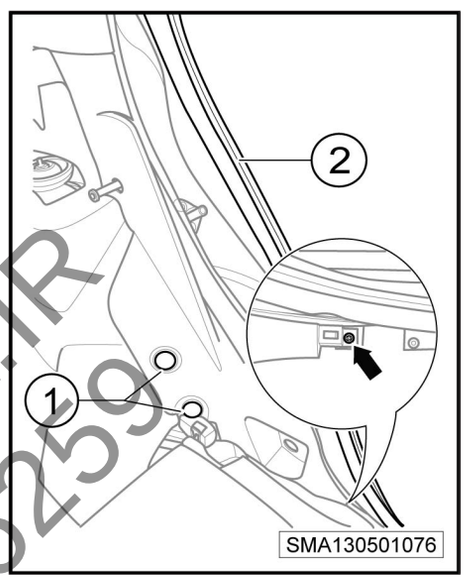
6. Unscrew the lower fixing bolts of the rear seat belt (-arrow-).
7. Remove the rear seat belt (-1-).



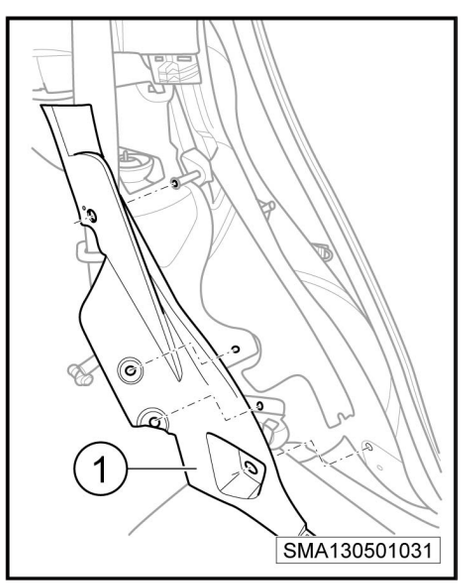
8. Press the rear seat backrest buttons in the (-arrow A-) direction.
9. Fold down the rear seat backrest (-1-) in the (-arrow B-) direction.



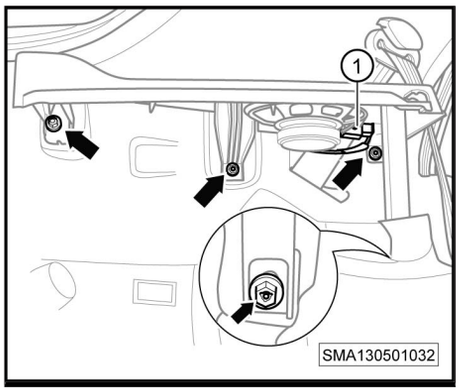
10. Remove the fixing cover of the C pillar lower trim (-1-).
11. Unscrew the fixing screws of the C pillar lower trim (-arrow-).
12. Remove the rear door seal (-2-).



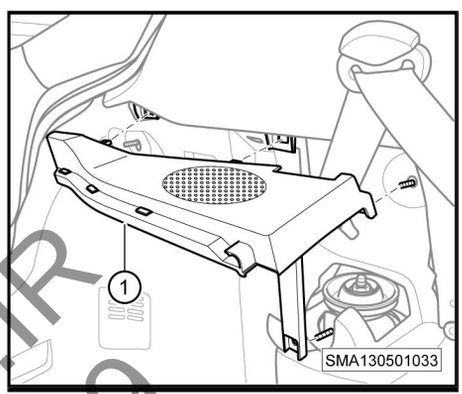
13. Remove the C pillar lower trim (-1-).



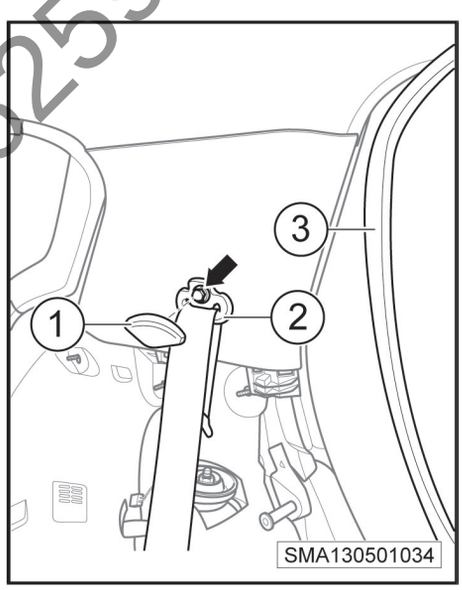
14. Disconnect the horn connector (-1-).
15. Unscrew the fixing bolts of the rear window shelf trim (-arrow-).



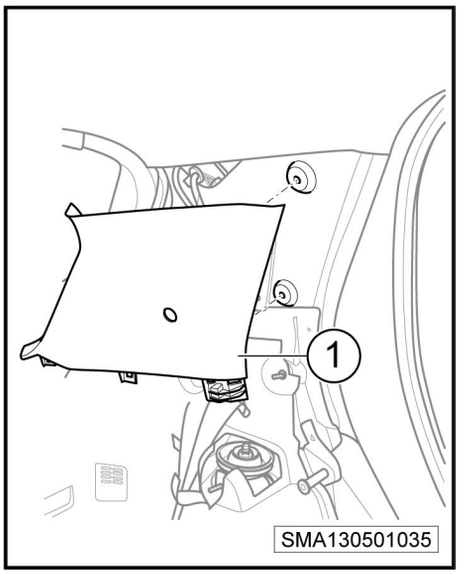
16. Remove the rear window shelf trim (-1-).



17. Remove the rear seat belt fixing bolt cap (-1-).
18. Unscrew the rear seat belt fixing bolts (-arrow-) and remove the rear seat belt (-2-).
19. Remove the rear door seal (-3-).



20. Remove the C pillar trim (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

1.3 Luggage compartment and trunk lid trim

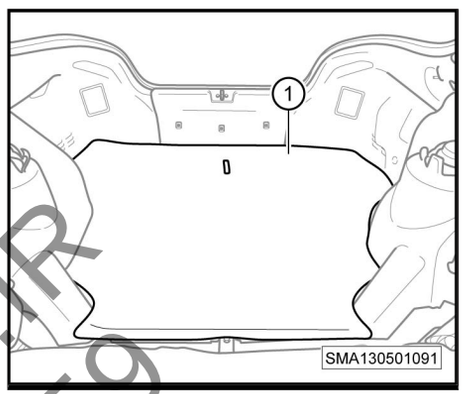
1.3.1 Removing and installing the luggage compartment trim (Model A13)

Caution

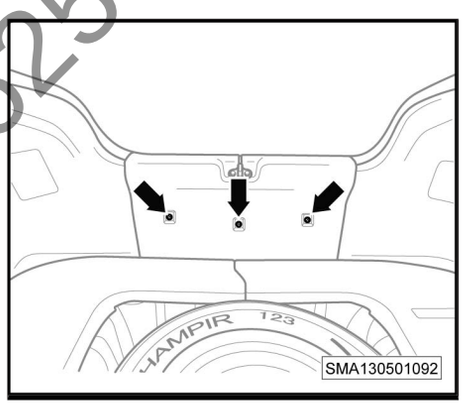
- Please wear protective gloves during repair.
- Remove the luggage compartment trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal

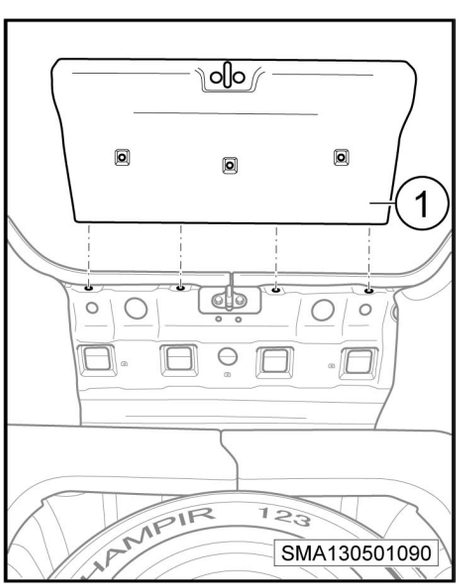
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the C pillar trim (Model A13) => refer to page 775.
3. Remove the luggage compartment lights .
4. Remove the luggage compartment floor (-1-).



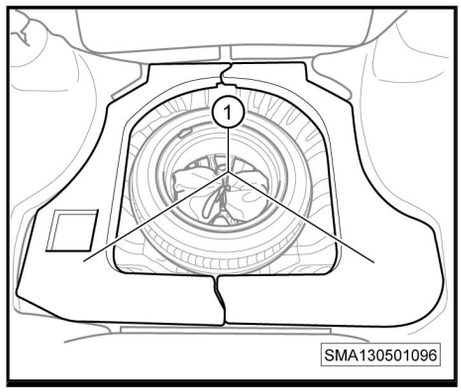
5. Unscrew the fixing screws of the luggage compartment rear trim (-arrow-).



6. Remove the luggage compartment rear trim (-1-).



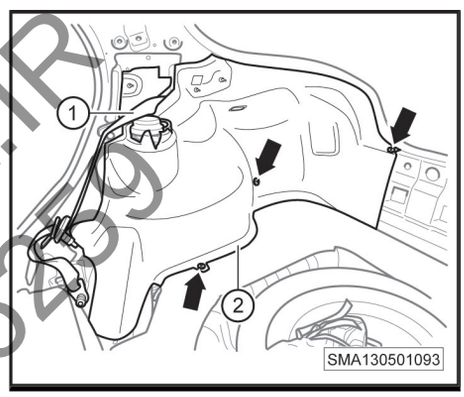
7. Remove the luggage compartment mat (-1-).



Note

- The removal and installation procedures of the left luggage compartment trim are the same as that of the right one.

8. Remove the rear seat belt (-1-).
9. Unscrew the fixing screws of the luggage compartment side trim (-arrow-).
10. Remove the luggage compartment side trim (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

05

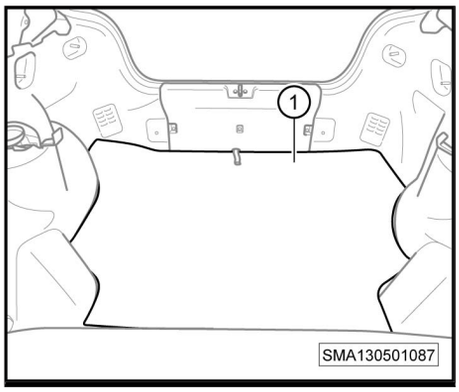
1.3.2 Removing and installing the luggage compartment trim (Model A13A)

Caution

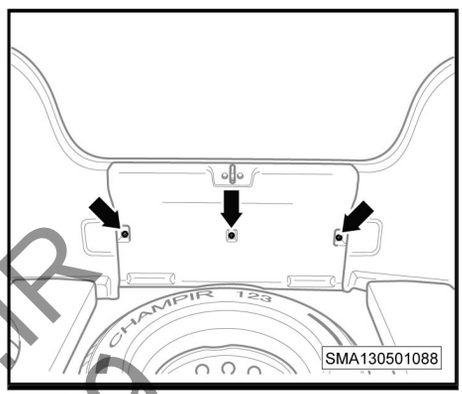
- Please wear protective gloves during repair.
- Remove the luggage compartment trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal

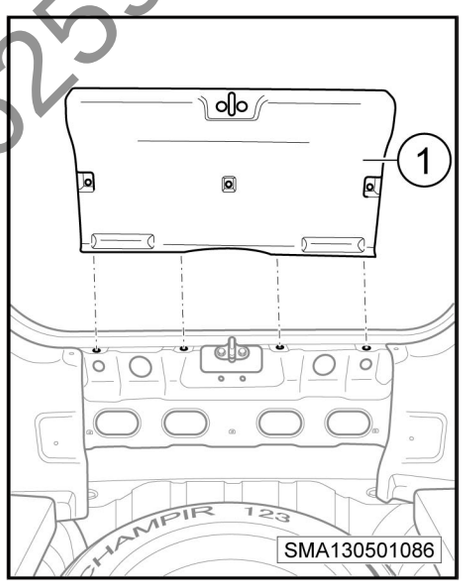
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the C pillar trim (Model A13A) => refer to page 778.
3. Remove the luggage compartment trim lights .
4. Remove the luggage compartment floor (-1-).



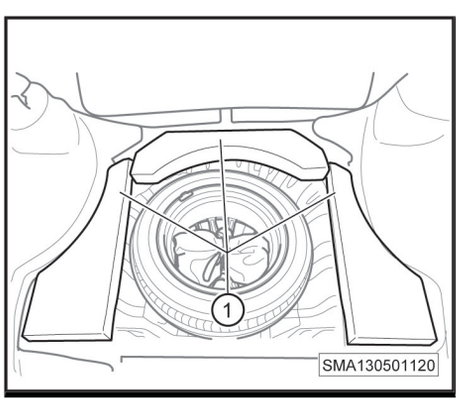
5. Unscrew the fixing screws of the luggage compartment rear trim (-arrow-).



6. Remove the luggage compartment rear trim (-1-).



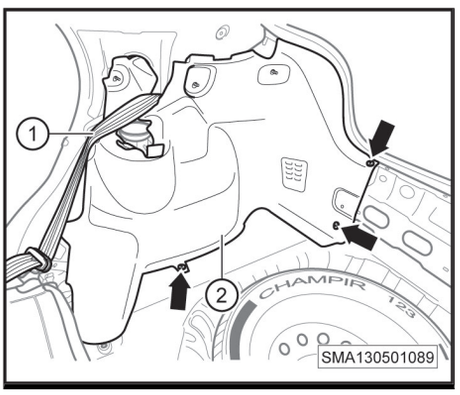
7. Remove the luggage compartment mat (-1-).



Note

- The removal and installation procedures of the left luggage compartment trim are the same as that of the right one.

8. Remove the rear seat belt (-1-).
9. Unscrew the fixing screws of the luggage compartment side trim (-arrow-).
10. Remove the luggage compartment side trim (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

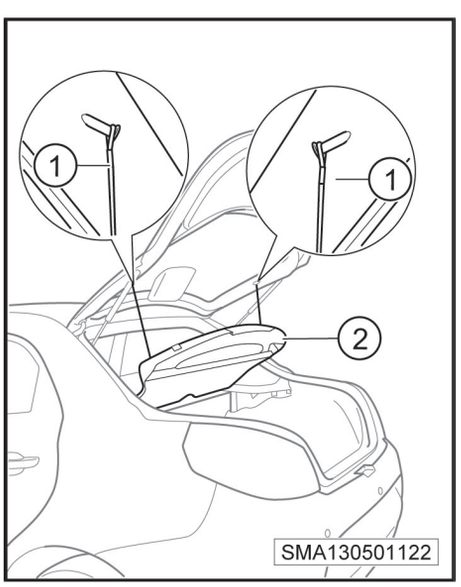
1.3.3 Removing and installing the trunk lid trim (Model A13)

Caution

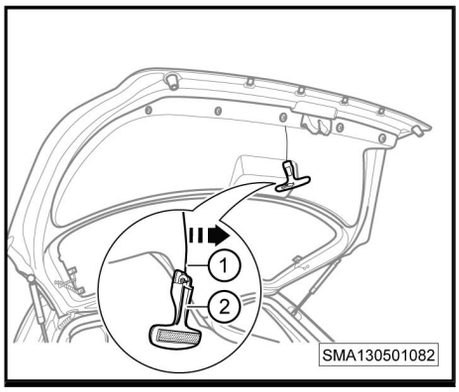
- Please wear protective gloves during repair.
- Remove the trunk lid trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal

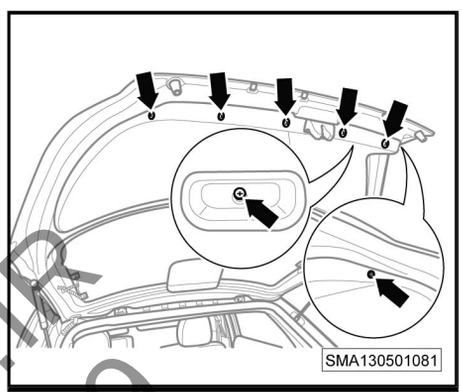
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the rear window shelf trim hooks on both sides (-1-).
3. Remove the rear window shelf trim (-2-).



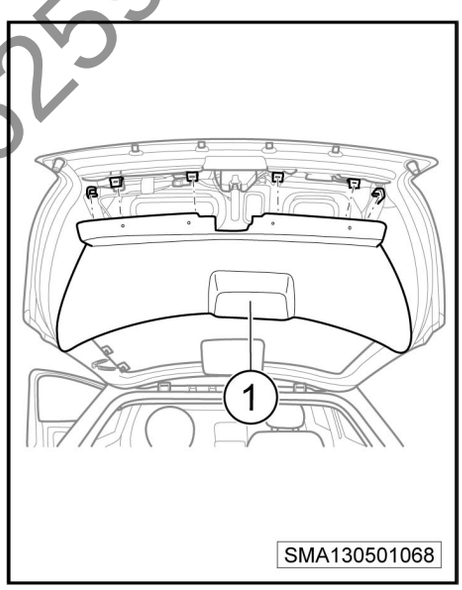
4. Remove the cable (-1-) in the (-arrow-) direction.
5. Remove the emergency escape pull handle (-2-).



6. Unscrew the fixing screws of the trunk lid trim (-arrow-).



7. Remove the trunk lid trim (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

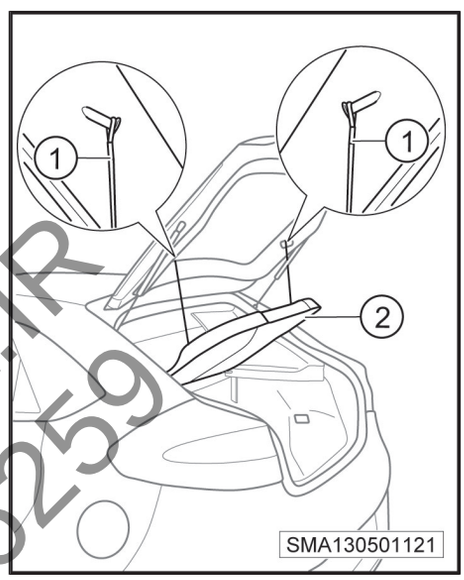
1.3.4 Removing and installing the trunk lid trim (Model A13A)

Caution

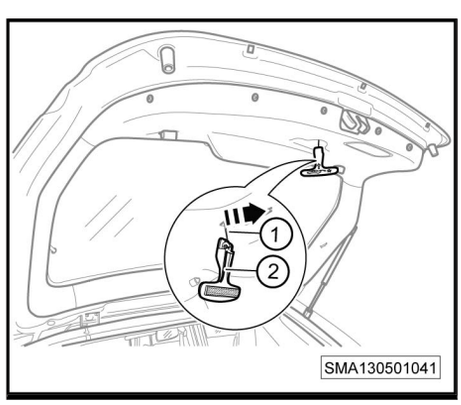
- Please wear protective gloves during repair.
- Remove the trunk lid trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal

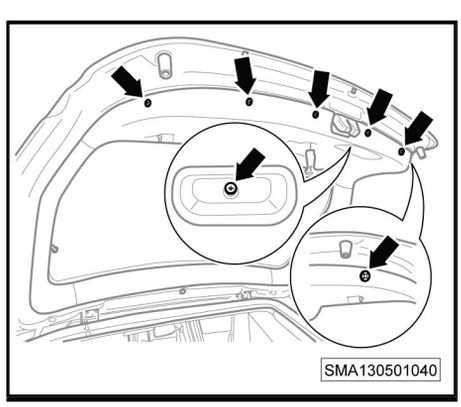
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the rear window shelf trim hooks on both sides (-1-).
3. Remove the rear window shelf trim (-2-).



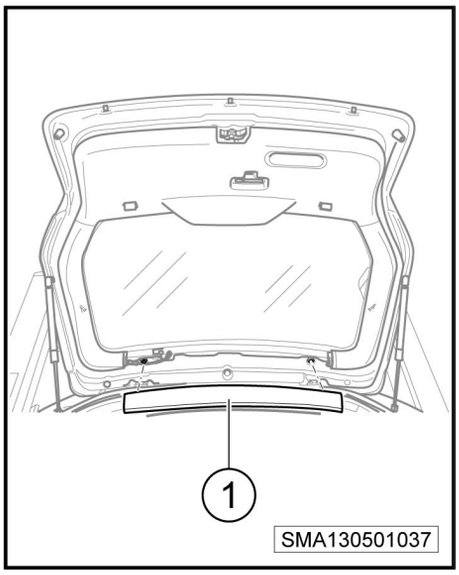
4. Remove the cable (-1-) in the (-arrow-) direction.
5. Remove the emergency escape pull handle (-2-).



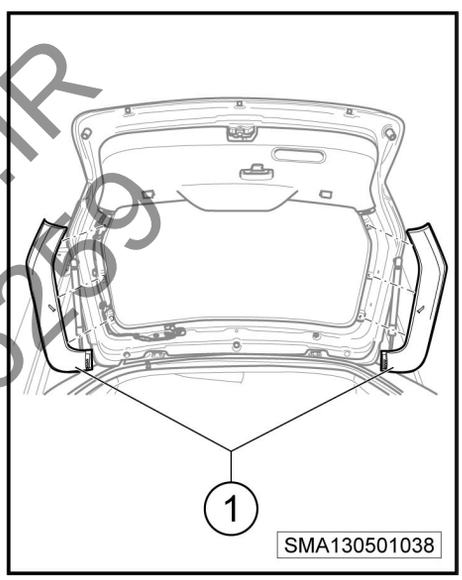
6. Unscrew the fixing screws of the trunk lid trim (-arrow-).



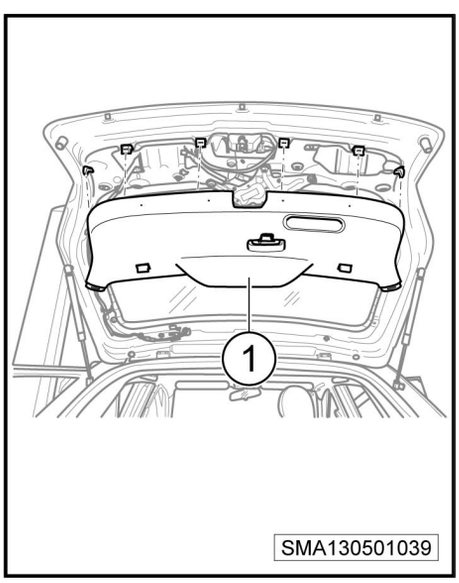
7. Remove the trunk lid side trim (-1-).



8. Remove the trunk lid trim (-1-).



9. Remove the trunk uppper trim (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

1.4 Roof interior trim

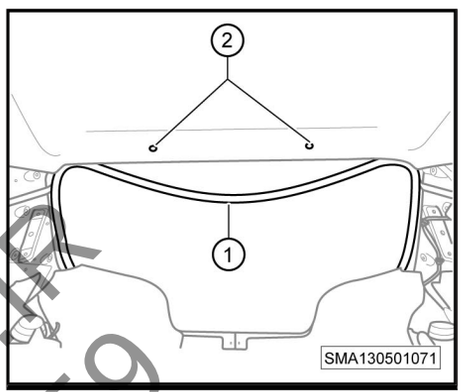
1.4.1 Removing and installing the roof interior trim (Model A13)

Caution

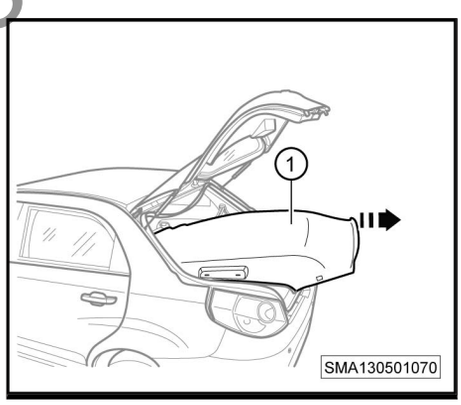
- Please wear protective gloves during repair.
- Remove the roof interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the A pillar trim => refer to page 771.
3. Remove the B pillar trim => refer to page 772.
4. Remove the C pillar trim (Model A13) => refer to page 775.
5. Remove the ceiling pull handle => refer to page 824.
6. Remove the sun visor => refer to page 823.
7. Remove the interior light assembly .=> refer to page 1125
8. Remove the luggage compartment seal (-1-).
9. Remove the fixing cover of the roof interior trim (-2-).



10. Remove the roof interior trim (-1-) in the (-arrow-) direction.



Installation

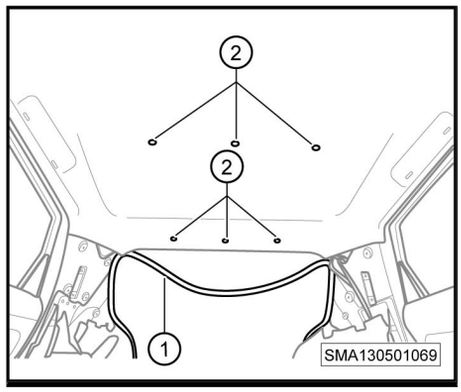
Installation shall follow the reverse sequence of the removal procedure.

1.4.2 Removing and installing the roof interior trim (Model A13A)

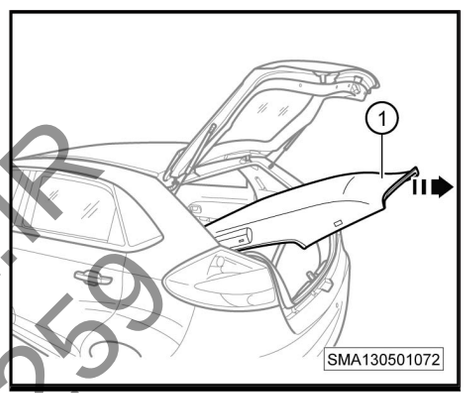
Caution

- Please wear protective gloves during repair.
- Remove the roof interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the A pillar trim => refer to page 771.
3. Remove the B pillar trim => refer to page 772.
4. Remove the C pillar trim (Model A131) => refer to page 778.
5. Remove the ceiling pull handle => refer to page 824.
6. Remove the sun visor => refer to page 823.
7. Remove the interior light assembly .=> refer to page 1125
8. Remove the luggage compartment seal (-1-).
9. Remove the fixing cover of the roof interior trim (-2-).



10. Remove the roof interior trim (-1-) in the (-arrow-) direction.

Installation

Installation shall follow the reverse sequence of the removal procedure.

1.5 Carpet

1.5.1 Removing and installing the carpet

Caution

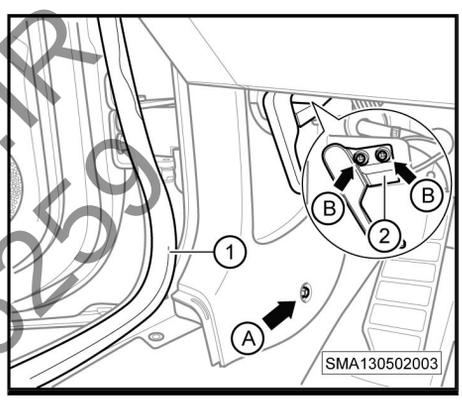
- Please wear protective gloves during repair.
- Remove the roof interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Note

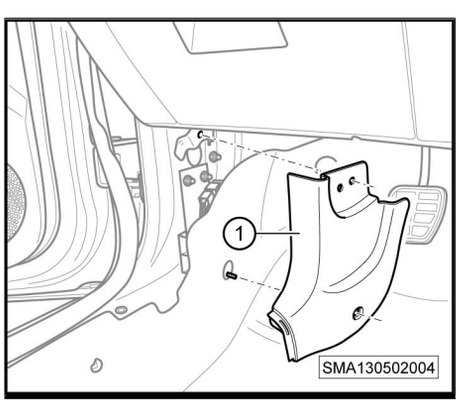
- The right front door inner sill trim is not equipped with an engine hood opening handle. The removal and installation procedures of the left trim are the same as that of the right one.

Removal

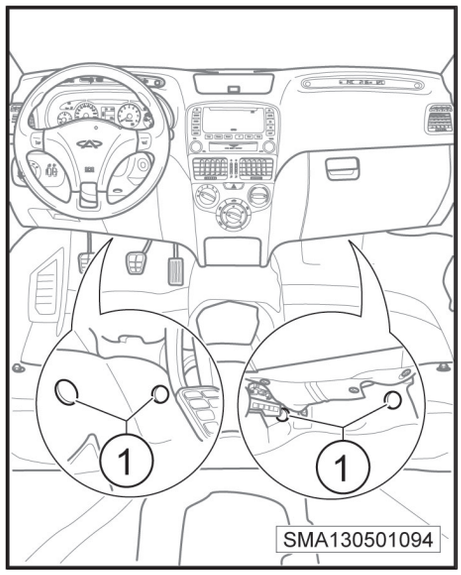
1. Remove the B pillar trim => refer to page 772.
2. Remove the C pillar trim (Model A13) => refer to page 775.
3. Remove the C pillar trim (Model A13A) => refer to page 778.
4. Remove the front seat => refer to page 833.
5. Remove the rear seat cushion => refer to page 835.
6. Remove the instrument console => refer to page 825.
7. Remove the front door seal (-1-).
8. Fixing screw of the front door inner sill trim (-arrow A-).
9. Fixing screws of the engine hood opening handle (-arrow B-).
10. Remove the engine hood opening handle (-2-).



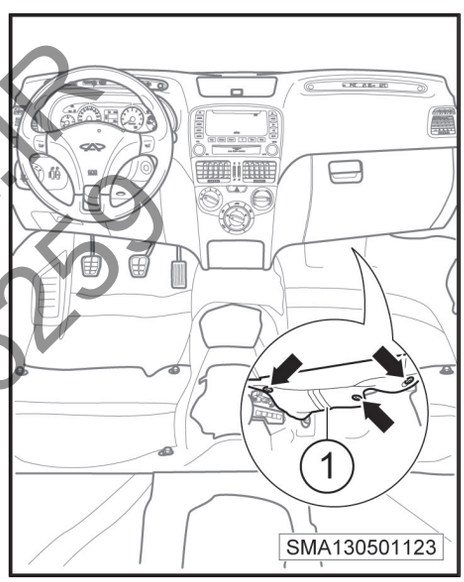
11. Remove the front door inner sill trim (-1-).



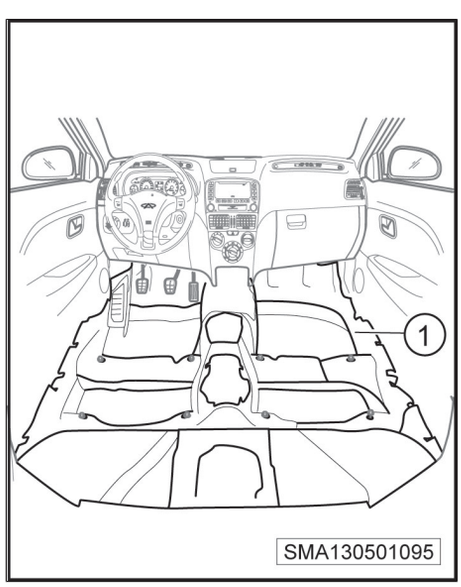
12. Remove the carpet fixing covers (-1-).



13. Unscrew the fixing screws (-arrow-).
14. Remove the passenger's side lower baffle (-1-).



15. Remove the carpet (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

2 Occupant Protections

2.1 Seat belt

2.1.1 Removing and installing the front seat belt retractor

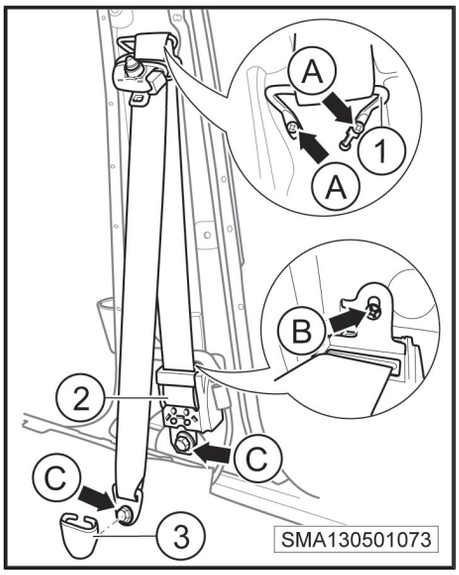
Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Keep the seat belt clean and check for damage.
- All fixing bolts must be tightened with the specified tightening torque.
- The removal and installation procedures of the front left seat belt retractor are the same as that of the front right one.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the pillar lower trim => refer to page 772.
3. Remove the seat belt upper bolt cap (-1-).
4. Unscrew the seat belt upper bolt (-arrow-) and remove the seat belt upper retainer (-2-).
   - Tightening torque of the bolt: 50±5 N•m

5. Unscrew the belt guide loop fixing screws (-arrow A-) and remove the belt guide loop (-1-).
6. Unscrew the locating screws of the front seat belt retractor (-arrow B-).
7. Remove the seat belt retractor lower cap (-3-).
8. Unscrew the fixing bolts (-arrow C-) of the seat belt retractor (-2-) and remove the front seat belt retractor (-2-).
   - Tightening torque of bolt : 50±5 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- Confirm the front seat belt retractor works properly.

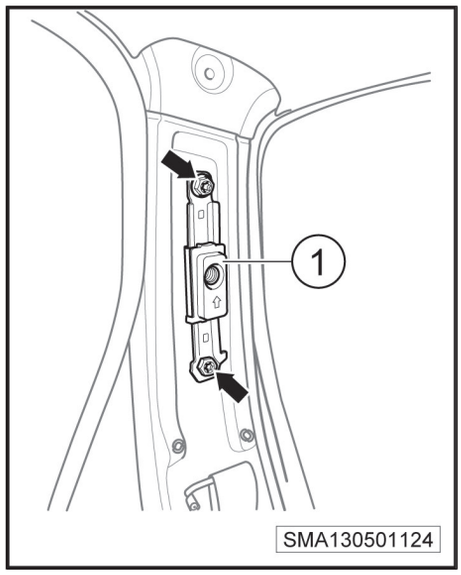
2.1.2 Removing and installing the front seat belt height adjuster

Caution

- Please wear protective gloves during repair.
- The removal and installation procedures of the front left seat belt height adjuster are the same as that of the front right one.
- Check if the front seat belt height adjuster is damaged and if it can be adjusted up and down freely.
- All fixing bolts must be tightened with the specified tightening torque.
- The removal and installation procedures of the left seat belt height adjuster are the same as that of the right one.

Removal

1. Remove the pillar trim => refer to page 772.
2. Unscrew the fixing bolts of the installed front seat belt height adjuster (-arrow-).
3. Remove the installed front seat belt height adjuster (-1-).
   - Tightening torque of bolt : 50±5 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- When installing the front seat belt height adjuster, face the indicating arrow upward.
- Confirm the front seat belt height adjuster works properly.

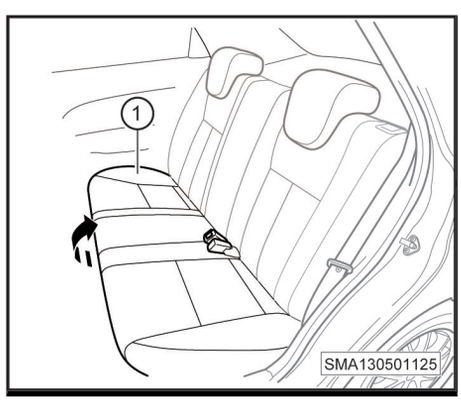
2.1.3 Removing and installing the middle rear seat belt retractor

Caution

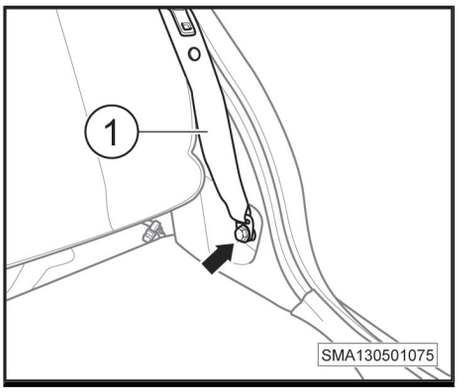
- Please wear protective gloves during repair.
- Keep the seat belt clean and check for damage.
- The removal and installation procedures of the left middle seat belt retractor are the same as that of the right one.
- All fixing bolts must be tightened with the specified tightening torque.

Removal

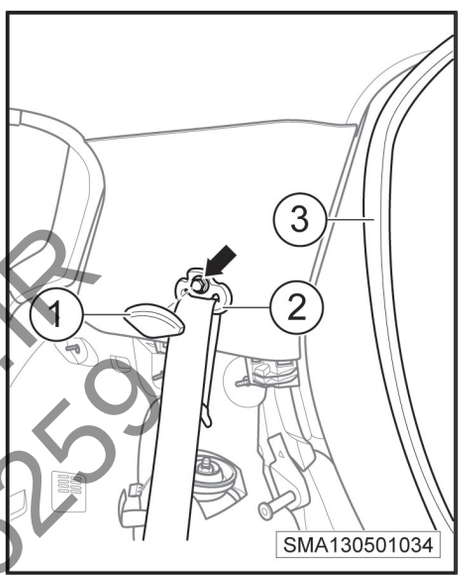
1. Remove the luggage compartment side trim (Model A13) => refer to page 783.
2. Remove the luggage compartment side trim (Model A13A) => refer to page 784.
3. Uncover the rear seat cushion (-1-) in the (-arrow-) direction.



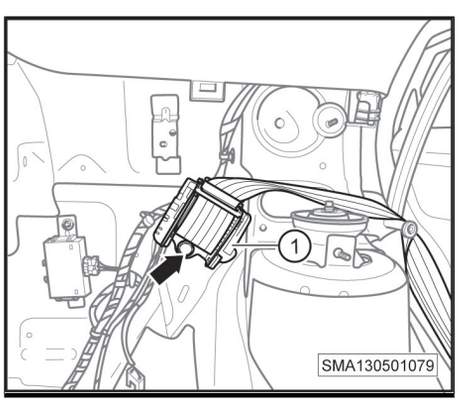
4. Unscrew the lower fixing bolts of the rear seat belt (-arrow-).
   - Tightening torque of bolt : 50±5 N•m
5. Remove the rear seat belt (-1-).



6. Remove the rear seat belt fixing bolt cap (-1-).
7. Unscrew the rear seat belt fixing bolts (-arrow-) and remove the rear seat belt (-2-).
   - Tightening torque of bolt: 50±5 N•m
8. Remove the rear door seal (-3-).



9. Unscrew the fixing bolts (-arrow-) and remove the rear seat belt retractor (-1-).
   - Tightening torque of bolt : 50±5 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- Confirm the rear seat belt retractor works properly.

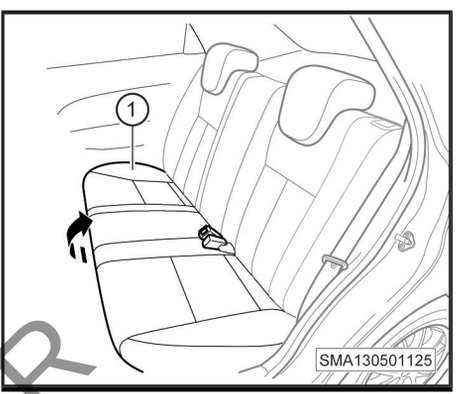
2.1.4 Removing and installing the middle rear belt buckle

Caution

- Please wear protective gloves during repair.
- Keep the seat belt clean and check for damage.
- All fixing bolts must be tightened with the specified tightening torque.

Removal

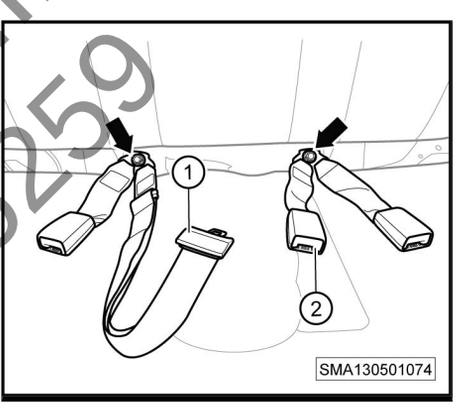
1. Uncover the rear seat cushion (-1-) in the (-arrow-) direction.



2. Unscrew the middle rear belt buckle fixing bolts (-arrow-).

- Tightening torque of bolt: 50±5 N•m

3. Remove the middle rear belt buckles (-1-) and (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- Confirm the middle rear belt buckles work properly.

2.2 Airbag

2.2.1 System instructions

Passive safety protection

- The passive safety protection can protect the occupant(s) inside a vehicle after a car crash.
- The passive safety protection device consists of two parts. One is seat belt, which can fasten the occupant(s) inside a vehicle to a safe position in case of a car crash.The other is airbag, which can assure occupant safety by buffering and absorbing the force of impact when the occupant inside a vehicle is crashed.

Airbag functions and components

- Airbags must work with seat belts. Airbags cannot take the place of seat belts. Driver and passengers must always fasten their belts and adjust them to the most proper position according to their body size.
- A slight crash would not trigger the airbag system. In case of grave front crash accidents, the airbag would inflate at a very rapid speed to protect the driver and front passenger.
- Airbag system consists of:

  a. Driver frontal airbag
  b. Front passenger frontal airbag
  c. Airbag control unit
  d. Airbag malfunction indicator

- The driver frontal airbag, installed in the steering wheel, would inflate to protect the driver in the event of a grave car crash.
- The front passenger frontal airbag, installed in the dashboard, would inflate to protect the front passenger in the event of a grave car crash.
- The airbag control unit, equipped with an impact sensor and installed on the body floor inside the console, would control the airbag to inflate to protect the driver and the front passenger in the event of a grave car crash.
- The airbag malfunction indicator, installed on the instrument cluster, would inform the driver of whether the airbag system is working properly. If the indicator stays lit after the engine stars, it indicates SRS faults, which need testing and repairing.

2.2.2 Notes

- The battery negative should keep disconnected from any airbag components for at least one minute before they are removed. Remove the airbag and the spiral coil and well preserve them before repairing the steering system.
- Keep the airbag facing upward and store it in a room. When triggered unexpectedly, the airbag will burst in the room. Otherwise, the airbag will burst toward bodies or objects, leading to injuries.
- The airbag, an expendable component, must be replaced after burst and refrain from reuse.

Diagnostic tips

- Use the X-431 diagnostic device and the connector to test the vehicle data.
- Fault confirmation is the currently selected diagnostic inspection and maintenance procedure.
- If the DTC fails to be deleted, then it will be a current fault.
- Use a digital multimeter to measure the electronic system voltage.
- Visually check the related wiring harness for damage.
- Check and clear the latest DTC causes about respective content of all fault codes.

Diagnosis and inspection of sporadic DTC faults

If the sporadic DTC faults occur, please check the following items:

- Check if the connector of the DTC-related actuator or sensor is properly installed.
- Check the connector pins of the actuator or sensor for leakage and corrosion.

- The scan tool monitors data based on this circuit.
- Check the leads for bending or squeezing.
- Check the sensor for dirt or damage.
- Consult materials and change or reset the DTC in the swing test.
- Check if the routing of wire harness is correct and proper.

Checking earth connection

A good earth connection is prerequisite for ensuring the normal operation of the circuit. If the earth terminal of the circuit is always exposed to the wet and dusty environment, the metal of the earth terminal will corrode and affect the circuit smoothness, thus causing various electrical system malfunctions. As the control circuit is very sensitive, the loosened or corroded wires may significantly affect the transmission of various signals in the electronic control circuit. Therefore, please note the followings when inspecting:

- Replace the earth bolts or nuts.
- Check the earth terminal and coil for corrosion.
- Clean them to assure sound contact.
- Clean and polish the earth terminal and coil when necessary to ensure good contact.
- Check if there is any accessory interfering with the earth circuit.

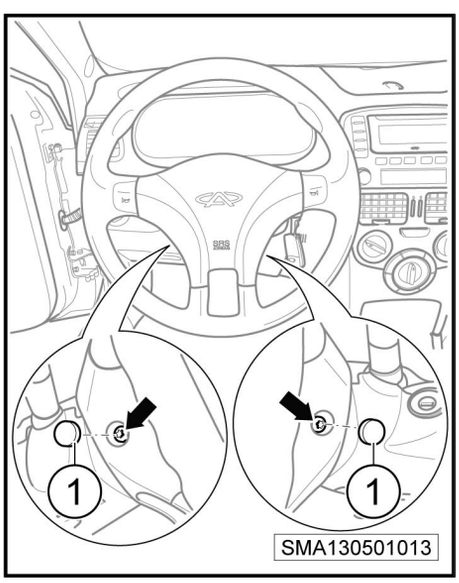
2.2.3 Removing and installing the driver's side airbag

Caution

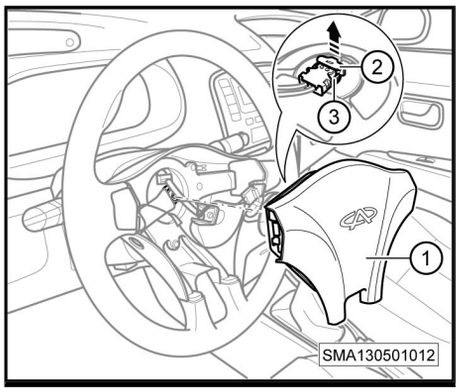
- Please wear protective gloves during repair.
- Replace damaged trim fixing clips.
- The battery negative should keep disconnected from the airbag components for at least one minute before they are removed.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the bolt caps (-1-) on both sides.
3. Unscrew the fixing bolts of the driver's side airbags on both sides (-arrow-).
   - Tightening torque of bolt : 15±3 N•m



4. Remove the driver's side airbag (-1-).
5. Pull out the connector clips (-2-) in the (-arrow-) direction and disconnect the driver's side airbag connector (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- Check if the airbag is properly installed.
- Use the vehicle diagnostic equipment to check the airbag system.

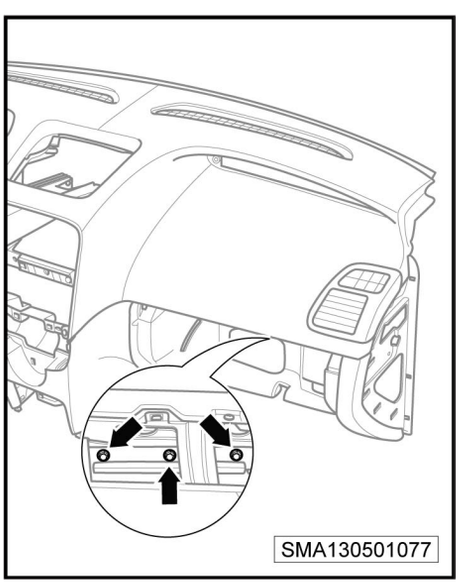
2.2.4 Removing and installing the front passenger's side airbag

Caution

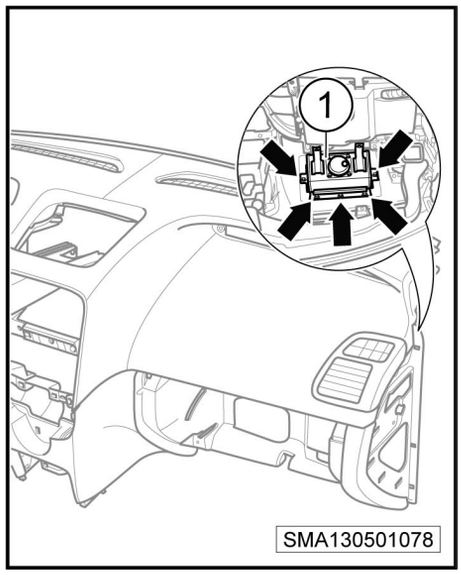
- Please wear protective gloves during repair.
- Remove the door interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.
- The battery negative should keep disconnected from the airbag components for at least one minute before they are removed.

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the instrument console.
3. Unscrew the fixing bolts of the front passenger's side airbag (-arrow-).
   - Tightening torque of bolt : 5±0.5 N•m



4. Unscrew the fixing bolts of the front passenger's side airbag (-arrow-).
   - Tightening torque of bolt: 5±0.5 N•m
5. Remove the front passenger's side airbag (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- Check if the airbag is properly installed.
- Use the vehicle diagnostic equipment to check the airbag system.

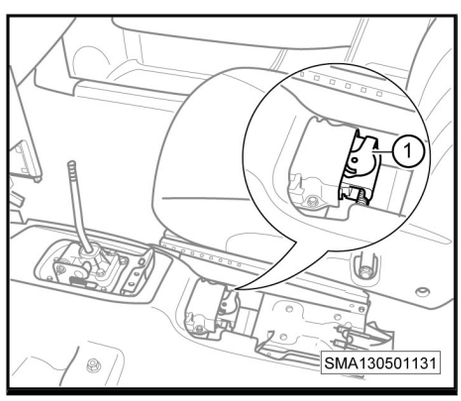
2.2.5 Removing and installing the airbag control module

Caution

- Please wear protective gloves during repair.
- Remove the door interior trim with an interior trim remover or a similar tool.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.
- The battery negative should keep disconnected from the airbag components for at least one minute before they are removed.

Removal

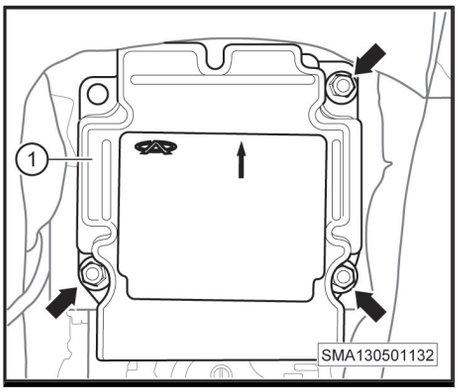
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the console.=> refer to page 825
3. Remove the parking brake.=> refer to page 747
4. Disconnect the connector of the airbag control module (-1-).



5. Unscrew the fixing bolts of the airbag control module (-arrow-).

- Tightening torque of bolt : 10±1 N•m

6. Remove the airbag control module (-1-).



Installation

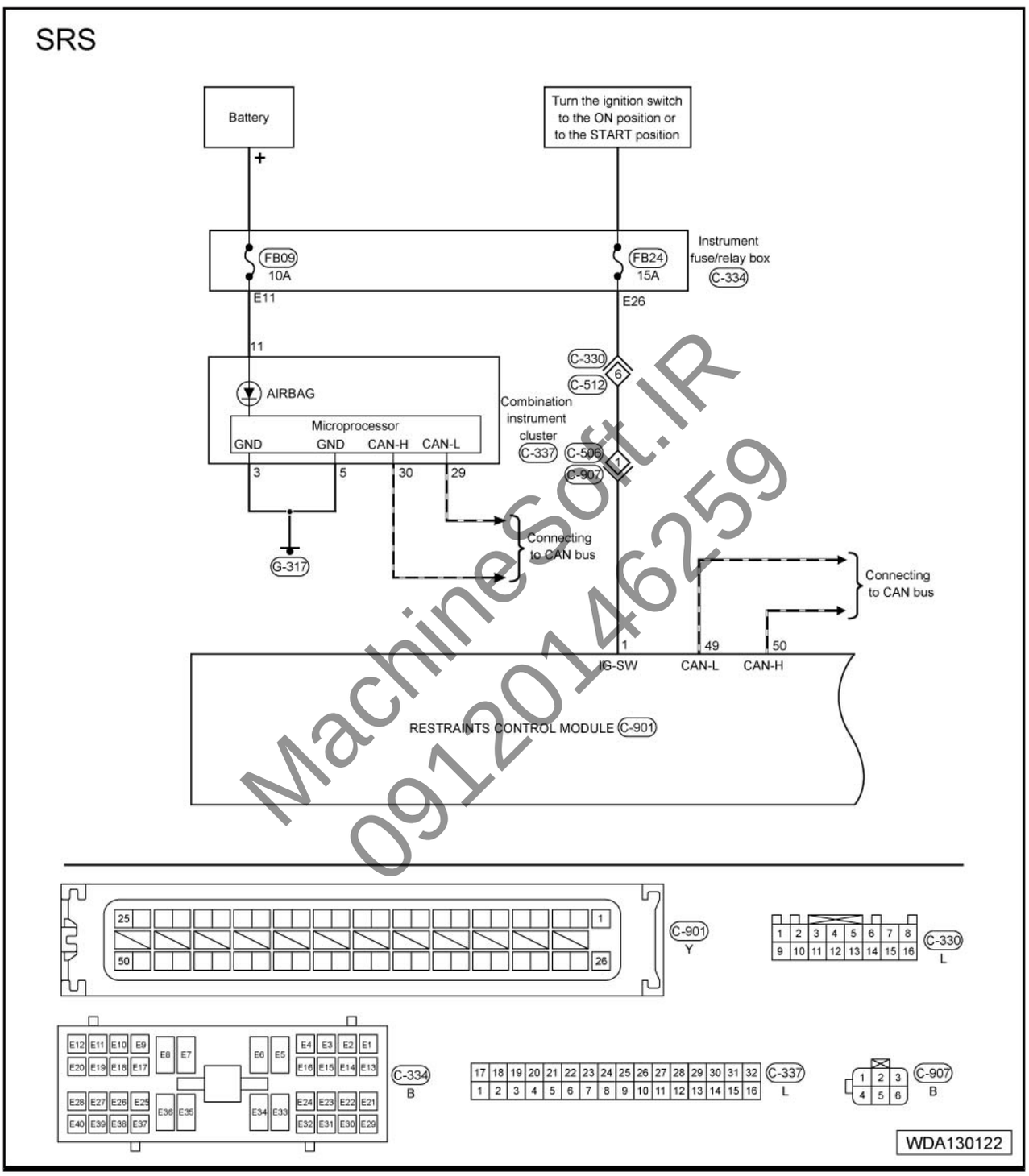
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- Install the airbag toward the vehicle front in the arrow direction indicated on the control module.
- It is impermissible to install the airbag onto other vehicles after it is removed.
- Check if the airbag is properly installed.
- Use the vehicle diagnostic equipment to check the airbag system.

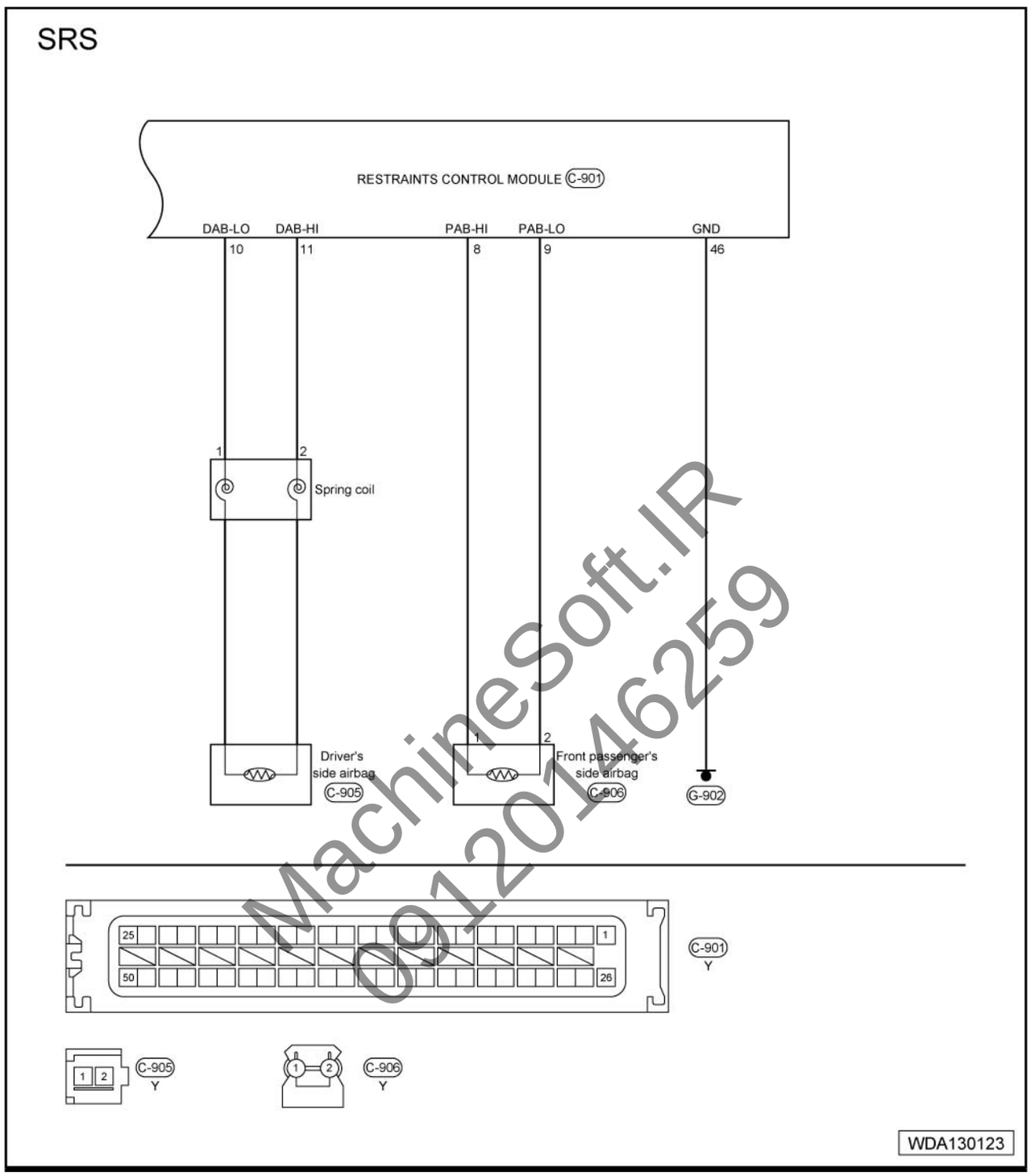
2.3 SRS fault diagnosis

2.3.1 SRS circuit diagram

SRS (page 1)



SRS (page 2)

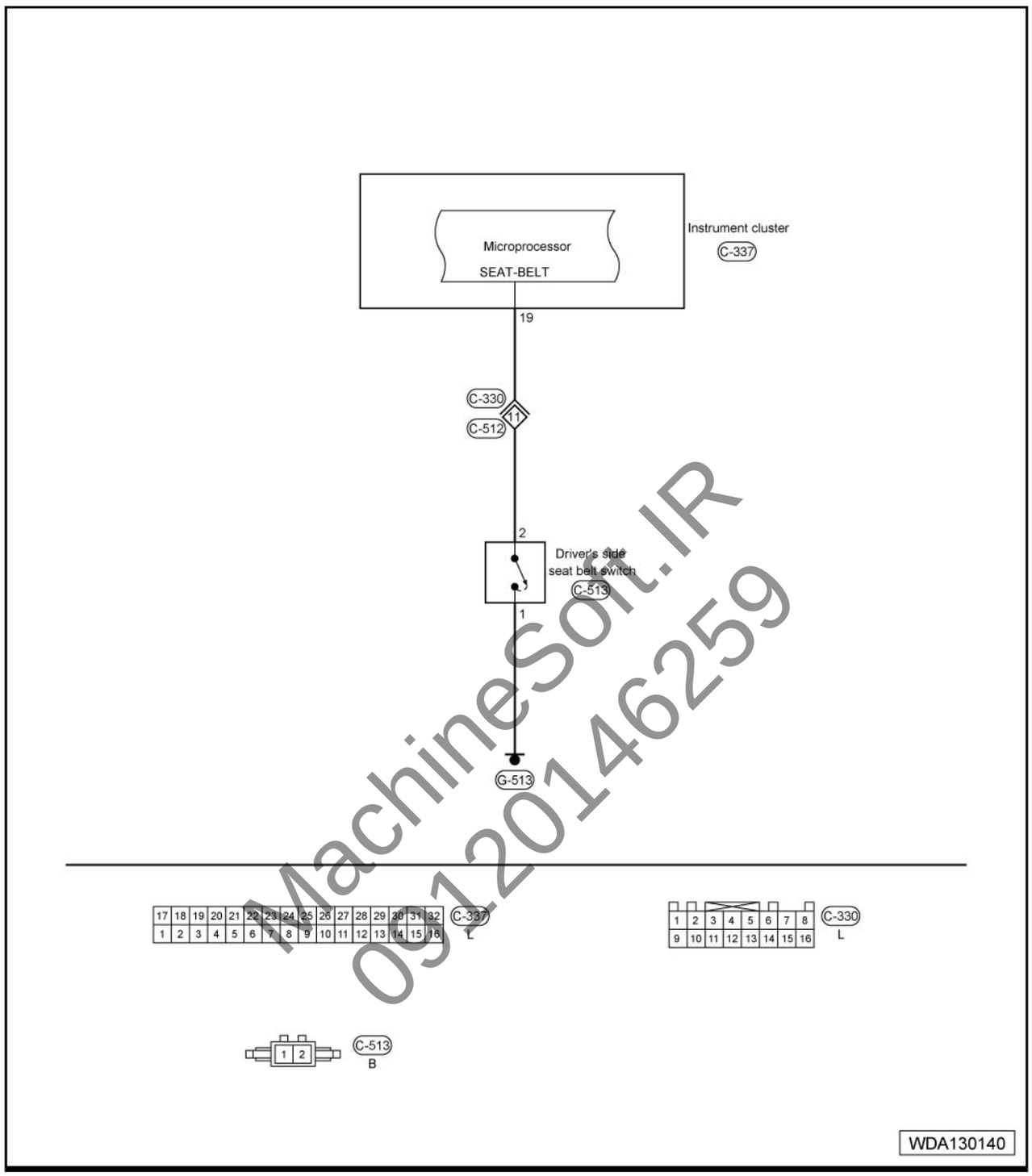


2.3.2 SRS DTC list

DTC	Definition
B1397	Driver seat belt latch plate fault
B1400	Excessive battery voltage
B1401	Low battery voltage
B1316	Short circuit of front passenger airbag
B1317	Open circuit of front passenger airbag

DTC	Definition
B1318	Short to ground or cross line of front passenger airbag
B1319	Short to power of front passenger airbag
B1322	Short circuit of driver airbag
B1324	Short to ground or cross line of driver airbag
B1325	Short to power of driver airbag
B1326	Open circuit of driver airbag

2.3.3 B1397 Driver seat belt latch plate fault



Inspect driver seat belt latch plate values

Seat belt connector pin No.	Function	Condition	Value (DC voltage range)
1	Conduct driver seat belt latch plate	Turn on ignition switch	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test conditions	DTC triggering conditions	Possible causes
B1397	Driver seat belt latch plate fault	Turn the ignition switch to the ON position and engage the latch plate	The instrument control unit detects driver seat belt latch plate faults	Wiring harness short/open circuit fault and seat belt latch plate switch fault

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

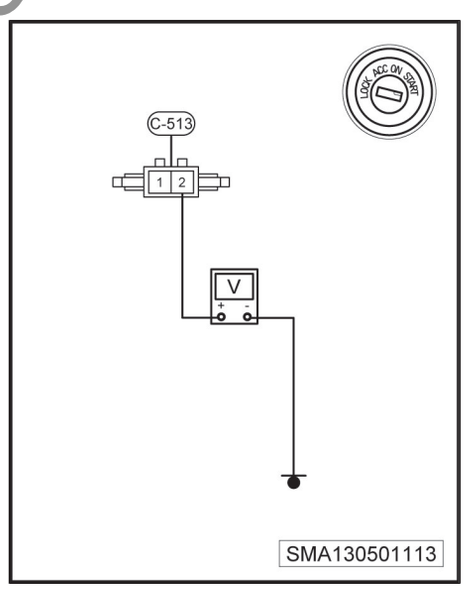
Diagnostic procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

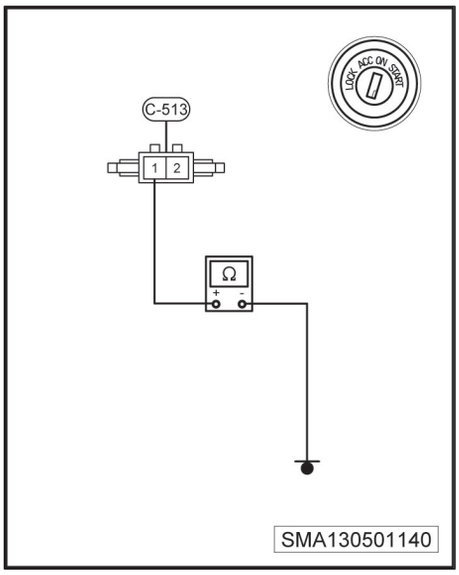
1. When turning the ignition switch to the ON position, disconnect the seat belt latch plate switch connector C-513 and check if the terminal 2 reaches the battery voltage.

- If yes, go to step 2.
- If not, check if the lead from the seat belt latch plate switch 2 to the instrument control unit terminal 19 has an open circuit. And repair the defective lead. ■



2. When turning the ignition switch to the LOCK position, check if the seat belt latch plate switch connector terminal 1 is properly earthed.

- If yes, go to step 3.
- If not, check if the lead from the seat belt latch plate switch connector terminal 1 to the earth terminals has an open circuit. And repair the defective lead. ■

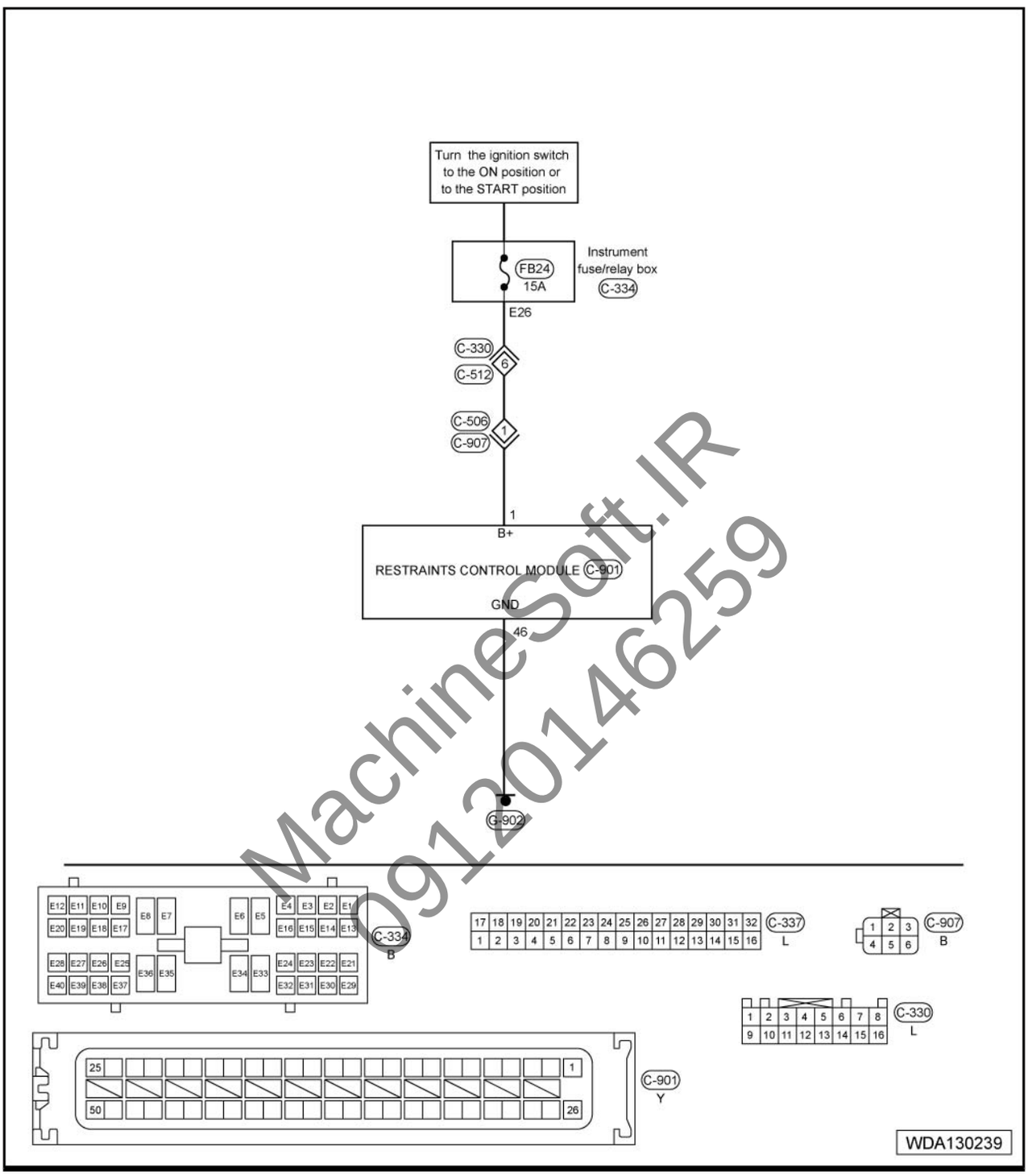


3. Replace the seat belt latch plate switch and retest it and read the fault code to verify if the code is present or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

2.3.4 B1400 Excessive battery voltage

B1401 Low battery voltage



Inspect SRS control unit values

SRS control unit pin No.	Function	Condition	Value (DC voltage range)
01	Supply power to SRS control unit	Turn on ignition switch	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test conditions	DTC triggering conditions	Possible causes
B1400	Excessive battery voltage	Turn the ignition switch to the ON position or to the START position	The connecting harness from the fuse to the SRS control unit has a short circuit	Wiring harness short circuit faults and SRS control unit internal faults
B1401	Low battery voltage	Turn the ignition switch to the ON position or to the START position	The connecting harness from the fuse to the SRS control unit has an open circuit	Wiring harness open circuit faults and SRS control unit internal faults

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

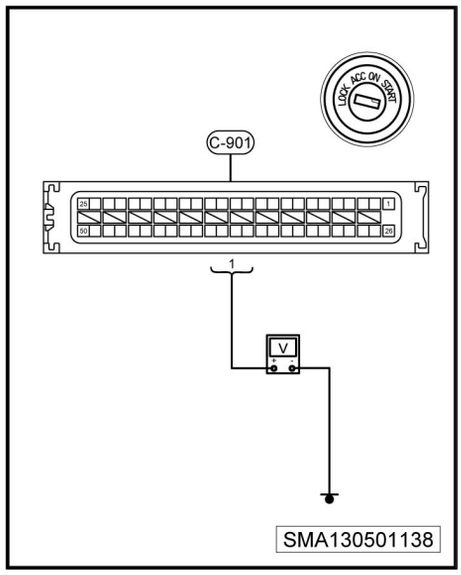
1. Check if the power supply fuse FB24 in the SRS control module has faults.

- If yes, replace it. ■
- If not, go to step 2.

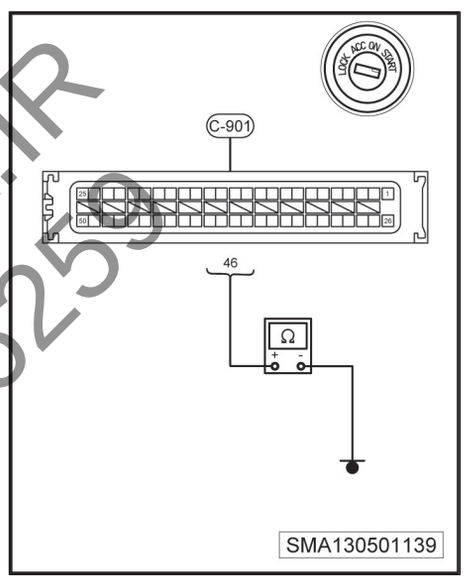
2. Check if the SRS control module pins/connectors are corrosive, tainted and loose.

- If the connectors/pins have faults, rectify the faults or replace the connectors/pins. ■
- If not, go to step 3.

3. Turn off the ignition switch and disconnect SRS control unit connector C-901.
4. When turning the ignition switch to the LOCK position, check if the SRS control unit connector terminal 1 reaches the battery voltage.
   - If yes, go to step 5.
   - If not, check if the lead from the SRS control unit connector terminal 01 to the FB24 fuse inside the fuse/relay box has a short or open circuit. And repair the defective lead. ■



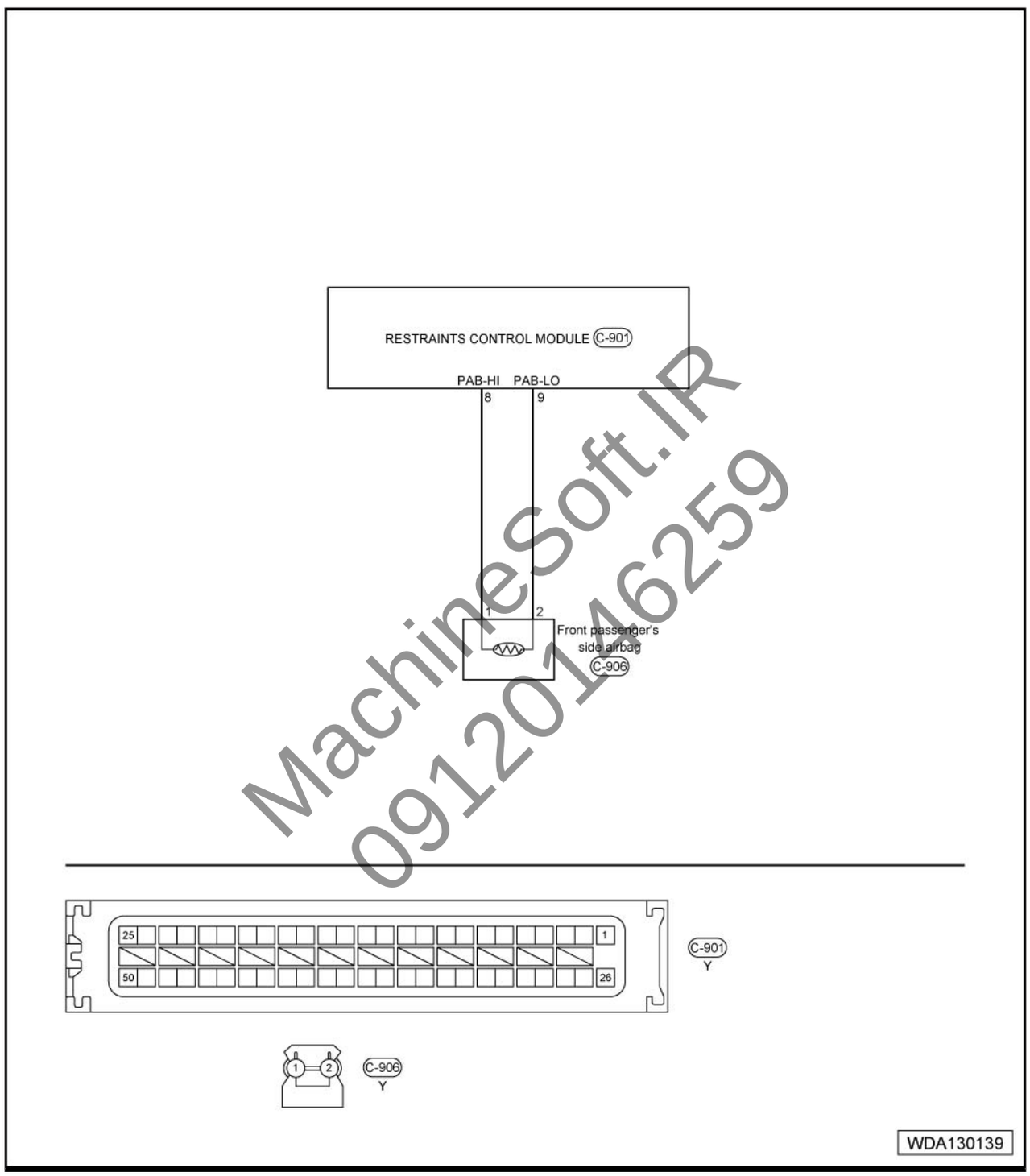
5. Check if the SRS control unit connector terminal 46 is properly earthed.
   - If yes, go to step 6.
   - If not, check if the lead from the SRS control unit connector terminal 46 to the earth terminals has a short or open circuit. And repair the defective lead. ■



6. Replace the SRS control unit and retest it and read the fault code to verify if the code is present or not.
   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

2.3.5 B1316 Short circuit of front passenger airbag

B1317 Open circuit of front passenger airbag
B1318 Short to ground or cross line of front passenger airbag
B1319 Short to power of front passenger airbag



Fault code definition and fault causes

DTC	DTC definition	DTC test conditions	DTC triggering conditions	Possible causes
B1316	Short circuit of front passenger airbag	Turn the ignition switch to the ON position	The SRS control unit detects a short circuit of front passenger airbag	Airbag faults and SRS control unit faults
B1317	Open circuit of front passenger airbag	Turn the ignition switch to the ON position	The SRS control unit detects an open circuit of front passenger airbag	Airbag faults and SRS control unit faults
B1318	Short to ground or cross line of front passenger airbag	Turn the ignition switch to the ON position	The connecting harness from the SRS control unit to the front passenger airbag has a short circuit	Wiring harness short circuit faults and SRS control unit faults
B1319	Short to power of front passenger airbag	Turn the ignition switch to the ON position	The connecting harness from the SRS control unit to the front passenger airbag has a short circuit	Wiring harness short circuit faults and SRS control unit faults

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

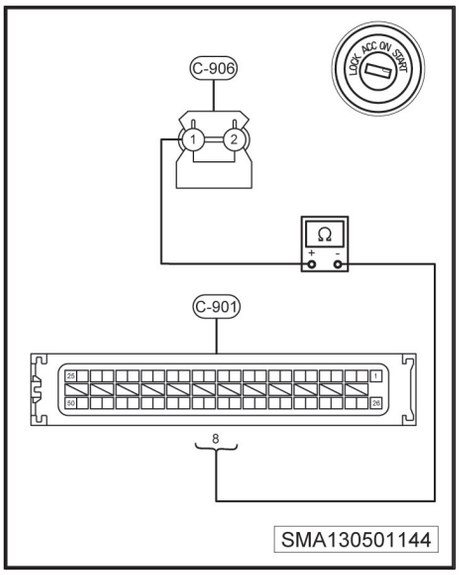
- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

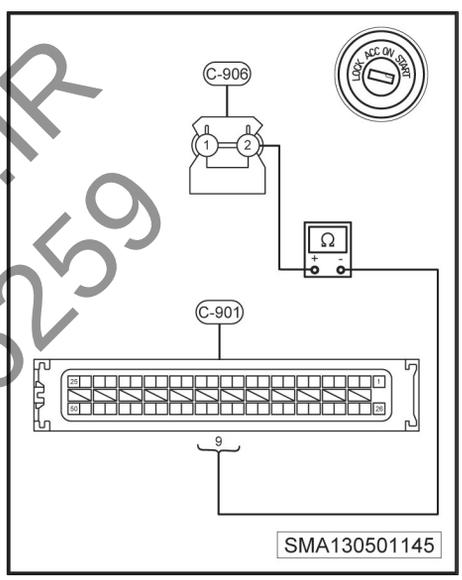
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn off the ignition switch and disconnect the battery negative cable. Disconnect the front passenger airbag connector C-906 and the SRS control unit connector C-901.
2. Check if the lead from the front passenger airbag connector terminal 1 to the SRS control unit connector terminal 8 is conducted.
   - If yes, go to step 3.
   - If not, check if the lead from the front passenger airbag connector terminal 1 to the SRS control unit connector terminal 8 has a short or open circuit. And repair the defective lead. ■



3. Check if the lead from the front passenger airbag connector terminal 2 to the SRS control unit connector terminal 9 is conducted.
   - If yes, go to step 4.
   - If not, check if the lead from the front passenger airbag connector terminal 2 to the SRS control unit connector terminal 9 has a short or open circuit. And repair the defective lead. ■

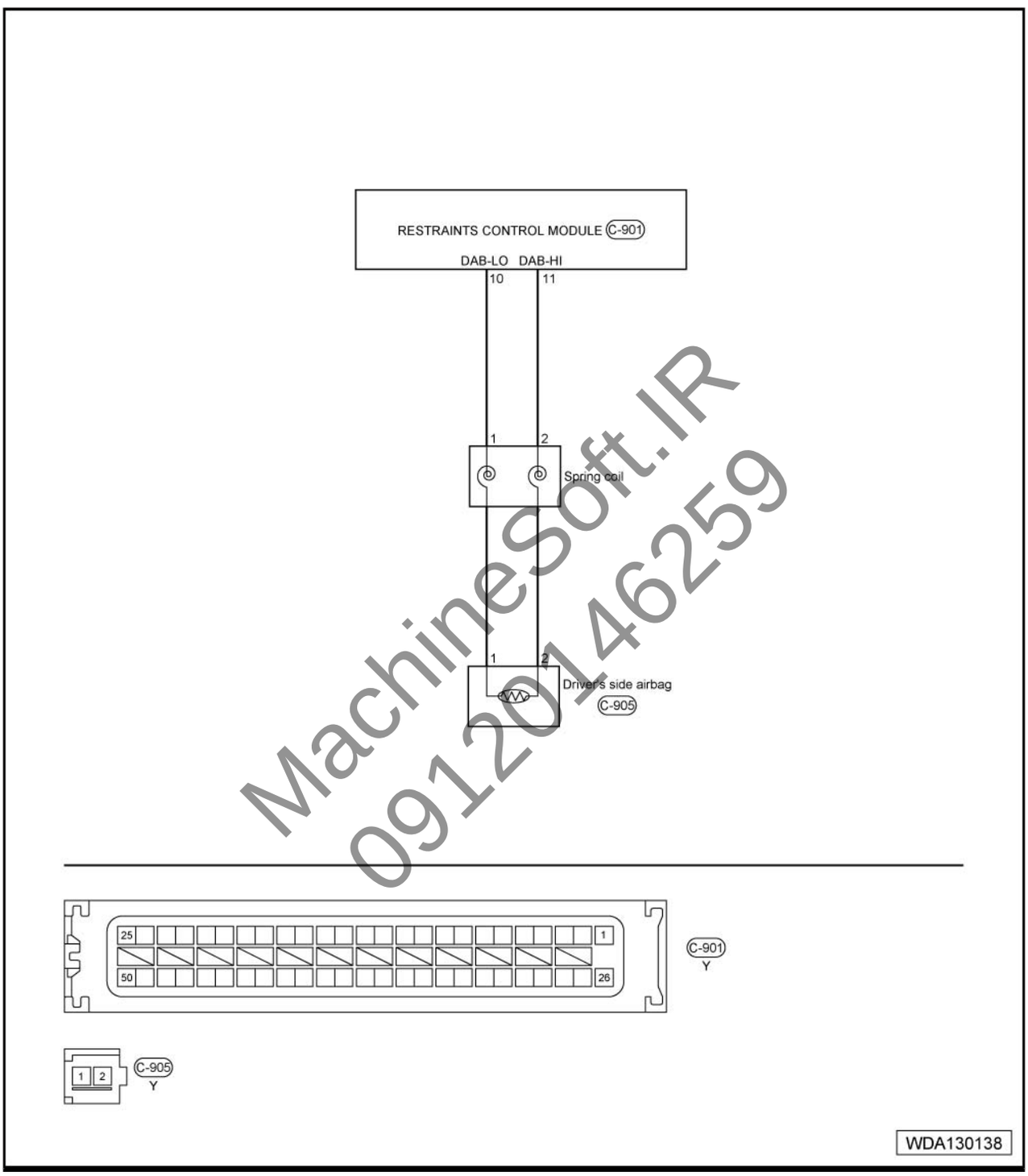


4. Replace the front passenger airbag and retest it and read the fault code to verify if the code is present or not.
   - If yes, go to step 5.
   - If not, the fault has been rectified. ■

5. Replace the SRS control unit and retest it and read the fault code to verify if the code is present or not.
   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

2.3.6 B1322 Short circuit of driver airbag

B1324 Short to ground or cross line of driver airbag
B1325 Short to power of driver airbag
B1326 Open circuit of driver airbag



Fault code definition and fault causes

DTC	DTC definition	DTC test conditions	DTC triggering conditions	Possible causes
B1322	Short circuit of driver airbag	Turn the ignition switch to the ON position	The SRS control unit detects a short circuit of driver airbag	Airbag faults and SRS control unit faults

DTC	DTC definition	DTC test conditions	DTC triggering conditions	Possible causes
B1324	Short to ground or cross line of driver airbag	Turn the ignition switch to the ON position	The connecting harness from the SRS control unit to the driver airbag has a short circuit	Wiring harness short circuit faults and SRS control unit faults
B1325	Short to power of driver airbag	Turn the ignition switch to the ON position	The connecting harness from the SRS control unit to the driver airbag has a short circuit	Wiring harness short circuit faults and SRS control unit faults
B1326	Open circuit of driver airbag	Turn the ignition switch to the ON position	The SRS control unit detects an open circuit of driver airbag	Airbag faults and SRS control unit faults

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.
- If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnostic procedures:

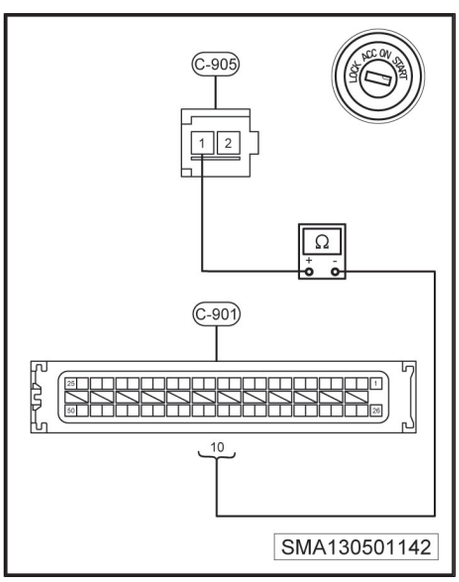
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn off the ignition switch and disconnect the battery negative cable. Disconnect the driver airbag connector C-905 and the SRS control unit connector C-901.

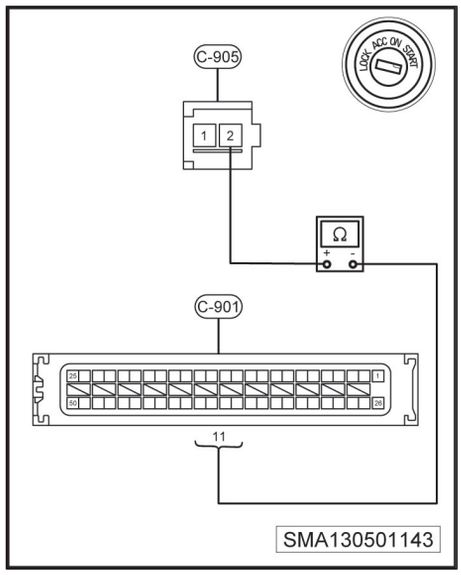
2. When turning the ignition switch to the LOCK position, check if the lead from the driver airbag connector terminal 1 to the SRS control unit connector terminal 10 is conducted.

- If yes, go to step 5.
- If not, go to step 4.



3. Check if the lead from the driver airbag connector terminal 2 to the SRS control unit connector terminal 11 is conducted.

- If yes, go to step 5.
- If not, go to step 4.



4. Check if the spring coil works properly.

- If yes, go to step 5.
- If not, replace the spring coil. Check if the lead from the driver airbag connector terminal to the SRS control unit connector terminal has a short or open circuit. ■

5. Replace the driver airbag and retest it and read the fault code to verify if the code is present or not.

- If yes, go to step 6.
- If not, the fault has been rectified. ■

6. Replace the SRS control unit and retest it and read the fault code to verify if the code is present or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

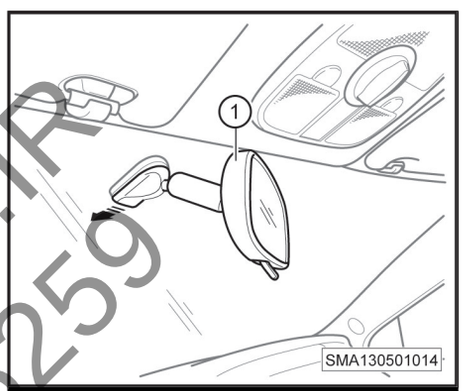
3 Interior Equipment

3.1 Interior rearview mirror

3.1.1 Removing and installing the interior rearview mirror

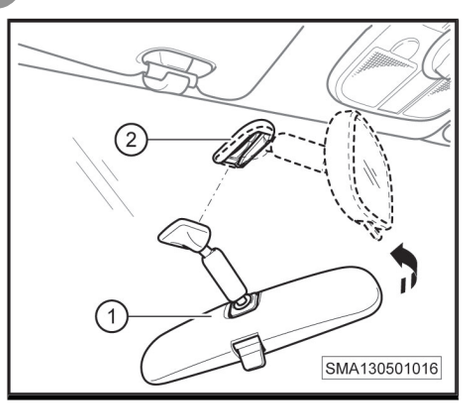
Removal

1. Remove the interior rearview mirror (-1-) in the (-arrow-) direction.



Installation

1. Fit the interior rearview mirror (-1-) into the fixing bracket (-2-).
2. Turn the interior rearview mirror to the right position in the (-arrow-) direction.



Note

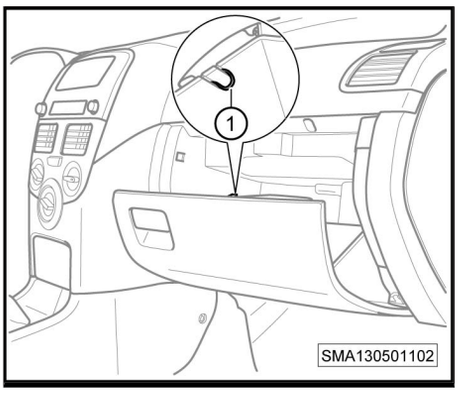
- Confirm that the interior rearview mirror is firmly installed in the fixing bracket.

3.2 Front passenger's side glove compartment

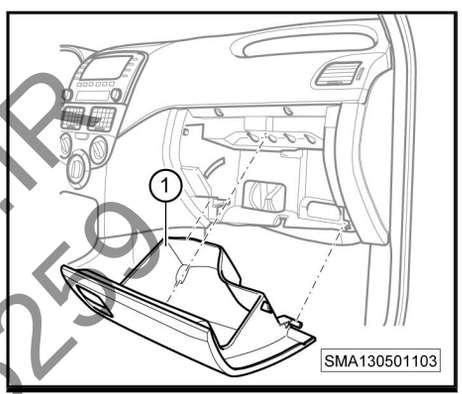
3.2.1 Removing and installing the front passenger's side glove compartment

Removal

1. Loosen the hook (-1-) from the front passenger's side glove compartment damper.



2. Remove the front passenger's side glove compartment (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

3.3 Sun visor

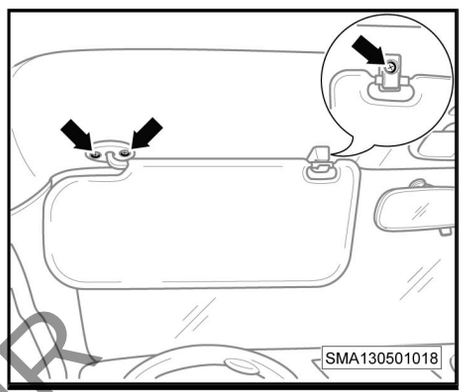
3.3.1 Removing and installing the sun visor

Note

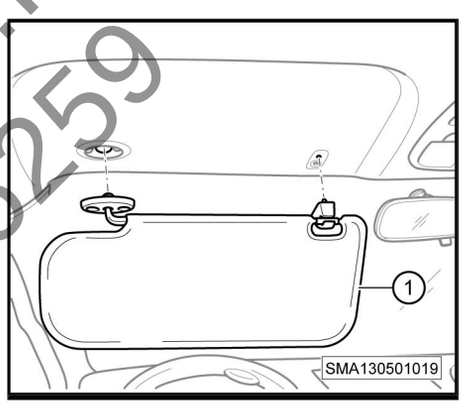
- The removal and installation procedures of the left sun visor are the same as that of the right one.

Removal

1. Unscrew the fixing bolts of the sun visor (-arrow-).



2. Remove the sun visor (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

3.4 Ceiling pull handle

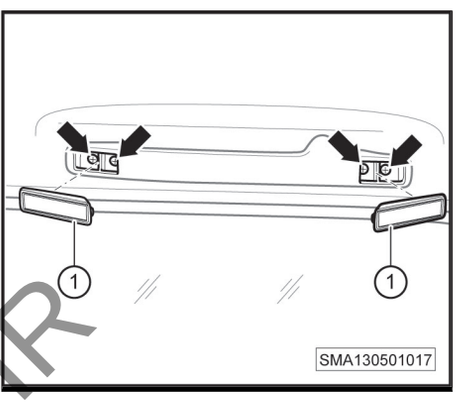
3.4.1 Removing and installing the ceiling pull handle

Note

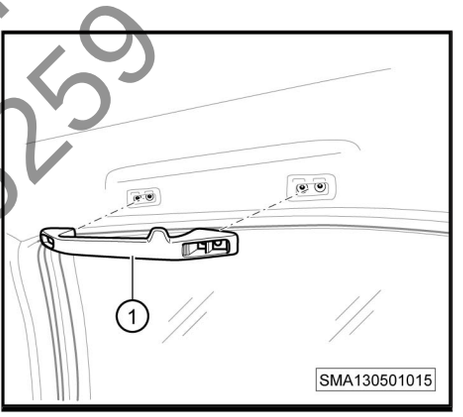
- The removal and installation procedures of the left ceiling pull handle are the same as that of the right one.

Removal

1. Remove the lids (-1-) on both sides.
2. Unscrew the fixing screws of the ceiling pull handle (-arrow-).



3. Remove the ceiling pull handle (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

3.5 Console

3.5.1 Removing and installing the console

Caution

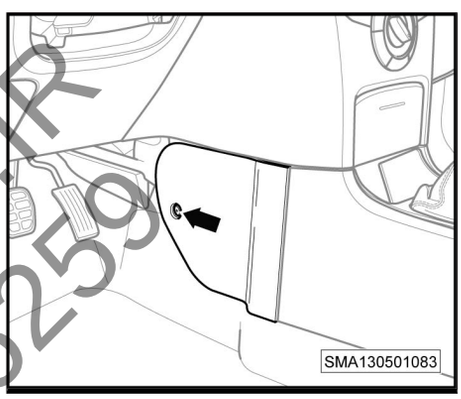
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Replace damaged trim fixing clips.

Note

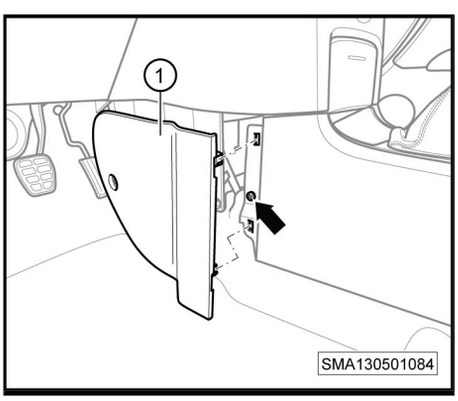
- The removal and installation procedures of the front left console trim are the same as that of the front right one.

Removal

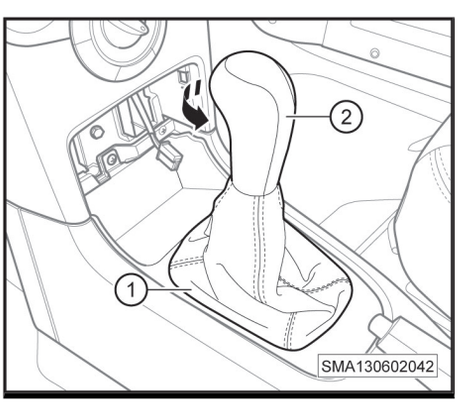
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the cigarette lighter .=> refer to page 1214
3. Unscrew the fixing bolts of the front console trim (-arrow-).



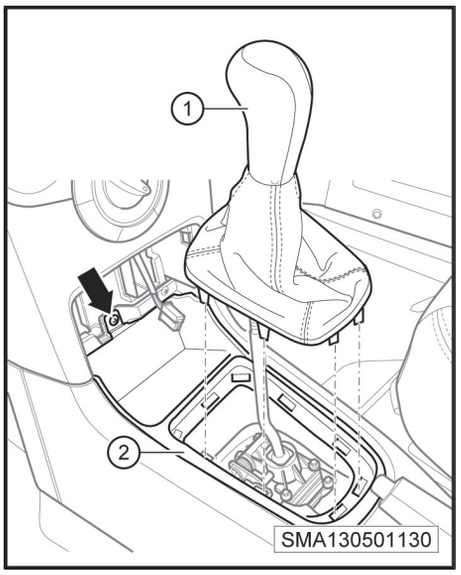
4. Remove the front console trim (-1-).
5. Unscrew the front fixing bolts of the console (-arrow-).



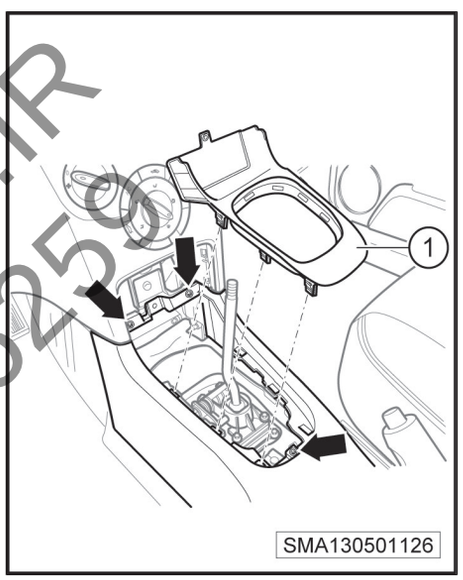
6. Pry out the shift handle panel (-1-).
7. Unscrew the shift handle (-2-) in the (-arrow-) direction.



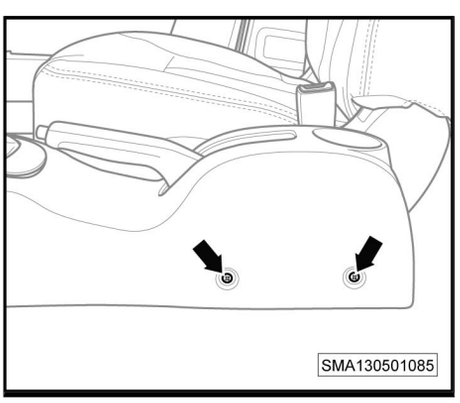
8. Remove the shift handle (-1-).
9. Unscrew the fixing bolts (-arrow-) of the shift handle panel (-2-).



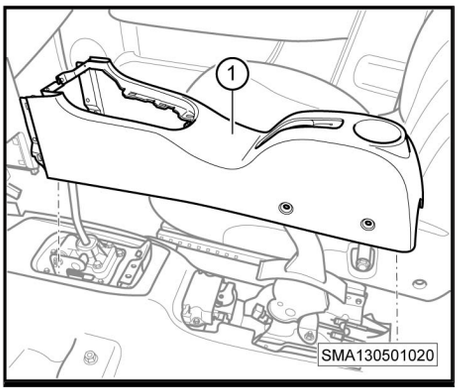
10. Remove the shift handle panel (-1-).
11. Unscrew the upper fixing bolts of the console (-arrow-).



12. Unscrew the fixing bolts of the console on both sides (-arrow-).



13. Remove the console (-1-).



Installation

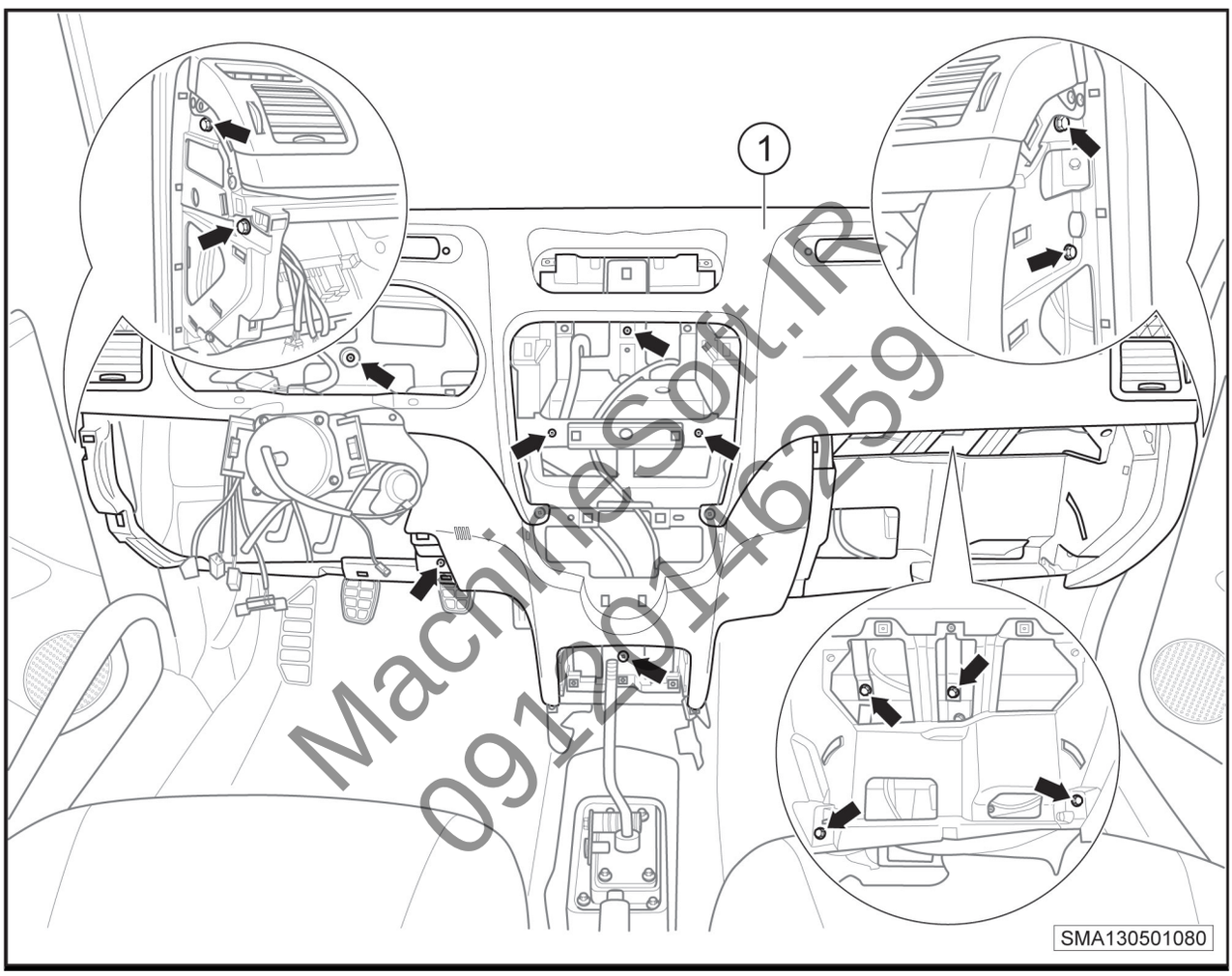
Installation shall follow the reverse sequence of the removal procedure.

3.6 Instrument console

3.6.1 Removing and installing the dashboard

Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- When removing, installing and repairing the dashboard assembly, two or more technicians are needed to assist the operation.



Removal

1. Remove the steering wheel .=> refer to page 650
2. Remove the A pillar trim => refer to page 771.
3. Remove the front passenger's side glove compartment (-1-) => refer to page 822.
4. Remove the console => refer to page 825.
5. Remove A/C control .=> refer to page 1227
6. Remove the audio system => refer to page 1205.
7. Remove the central storage compartment => refer to page 831.
8. Left lower guard plate of the dashboard => refer to page 832.

9. Unscrew the fixing bolts of the dashboard (-arrow-).
10. Remove the dashboard (-1-).

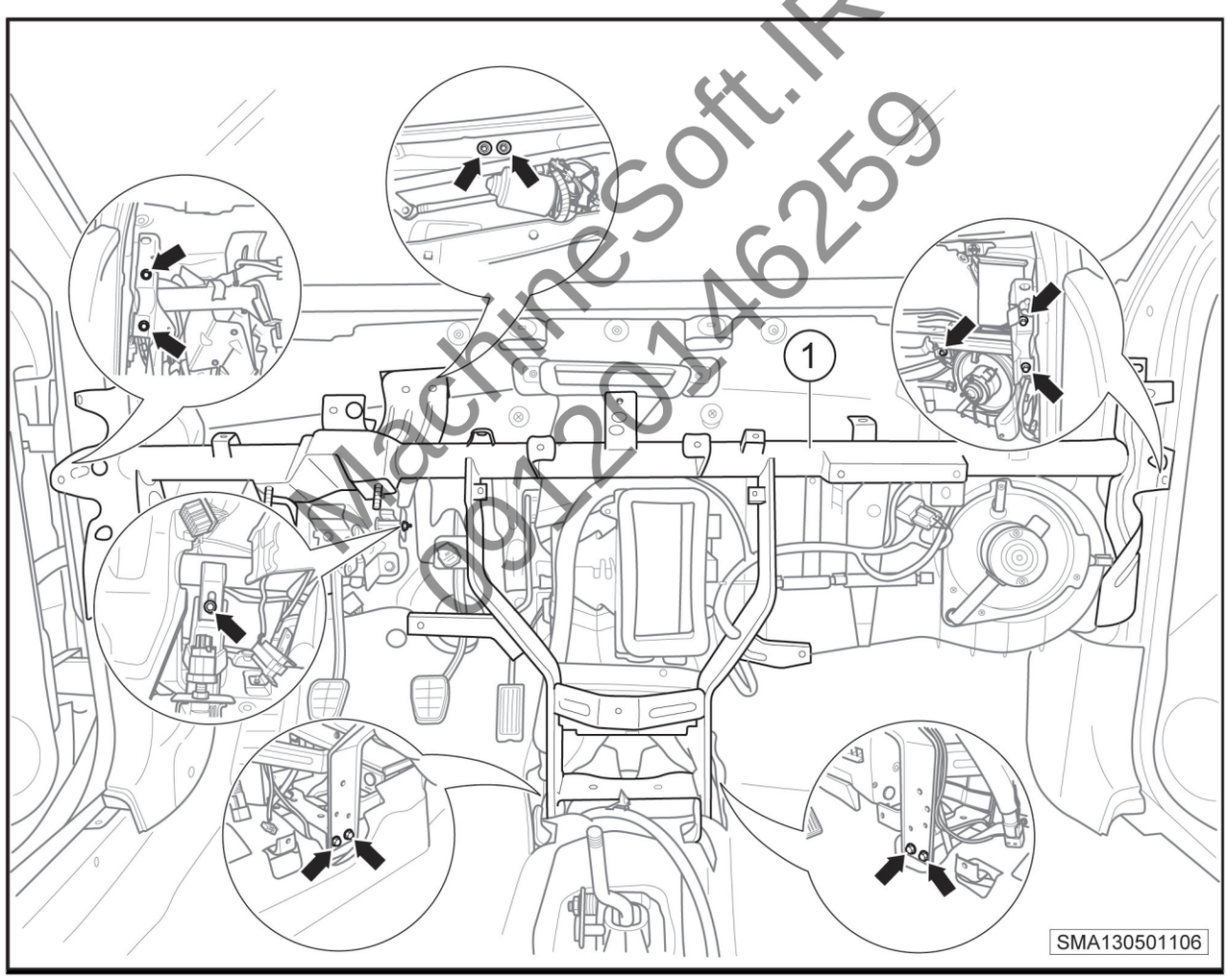
Installation

Installation shall follow the reverse sequence of the removal procedure.

3.6.2 Removing and installing the cross car beam

Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- When removing, installing and repairing the cross car beam, two or more technicians are needed to assist the operation.



Removal

1. Remove the dashboard => refer to page 828.
2. Remove the fuse relay box .
3. Disconnect the dashboard wiring harness .

4. Unscrew the fixing bolts of the cross car beam (-arrow-).
5. Remove the cross car beam (-1-).

Installation

Installation shall follow the reverse sequence of the removal procedure.

3.7 Central storage compartment

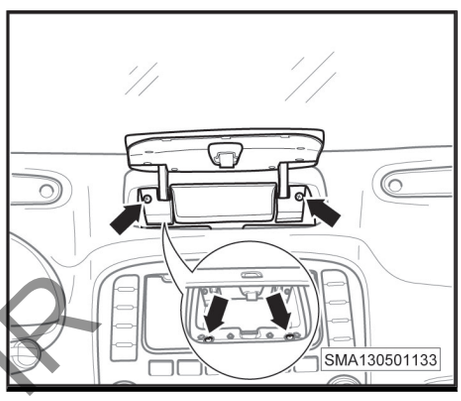
3.7.1 Removing and installing the central storage compartment

Caution

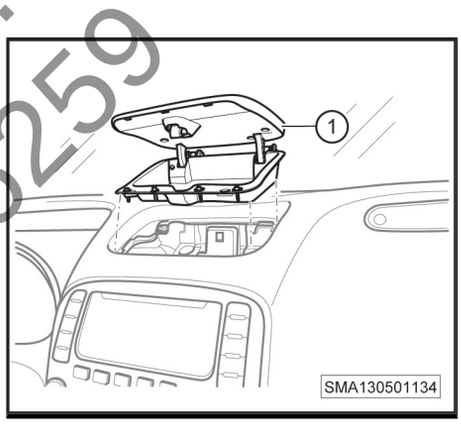
- Please wear protective gloves during repair.
- The interior trims must never be scratched.

Removal

1. Unscrew the fixing screws of the central storage compartment (-arrow-).



2. Remove the central storage compartment (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

3.8 Left lower guard plate of the dashboard

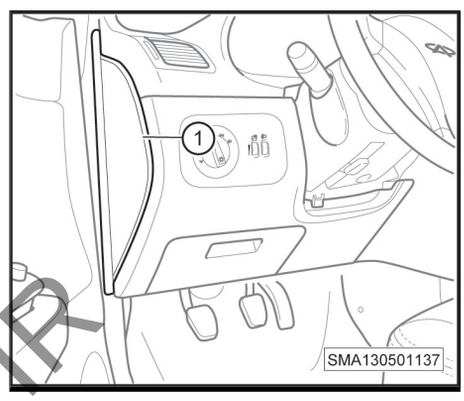
3.8.1 Removing and installing the left lower guard plate of the dashboard

Caution

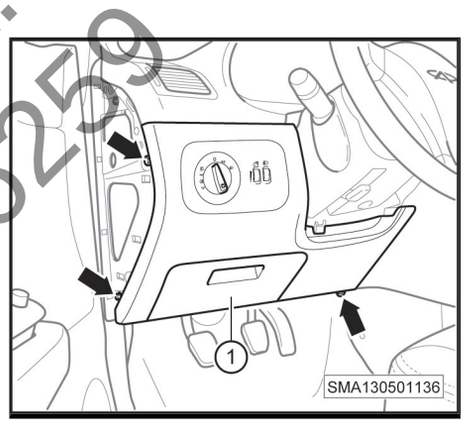
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

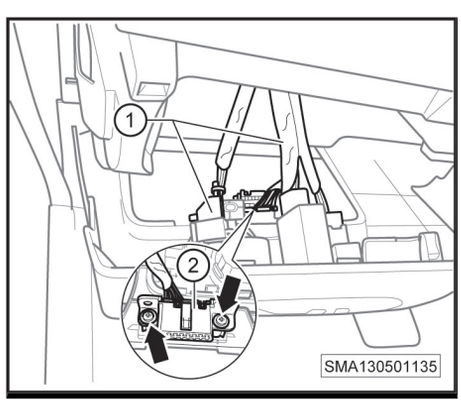
1. Remove the left plate of the dashboard (-1-).



2. Unscrew the fixing screws of the left lower guard plate of the dashboard (-arrow-).
3. Remove the left lower guard plate of the dashboard (-1-).



4. Disconnect the headlamp combination switch connector (-1-).
5. Unscrew the fixing screws of the diagnostic connector (-arrow-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

4 Seat

4.1 Front seat

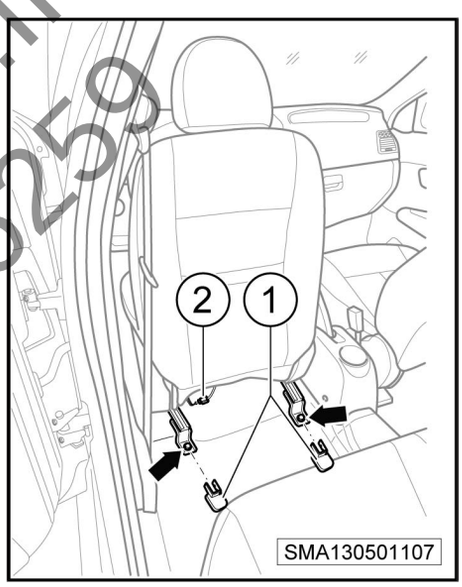
4.1.1 Removing and installing the front seat

Caution

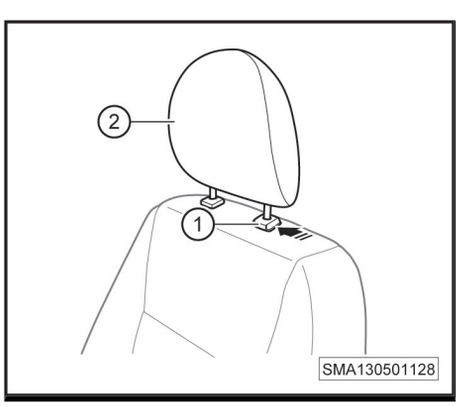
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- The removal and installation procedures of the driver's side seat are the same as that of the front passenger's side seat.

Removal

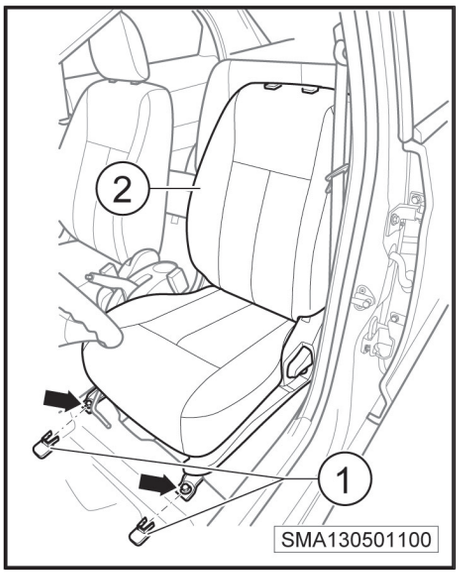
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the bolt caps (-1-).
3. Unscrew the fixing bolts of the driver's side seat (-arrow-).
4. Disconnect the seat occupation recognition sensor connector (-2-).



5. Press the button (-1-) in the (-arrow-) direction.
6. Remove the front seat headrest (-2-).



7. Remove the bolt caps (-1-).
8. Unscrew the fixing bolts of the driver's side seat (-arrow-).
   - Tightening torque of bolt: 50±5 N•m
9. Remove the driver's side seat (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified tightening torque.
- Check if the front seat is properly installed.
- Check if the front seat can be adjusted back and forth freely.

4.2 Rear seat

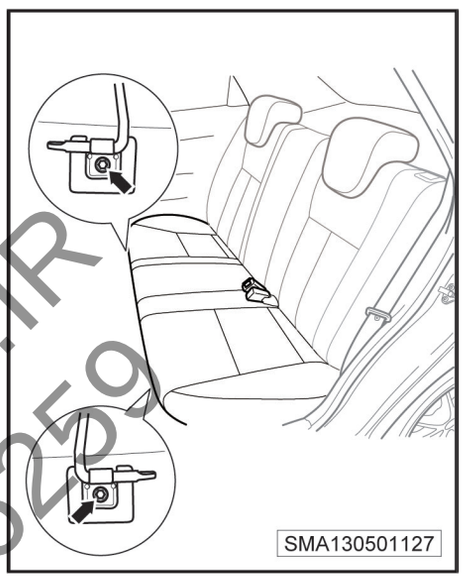
4.2.1 Removing and installing the rear seat

Caution

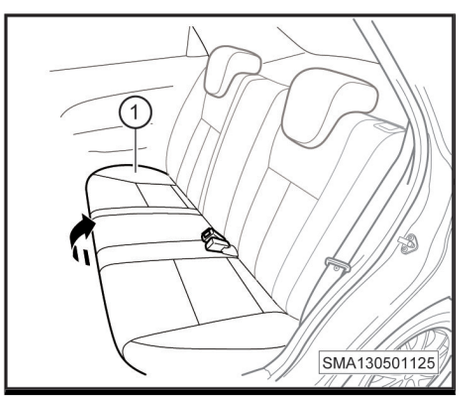
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

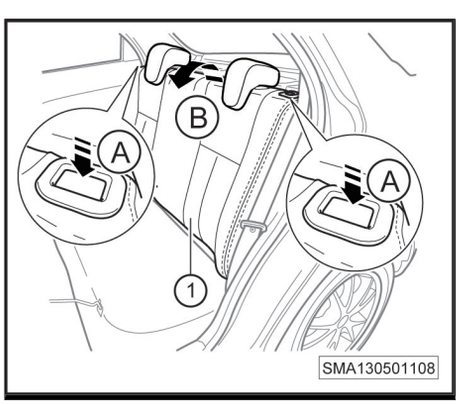
1. Remove the luggage compartment floor.
2. Unscrew the fixing bolts of the rear seat cushion (-arrow-).



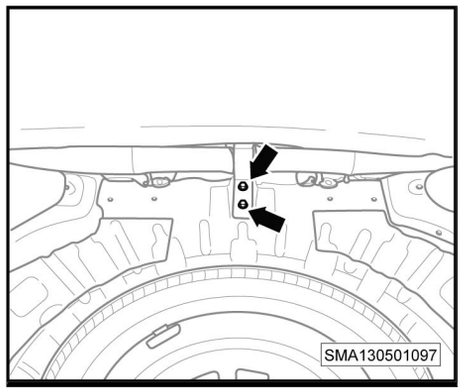
3. Remove the rear seat cushion (-1-) in the (-arrow-) direction.



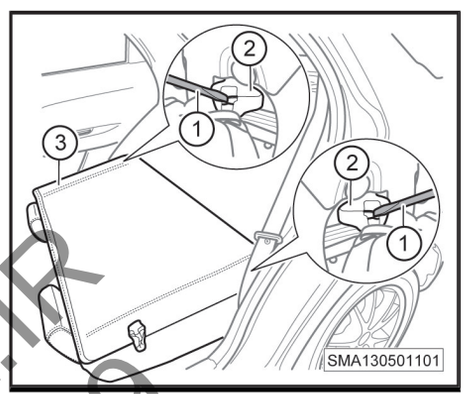
4. Press the rear seat backrest buttons in the (-arrow A-) direction.
5. Fold down the rear seat backrest (-1-) in the (-arrow B-) direction.



6. Unscrew the fixing bolts (-arrow-) from the rear seat backrest.



7. Loosen the clips (-2-) on both sides with the slotted screwdriver (-1-).
8. Remove the rear seat backrest (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

0502 Body Exterior

1 Front Body

1.1 Front bumper

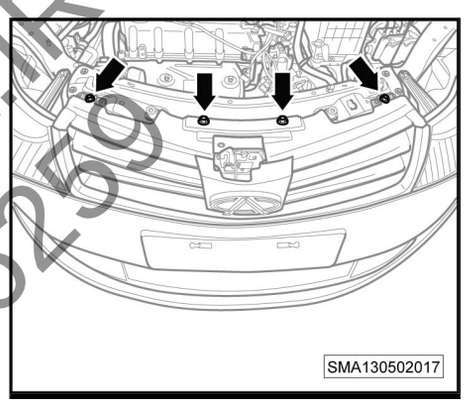
1.1.1 Removing and installing the front bumper

Caution

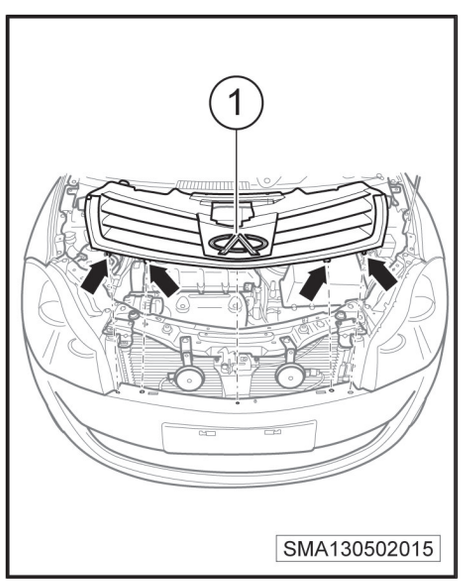
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

1. Unscrew the fixing screws of the front air intake grid (-arrow-).



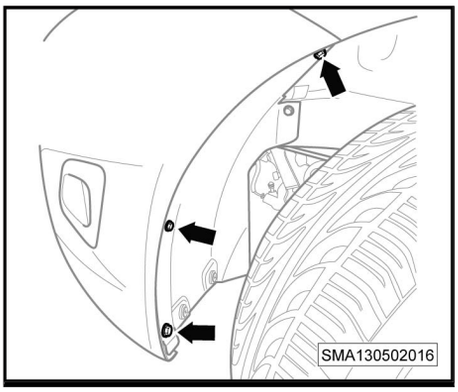
2. Disengage the lower fixing clips (-arrow-) and remove the front air intake grid (-1-).



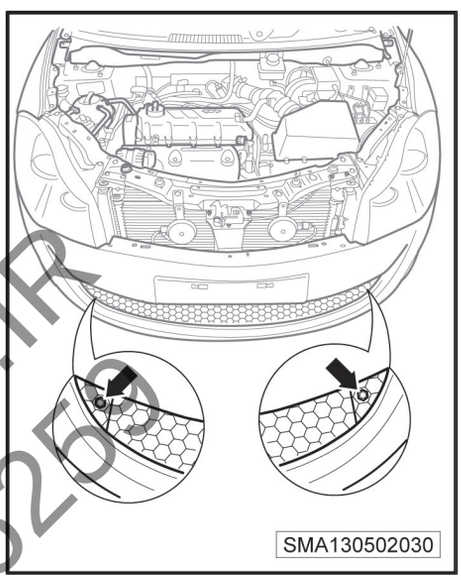
Note

- The removal and installation procedures of the left-side fixing bolts of the front bumper are the same as that of the right-side ones.

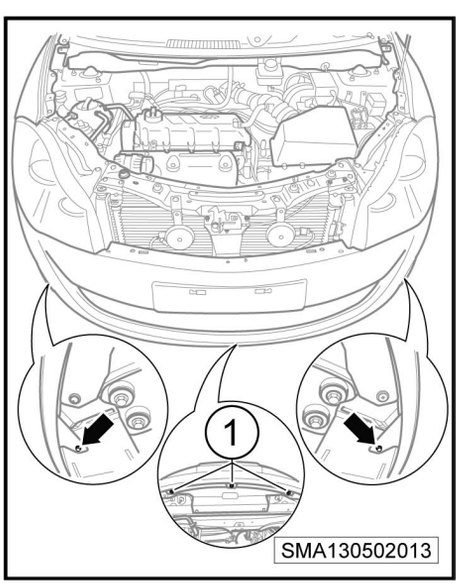
3. Unscrew the left-side and right-side fixing bolts of the front bumper (-arrow-).



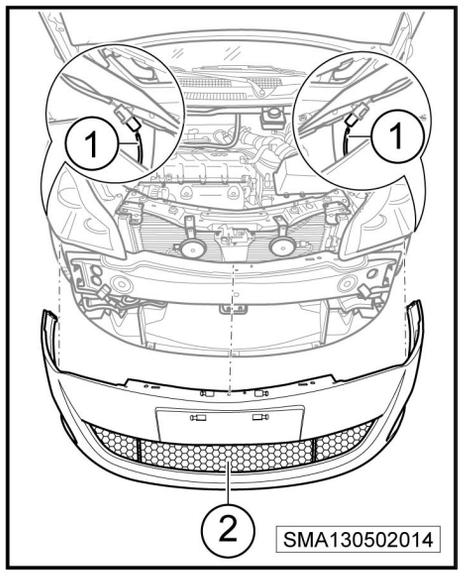
4. Unscrew the middle fixing bolts of the front bumper (-arrow-).



5. Remove the lower fixing clips (-1-) from the front bumper.
6. Unscrew the lower fixing screws of the front bumper (-arrow-).



7. Disconnect the connectors of the left and right fog lamps (-1-).
8. Remove the front bumper (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the front bumper is installed properly and fit well with the body clearance.

1.2 Engine hood

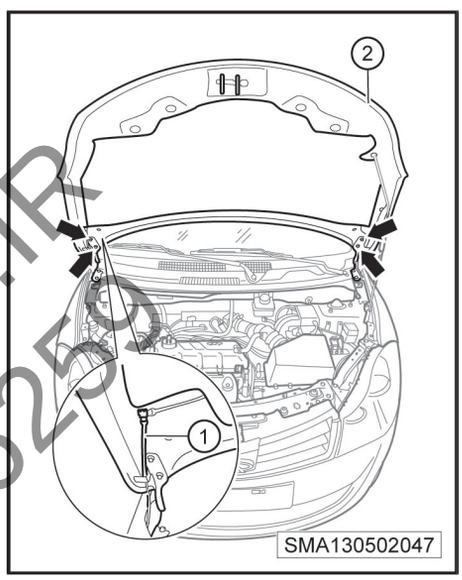
1.2.1 Removing and installing the engine hood

Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Two or more technicians are needed to assist the operation when removing and installing the engine hood.

Removal

1. Disconnect the spray pipe of the wiper (-1-).
2. Unscrew the engine hood fixing bolts (-arrow-).
3. Remove the engine hood (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the engine hood is installed properly and fit well with the body clearance.
- Make sure that the engine hood can be opened and closed normally.

1.3 Front fender

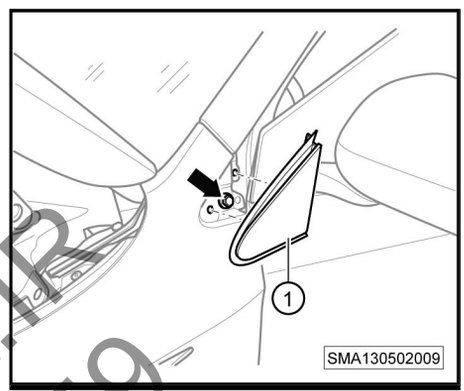
1.3.1 Removing and installing the front fender

Caution

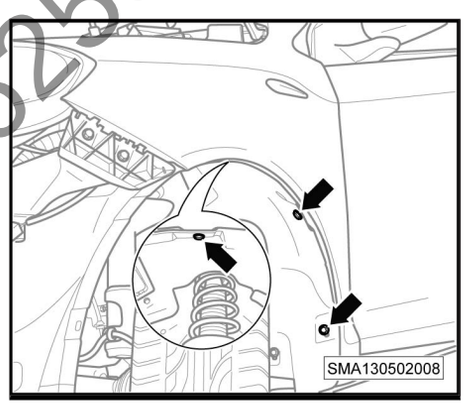
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- The removal and installation procedures of the front left fender are the same as that of the front right one.

Removal

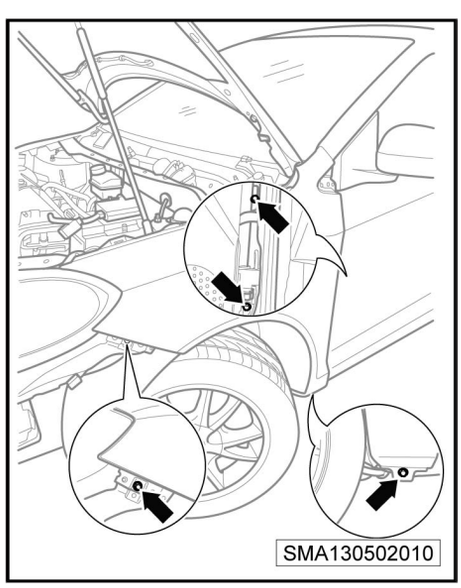
1. Remove the side turn signal .
2. Remove the front bumper => refer to page 838.
3. Remove the wiper cover => refer to page 846.
4. Remove the exterior triangle trim of A pillar (-1-).
5. Unscrew the fixing bolt connecting the front fender and the A pillar (-arrow-).



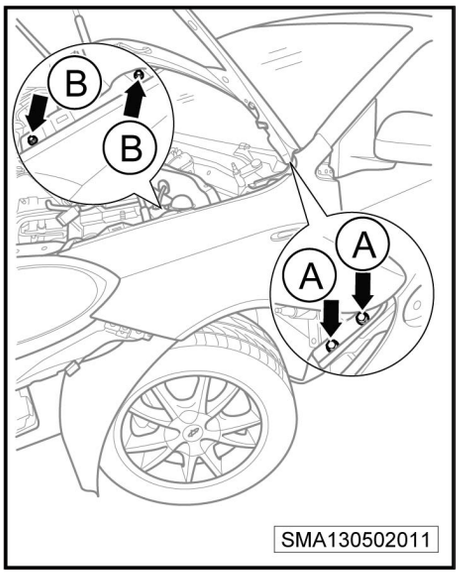
6. Unscrew the fixing bolts connecting the front fender and the front wheel trim panel (-arrow-).



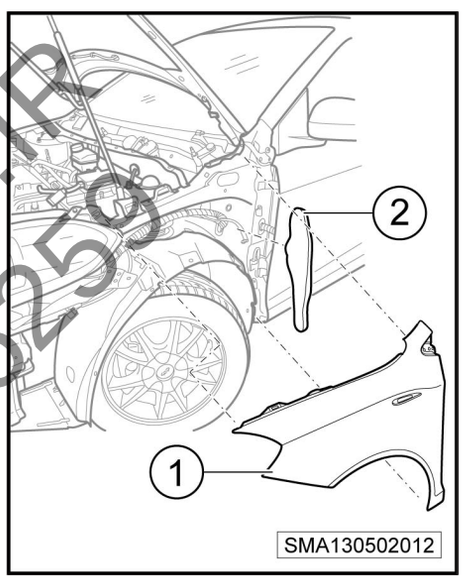
7. Unscrew the fixing bolts connecting the front fender and the body (-arrow-).



8. Unscrew the fixing bolts connecting the front fender and the body (-arrow A-).
9. Unscrew the fixing bolts connecting the front fender and the body (-arrow B-).



10. Remove the front fender (-1-).
11. Remove the foam block (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the front fender is installed properly and fit well with the body clearance.

1.4 Engine hood lock

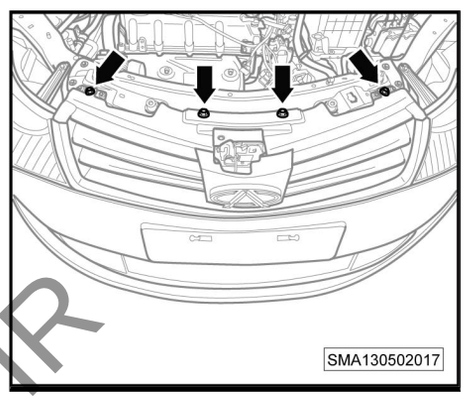
1.4.1 Removing and installing the engine hood lock

Caution

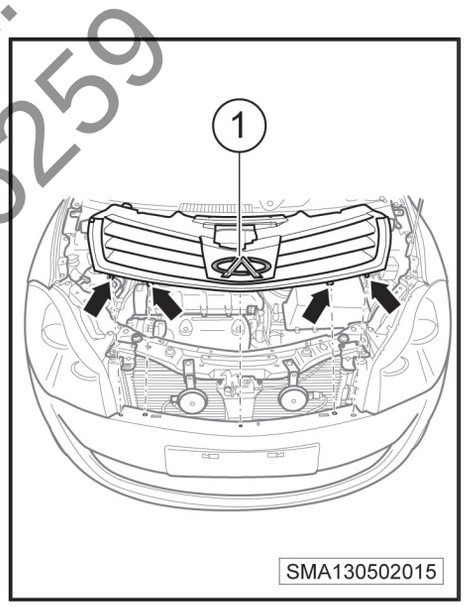
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

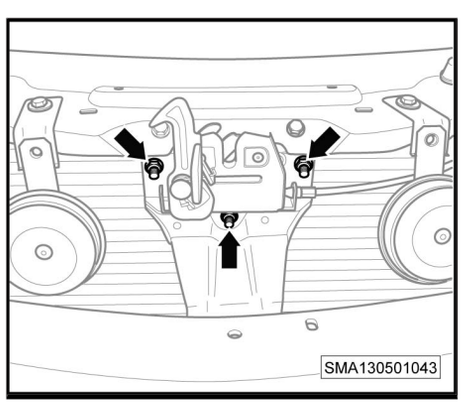
1. Unscrew the fixing bolts of the front air intake grid (-arrow-).



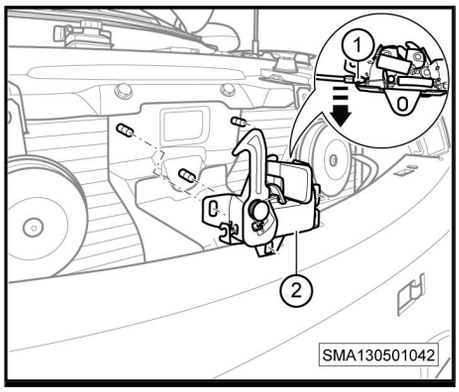
2. Disengage the lower fixing clips (-arrow-) and remove the front air intake grid (-1-).



3. Unscrew the engine hood lock fixing screws (-arrow-).



4. Disconnect the engine hood lock cable (-1-) in the (-arrow-) direction.
5. Remove the engine hood lock (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the engine hood lock is installed properly.
- Make sure that the engine hood lock can be locked and released normally.

1.5 Wiper cover

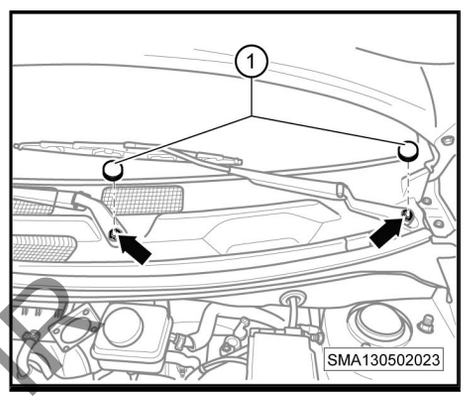
1.5.1 Removing and installing the wiper cover

Caution

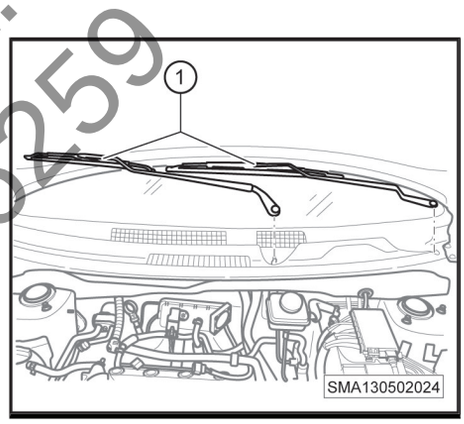
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

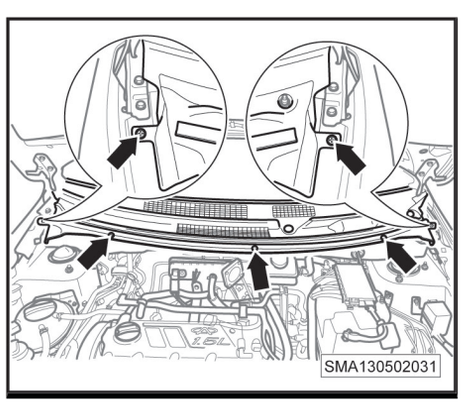
1. Remove the bolt caps (-1-).
2. Unscrew the wiper fixing bolts (-arrow-).



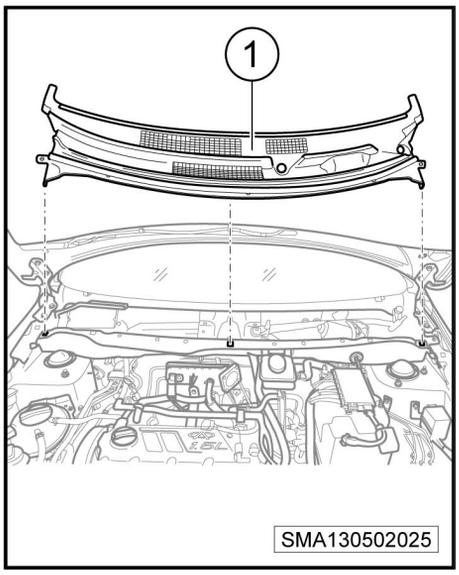
3. Remove the wiper (-1-).



4. Remove the upper seal of the wiper cover and unscrew the wiper cover fixing bolts (-arrow-).



5. Remove the wiper cover (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

2 Rear Body

2.1 Rear bumper

2.1.1 Removing and installing the rear bumper (Modle A13)

Caution

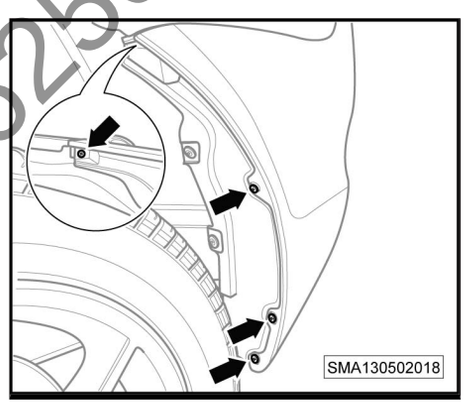
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Note

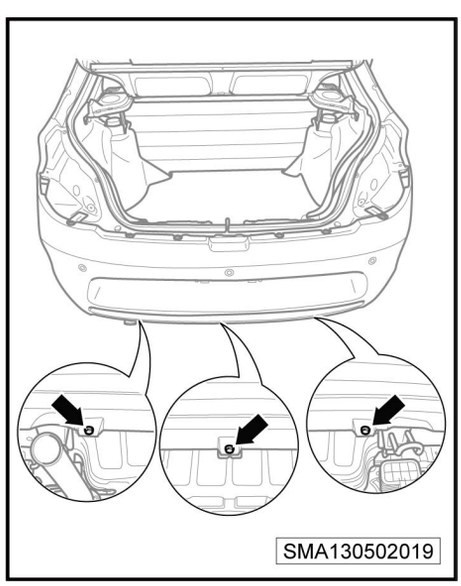
- The removal and installation procedures of the left-side fixing bolts of the rear bumper are the same as that of the right-side ones.

Removal

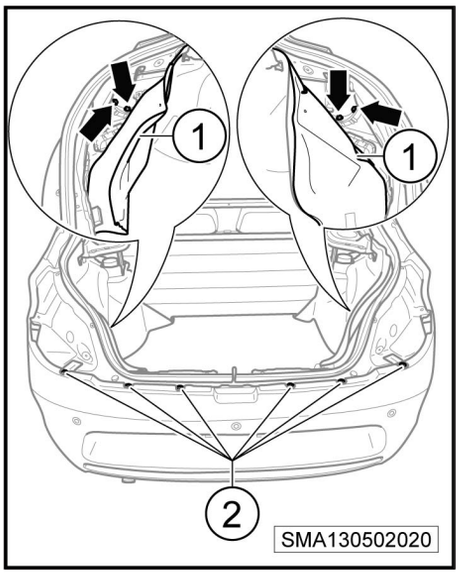
1. Remove the tail lights => refer to page 1141.
2. Unscrew the left-side and right-side fixing screws of the rear bumper (-arrow-).



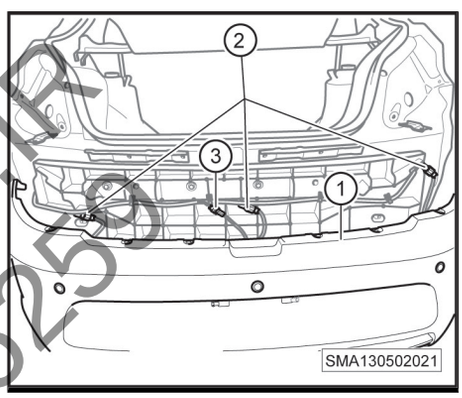
3. Unscrew the lower fixing screws of the rear bumper (-arrow-).



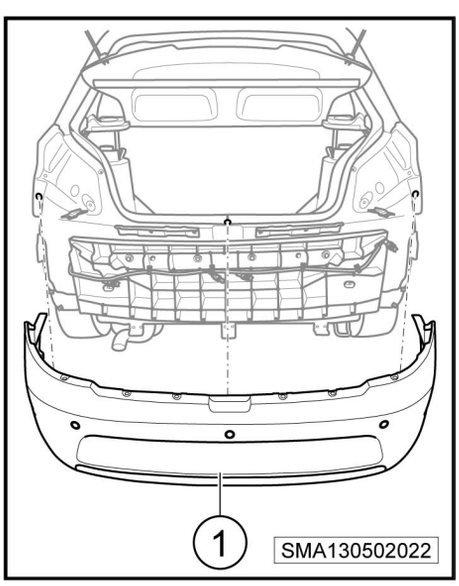
4. Uncover the left and right sound-proof pads in the luggage compartment (-1-).
5. Unscrew the left and right interior fixing bolts of the rear bumper (-arrow-).
6. Remove the fixing clips (-2-) from the rear bumper.



7. Remove the rear bumper (-1-).
8. Disconnect the rear reversing radar connectors (-2-) and the rear number plate lamp connector (-3-).



9. Remove the rear bumper (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the rear bumper is installed properly and fit well with the body clearance.

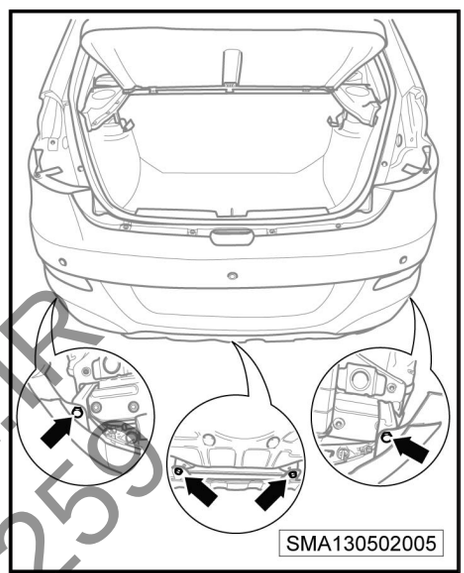
2.1.2 Removing and installing the rear bumper (Model A13A)

Caution

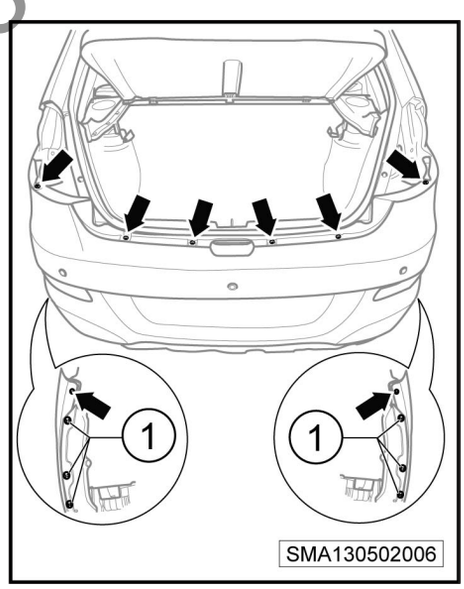
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

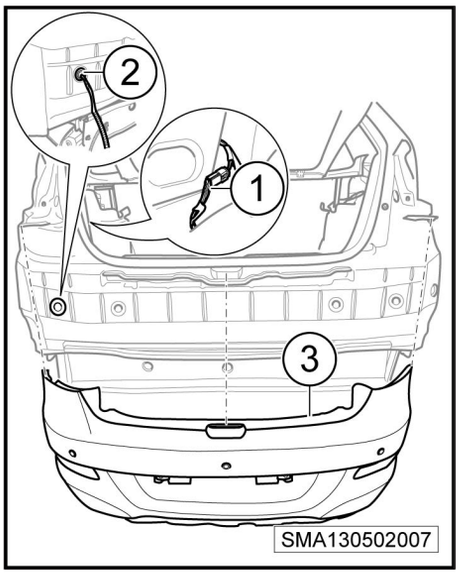
1. Remove the tail lights => refer to page 1141.
2. Unscrew the lower fixing screws of the rear bumper (-arrow-).



3. Unscrew the left and right interior fixing bolts of the rear bumper (-1-).
4. Remove the fixing clips (-arrow-) from the rear bumper.



5. Disconnect the rear bumper wiring harness connector (-1-) and remove the wiring harness (-2-).
6. Remove the rear bumper (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the rear bumper is installed properly and fit well with the body clearance.

2.2 Trunk lid

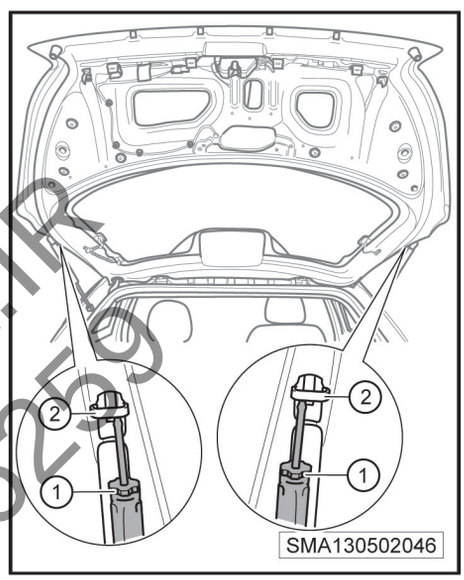
2.2.1 Removing and installing the trunk lid (Model A13)

Caution

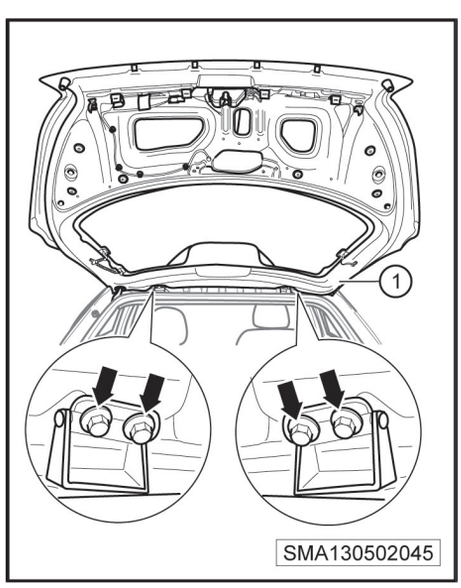
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Two or more technicians are needed to assist the operation when removing and installing the trunk lid.

Removal

1. Remove the high-level brake lamp => refer to page 1145.
2. Remove the trunk lid wiring harness .
4. Pry out the hydraulic tappet clips (-2-) with a slotted screwdriver (-1-) and remove the tappets.



5. Unscrew the left and right fixing screws of the trunk lid (-arrow-).
6. Remove the trunk lid (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the trunk lid is installed properly and fit well with the body clearance.
- Make sure that the trunk lid can be opened and closed normally.

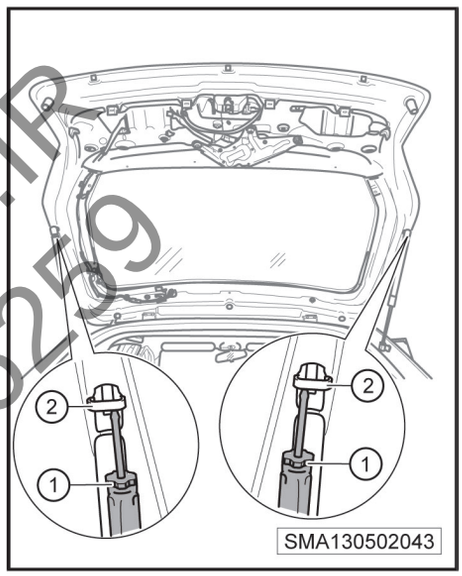
2.2.2 Removing and installing the trunk lid (Model A13A)

Caution

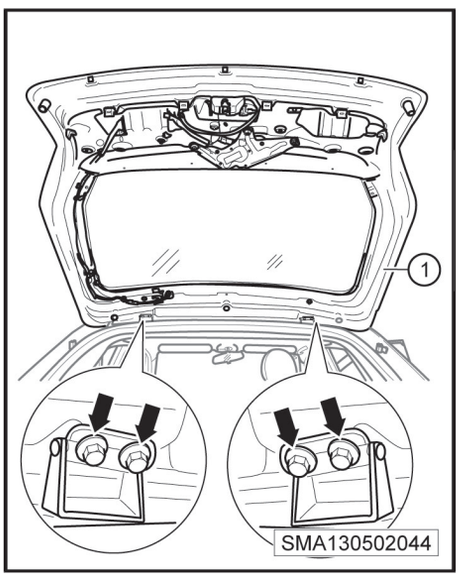
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Two or more technicians are needed to assist the operation when removing and installing the trunk lid.

Removal

1. Remove the high-level brake lamp => refer to page 1145.
2. Remove the trunk lid wiring harness .
5. Pry out the hydraulic tappet clips (-2-) with a slotted screwdriver (-1-) and remove the tappets.



6. Unscrew the left and right fixing screws of the trunk lid (-arrow-).
7. Remove the trunk lid (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the trunk lid is installed properly and fit well with the body clearance.
- Make sure that the trunk lid can be opened and closed normally.

2.3 Trunk lid lock

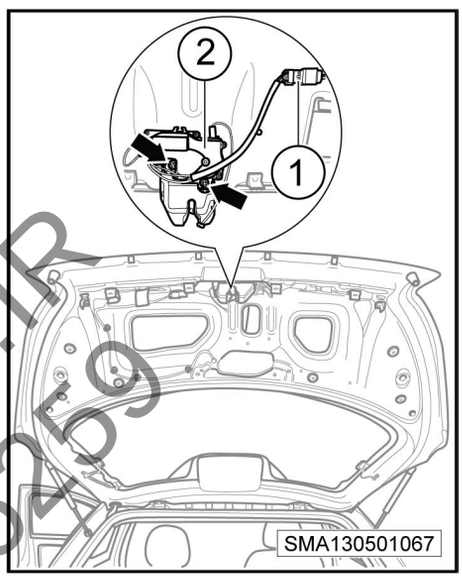
2.3.1 Removing and installing the trunk lid lock (Model A13)

Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

1. Remove the trunk lid trim (Model A13).
2. Disconnect the trunk lid lock connector (-1-).
3. Unscrew the fixing bolts of the trunk lid lock (-arrow-) and remove the trunk lid lock (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the trunk lid lock is installed properly.
- Make sure that the trunk lid lock can be locked and released normally.

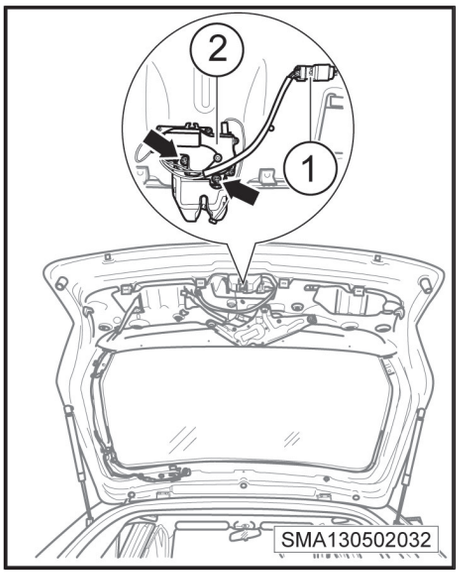
2.3.2 Removing and installing the trunk lid lock (Model A13A)

Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

1. Remove the trunk lid trim (Model A13A).
2. Disconnect the trunk lid lock connector (-1-).
3. Unscrew the fixing bolts of the trunk lid lock (-arrow-) and remove the trunk lid lock (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the trunk lid lock is installed properly.
- Make sure that the trunk lid lock can be locked and released normally.

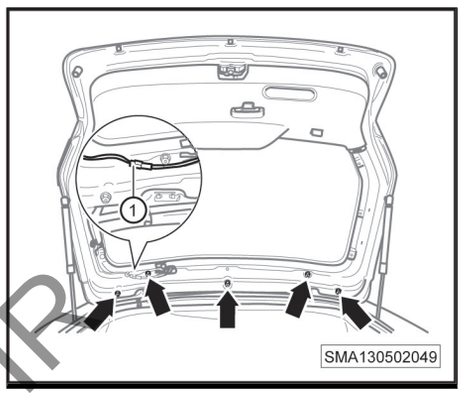
2.4 Rear fender assembly

2.4.1 Rear fender assembly (Model A13A)

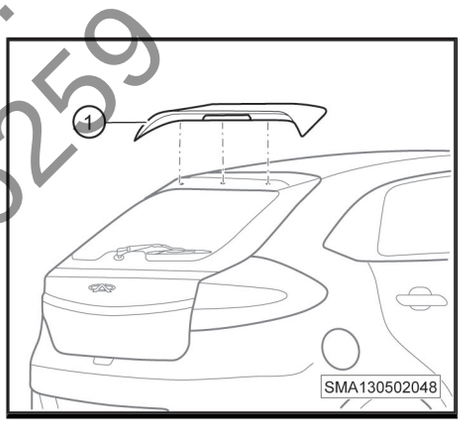
Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal



1. Remove the trunk lid trim (Model A13A).
2. Disconnect the high-level brake lamp connector (-1-).
3. Unscrew the fixing bolts of the rear fender assembly (-arrow-).



4. Remove the fixing bolts of the rear fender assembly (-1-).

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the rear fender assembly is installed properly.

3 Door Assemblies

3.1 Door assembly

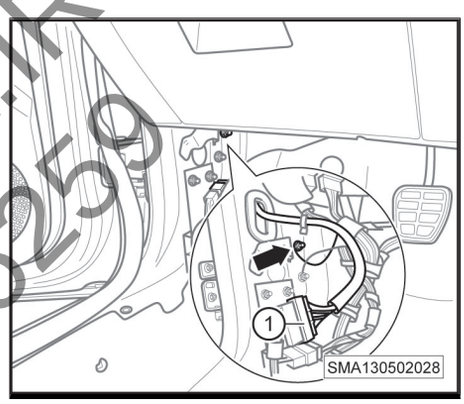
3.1.1 Removing and installing the front door assembly

Caution

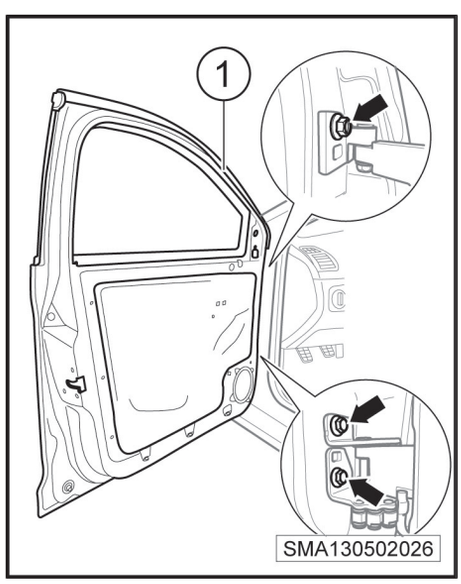
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

1. Remove the front door trim. => refer to page 764
2. Disconnect the front door wiring harness connector (-1-).
6. Unscrew the fixing nut of the front door wiring harness earth terminal (-arrow-).



1. Unscrew the fixing bolts of the front door (-arrow-).
3. Remove the front door assembly (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

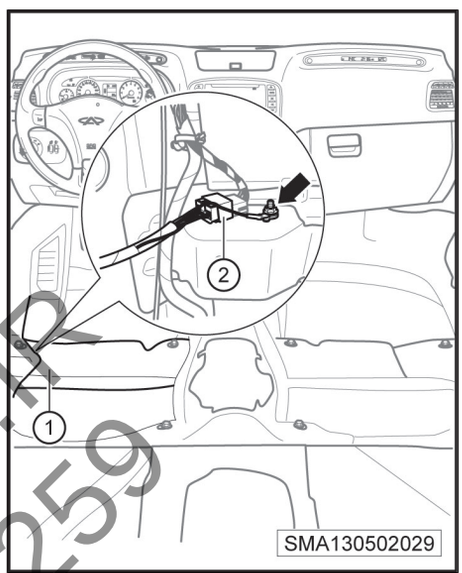
3.1.2 Removing and installing the rear door assembly

Caution

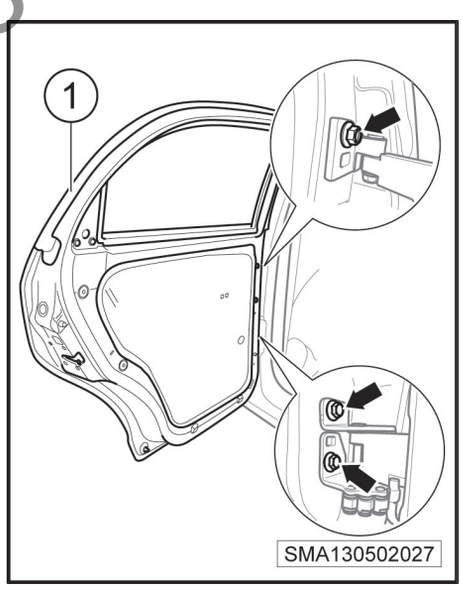
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.

Removal

1. Remove the front seats. => refer to page 833
2. Remove the B pillar trim. => refer to page 772
3. Uncover the front seat floor (-1-).
4. Disconnect the rear door wiring harness connector (-2-).
5. Unscrew the fixing nut of the rear door wiring harness earth terminal (-arrow-).



6. Unscrew the fixing bolts of the rear door (-arrow-).
7. Remove the rear door assembly (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

3.2 Door handle

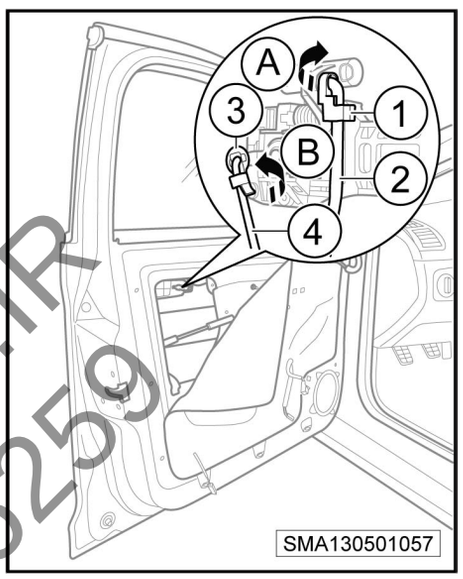
3.2.1 Removing and installing the front door handle

Note

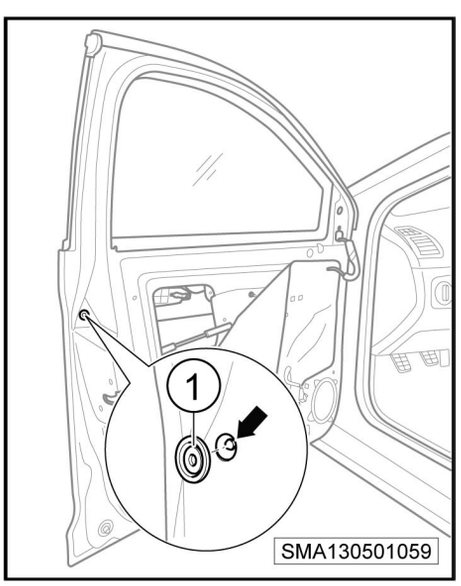
- The removal and installation procedures of the front left door handle are the same as that of the front right one.

Removal

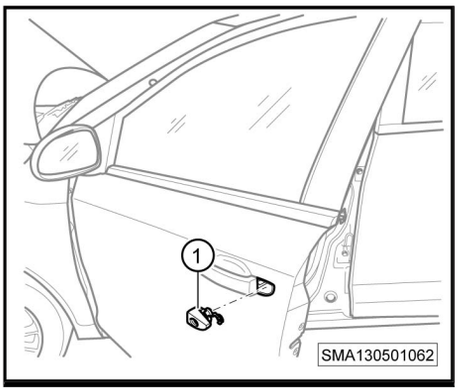
1. Remove the front door trim and remove the door waterproof film.
2. Release the clip (-1-) in the (-arrow A-) direction and disconnect the front door handle lever (-2-).
3. Release the clip (-3-) in the (-arrow B-) direction and disconnect the front door lock lever (-4-).



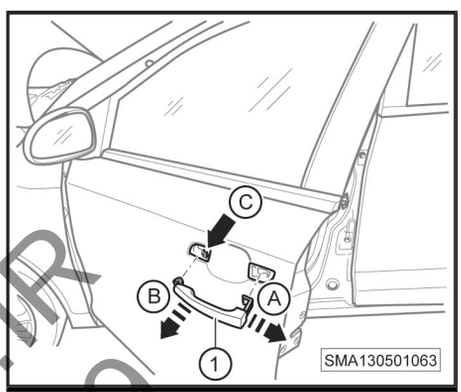
4. Remove the front door plug (-1-).
5. Unscrew the fixing nut of the door lock cylinder (-arrow-).



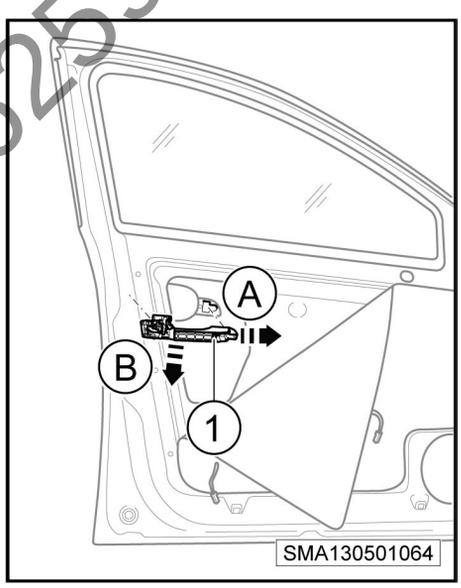
6. Remove the door lock cylinder (-1-).



7. Disengage the door handle (-1-) in the (-arrow A-) direction.
8. Remove the door handle in the (-arrow B-) direction.
9. Unscrew the door handle mounting bracket bolt (-arrow C-).



10. Disengage the door handle bracket (-1-) in the (-arrow A-) direction.
11. Remove the door handle bracket in the (-arrow B-) direction.



Installation

Installation shall follow the reverse sequence of the removal procedure.

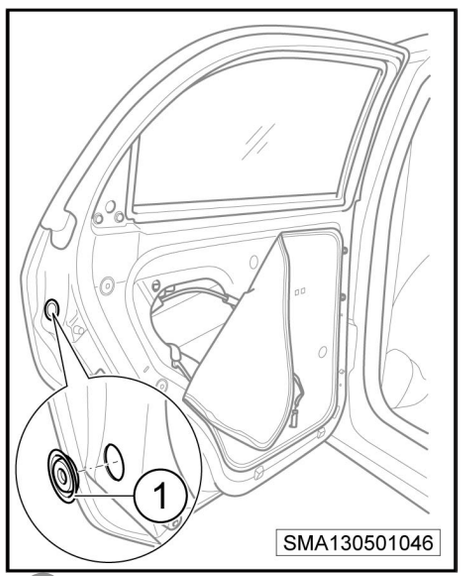
3.2.2 Removing and installing the rear door handle

Note

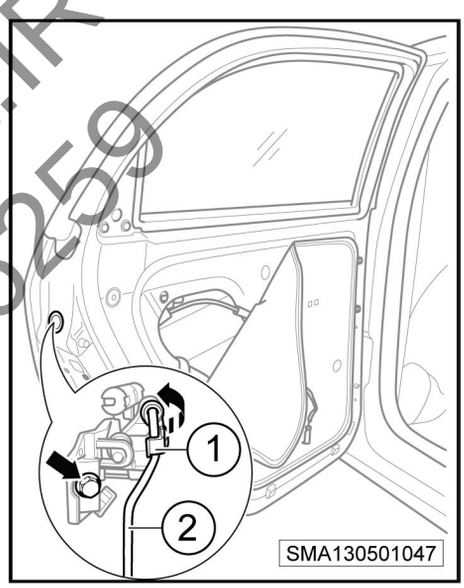
- The removal and installation procedures of the front left door handle are the same as that of the front right one.

Removal

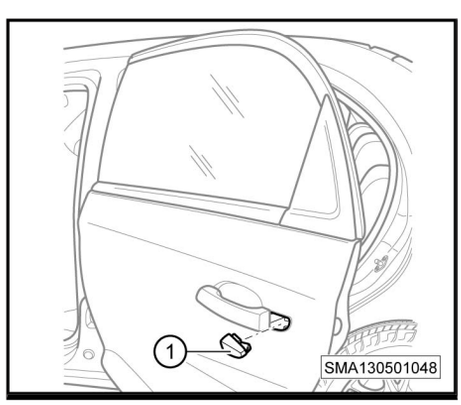
1. Remove the rear door trim and remove the door waterproof film.
2. Remove the rear door plug (-1-).



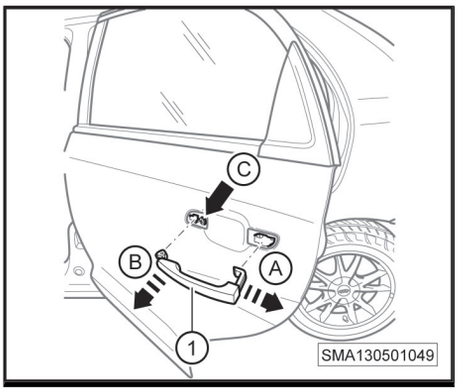
3. Disengage the door lock lever (-1-) in the (-arrow-) direction and disconnect the cable (-2-).
4. Unscrew the fixing nut of the door lock cylinder (-arrow-).



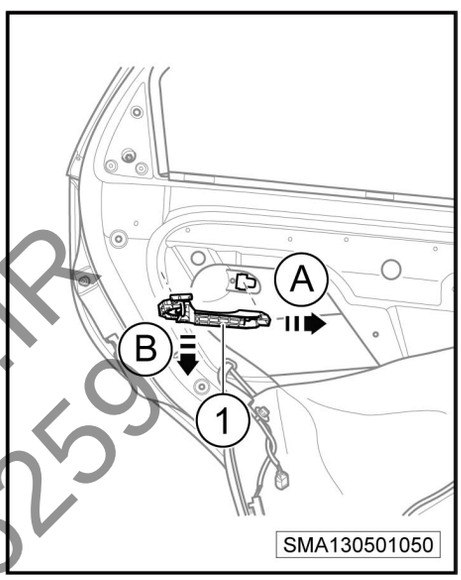
5. Remove the door lock cylinder (-1-).



6. Disengage the door handle (-1-) in the (-arrow A-) direction.
7. Remove the door handle in the (-arrow B-) direction.
8. Unscrew the door handle mounting bracket bolt (-arrow C-).



9. Disengage the door handle bracket (-1-) in the (-arrow A-) direction.
10. Remove the door handle bracket in the (-arrow B-) direction.



Installation

Installation shall follow the reverse sequence of the removal procedure.

3.3 Door lock assembly

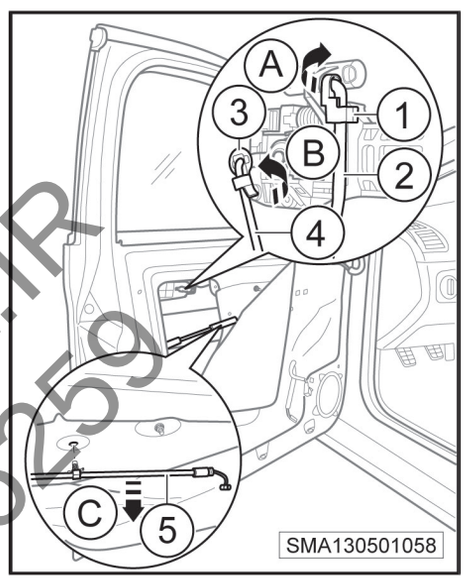
3.3.1 Removing and installing the front door lock assembly

Note

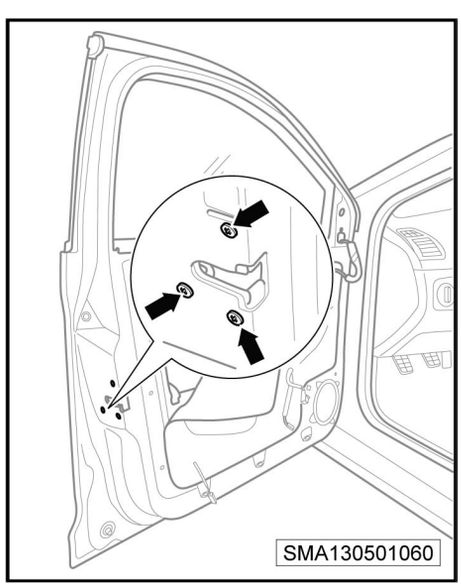
- The front side window shall be moved up to the utmost position.
- The removal and installation procedures of the front left door lock are the same as that of the front right one.

Removal

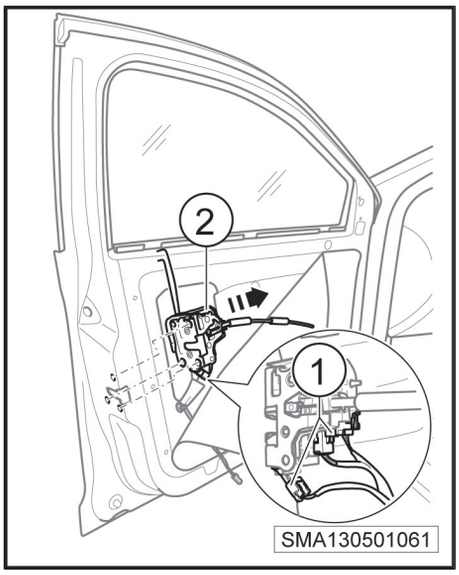
1. Remove the front door trim. => refer to page 764
2. Release the clip (-1-) in the (-arrow A-) direction and disconnect the front door handle lever (-2-).
3. Release the clip (-3-) in the (-arrow B-) direction and disconnect the front door lock lever (-4-).
4. Disconnect the front inner door handle cable (-5-) in the (-arrow C-) direction.



5. Unscrew the fixing screws of the front door lock assembly (-arrow-).



6. Disconnect the rear door lock assembly connector (-1-).
7. Remove the front door lock assembly (-2-) in the (-arrow-) direction.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the front door lock assembly is installed properly.
- Make sure that the front door can be opened and closed normally.

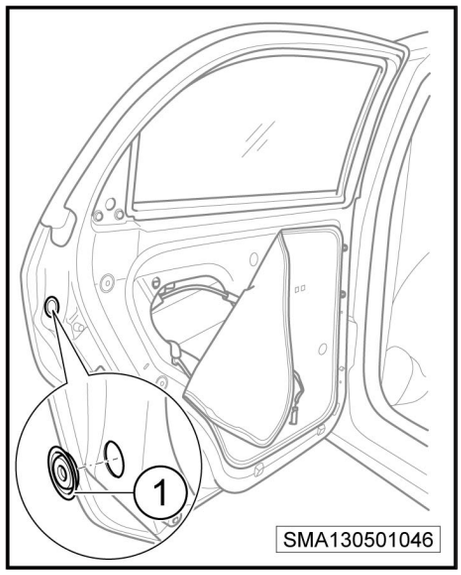
3.3.2 Removing and installing the rear door lock assembly

Note

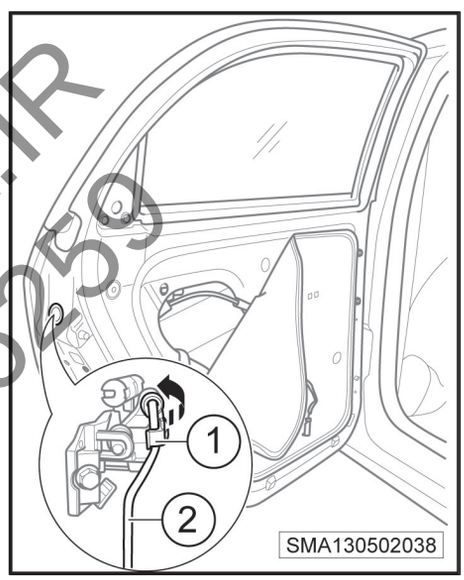
- The rear side window shall be moved up to the utmost position.
- The removal and installation procedures of the rear left door lock are the same as that of the rear right one.

Removal

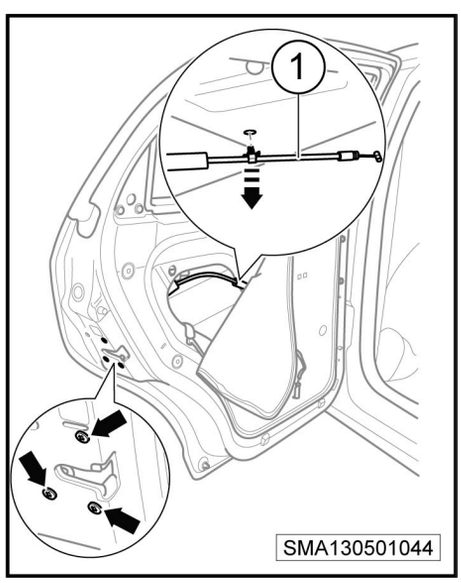
1. Remove the rear door trim.=> refer to page 768
2. Remove the rear door plug (-1-).



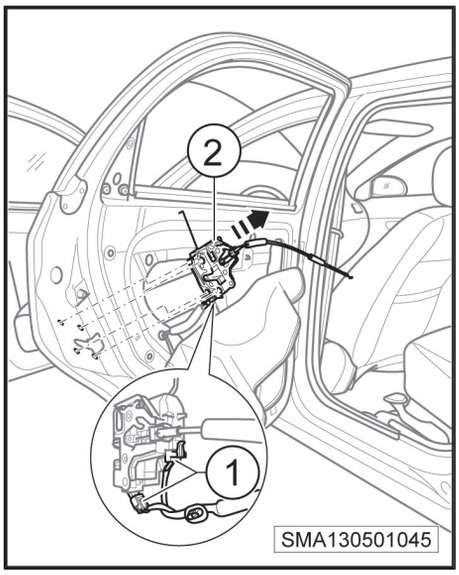
3. Disengage the door lock lever (-1-) in the (-arrow-) direction and disconnect the cable (-2-).



4. Unscrew the fixing screws of the rear door lock assembly (-arrow-).
5. Disengage the rear door lock cable (-1-) in the (-arrow-) direction.



6. Disconnect the rear door lock assembly connector (-1-).
7. Remove the rear door lock assembly (-2-) in the (-arrow-) direction.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the rear door lock assembly is installed properly.
- Make sure that the rear door can be opened and closed normally.

3.4 Exterior mirrors

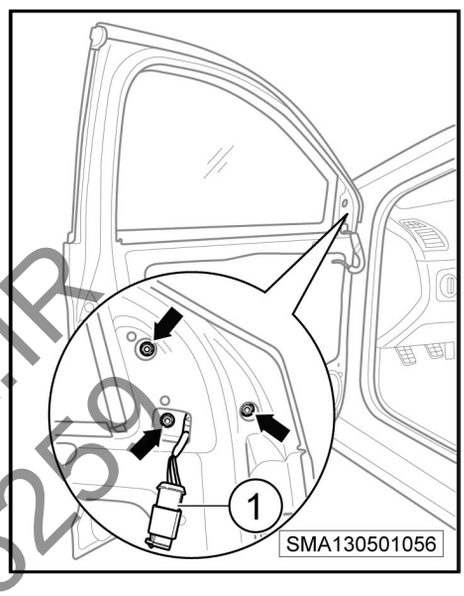
3.4.1 Removing and installing the exterior mirrors

Note

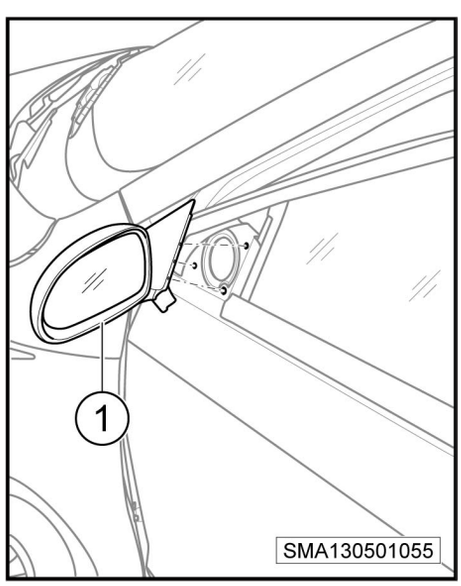
- The removal and installation procedures of the left exterior mirror are the same as that of the right one.

Removal

1. Remove the front door trim. => refer to page 788
2. Disconnect exterior mirror connector (-1-).
3. Unscrew the fixing nuts of the exterior mirror (-arrow-).



4. Remove the mirror (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

3.5 Door seal

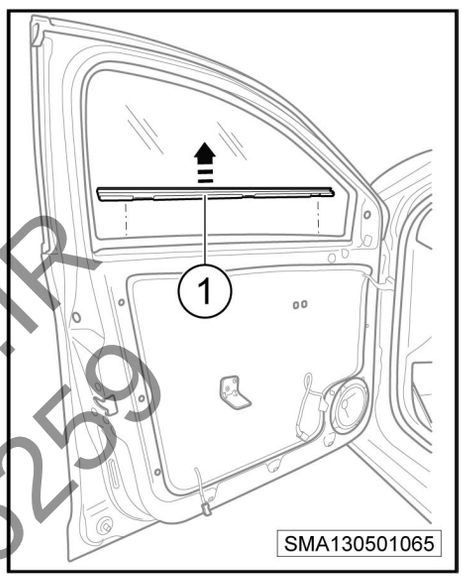
3.5.1 Removing and installing the front door seal

Note

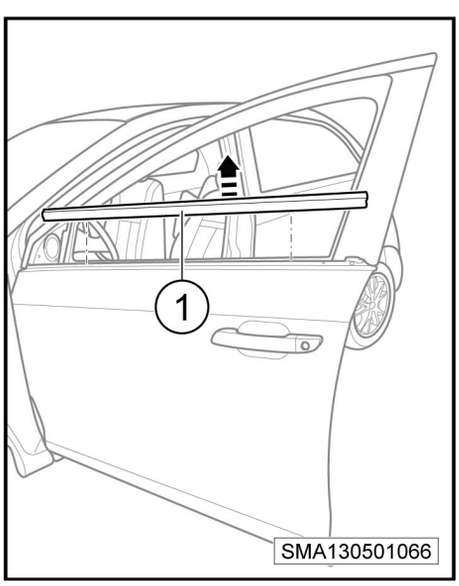
- The removal and installation procedures of the front left door seal are the same as that of the front right one.

Removal

1. Remove the front door trim. => refer to page 764
2. Remove the exterior mirror.
3. Remove the front inner door seal (-1-) in the (-arrow-) direction.



4. Remove the front outer door seal (-1-) in the (-arrow-) direction.



Installation

Installation shall follow the reverse sequence of the removal procedure.

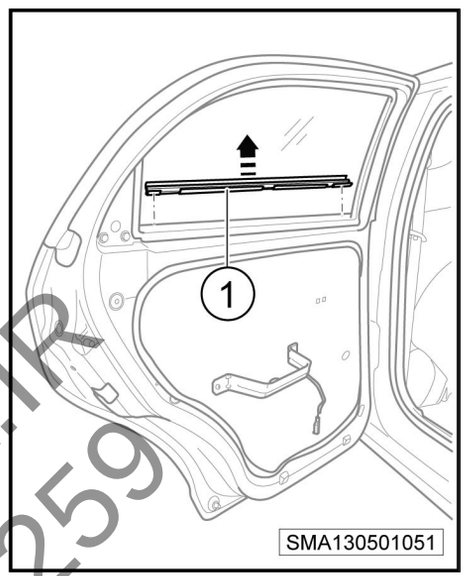
3.5.2 Removing and installing the rear door seal

Note

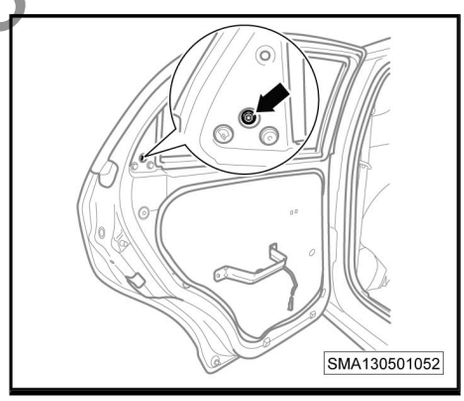
- The removal and installation procedures of the rear left door seal are the same as that of the rear right one.

Removal

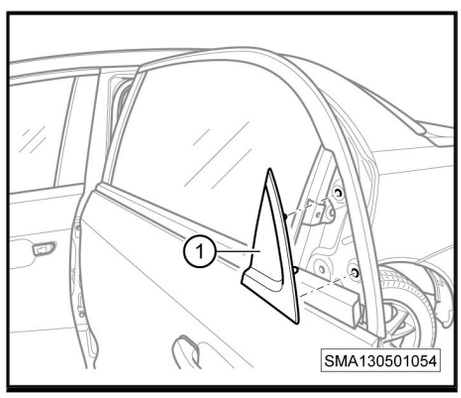
1. Remove the rear door trim.
2. Remove the rear inner door seal (-1-) in the (-arrow-) direction.



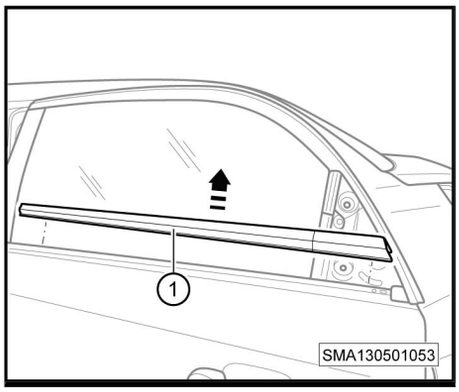
3. Unscrew the fixing screw of the rear door exterior triangle trim (-arrow-).



4. Remove the rear door exterior triangle trim (-1-).



5. Remove the rear outer door seal (-1-) in the (-arrow-) direction.



Installation

Installation shall follow the reverse sequence of the removal procedure.

4 Windows

4.1 Door window

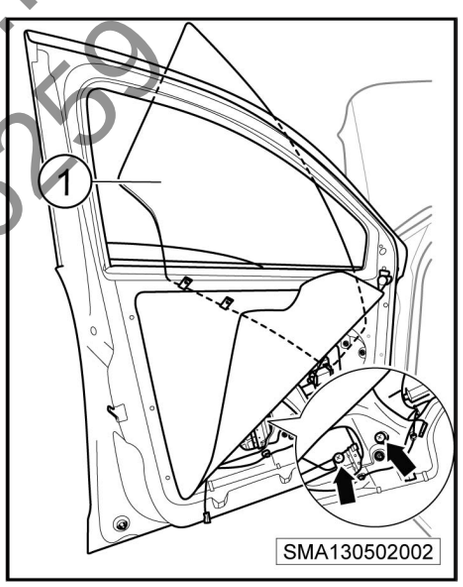
4.1.1 Removing and installing the front door window

Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Please take care and never damage the window when removing and installing the front door windows.
- The removal and installation procedures of the front left door window are the same as that of the front right one.

Removal

1. Remove the front door trim. => refer to page 764
2. Remove the front door seal.
3. Lower the front door window to a proper height and unscrew the fixing bolts of the front door window (-arrow-).
4. Remove the front door window (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the front door window is installed properly.
- Make sure that door seals between the front door window and the front door are in good condition.

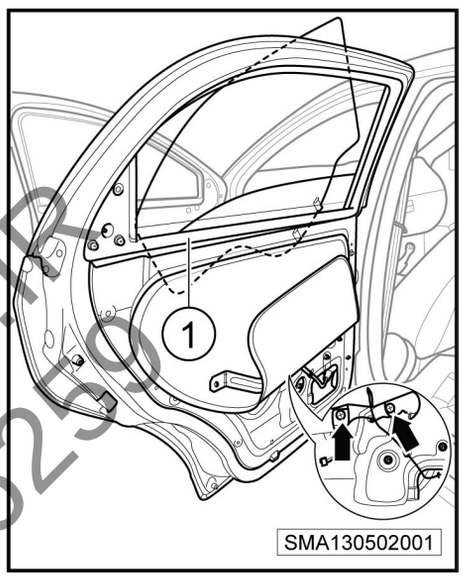
4.1.2 Removing and installing the rear door window

Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Please take care and never damage the window when removing and installing the rear door windows.
- The removal and installation procedures of the rear left door window are the same as that of the rear right one.

Removal

1. Remove the rear door trim.
2. Remove the rear door seal.
3. Lower the rear door window to a proper height and unscrew the fixing bolts of the rear door window (-arrow-).
4. Remove the rear door window (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the rear door window is installed properly.
- Make sure that door seals between the rear door window and the rear door are in good condition.

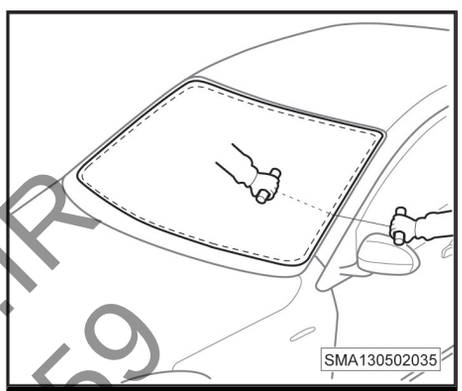
4.2 Windshield

4.2.1 Removing and installing the front windshield

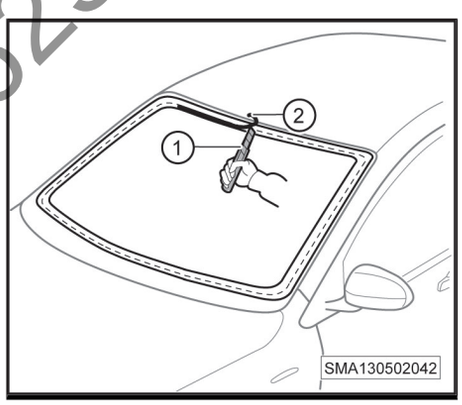
Caution

- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Please take care and never damage the window when removing and installing the front windshield.
- Two or more technicians are needed to assist the operation when removing and installing the front windshield.

Removal

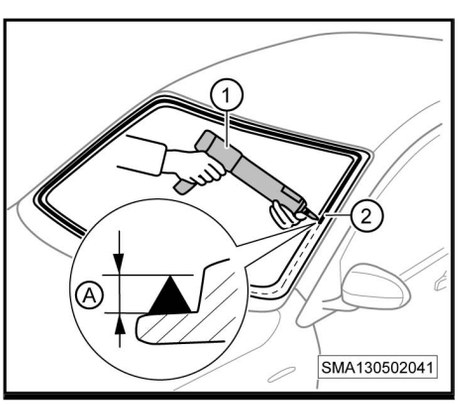


1. Remove the wiper cover.
2. Remove the left and right A pillar trim.
3. Remove the front windshield (-2-) with the tool (-1-).



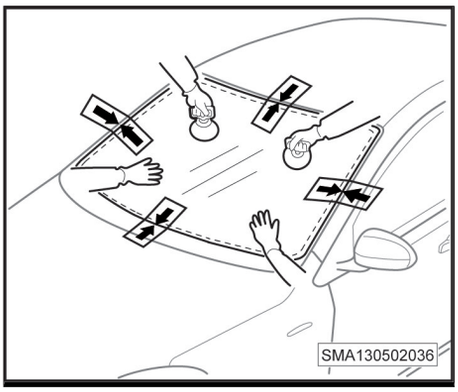
4. Remove the sealant residue (-2-) on the frame with a scraper (-1-).

Installation



1. Prime the vehicle body and the windshield before applying silicon sealant on the front windshield.
2. Apply sealant (-2-) to the frame with the tool (-1-).
   - Thickness of sealant A: 10 mm

3. Install the front windshield (-2-) with the tool (-1-).
4. Attach adhesive tapes (-arrow-) around the front windshield.



Caution

- Spray water on the windshield after the sealant completely dries out to check for leakage.
- You shall drive the vehicle at a low speed to avoid the windshield from falling due to vibration.

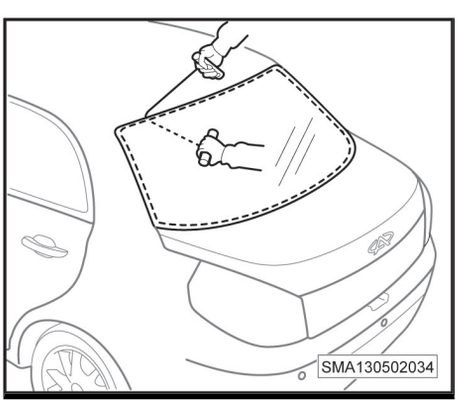
4.2.2 Removing and installing the rear windshield (Model A13)

Caution

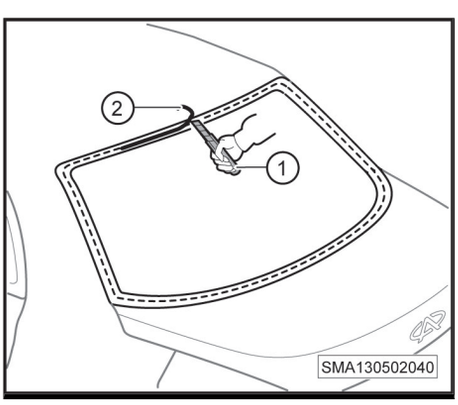
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Please take care and never damage the window when removing and installing the rear windshield.
- Two or more technicians are needed to assist the operation when removing and installing the rear windshield.

Removal

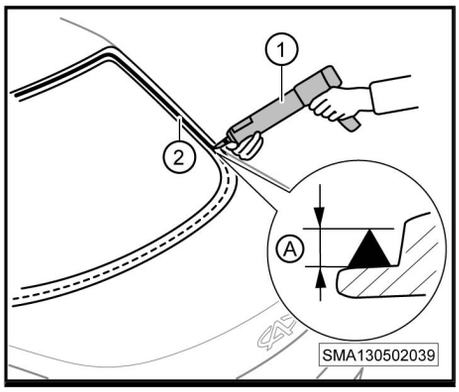
1. Remove the high-level brake lamp .
2. Remove the rear windshield (-2-) with the tool (-1-).



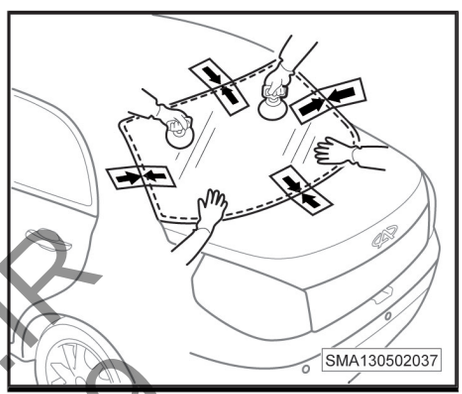
3. Remove the sealant residue (-2-) on the frame with a scraper (-1-).



Installation



1. Prime the vehicle body and the windshield before applying silicon sealant on the rear windshield.
2. Apply sealant (-2-) to the frame with the tool (-1-).
   - Thickness of sealant A: 10 mm



3. Install the rear windshield (-2-) with the tool (-1-).
4. Attach adhesive tapes (-arrow-) around the rear windshield.

Caution

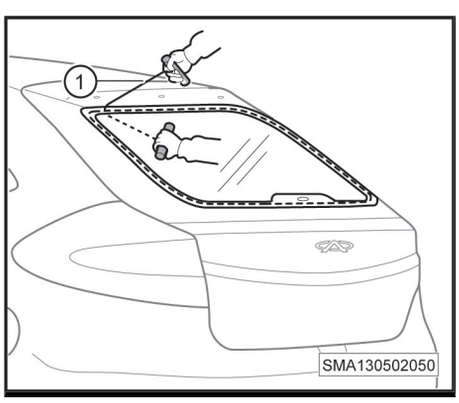
- Spray water on the windshield after the sealant completely dries out to check for leakage.
- You shall drive the vehicle at a low speed to avoid the windshield from falling due to vibration.

4.2.3 Removing and installing the rear windshield (Model A13A)

Caution

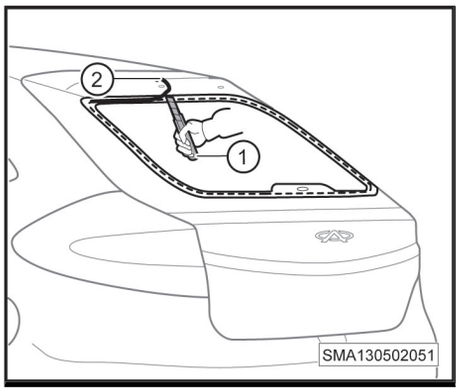
- Please wear protective gloves during repair.
- The interior trims and the body paint must never be scratched.
- Please take care and never damage the window when removing and installing the rear windshield.
- Two or more technicians are needed to assist the operation when removing and installing the rear windshield.

Removal



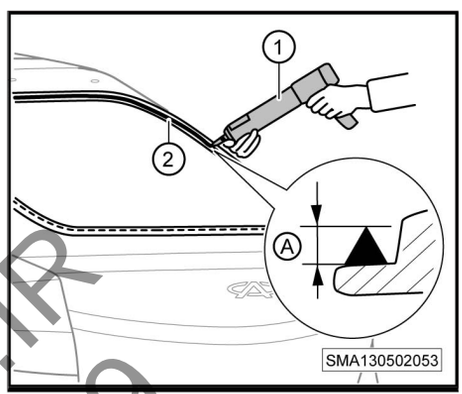
1. Remove the rear wiper .
2. Remove the rear fender assembly => refer to page 857.
3. Remove the rear windshield with the tool (-1-).

4. Remove the sealant residue (-2-) on the frame with a scraper (-1-).

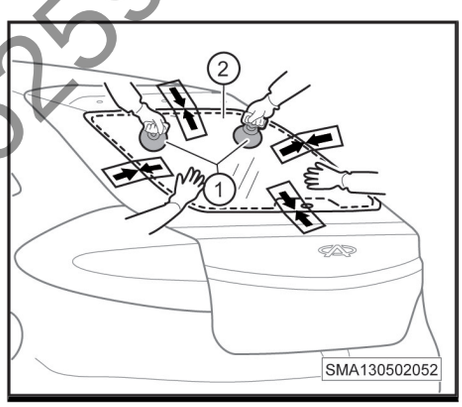


Installation

1. Prime the vehicle body and the windshield before applying silicon sealant on the rear windshield.
2. Apply sealant (-2-) to the frame with the tool (-1-).
   - Thickness of sealant A: 10 mm



3. Install the rear windshield (-2-) with the tool (-1-).
4. Attach adhesive tapes (-arrow-) around the rear windshield.



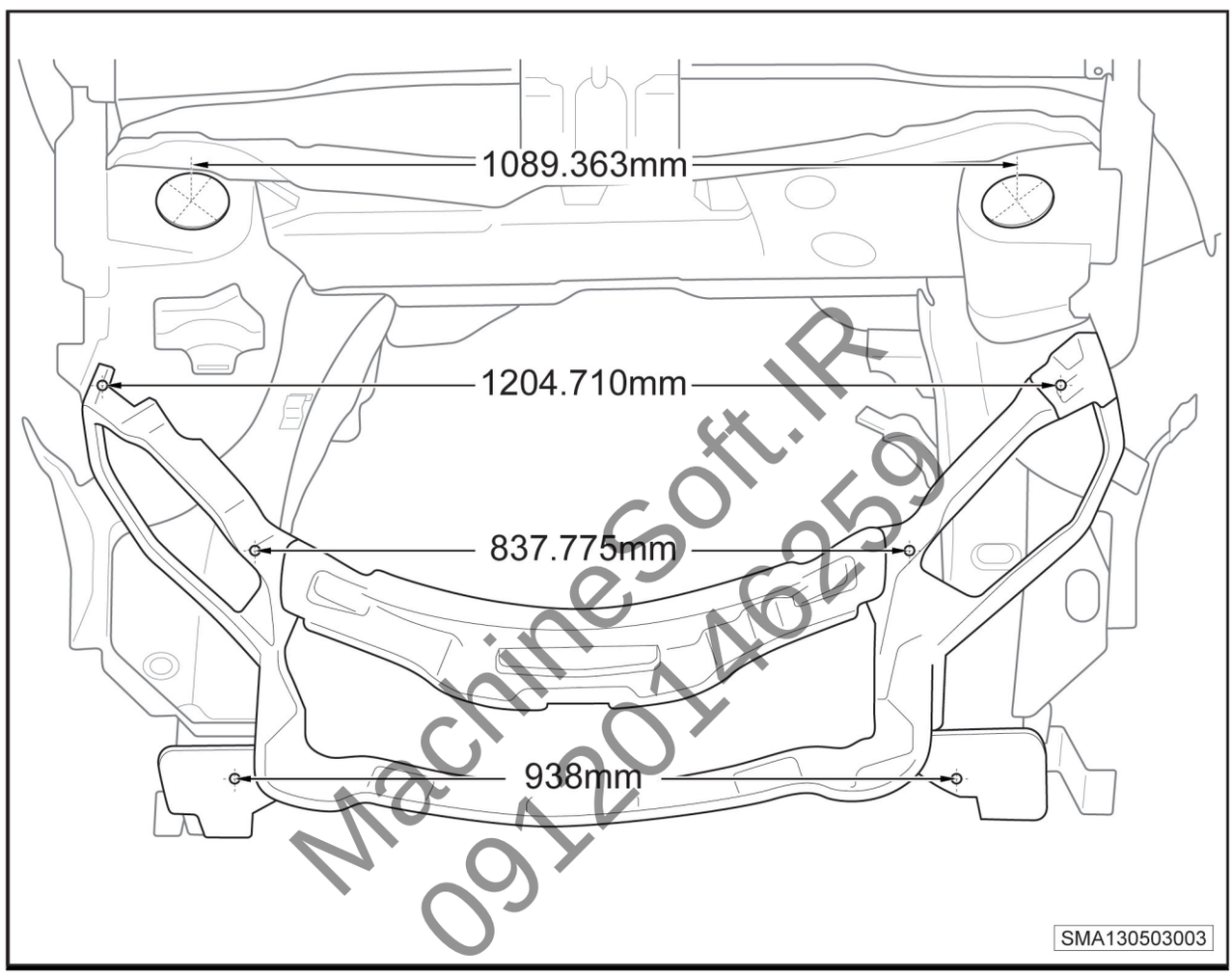
Caution

- Spray water on the windshield after the sealant completely dries out to check for leakage.
- You shall drive the vehicle at a low speed to avoid the windshield from falling due to vibration.

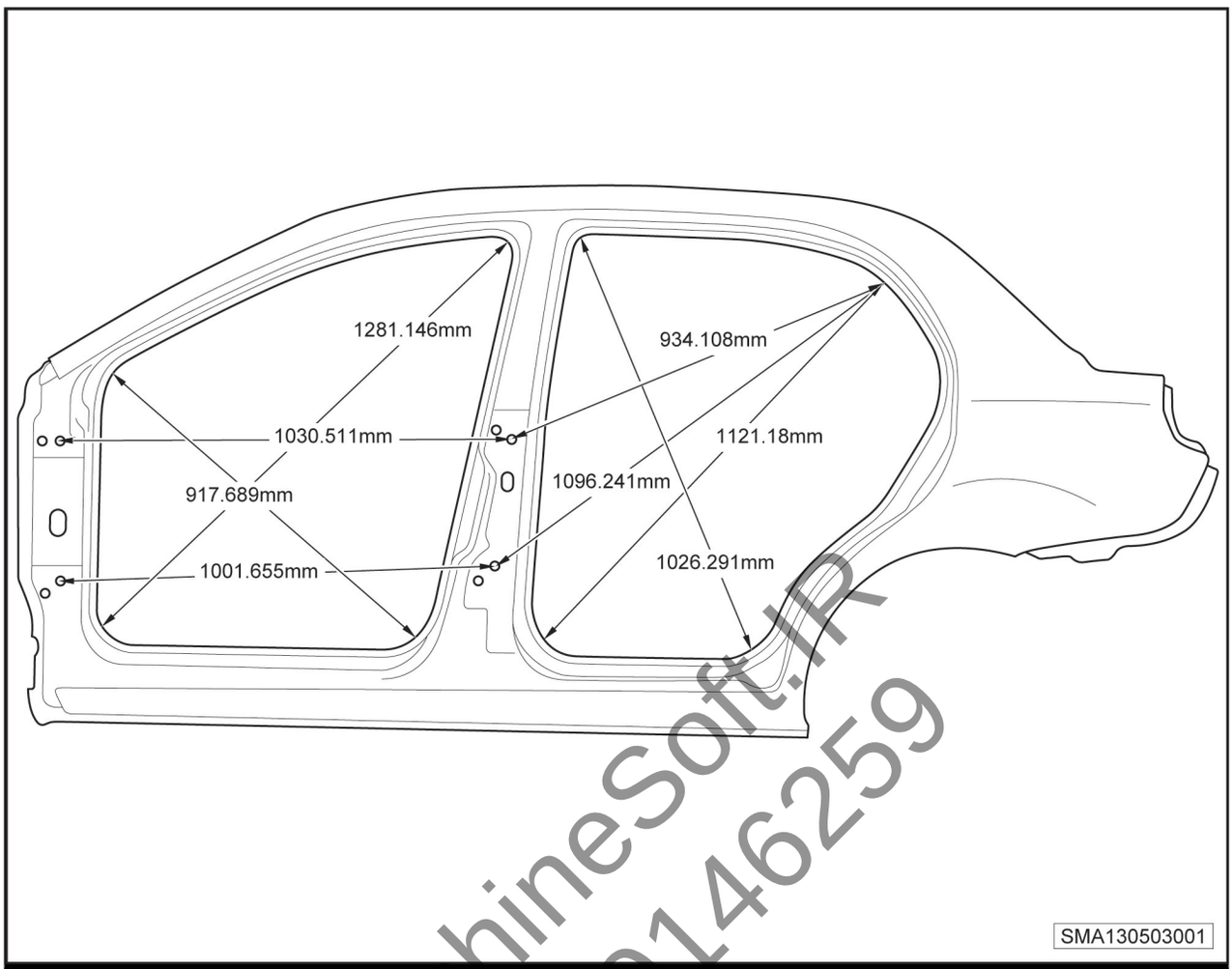
0503 Frame

1 Body Dimensions

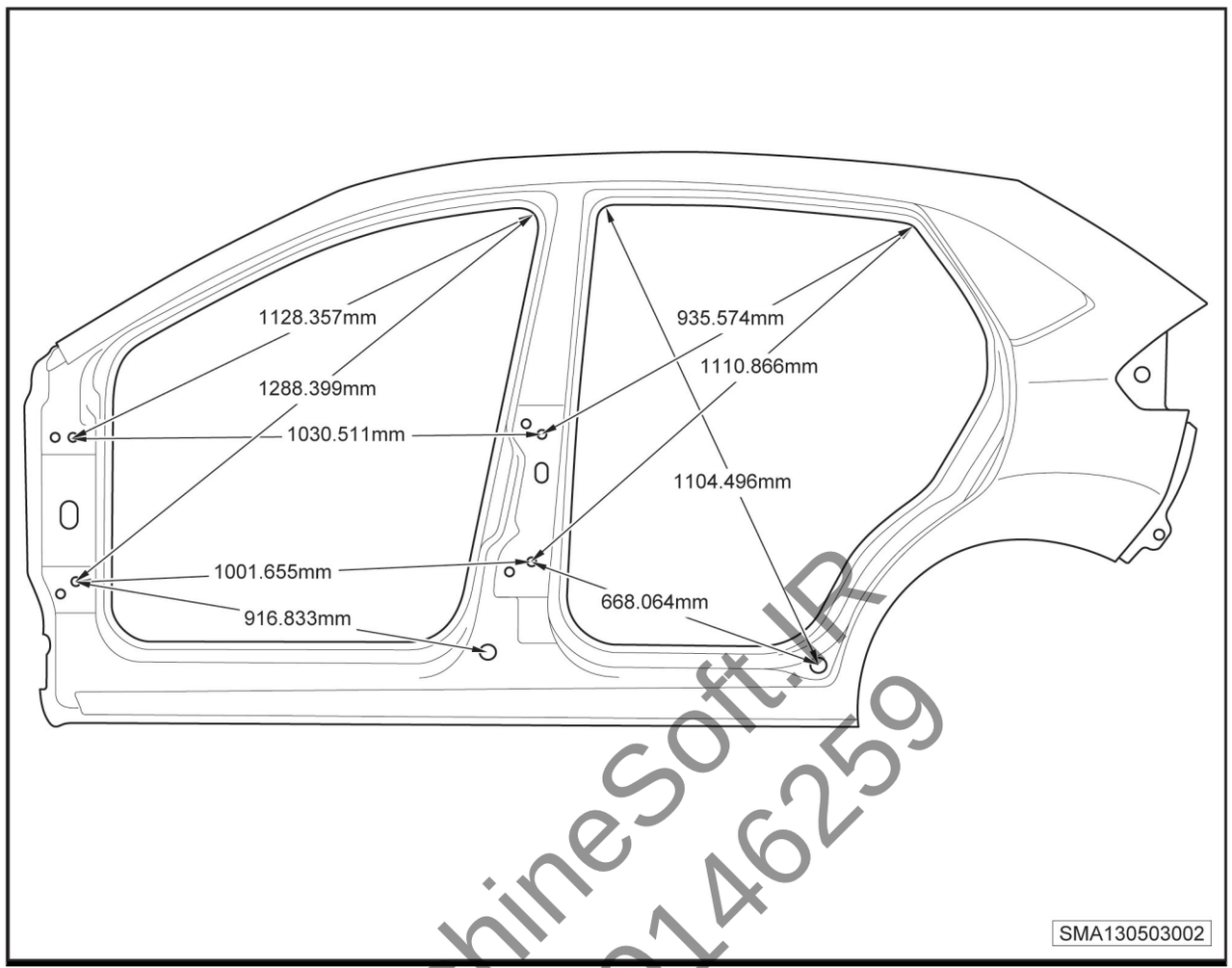
1.1 Engine compartment dimensions



1.2 Body opening dimensions (Model A13)

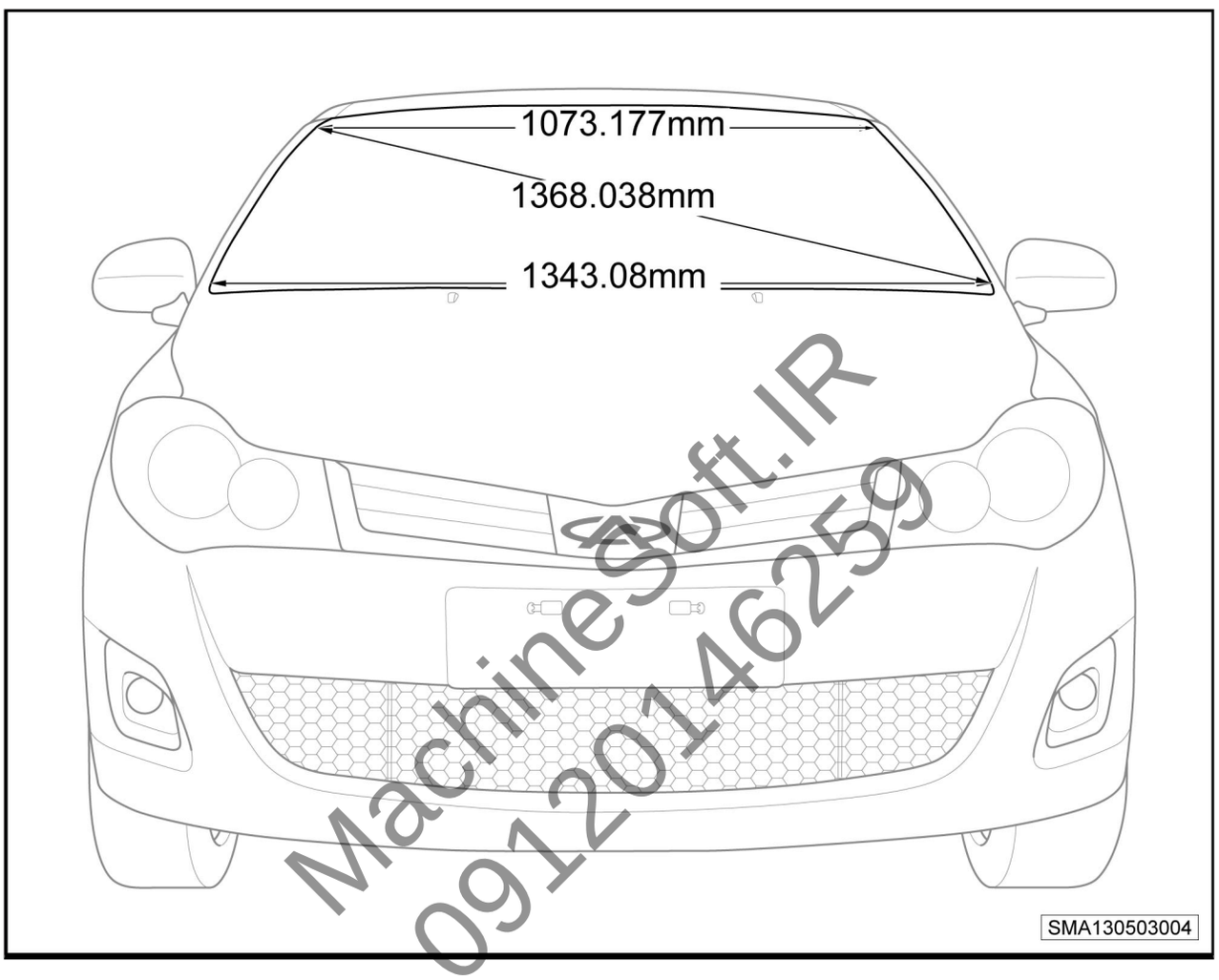


1.3 Body opening dimensions (Model A13A)

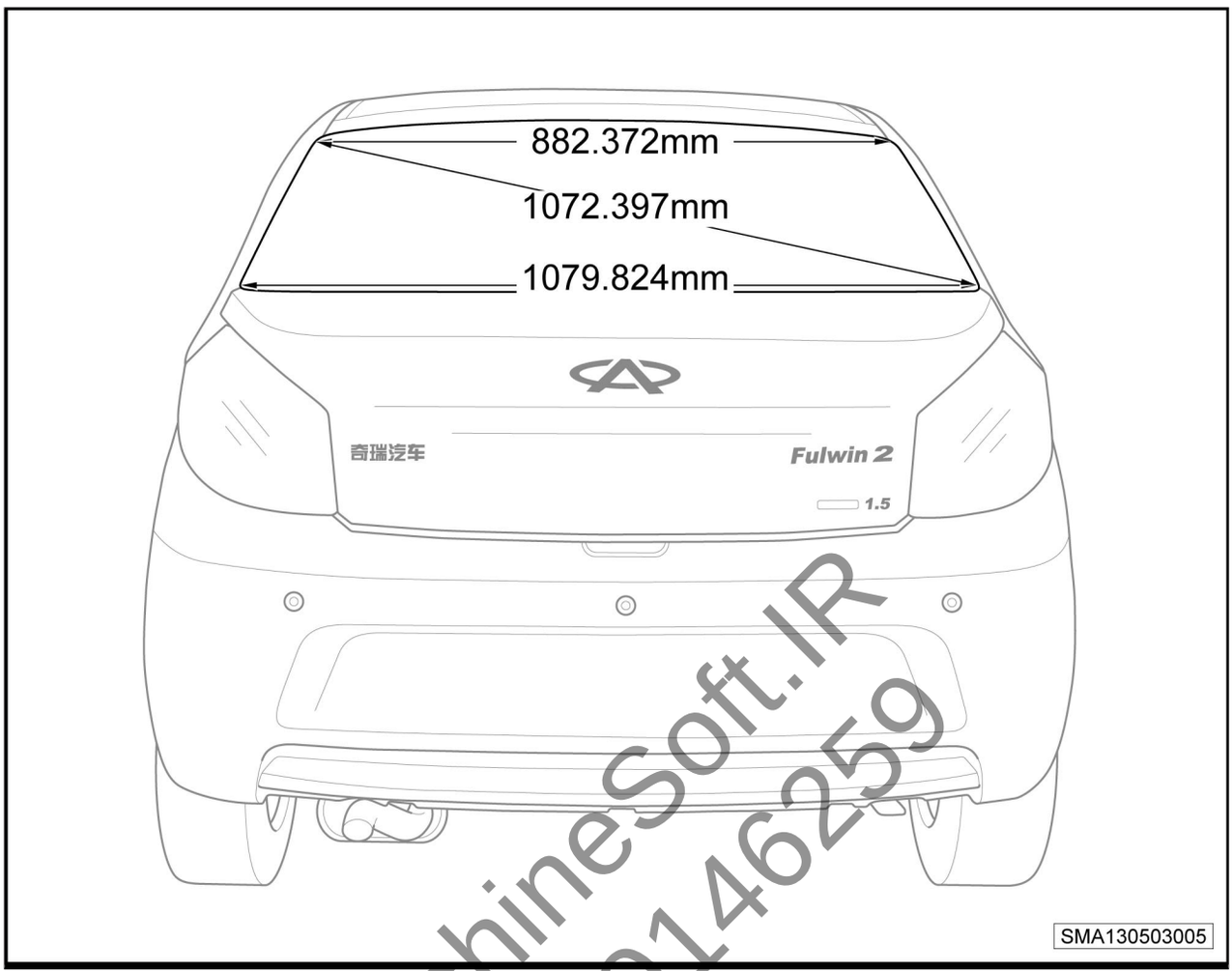


2 Window Dimensions

2.1 Front window dimensions



2.2 Rear window dimensions



0601 Clutch Device

1 General Information

1.1 Important notes

- The clutch device is a control mechanism to transmit and separate power. It transfers the engine power output to the transaxle and realizes smooth power combination and temporary separation between the engine and the transmission, thus facilitating vehicle starting and stopping, gear shifting and other operations.
- The clutch is installed inside the clutch housing between the engine and the transaxle. The clutch assembly is fixed to the rear face of the flywheel with bolts, which is composed of a pressure plate and a friction disc.
- When the vehicle starts moving, the clutch disc gradually engages with the pressure plate. The engine power is transferred to the drive train via the friction between the clutch disc and the pressure plate to make the vehicle start moving smoothly.
- When the vehicle is moving, the driver can depress or release the clutch pedal as required to realize the temporary separation or gradual engagement of the engine and the transaxle, thus to cut off or transfer the power from the engine to the transaxle.
- When shifting gear, the clutch pressure plate may temporarily cut off the power transmission between the drive train and the engine, to reduce the impact and collision between gears and realize a smooth gear shifting.
- The hydraulic clutch system uses brake fluid which is irritating to the skin. If it contacts your skin, please rinse with water thoroughly at once.
- When removing and installing the transaxle assembly, you shall use the hydraulic jack to support the transaxle. In addition, two or more technicians are needed to assist the operation to ensure safety.
- Only use the brake fluid approved by Chery Automobile Co., Ltd..
- All bolts must be tightened with the specified tightening torque.
- The clutch device consists of the following components:

  a. Clutch pedal
  b. Clutch master cylinder
  c. Clutch slave cylinder
  d. Hydraulic clutch pipeline
  e. Release bearing and release lever
  f. Clutch disc
  g. Clutch pressure plate
  h. Flywheel

1.2 Product specifications

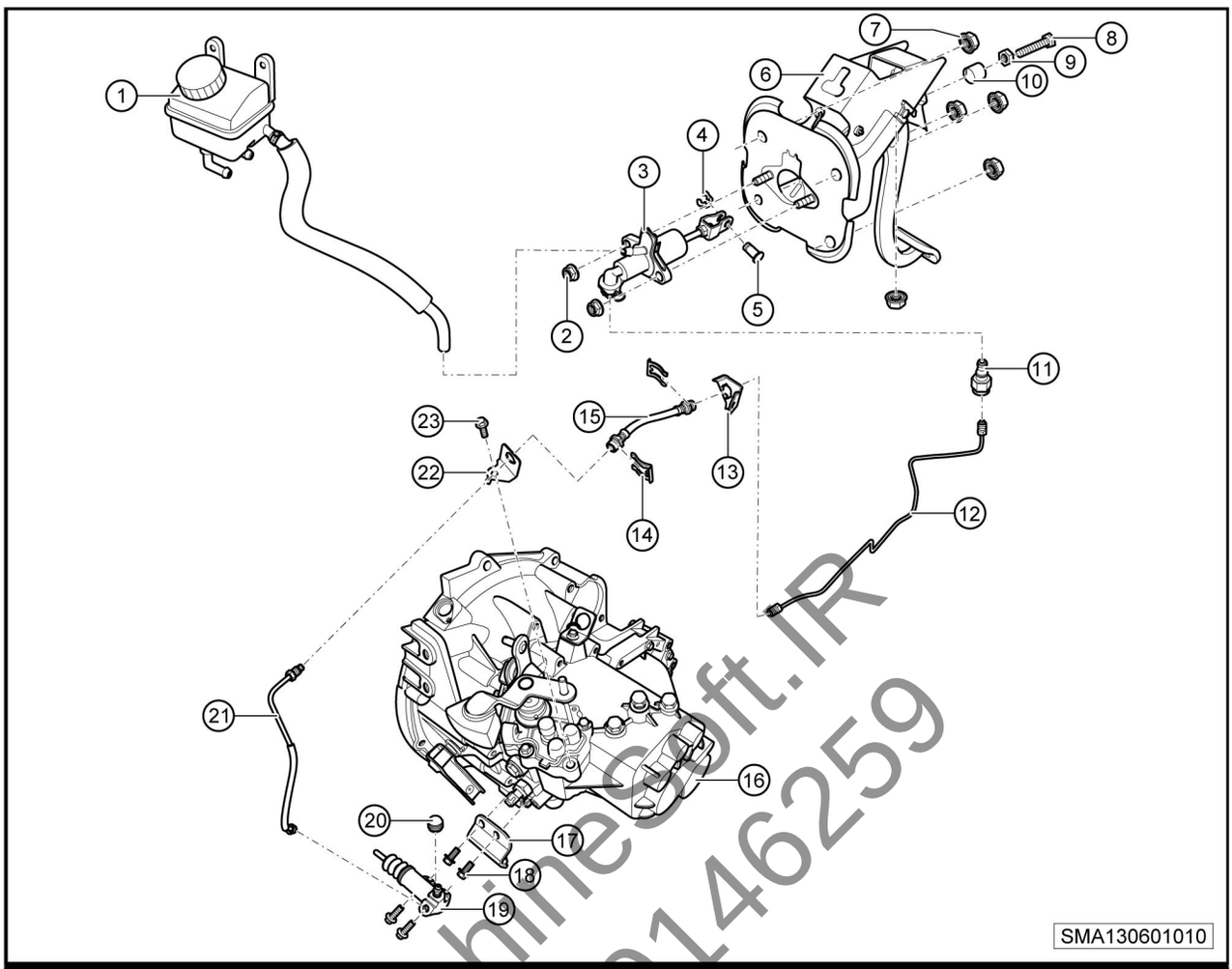
Torque specifications

Component	Torque (N·m)
Fixing bolt of the clutch pedal	25±3
Fixing bolt of the clutch master cylinder	10±1
Fixing bolt of the clutch slave cylinder	25±3
Fixing bolt of the clutch slave cylinder bracket	25±3
Fixing bolt of the clutch pressure plate	23±2
Fixing bolt of the flywheel	110±5
Pipe connector of the clutch system	16.5±2.5

Standard parameters of clutch components

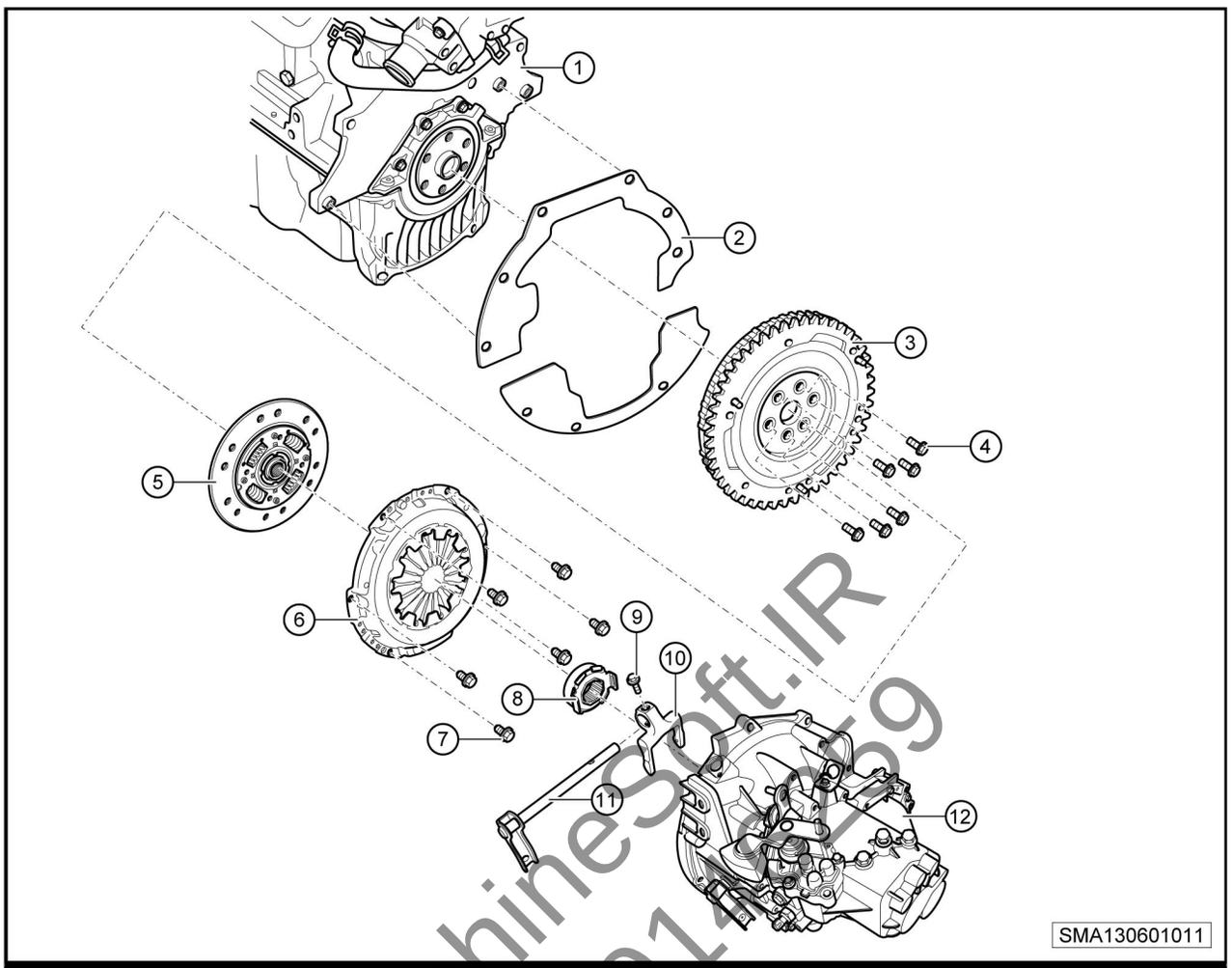
Component	Inspection item	Specification
Clutch pedal	Clutch pedal height	203.6±3 mm
	Standard clutch pedal travel	118±12 mm
	Free clearance	10±2 mm
	Pedal effort	138 N
Clutch disc	Outer diameter	228 mm
	Inner diameter	155 mm
Clutch pressure plate	Pressing force	＞4500 N
	Separation force	＜1480 N

1.3 The hydraulic control mechanism drawing



1. Reservoir	2. Fixing nut of the clutch master cylinder
3. Clutch master cylinder	4. Clamp spring
5. Dowel pin	6. Clutch pedal assembly
7. Fixing nut of the clutch pedal	8. Pedal height adjustment bolt
9. Pedal height adjustment nut	10. Adjustment bolt rubber sleeve
11. Quick connector	12. Pipe A
13. Mounting bracket A	14. Pipe fixing clamp spring
15. Hose	16. Transaxle assembly
17. Mounting bracket of the clutch slave cylinder	18. Fixing bolt of the slave cylinder bracket
19. Clutch slave cylinder	20. Sealing cap
21. Pipe B	22. Mounting bracket of the pipe B
23. Fixing bolt of the bracket B	

1.4 The clutch device drawing



1. Engine assembly	2. Clapboard
3. Flywheel	4. Fixing bolt of the flywheel
5. Friction disc	6. Clutch pressure plate
7. Fixing bolt of the pressure plate	8. Release bearing
9. Bracket fixing bolt	10. Release bearing bracket
11. Release lever	12. Transaxle assembly

2 Diagnosis and Inspection

2.1 Checking the clutch pedal free clearance and travel

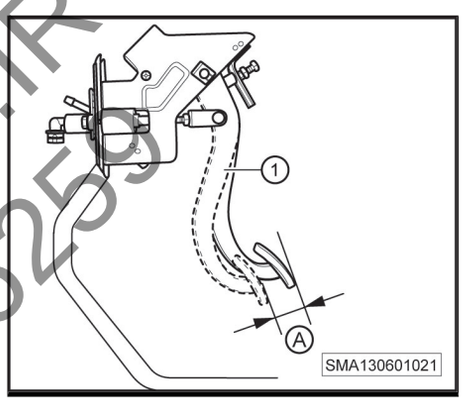
Caution

- If the clutch pedal travel does not meet the technical standard, it may lead to incomplete clutch separation, clutch slipping and other failures.
- If the inspection data of the following items do not meet the technical standard, you shall adjust the clutch pedal.

Checking the clutch pedal free clearance

1. Gently press the clutch pedal (-1-) by hand, and stop pressing when feeling the resistance; then test the distance (-A-) as the free clearance.

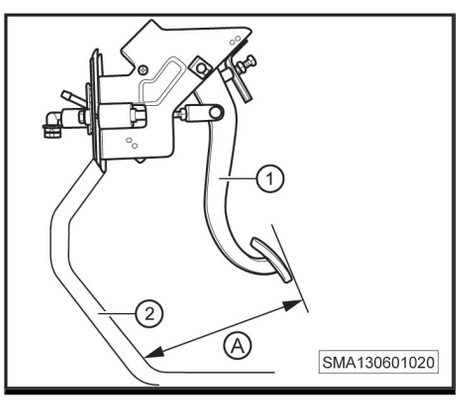
- The free clearance: 10±2 mm



Checking the clutch pedal travel

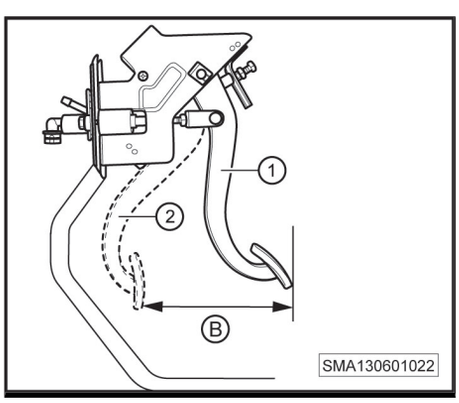
1. The distance (-A-) between the clutch pedal (-1-) and the vehicle body (-2-) is the clutch pedal height.

- The clutch pedal height: 203.6±3 mm



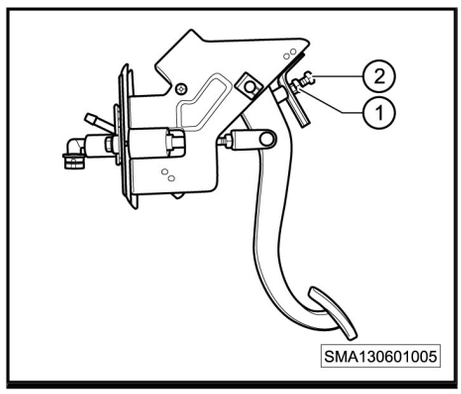
2. Record the original position of the clutch pedal (-1-) as a benchmark.
3. Press the clutch pedal to its limit position (-2-).
4. The distance (-B-) between the two positions is the clutch pedal travel.

- The standard clutch pedal travel: 118±12 mm



2.2 Adjusting the clutch pedal free clearance and travel

Adjusting the clutch pedal free clearance

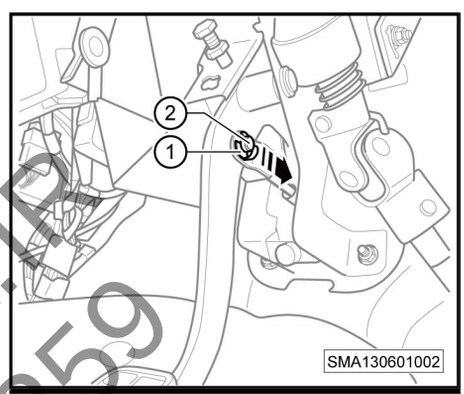


1. Loosen the fixing nut (-1-), adjust the height of the bolt (-2-).

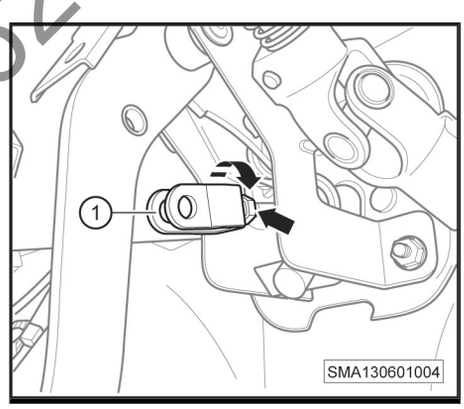
- Tightening torque of the fixing nut: 10±2 N•m

2. Check whether the clutch free clearance meets the standard; if not, please readjust.

Adjusting the clutch pedal travel



1. Release the clamp spring (-1-) in the (-arrow-) direction.
2. Remove the dowel pin (-2-).



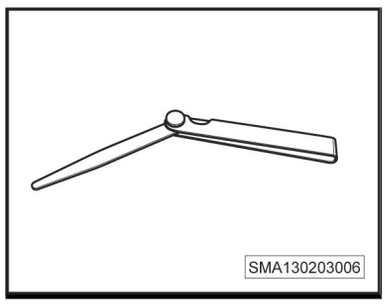
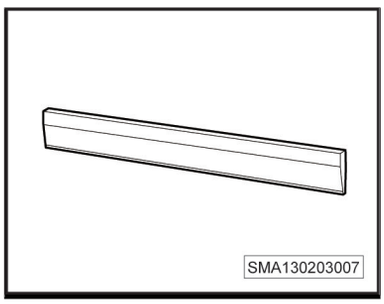
3. Loosen the fixing nut (-arrow-).

- Tightening torque of the fixing nut: 12±2 N•m

4. Loosen the clutch pedal mounting bracket (-1-) in the (-arrow-) direction and adjust the bracket distance.
5. After the adjustment, tighten the fixing nut and install the clutch pedal.
6. Check whether the pedal travel meets the standard; if not, please readjust.

2.3 Checking the clutch pressure plate

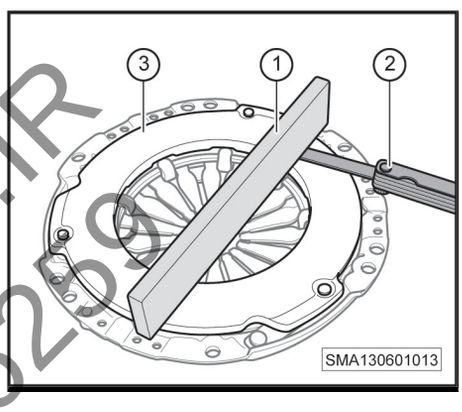
Maintenance tools and common equipment

	
Clearance gauge	Ruler

Methods

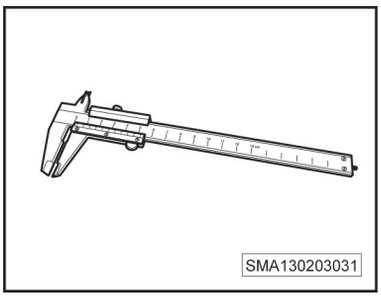
1. Place the ruler (-1-) on the contact surface (-3-) of the pressure plate and test the planeness of the pressure plate with the clearance gauge (-2-).

- Standard planeness: ⩽ 0.3 mm



2.4 Checking the friction disc

Maintenance tools and common equipment

	
Vernier	

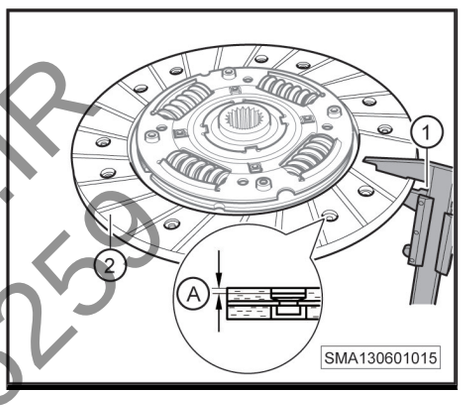
Methods

1. Check the thickness of the friction disc (-2-) with the vernier (-1-).

- Standard thickness: 7.3±0.3 mm

2. Check the rivet's wear limit (-A-).

- Wear limit: 0.8 mm



2.5 Clutch fault list

Condition	Cause	Troubleshooting
Incomplete clutch separation	Excessive free clearance, and inadequate separation travel	Check and adjust the clutch pedal travel
	Release bearing wear	Replace the release bearing
	Excessive wear of the clutch pressure plate and the diaphragm spring	Replace the pressure plate assembly
	Inadequate fluid or unwanted air in the hydraulic clutch system	Add fluid and discharge the air from the system
	Damage to the driven plate spline hole or the input shaft spline	Replace the driven plate or the input shaft
	Damage to the release bearing location bracket	Replace the location bracket
Clutch slipping	Too short clutch pedal free travel, and incorrect installation/adjustment of the release mechanism	Check and adjust the clutch pedal travel
	Exceeding the wear limit of clutch disc	Replace the clutch disc
	Fault of the pressure plate assembly, and fatigue of the diaphragm spring	Replace the pressure plate assembly
	Oil stain on the friction disc surface	Remove the oil stain, and check the input shaft oil seal for leakage
	Friction loss due to flywheel surface wear	Replace the flywheel
Heavy clutch operation	Blockage of the clutch pedal or incorrect installation	Check and reinstall the clutch pedal
	Air or impurities in the hydraulic clutch system	Replace the fluid and discharge the air from the system
Abnormal noise and vibration of the clutch	Inadequate oil or ablation noise in the release bearing	Replace the release bearing
	Damage to the internal gears of the transaxle	Check and replace the damaged gear
	Severe wear of the driven plate spline hole or the input shaft spline	Replace the driven plate or the input shaft
	Rugged pressure plate diaphragm, or damage of the diaphragm spring	Replace the pressure plate assembly
	Skewed installation of the pressure plate, deviating from the flywheel center	Reinstall the pressure plate

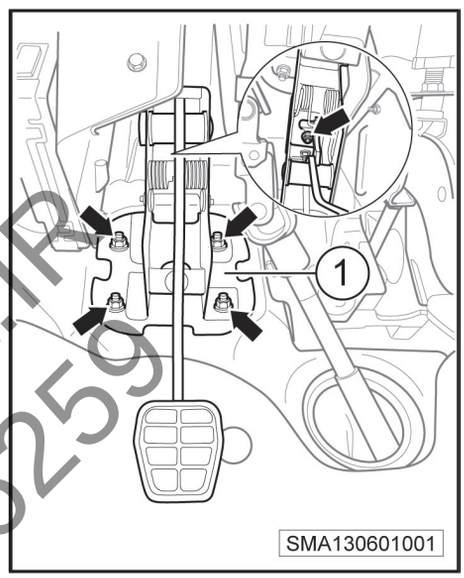
3 Clutch

3.1 Clutch release mechanism

3.1.1 Removing and installing the clutch pedal assembly

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the clutch master cylinder => refer to page 894.
3. Unscrew the fixing nuts of the clutch pedal (-arrow-).
   - Tightening torque of the nut: 25±3 N•m
4. Remove the clutch pedal assembly (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

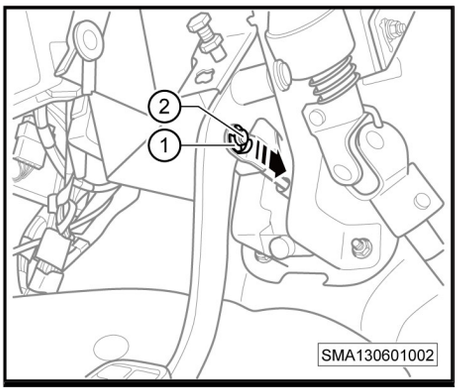
- Checking the clutch pedal travel is required => refer to page 889.

3.1.2 Removing and installing the clutch master cylinder

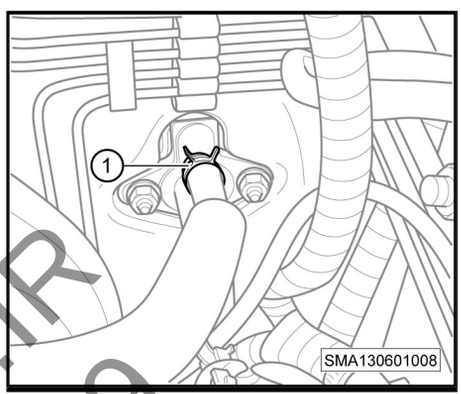
Caution

- The master cylinder contains brake fluid which is harmful to the skin; thus, please wear protective gloves during repair.
- If it contacts your skin, please rinse with water immediately.
- Recycle the leaking brake fluid in repair with a vessel.
- Prevent the brake fluid from splashing on the vehicle; otherwise, it may damage the vehicle paintwork. If the brake fluid splashes on the paintwork, please rinse it with water immediately.

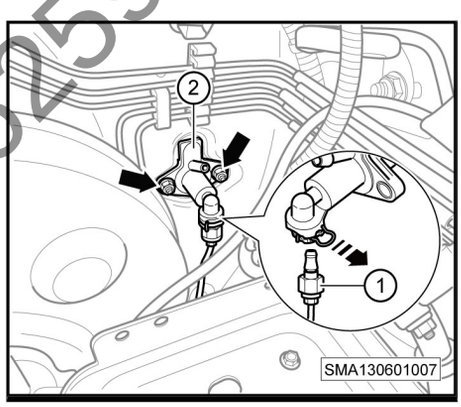
Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the battery => refer to page 975.
3. Release the clamp spring (-1-) in the (-arrow-) direction.
4. Remove the dowel pin (-2-).



5. Release the hydraulic pipeline clamp (-1-) and disconnect the pipeline.



6. Release the oil pipe clamp spring in the (-arrow-) direction and disconnect the oil pipe connector (-1-).
7. Unscrew the fixing nuts of the clutch master cylinder (-arrow-) and remove the clutch master cylinder (-2-).
   - Tightening torque of the nut: 10±1 N•m

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

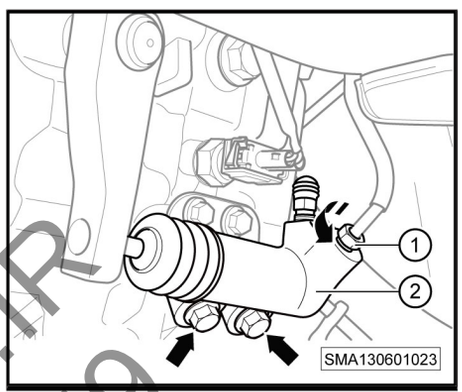
- Discharging the air from the hydraulic clutch system is required => refer to page 898.
- Checking the clutch pedal travel is required => refer to page 889.

3.1.3 Removing and installing the clutch slave cylinder

Caution

- The slave cylinder contains brake fluid which is harmful to the skin; thus, please wear protective gloves during repair.
- If it contacts your skin, please rinse with water immediately.
- Recycle the leaking brake fluid in repair with a vessel.
- Prevent the brake fluid from splashing on the vehicle; otherwise, it may damage the vehicle paintwork. If the brake fluid splashes on the paintwork, please rinse it with water immediately.

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Unscrew the oil pipe connector (-1-) in the (-arrow-) direction.
3. Unscrew the fixing bolts (-arrow-) and remove the slave cylinder (-2-).
   - Tightening torque of the bolt: 25±3 N•m

Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Apply grease on the joint between the slave cylinder pushrod and the release lever.
- Discharging the air from the hydraulic clutch system is required => refer to page 898.
- Checking the clutch pedal travel is required => refer to page 889.

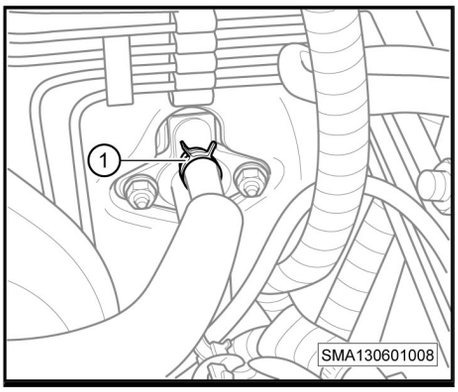
3.1.4 Removing and installing the hydraulic clutch pipeline

Caution

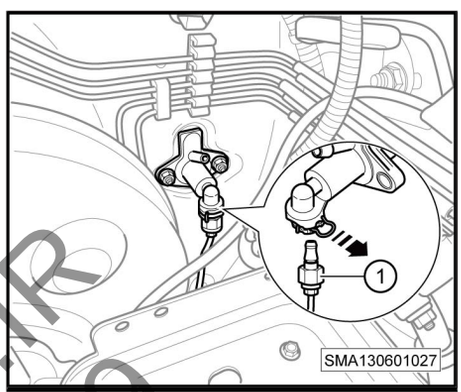
- The slave cylinder contains brake fluid which is harmful to the skin; thus, please wear protective gloves during repair.
- If it contacts your skin, please rinse with water immediately.
- Recycle the leaking brake fluid in repair with a vessel.
- Prevent the brake fluid from splashing on the vehicle; otherwise, it may damage the vehicle paintwork. If the brake fluid splashes on the paintwork, please rinse it with water immediately.

Removal

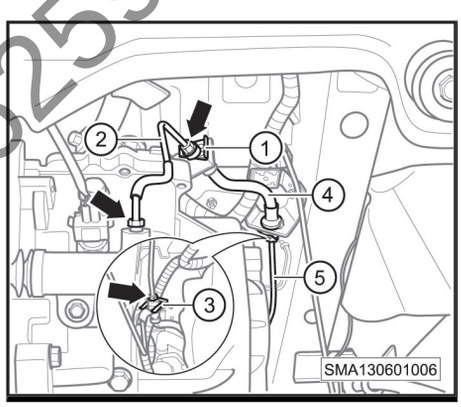
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the battery => refer to page 975.
3. Release the hydraulic pipeline clamp (-1-) and disconnect the pipeline.



4. Release the oil pipe clamp spring in the (-arrow-) direction and disconnect the oil pipe connector (-1-).



5. Remove the pipeline connectors (-arrow-).
   - Tightening torque of the pipeline connector: 16.5±2.5 N•m
6. Loosen the fixing clamp (-1-) and remove the pipe (-2-).
7. Loosen the fixing clamp spring (-3-) and remove the pipe (-5-).
8. Remove the hose (-4-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Discharging the air from the hydraulic clutch system is required => refer to page 898.

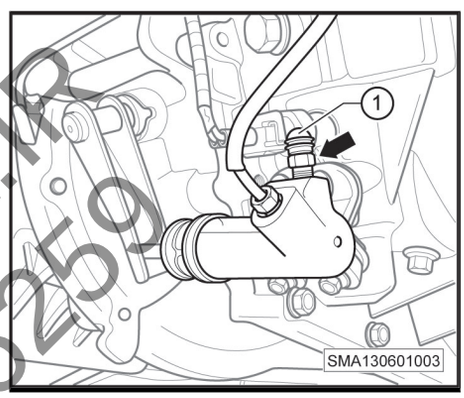
3.1.5 Discharging the air from the clutch hydraulic system

Caution

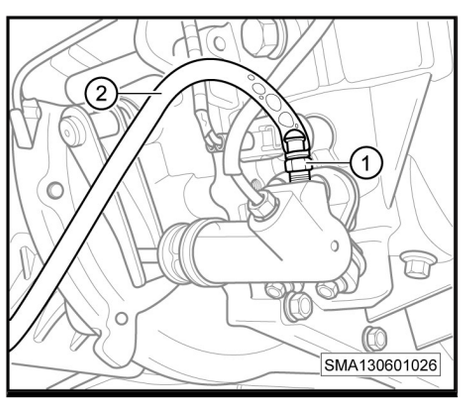
- The brake fluid is harmful to skin, thus please wear protective gloves during repair.
- If it contacts your skin, please rinse with water immediately.
- Recycle the leaking brake fluid in repair with a vessel.
- Prevent the brake fluid from splashing on the vehicle; otherwise, it may damage the vehicle paintwork. If the brake fluid splashes on the paintwork, please rinse it with water immediately.
- Make sure that there is enough brake fluid in the reservoir before air discharge.
- After air discharge, you shall check whether the brake fluid level of the reservoir meets the standard and whether there is a leak in the oil pipe and the connector of the clutch system.
- Only use the brake fluid approved by Chery Automobile Co., Ltd.; otherwise, it may lead to pipeline corrosion.
- Brake fluid type: DOT-4.

Procedures

1. Remove the sealing cap (-1-).
2. Unscrew the exhaust bolt (-arrow-).



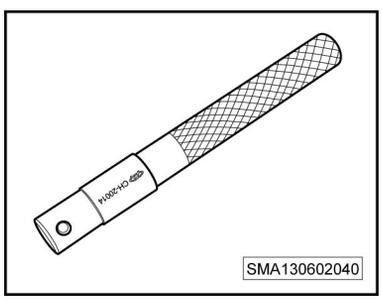
3. Connect the transparent hose (-2-) to the exhaust bolt (-1-).
4. Gently press the clutch pedal until there is no more bubbles appearing in the exhaust hose, then tighten the exhaust bolt.
5. Press the clutch pedal for several times to fix it in the position. Then unscrew the exhaust bolt to discharge air, and quickly tighten the bolt.
6. Repeat the operation of step 5 until the air in the clutch system is all discharged.
7. Tighten the exhaust bolt (-1-), remove the hose, and put on the sealing cap.
8. Check the brake fluid in the reservoir.



3.2 Clutch and pressure plate

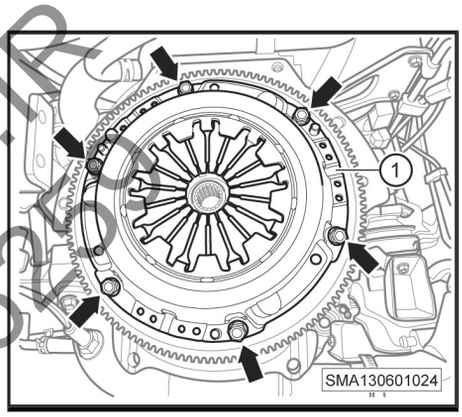
3.2.1 Removing and installing the clutch

Maintenance tools and common equipment

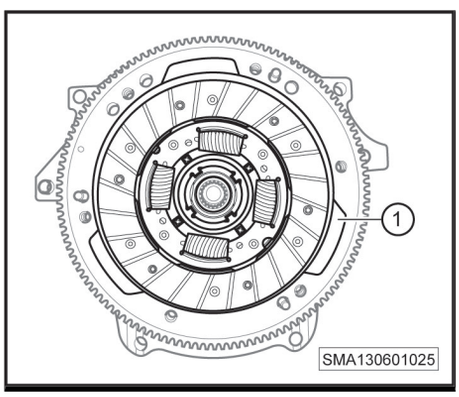
	
Clutch installation tool	

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the transaxle assembly => refer to page 920.
3. Unscrew the fixing bolts (-arrow-) and remove the clutch pressure plate (-1-).
   - Tightening torque of the bolt: 23±2 N•m



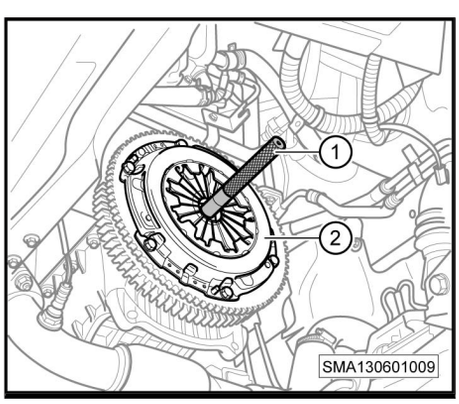
4. Remove the clutch disc (-1-).



Installation

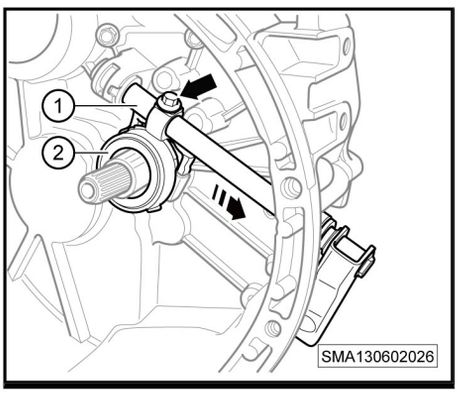
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Apply grease on the clutch disc spline.
- Align the clutch installation tool (-1-) with the center of the clutch (-2-) to install.
- Tighten the fixing bolt of the clutch pressure plate with the specified torque diagonally and evenly.



3.2.2 Removing and installing the release bearing

Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the transaxle assembly => refer to page 920.
3. Unscrew the fixing bolt (-arrow-).
   - Tightening torque of the bolt: 20±2 N•m
4. Remove the release shaft (-1-) in the (-arrow-) direction.
5. Remove the release bearing (-2-).

Installation

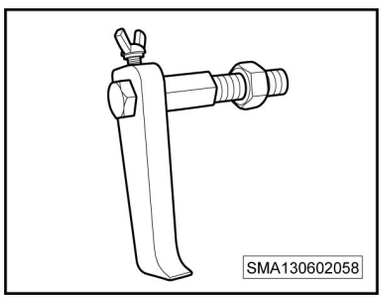
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Apply grease on the joint between the release bearing and the release shaft.

4 Flywheel

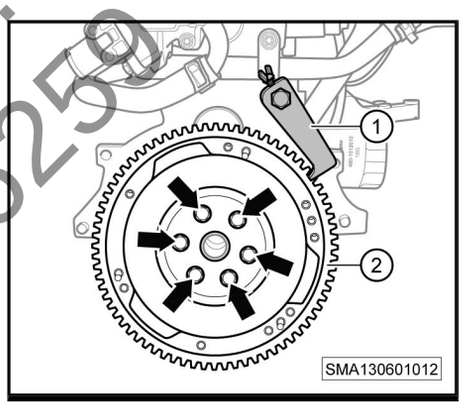
4.1 Removing and installing the flywheel

Maintenance tools and common equipment

	
Flywheel installation tool	

Removal

1. Remove the clutch => refer to page 899.
2. Fix the flywheel ring gear with the flywheel installation tool (-1-).
3. Unscrew the flywheel fixing bolts (-arrow-) and remove the flywheel (-2-).
   - Tightening torque of the bolt: 110±5 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the flywheel fixing bolts diagonally and evenly.
- First tighten the bolts to the torque of 60 N•m, then tighten them to the torque of 110±5 N•m.
- Replace the flywheel fixing bolts which can only be used once and shall be scrapped after removal.

0602 Operation Mechanism and Housing

1 General Information

1.1 Important notes

- The operation mechanism is a control mechanism to shift gears on the transaxle, which increases or decreases the vehicle speed by changing gears.
- When the vehicle reaches a certain speed, the driver can change gears through the operation mechanism according to the road condition and vehicle speed, to control the driving speed.
- When removing and installing the transaxle assembly, you shall use the hydraulic jack to support the transaxle. In addition, two or more technicians are needed to assist the operation to ensure safety.
- When reassembling the transaxle, you shall apply sealant on the transaxle housing joint.
- Each part of the transaxle shall be kept clean and intact during repair.
- All fixing bolts must be tightened with the specified tightening torque.
- The operation mechanism and its housing consist of the following components:

  a. Shift handle
  b. Gear selection and shift mechanism
  c. Shift cable
  d. Transaxle housing
  e. Clutch housing

1.2 Product specifications

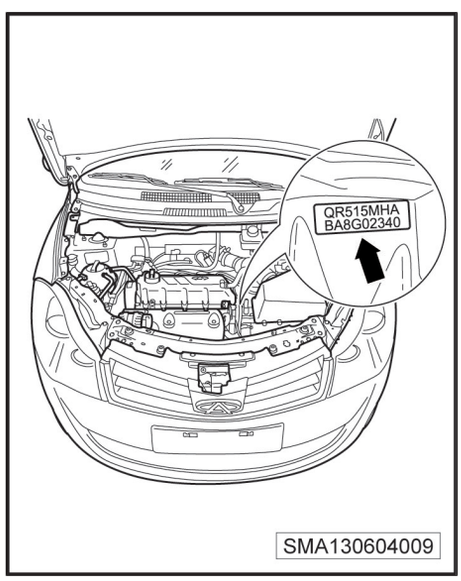
Torque specifications

Component	Torque (N·m)
Coupling bolt between the transaxle and the engine	45±5
Fixing bolt of shift lever assembly housing	20±2
Shift lever fixing bolt	10±1
Location bracket of the shift cable	25±2
Reverse shift arm bracket bolt	25±2
Coupling bolt of the transaxle housing	25±2
Reverse gear idler shaft bolt	38±2.5
Coupling bolt of the gear selection and shift mechanism assembly	25±2
Shaft holder of the gear selection and shift mechanism	32±2.5
Reverse gear switch	25±2
Shift fork shaft holder	20±2
Oil drain\limit bolt	44±3
Clutch release fork bolt	20±2
Clutch release arm bolt\nut	20±2
Gear selector arm bracket bolt	25±2
Reverse gear locking mechanism bolt	18±2
Fixing bolt of the left mount bracket and transaxle side	46±5
Fixing bolt of front mount bracket, transaxle and engine	46±5

Composition and meaning of the transaxle number

The position of QR515MHA transaxle number

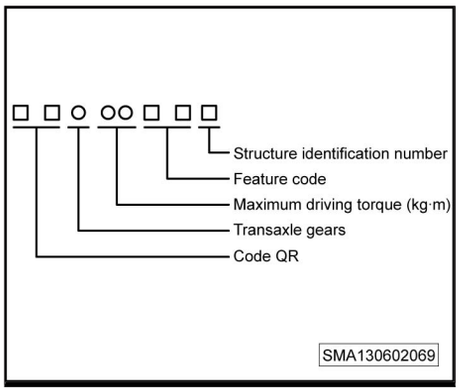
As shown in the figure, the transaxle number is located in the engine compartment and printed on the clutch housing in the front of the transaxle (-arrow-).



For transaxle QR515, the number consists of two parts: the transaxle type and the identification number.

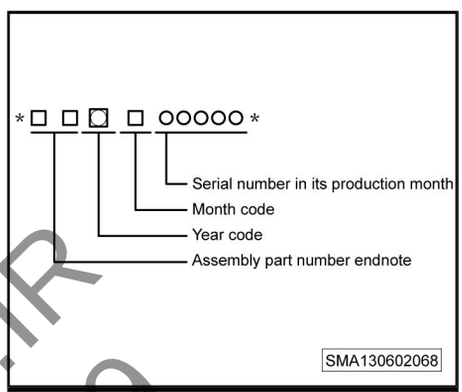
Transaxle type:

The complete transaxle type is shown in the figure.
The transaxle type consists of the code QR, the transaxle gears, the maximum driving torque, the feature code and the structure identification number.



Identification number:

The complete transaxle identification number is shown in the figure.
The identification number consists of the assembly part number endnote ("AA" for none), the production year and month code, the serial number in its production month and the start-stop symbol "*". For the production year and month code, please refer to the look-up tables of production year and month code.



Note: "○" stands for Arabic numerals, "□" for letters, and "◯" for Arabic numerals or letters. The endnote is at the end of the part number. No endnote is needed for basic models. When changing the parts and assembly in terms of their structure, size, material, heat treatment and surface treatment based on the original products, please remember to change the endnote. Letters in the code shall be capitals, starting from A to Z. In order to avoid confusion, letters "I", "O" and "X" shall not be used. If the change does not affect the interchangeability, please start with A; if the change does affect the interchangeability, please start with B instead of A.

Year code look-up table

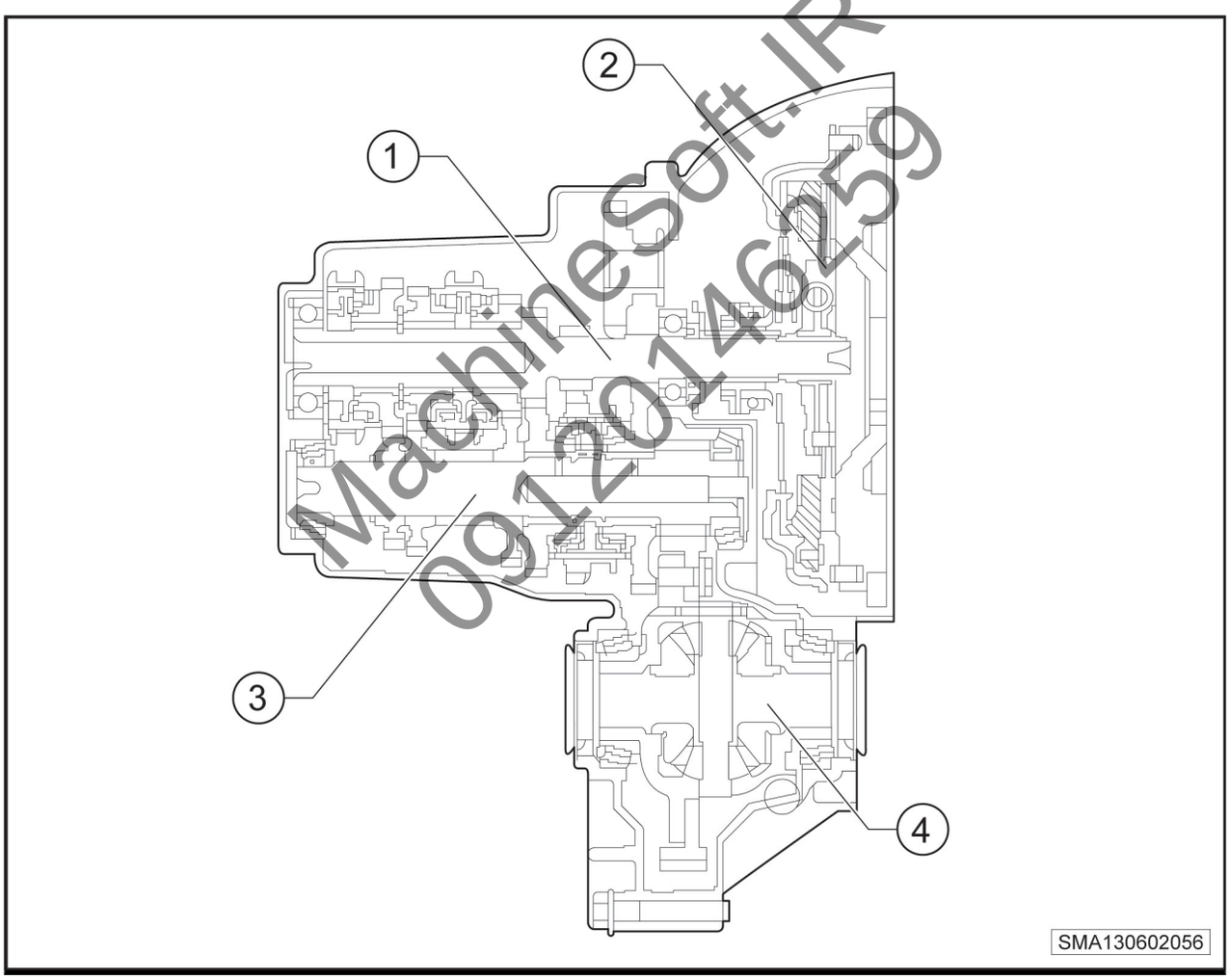
Year	Code	Year	Code
1999	X	2015	F
2000	Y	2016	G
2001	1	2017	H
2002	2	2018	J
2003	3	2019	K
2004	4	2020	L
2005	5	2021	M
2006	6	2022	N
2007	7	2023	P
2008	8	2024	R
2009	9	2025	S
2010	A	2026	T
2011	B	2027	V
2012	C	2028	W

Year	Code	Year	Code
2013	D	2029	X
2014	E	2030	Y

Month code look-up table

Month	Code	Month	Code
January	A	July	G
February	B	August	H
March	C	September	J
April	D	October	K
May	E	November	L
June	F	December	M

QR515MHA transaxle assembly drawing



1. Input shaft	2. Clutch
3. Output shaft	4. Differential

Transaxle features

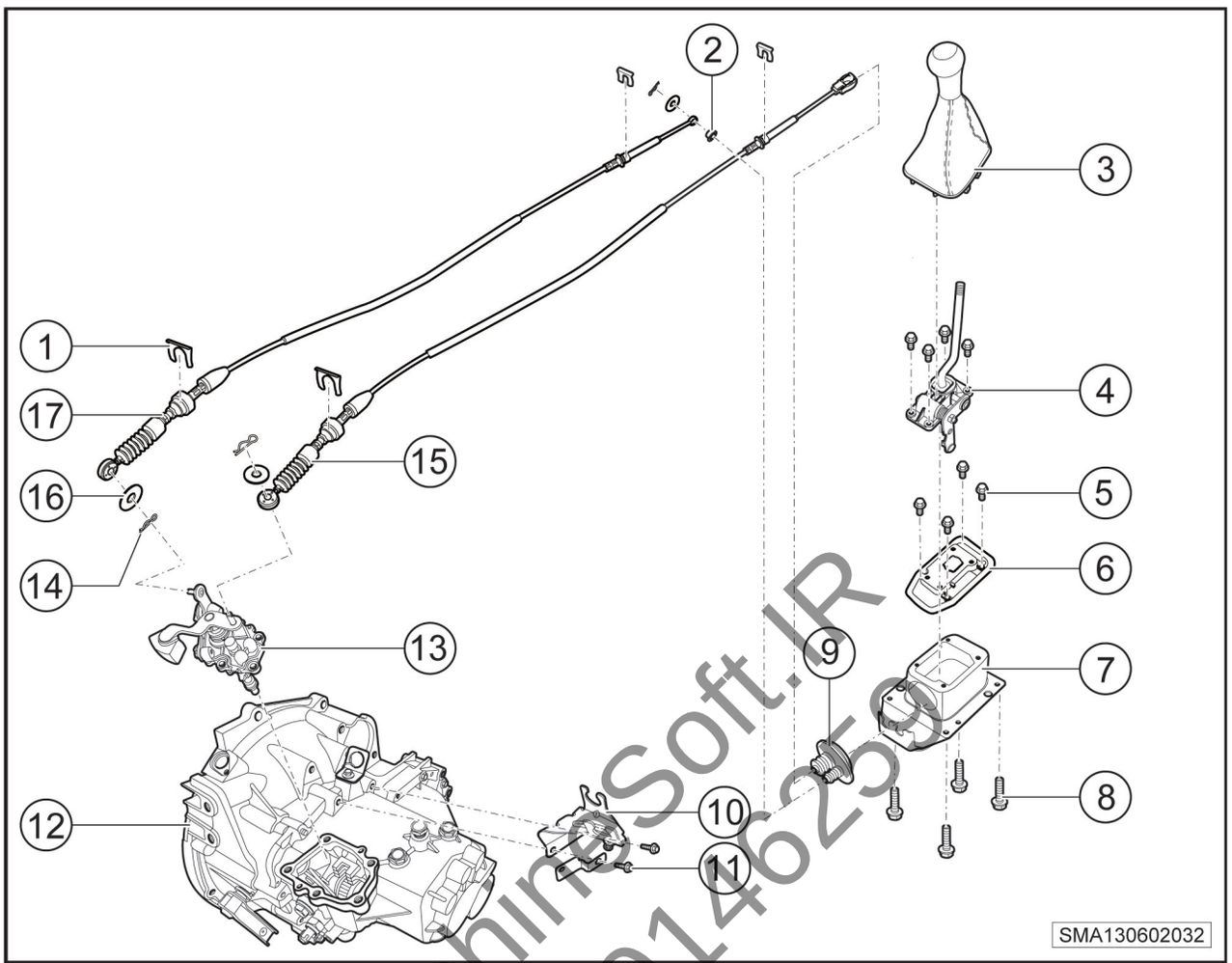
- Tranaxle QR515MHA can achieve five forward gears and one reverse gear via three sets of synchronizer, input shaft and output shaft. All the forward gears adopt the conventional mesh mode, and the reverse gear

involves a sliding idler device. The synchronizer of 1st and 2nd gear is installed on the output shaft, while the synchronizer of 3rd, 4th and 5th gear is on the input shaft. When the transaxle shifts into a gear, the gear and the gear hub engage with each other for power transmission, in which the output gear on the output shaft drives the driven gear of the final drive and the differential assembly, thus driving the shaft to spin wheels.

Technical parameters

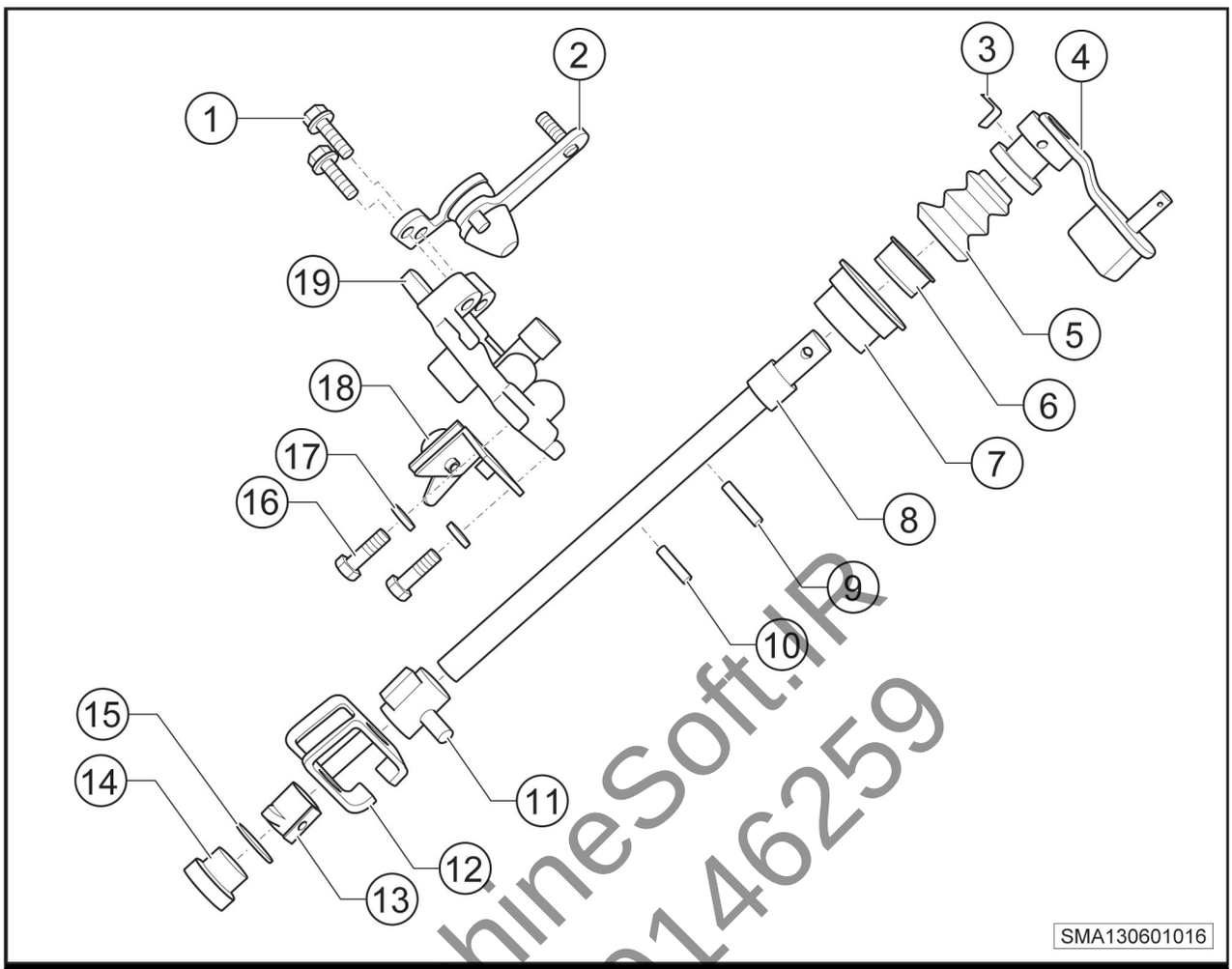
Type	QR515MHA	
Gear	Speed ratio	Gear ratio
1st gear	3.545	39/11
2nd gear	2.05	41/20
3rd gear	1.423	37/26
4th gear	1.065	33/31
5th gear	0.865	32/37
Reverse gear	3.364	37/11
Final drive ratio	3.55	71/20
Speedometer	0.806	29/36
Maximum input torque	150 Nm	
Lubricant type	GL-4 75W-90	
Lubricant capacity	2.3 L	

1.3 The operation mechanism drawing



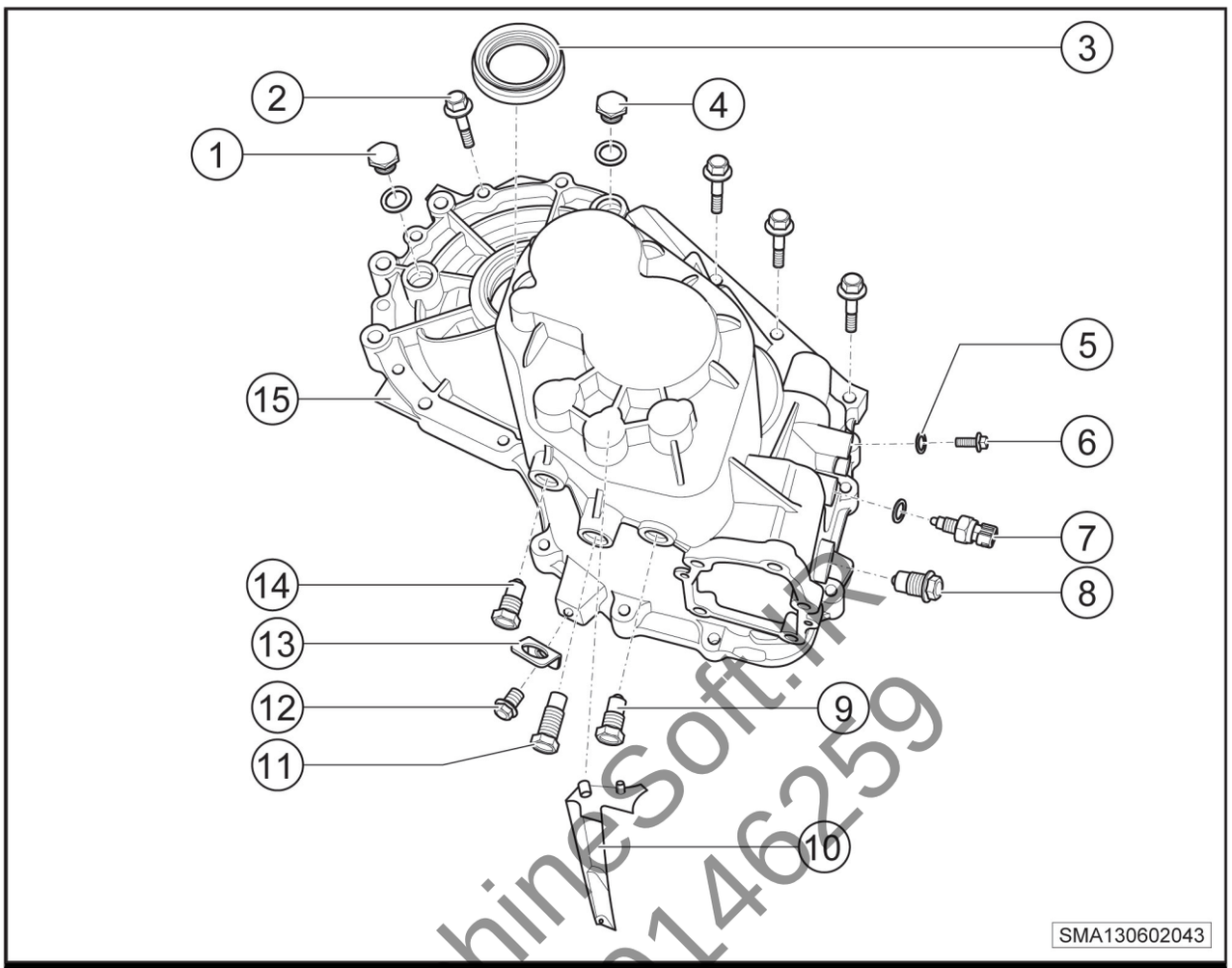
1. Clip	2. Plastic sleeve
3. Shift handle	4. Shift lever
5. Fixing bolt	6. Shift lever panel
7. Shift lever assembly housing	8. Fixing bolt of the shift lever assembly housing
9. Dust cover of the shift cable	10. Location bracket of the shift cable
11. Fixing bolt of the shift cable bracket	12. Transaxle assembly
13. Gear selection and shift mechanism assembly	14. Dowel pin
15. Selection cable	16. Gasket
17. Shift cable	

1.4 Gear selection and shift mechanism drawing



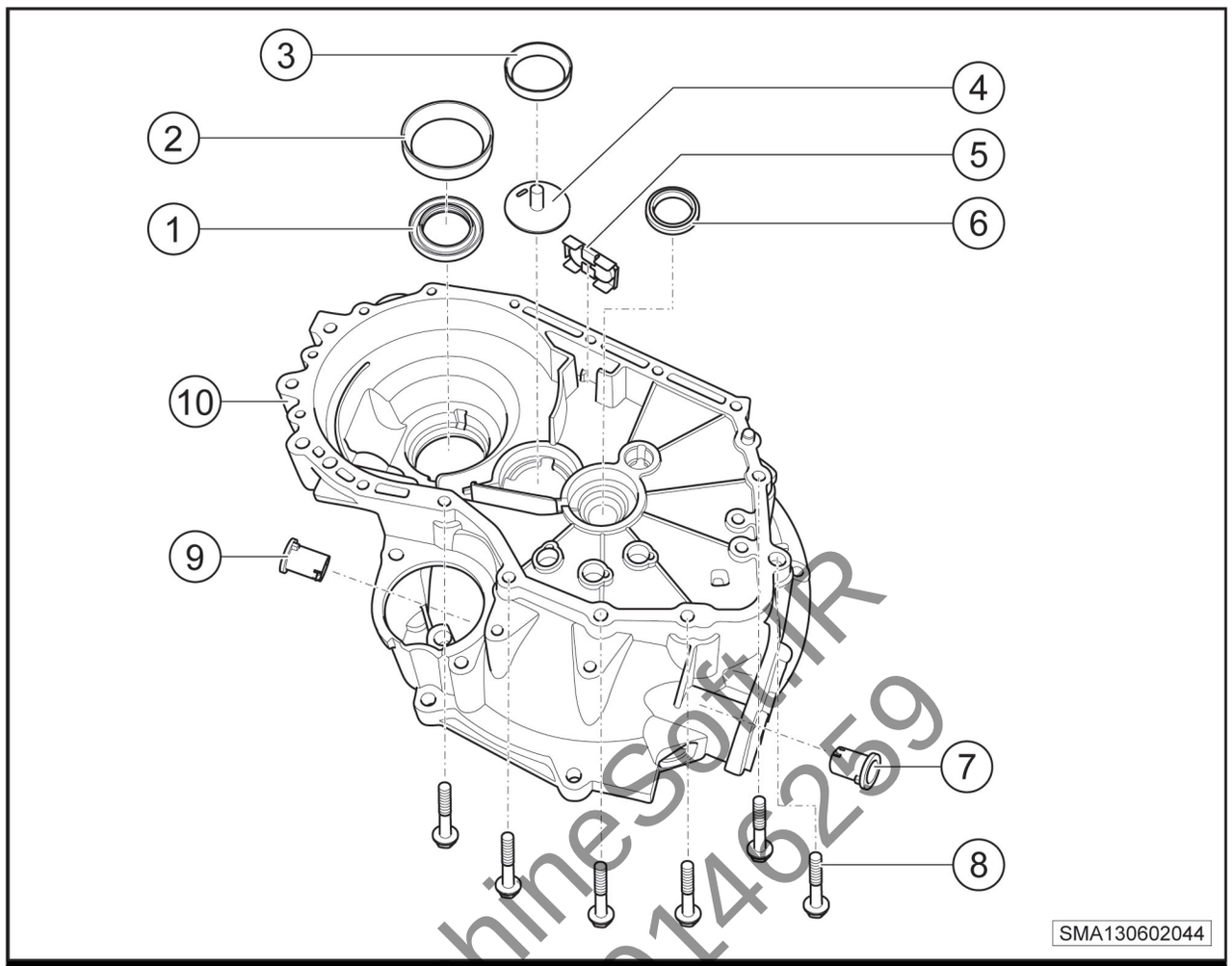
1. Fixing bolt of the gear selector arm bracket	2. Selector arm bracket
3. Gasket	4. Shift arm with balance block
5. Dust cover	6. Oil seal
7. Selector arm	8. Gear selector lever
9. Dowel pin	10. Dowel pin
11. Shift lever fork	12. Gear interlock bracket
13. Sleeve	14. Retainer
15. Spacer	16. Reverse gear locking mechanism bolt
17. Bolt washer	18. Reverse gear locking mechanism
19. Shift mechanism panel	

1.5 The transaxle housing drawing



1. Oil drain bolt	2. Housing fixing bolt
3. Oil seal	4. Oil limit bolt
5.Gasket	6.Bolt
7. Reverse gear switch	8. Shift mechanism lock bolt
9. 1st and 2nd gear lock bolt	10. Clapboard
11. 3rd and 4th gear lock bolt	12. Hook fixing bolt
13. Hook	14. 5th gear lock bolt
15. Transaxle housing	

1.6 Clutch housing drawing



1. Oil seal	2. Differential tapered bearing outer ring
3. Output shaft bearing outer ring	4. Oil deflector
5. Magnet	6. Input shaft oil seal
7. Sleeve	8. Housing fixing bolt
9. Sleeve	10. Clutch housing

2 Diagnosis and Inspection

2.1 The operation mechanism fault list

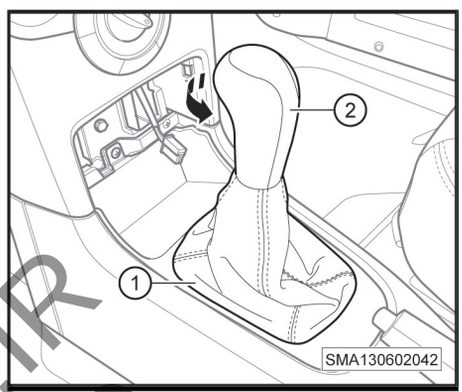
Condition	Cause	Troubleshooting
Gear shift difficulty	Improper adjustment of the clutch travel, and incomplete separation	Check and adjust the clutch travel
	Improper adjustment of the shift system or occurrence of interference	Check the shift cable
	Failure or wear of the synchronizer ring	Replace the damaged synchronizer ring
	Loosening of the shift fork fixing screw, or wear and distortion	Replace the damaged shift fork
Gear shift failure	Excessive clearance or loosening of the shift cable	Check and repair the shift cable
	Damage or serious distortion of the shift fork	Replace the damaged shift fork
	Loosening or damage of the shift actuator arm	Replace the damaged shift arm
Gear trip stop or disengagement	Wear of the synchronizer gear sleeve or the tapered gear surface	Replace the damaged synchronizer gear sleeve or the conjoint gear
	Self-locking spring failure	Replace the disabled self-locking spring
Abnormal noise of gear shift	Damage to the input and output shaft bearing	Replace the damaged bearing
	Bump or damage to the gear tooth surface	Check and replace the damaged gear
	Excessive axial gear clearance	Check and replace the gear shaft
	Low oil level and inadequate lubrication	Check for oil leakage and add lubricant
	Foreign matters within the transaxle assembly	Disassemble the housing and remove the foreign matter
Transaxle leakage	Excessive wear or damage to the oil seal	Replace the oil seal
	Uneven sealant coating or gasket damage	Disassemble the housing and reinstall it as required
	Late rectification of bumps on the joint surface	Replace the transaxle housing

3 Gear Selection and Shift Mechanism

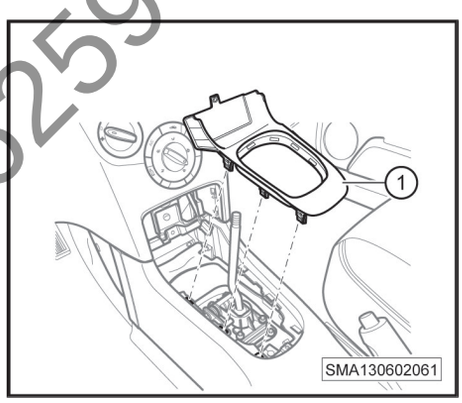
3.1 Removing and installing the shift handle

Removal

1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the ashtray => refer to page 1214.
3. Lever out the handle fixed panel (-1-).
4. Unscrew the shift handle (-2-) in the (-arrow-) direction.



5. Remove the shift handle (-1-).



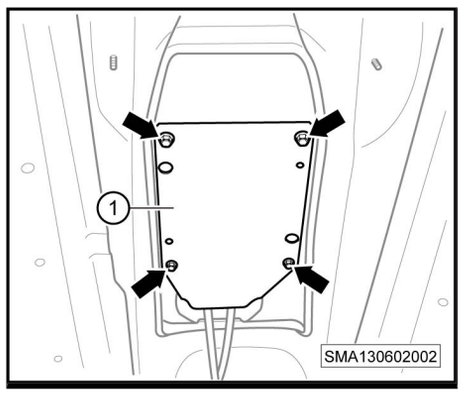
Installation

Installation shall follow the reverse sequence of the removal procedure.

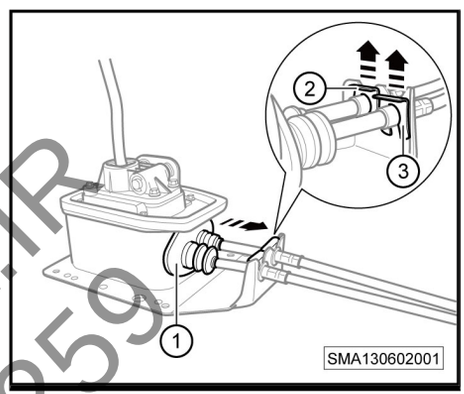
3.2 Removing and installing the shift lever assembly

Removal

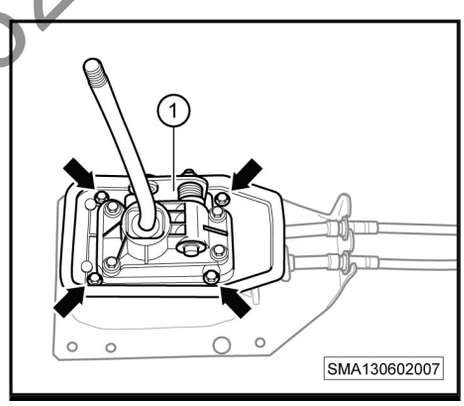
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the shift handle (-1-) => refer to page 913.
3. Remove the exhaust pipe => refer to page 232.
4. Remove the exhaust pipe heat shield.
5. Unscrew the fixing bolts (-arrow-) and remove the shift lever assembly (-1-).
   - Tightening torque of the bolt: 20±2 N•m



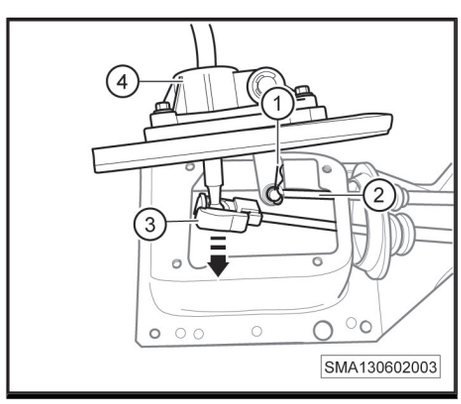
6. Remove the dust cover of the shift cable (-1-) in the (-arrow-) direction.
7. Loosen the shift cable clamp springs (-2-) and (-3-) in the (-arrow-) direction.



8. Unscrew the fixing bolts (-arrow-) and remove the panel (-1-).
   - Tightening torque of the bolt: 10±1 N•m



9. Remove the dowel pin (-1-) and the shift cable (-2-).
10. Remove the selection cable (-3-) in the (-arrow-) direction.
11. Remove the shift lever (-4-).

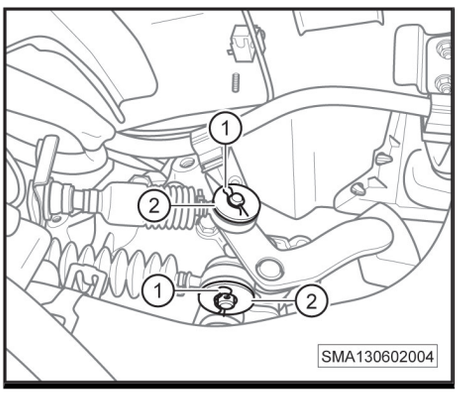


Installation

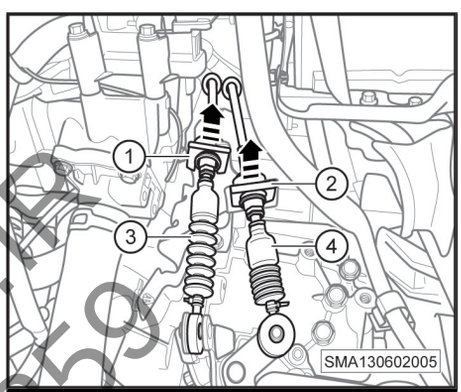
Installation shall follow the reverse sequence of the removal procedure.

3.3 Removing and installing the gear selection and shift cable

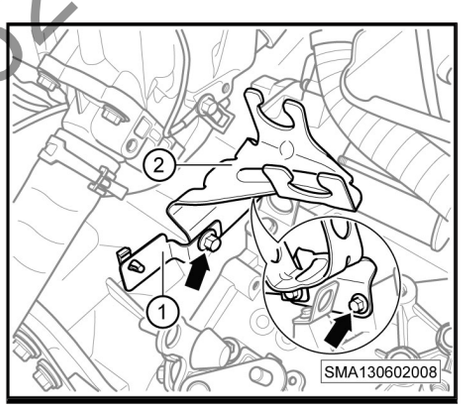
Removal



1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the air filter assembly => refer to page 239.
3. Remove the shift lever assembly => refer to page 914.
4. Remove the dowel pin (-1-) and the gasket (-2-) of the shift cable.



5. Release the selection cable clamp (-1-) and the shift cable clamp (-2-) in the (-arrow-) direction.
6. Remove the selection cable (-3-) and the shift cable (-4-).



7. Unscrew the fixing bolts (-arrow-).
   - Tightening torque of the bolt: 25±2 N•m
8. Remove the bracket (-1-) and the cable mounting bracket (-2-).

Installation

Installation shall follow the reverse sequence of the removal procedure.

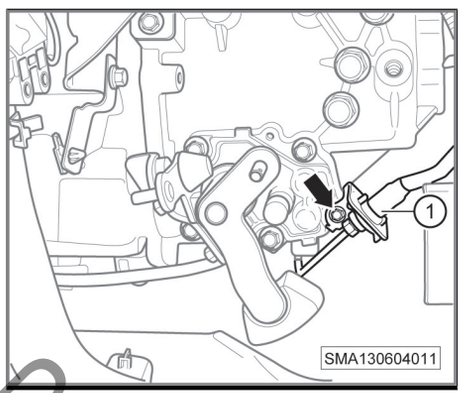
3.4 Removing and installing the gear selection and shift mechanism assembly

Note

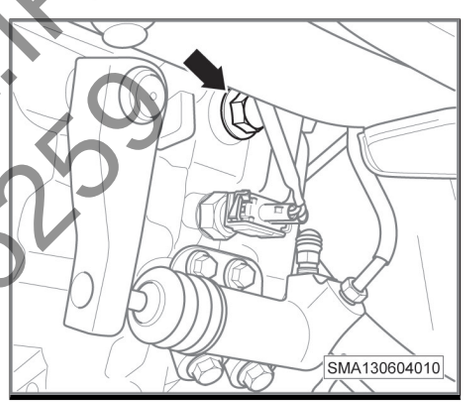
- During removal and installation of the gear selection and shift mechanism assembly, the transaxle shall be shifted to neutral.

Removal

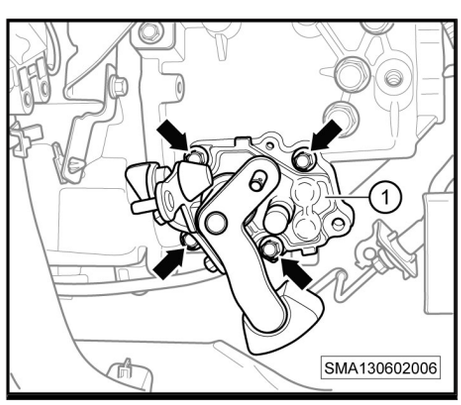
1. Remove the gear selection and shift cable => refer to page 915.
2. Unscrew the fixing bolt (-arrow-) of the hydraulic pipeline bracket.
   - Tightening torque of the bolt: 25±2 N•m
3. Move the mounting bracket and hose (-1-).



4. Unscrew the fixing bolt of the gear selection and shift mechanism (-arrow-).
   - Tightening torque of the bolt: 32±2.5 N•m



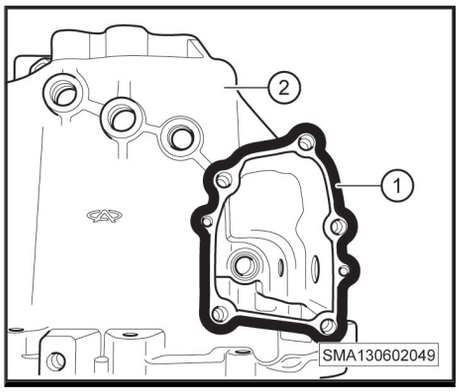
5. Unscrew the fixing bolts (-arrow-).
   - Tightening torque of the bolt: 25±2 N•m
6. Remove the gear selection and shift mechanism assembly (-1-).



Installation

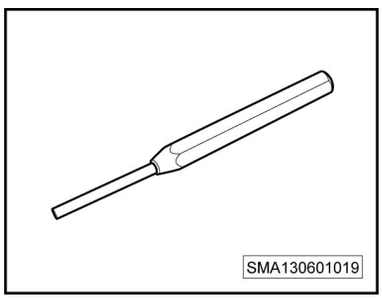
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Make sure that the joint surface between the housing and the gear selection and shift mechanism assembly (-2-) is clean and free of oil, and apply sealant (-1-) evenly.
- Tighten the bolts with the specified tightening torque.



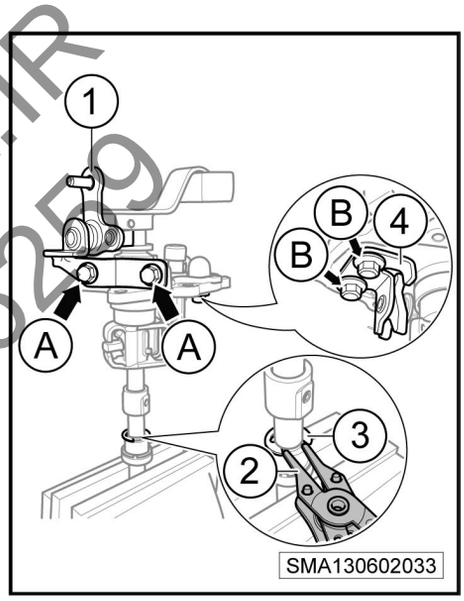
3.5 Disassembling the gear selection and shift mechanism assembly

Maintenance tools and common equipment

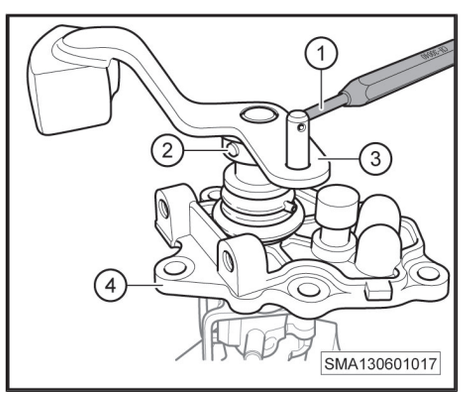
	
Punch	

Removal

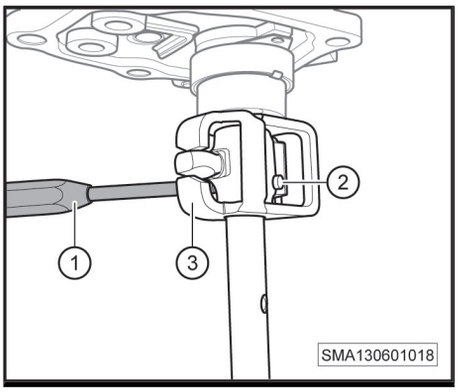
1. Remove the gear selection and shift mechanism assembly => refer to page 916.
2. Unscrew the fixing bolts (-arrow A-) of the gear selector arm bracket (-1-).
   - Tightening torque of the bolt: 25±2 N•m
3. Remove the gear selector arm bracket (-1-).
4. Remove the clamp spring (-3-) with a spring plier (-2-).
5. Unscrew the fixing bolts (-arrow B-) of the reverse gear locking mechanism, and remove the mechanism.
   - Tightening torque of the bolt: 18±2 N•m
6. Remove the reverse gear locking mechanism (-4-).



7. Knock out the dowel pin (-2-) with a punch (-1-).
8. Remove the shift arm (-3-) and the retaining board (-4-).



9. Knock out the dowel pin (-2-) with a punch (-1-).
10. Remove the shift lever (-3-).



Installation

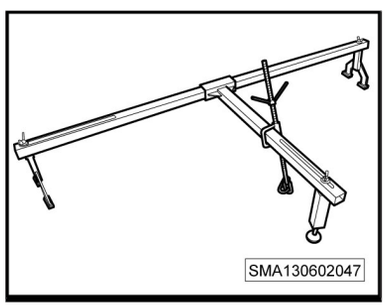
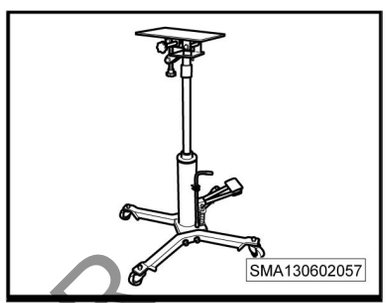
Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the bolts with the specified tightening torque.
- Replace the damaged dowel pin.

4 Transaxle Assembly

4.1 Removing and installing the transaxle assembly

Maintenance tools and common equipment

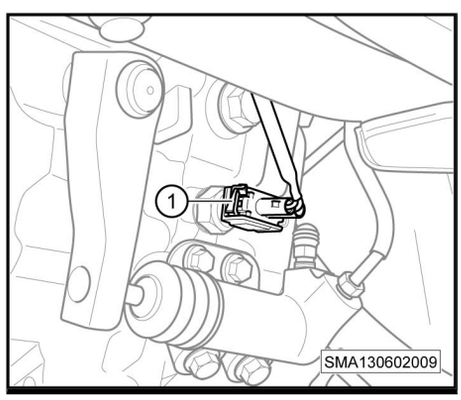
	
Engine hanger	Jack

Caution

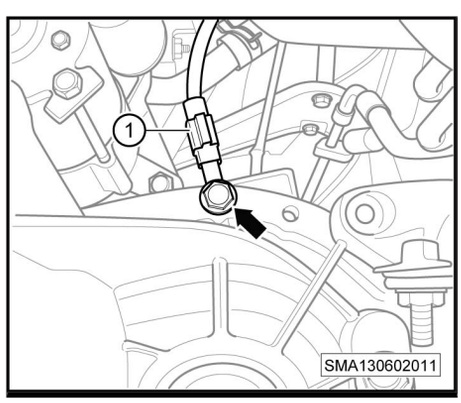
- When removing, installing and repairing the transaxle assembly, two or more technicians are needed to assist the operation.

Removal

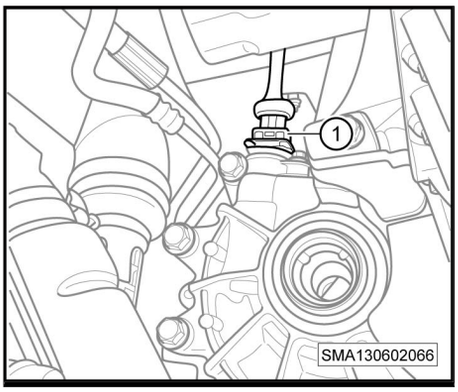
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Remove the starter => refer to page 979.
3. Remove the air filter => refer to page 239.
4. Remove the axle shaft => refer to page 618.
5. Remove the gear selection cable and the shift cable => refer to page 915.
6. Remove the hydraulic clutch pipeline => refer to page 896.
7. Discharge the transaxle lubricant => refer to page 37.
8. Disconnect the reverse gear switch connector (-1-).



9. Unscrew the fixing bolt (-arrow-) of the earth wire (-1-).
   - Tightening torque of the bolt: 10±2 N•m

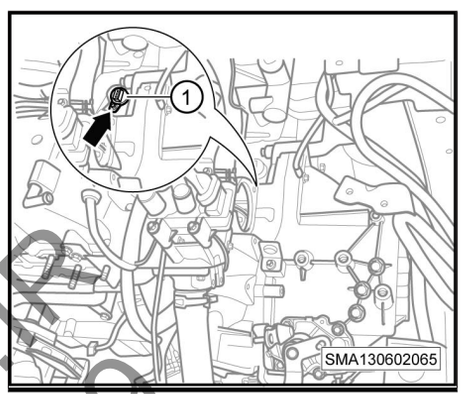


10. Disconnect the odometer sensor connector (-1-).



11. Unscrew the fixing bolt of the odometer sensor (-arrow-) and remove the sensor (-1-).

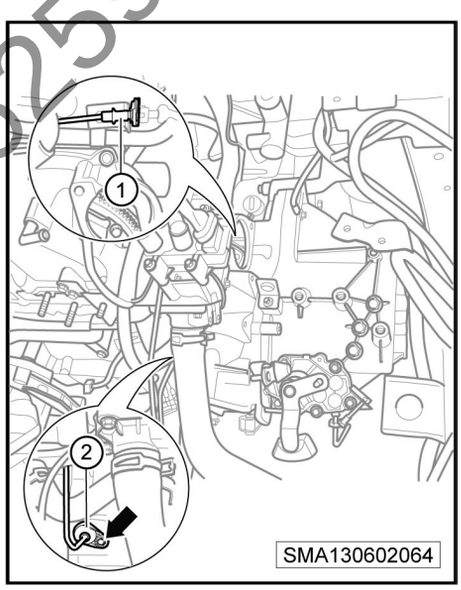
- Tightening torque of the bolt: 10±2 N•m



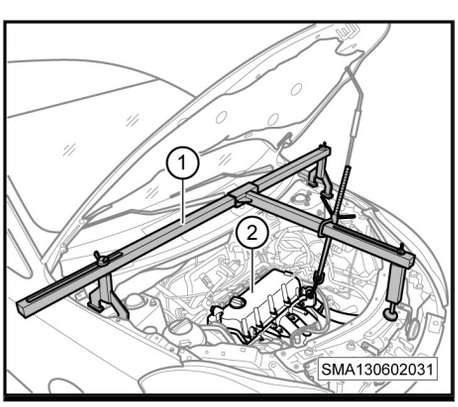
12. Disconnect the crankshaft position sensor connector (-1-).

13. Unscrew the fixing bolt of the crankshaft position sensor (-arrow-) and remove the sensor (-2-).

- Tightening torque of the bolt: 10±2 N•m

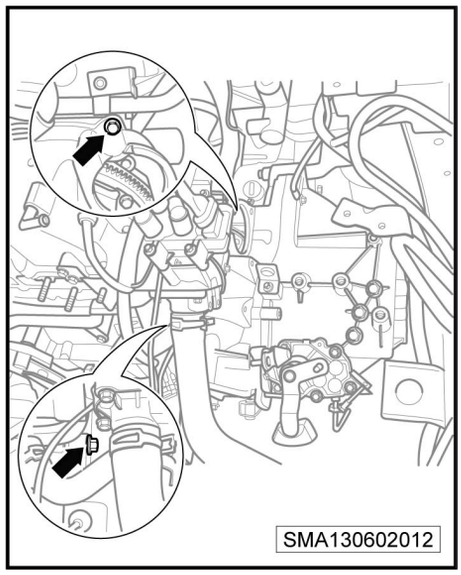


14. Fix the engine assembly (-2-) with the engine hanger (-1-).



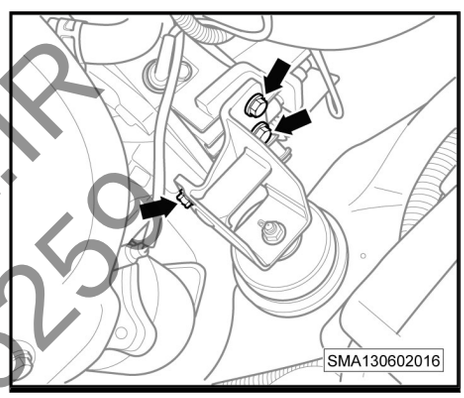
15. Unscrew the upper fixing bolts of the transaxle (-arrow-).

- Tightening torque of the bolt: 45±5 N•m



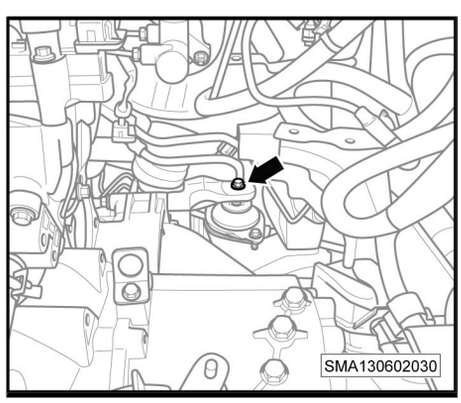
16. Unscrew the fixing bolts of the front mount (-arrow-).

- Tightening torque of the bolt: 46±5 N•m

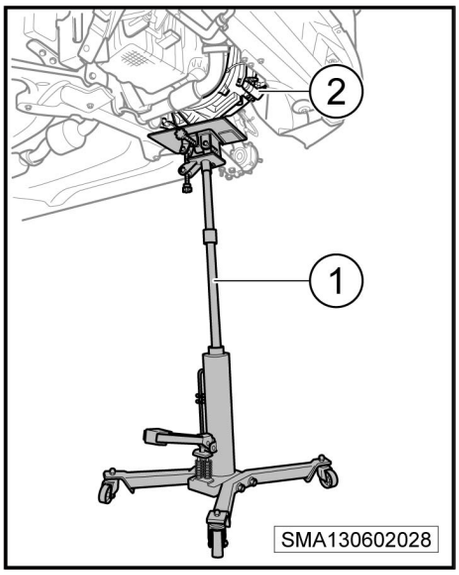


17. Unscrew the fixing bolt of the transaxle side mount (-arrow-).

- Tightening torque of the bolt: 46±5 N•m

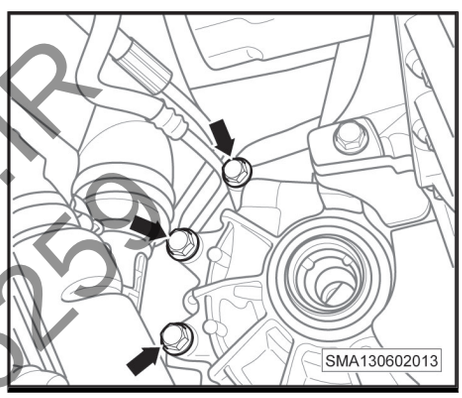


18. Lift the vehicle and hold the transaxle assembly (-2-) with the jack (-1-).



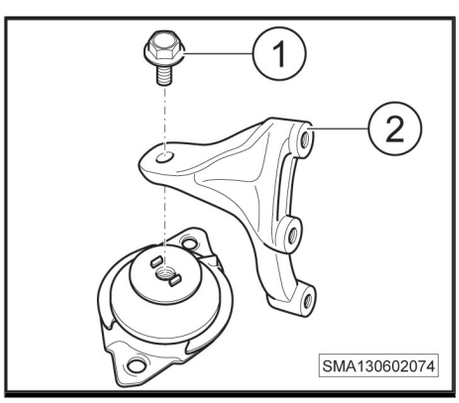
19. Unscrew the coupling bolts between the transaxle and the mount (-arrow-).

- Tightening torque of the bolt: 46±5 N•m



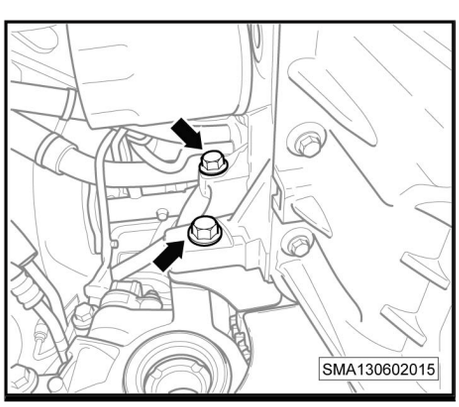
20. Remove the fixing bolt of the transaxle side mount (-1-).

21. Remove the transaxle side mount (-2-).



22. Unscrew the coupling bolts between the transaxle and the engine (-arrow-).

- Tightening torque of the bolt: 45±5 N•m

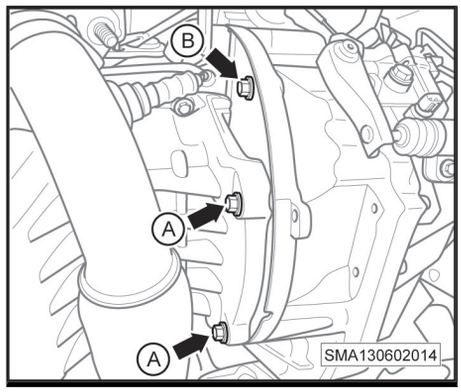


23. Unscrew the coupling bolts between the transaxle and the engine (-arrow A-).

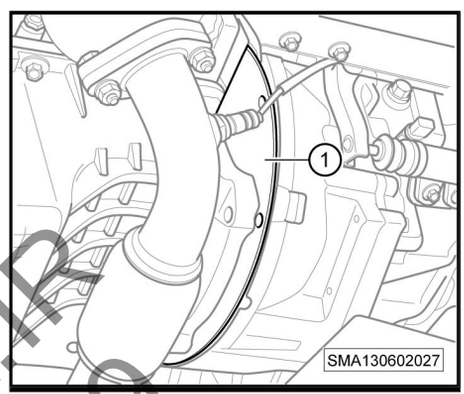
- Tightening torque of bolt A: 45±5 N•m

24. Unscrew the fixing bolt of the transaxle partition wall (-arrow B-).

- Tightening torque of bolt B: 45±5 N•m

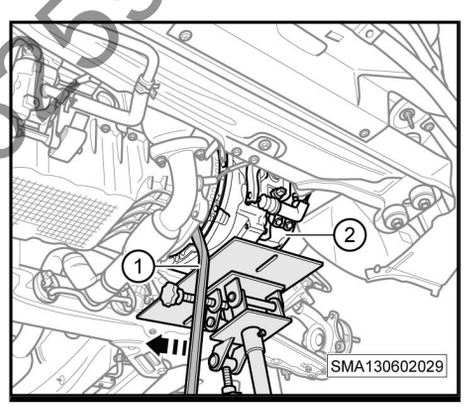


25. Remove the transaxle partition wall (-1-).



26. Separate the transaxle assembly (-2-) from the engine in the (-arrow-) direction with a crowbar (-1-).

27. Remove the transaxle assembly.



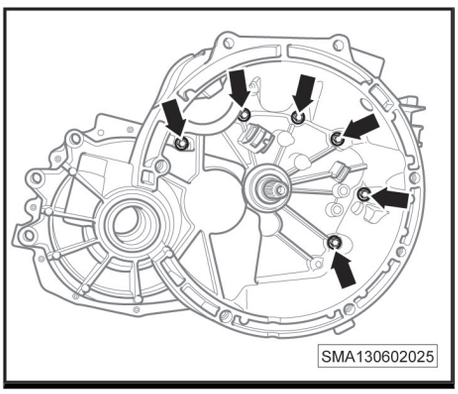
Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

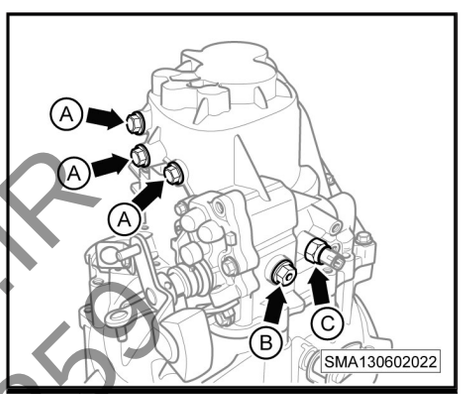
- Clean the input shaft spline and apply grease on the spline.
- Pay attention to the length and position of the bolts. The transaxle fixing bolts are not interchangeable.
- Only remove the engine hanger after you make sure the transaxle is completely fixed.
- Check and add transaxle lubricant => refer to page 37.
- Discharging the air from the hydraulic clutch system is required => refer to page 898.
- Checking the clutch pedal travel is required => refer to page 889.

4.2 Disassembling and assembling the transaxle assembly

Removal



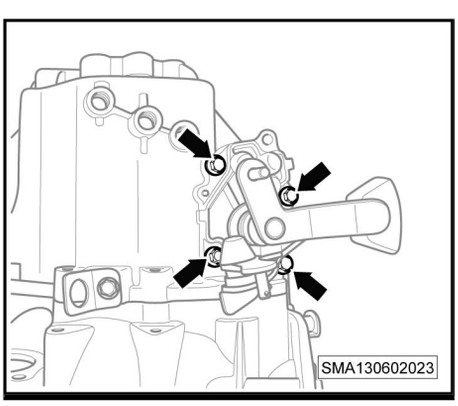
1. Remove the transaxle assembly => refer to page 920.
2. Remove the release bearing => refer to page 900.
3. Unscrew the fixing bolts of the transaxle housing (-arrow-).
   - Tightening torque of the bolt: 25±2 N•m



4. Unscrew the gear lock bolts (-arrow A-).
   - Tightening torque of bolt A: 20±2 N•m
5. Unscrew the locating bolt of the gear shift mechanism (-arrow B-).
   - Tightening torque of bolt B: 32±2.5 N•m
6. Unscrew the reverse light switch (-arrow C-).
   - Tightening torque of the reverse light switch: 25±2 N•m

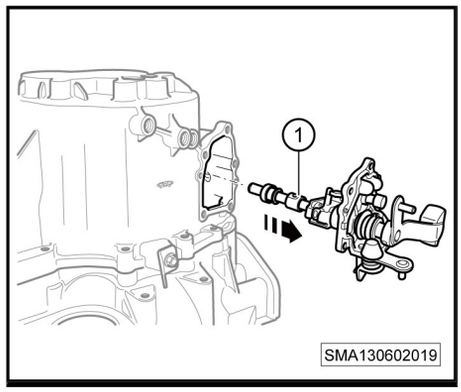
Note

- During removal and installation of the gear selection and shift mechanism assembly, the transaxle shall be shifted to neutral.

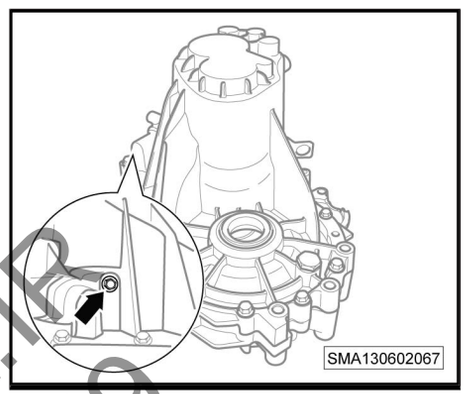


7. Unscrew the fixing bolts of the gear shift assembly (-arrow-).
   - Tightening torque of the bolt: 25±2 N•m

8. Remove the gear shift assembly (-1-) in the (-arrow-) direction.

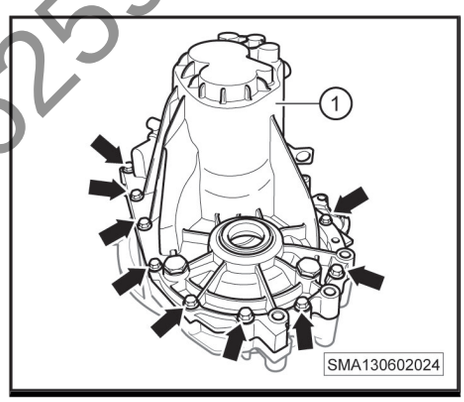


9. Unscrew the fixing bolt of the reverse gear idler shaft (-arrow-).
   - Tightening torque of the bolt: 38±2.5 N•m



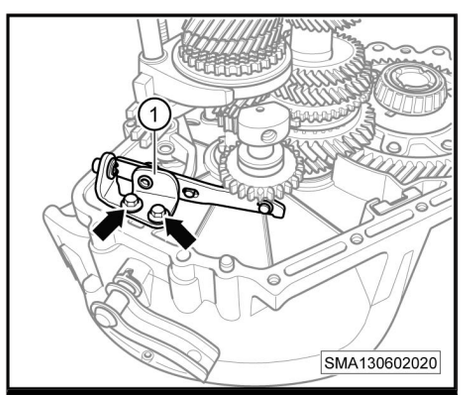
10. Unscrew the fixing bolts of the transaxle housing (-arrow-).
    - Tightening torque of the bolt: 25±2 N•m

11. Gently knock the transaxle housing (-1-) with a hand hammer and remove it.

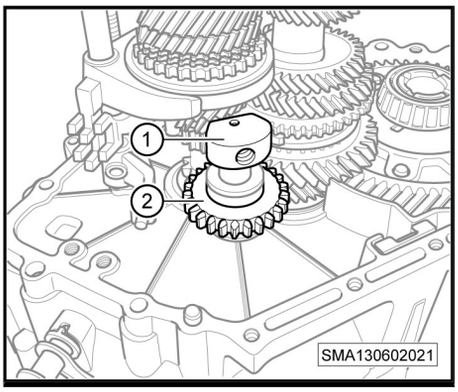


12. Unscrew the fixing bolts of the reverse gear fork (-arrow-).
    - Tightening torque of the bolt: 25±2 N•m

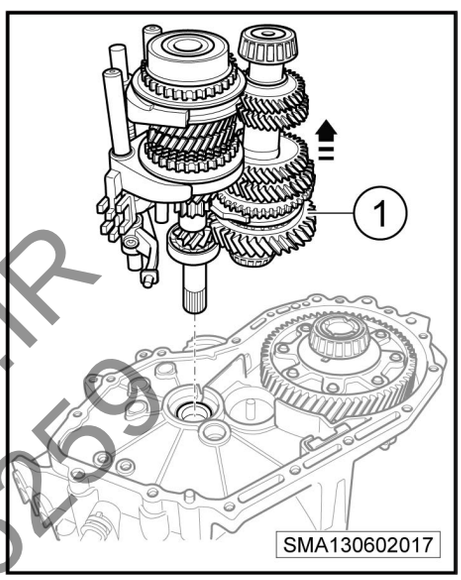
13. Remove the reverse gear fork (-1-).



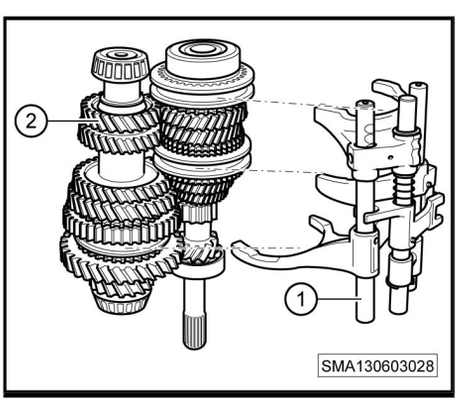
14. Remove the reverse gear idler shaft (-1-) and the reverse gear (-2-).



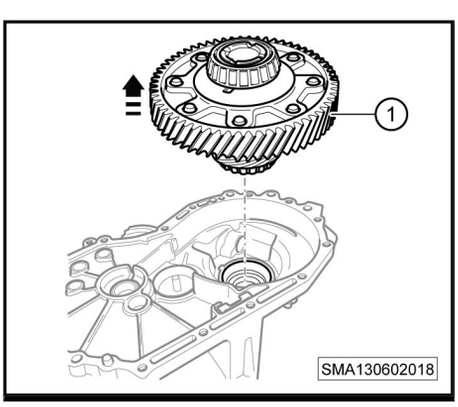
15. Remove the input and output shaft assembly (-1-) in the (-arrow-) direction.



16. Remove the shift fork assembly (-1-) from the input and output shaft assembly.



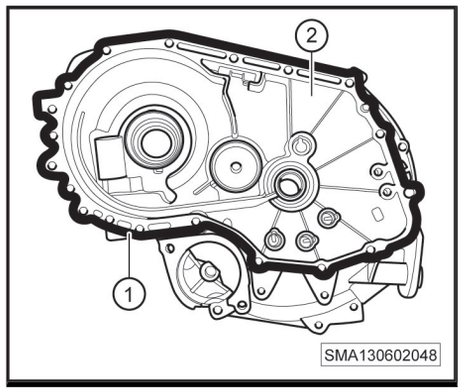
17. Remove the differential assembly (-1-) in the (-arrow-) direction.



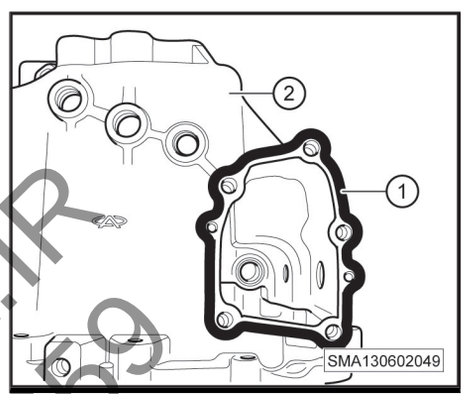
Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- It is required to remove the sealant residue on the housing (-2-).
- Make sure that the joint surface of the housing (-2-) is clean and free of oil, and apply sealant (-1-) evenly.
- Tighten the bolts with the specified tightening torque.



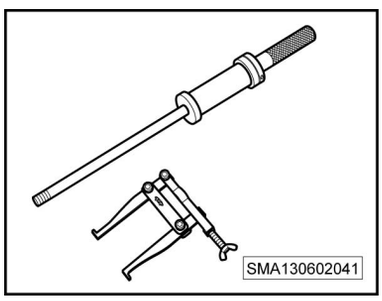
- Make sure that the joint surface between the housing and gear shift assembly (-2-) is clean and free of oil, and apply sealant (-1-) evenly.
- Tighten the bolts with the specified tightening torque.



5 Transaxle Housing

5.1 Disassembling the transaxle housing

Maintenance tools and common equipment

	
Bearing inner ring remover and puller	

Note

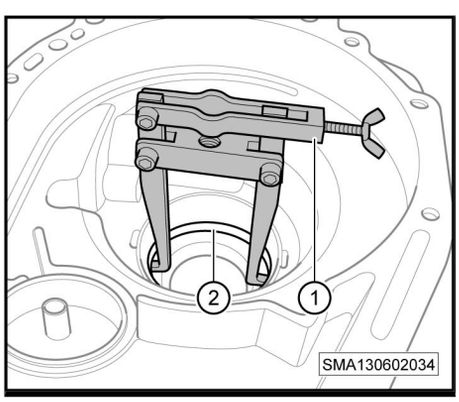
- The procedures of removing the transaxle housing, the differential bearing outer ring on the clutch housing and the oil seal are the same.

Caution

- The oil seal cannot be reused and must be replaced after removal.

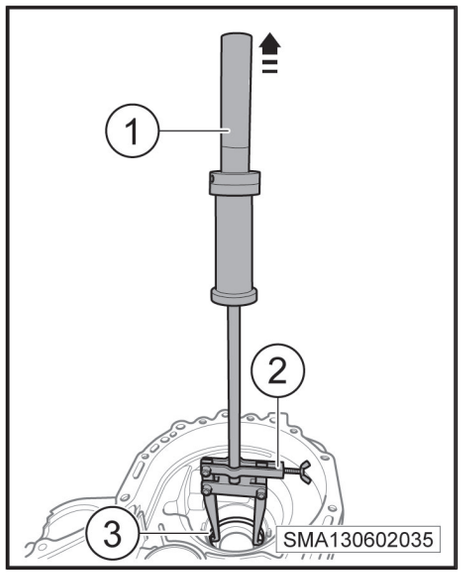
Disassembly

1. Fix the bearing inner ring remover (-1-) on the bearing outer ring (-2-).

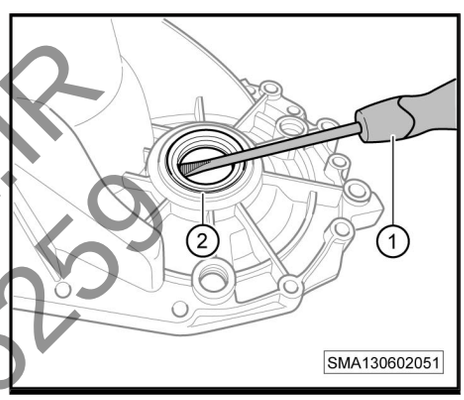


2. Install the puller (-1-) on the bearing inner ring remover (-2-).

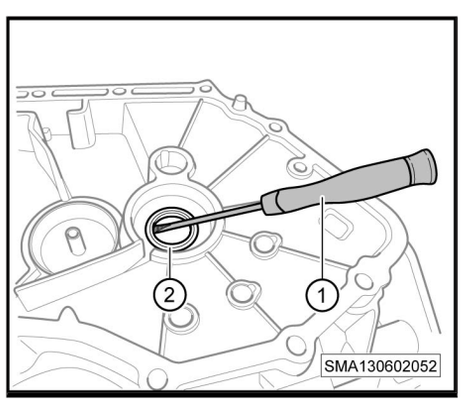
3. Pull out the bearing outer ring (-3-) in the (-arrow-) direction with the puller.



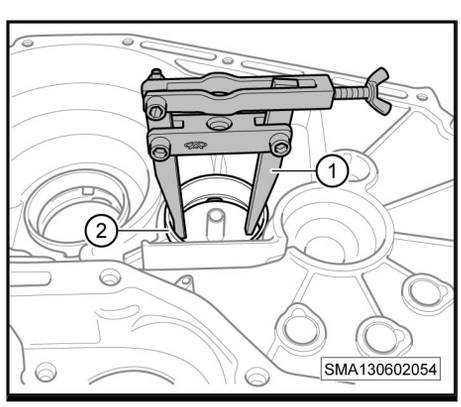
4. Lever out the axle shaft oil seal (-2-) with the slotted screwdriver (-1-).



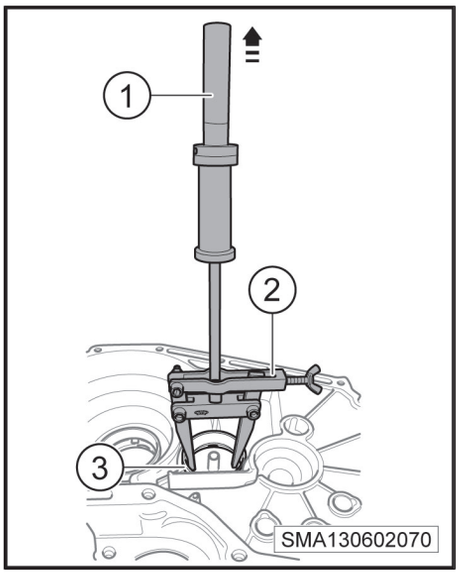
5. Lever out the input shaft oil seal (-2-) with the slotted screwdriver (-1-).



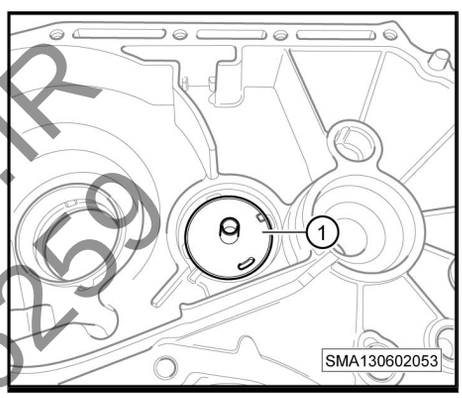
6. Fix the remover (-1-) on the output shaft bearing outer ring (-2-).



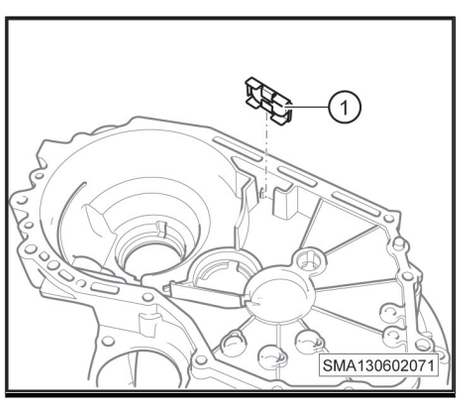
7. Install the puller (-1-) on the bearing inner ring remover (-2-).
8. Pull out the output shaft bearing outer ring (-3-) in the (-arrow-) direction with the puller.



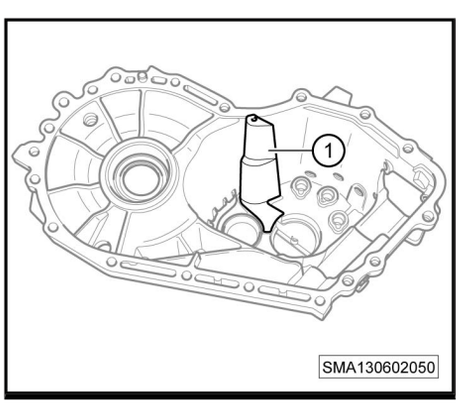
9. Remove the oil deflector (-1-).



10. Remove the magnet (-1-).

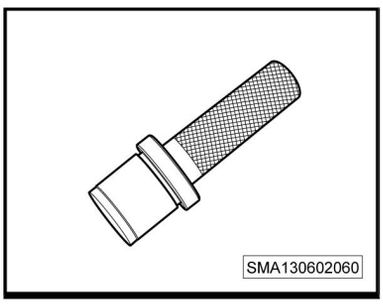
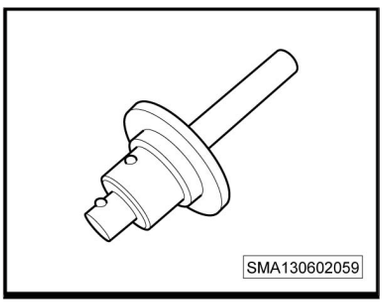
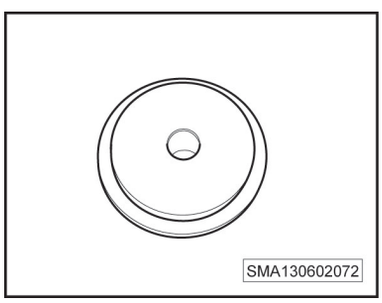


11. Remove the baffle (-1-).



5.2 Assembling the transaxle housing

Maintenance tools and common equipment

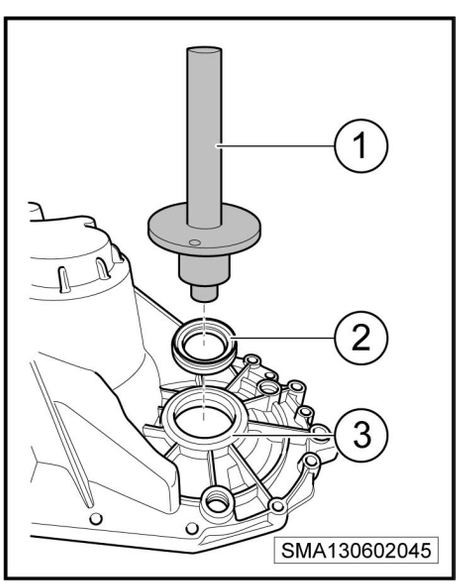
	
Input shaft oil seal installation tool	Axle shaft oil seal installation tool
	
Bearing outer ring installation tool	

Note

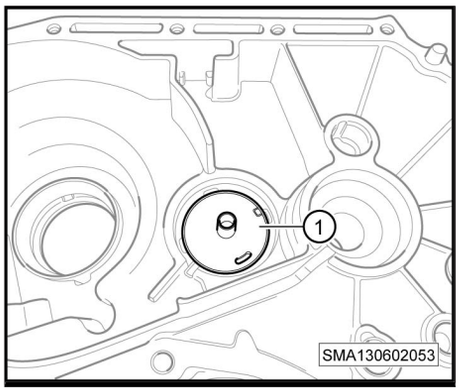
- The procedures of installing the transaxle housing, the differential bearing outer ring on the clutch housing and the axle shaft oil seal are the same.

Assembly

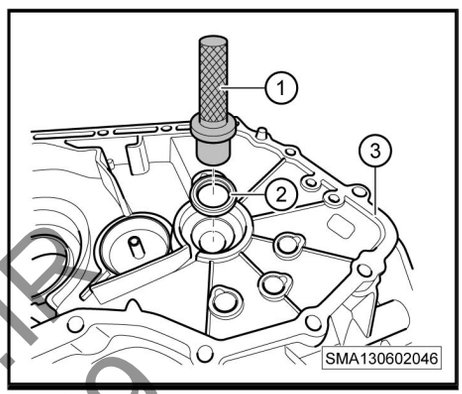
1. Install the axle shaft oil seal (-2-) to the transaxle housing (-3-) with the tool (-1-).



2. Install the oil deflector (-1-).

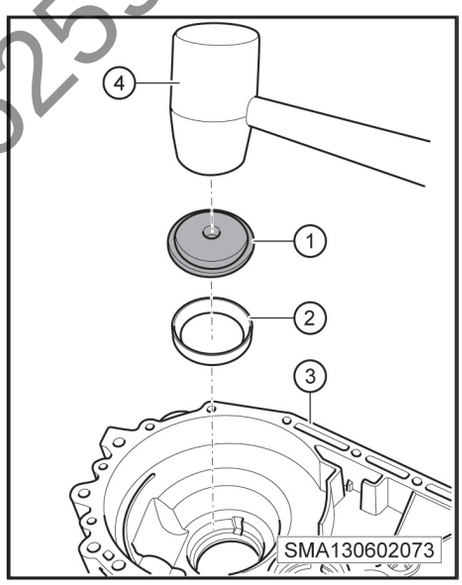


3. Install the input shaft oil seal (-2-) to the transaxle housing (-3-) with the tool (-1-).

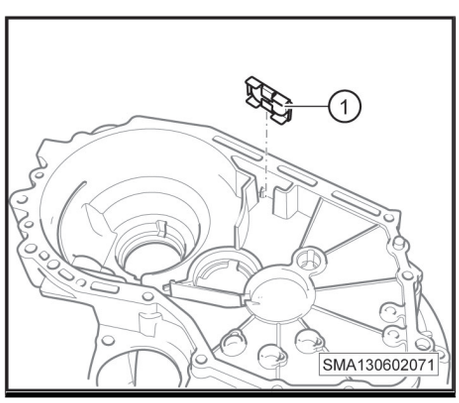


4. Install the bearing outer ring installation tool (-1-) onto the bearing outer ring (-2-).

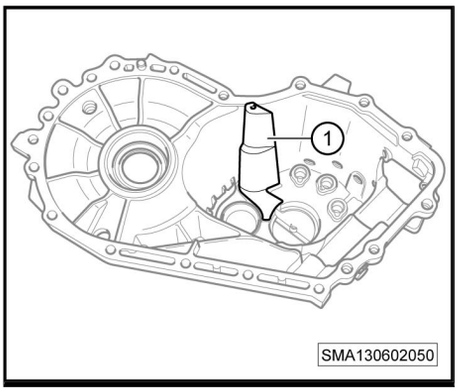
5. Install the bearing outer ring into the housing (-3-) with a hand hammer (-4-).



6. Install the magnet (-1-).



7. Install the baffle (-1-).

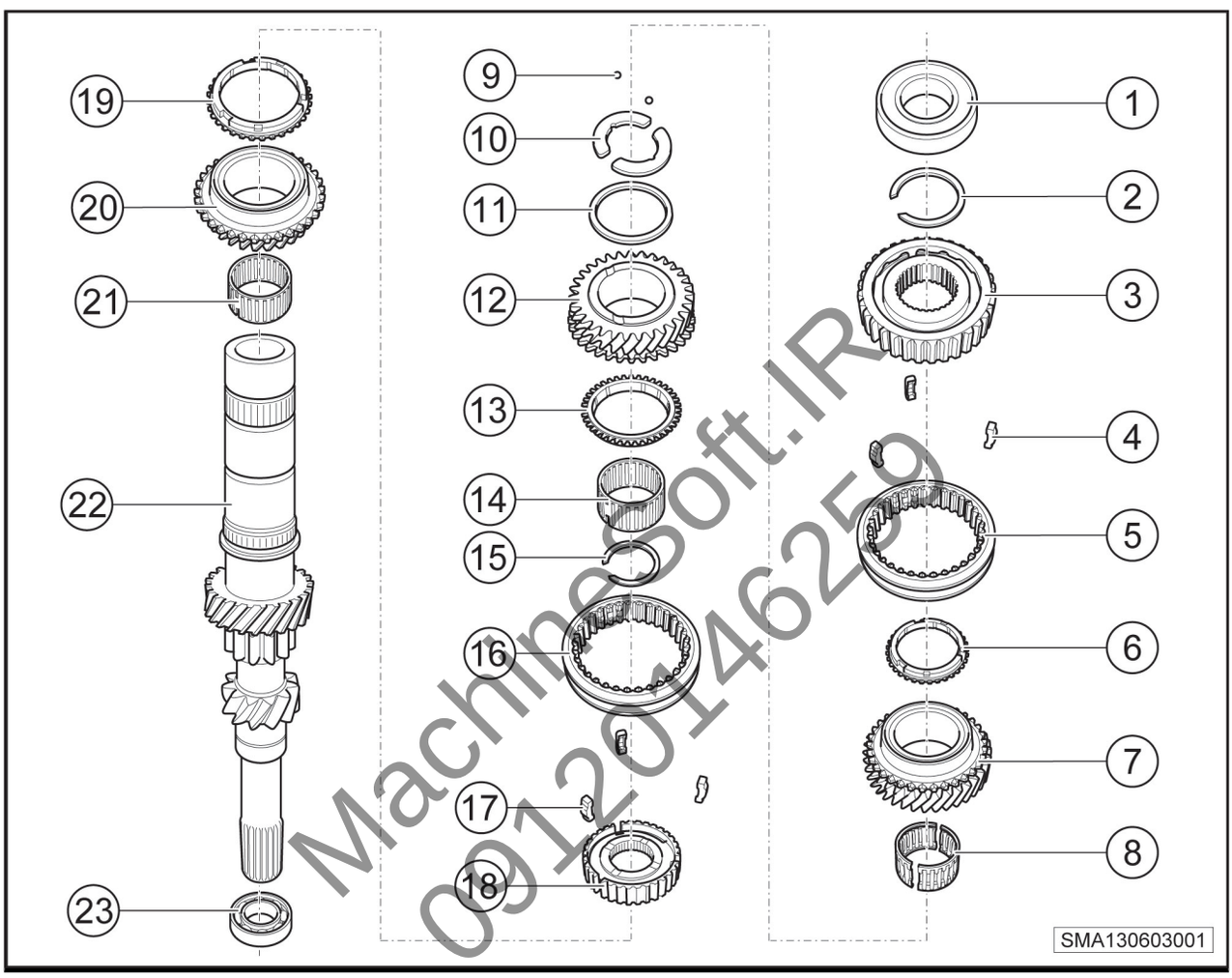


0603 Gear and Shaft

06

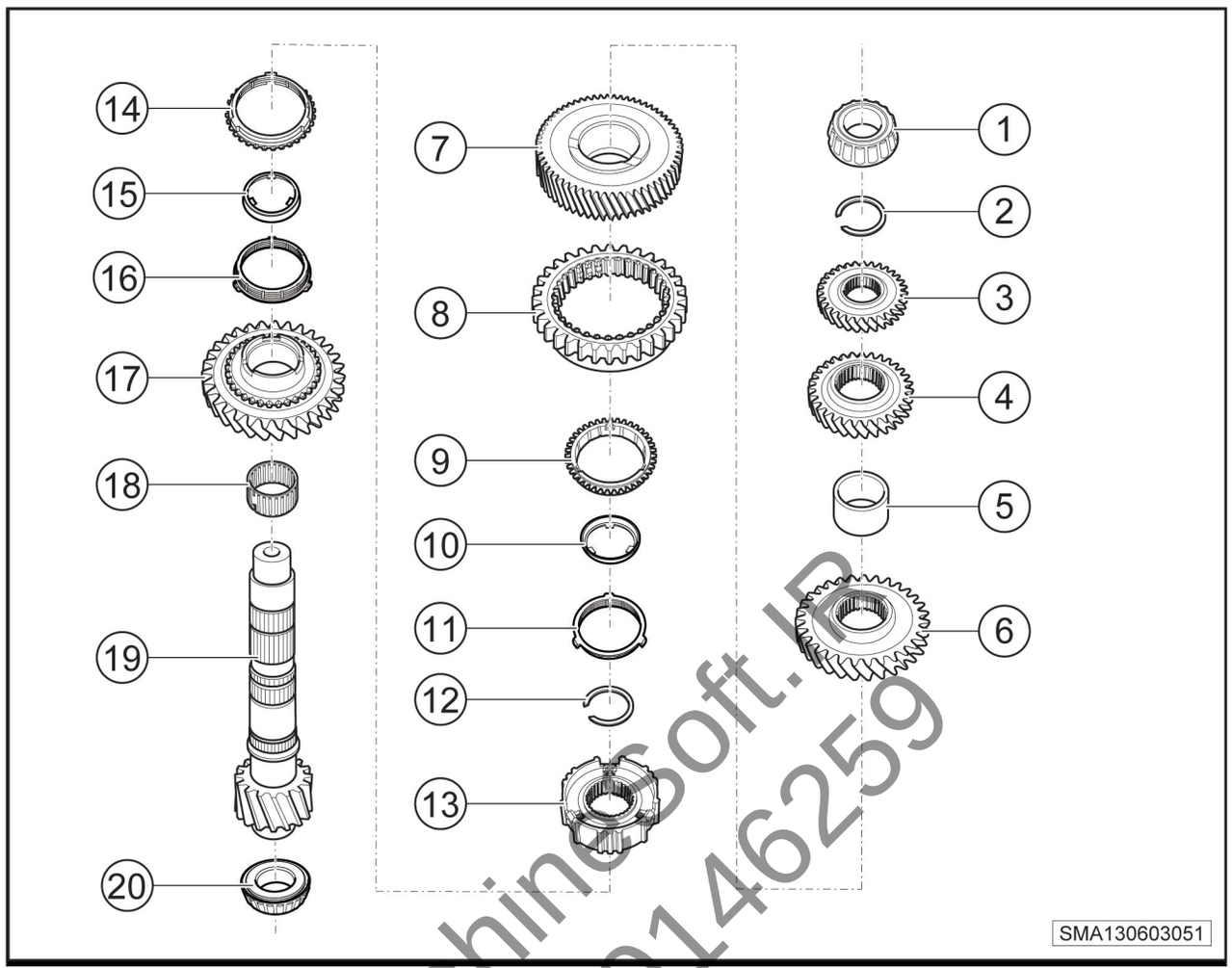
1 General Information

1.1 The input shaft assembly drawing



1. Input shaft rear bearing	2. Rear clamp spring
3. 5th gear synchronizing gear	4. 5th gear synchronizer cotter
5. 5th gear synchronizer outer ring	6. 5th gear synchronizing ring
7. 5th speed gear	8. 5th gear needle bearing
9. Steel ball	10. Gear baffle
11. Gear baffle clamp spring	12. 4th gear driving gear
13. 4th gear synchronizing ring	14. 4th gear needle bearing
15. Front clamp spring	16. 3rd and 4th gear synchronizer outer ring
17. 3rd and 4th gear synchronizer cotter	18. 3rd and 4th synchronizing gear
19. 3rd gear synchronizing ring	20. 3rd gear driving gear
21. 3rd needle bearing	22. Input shaft
23. Input shaft front bearing	

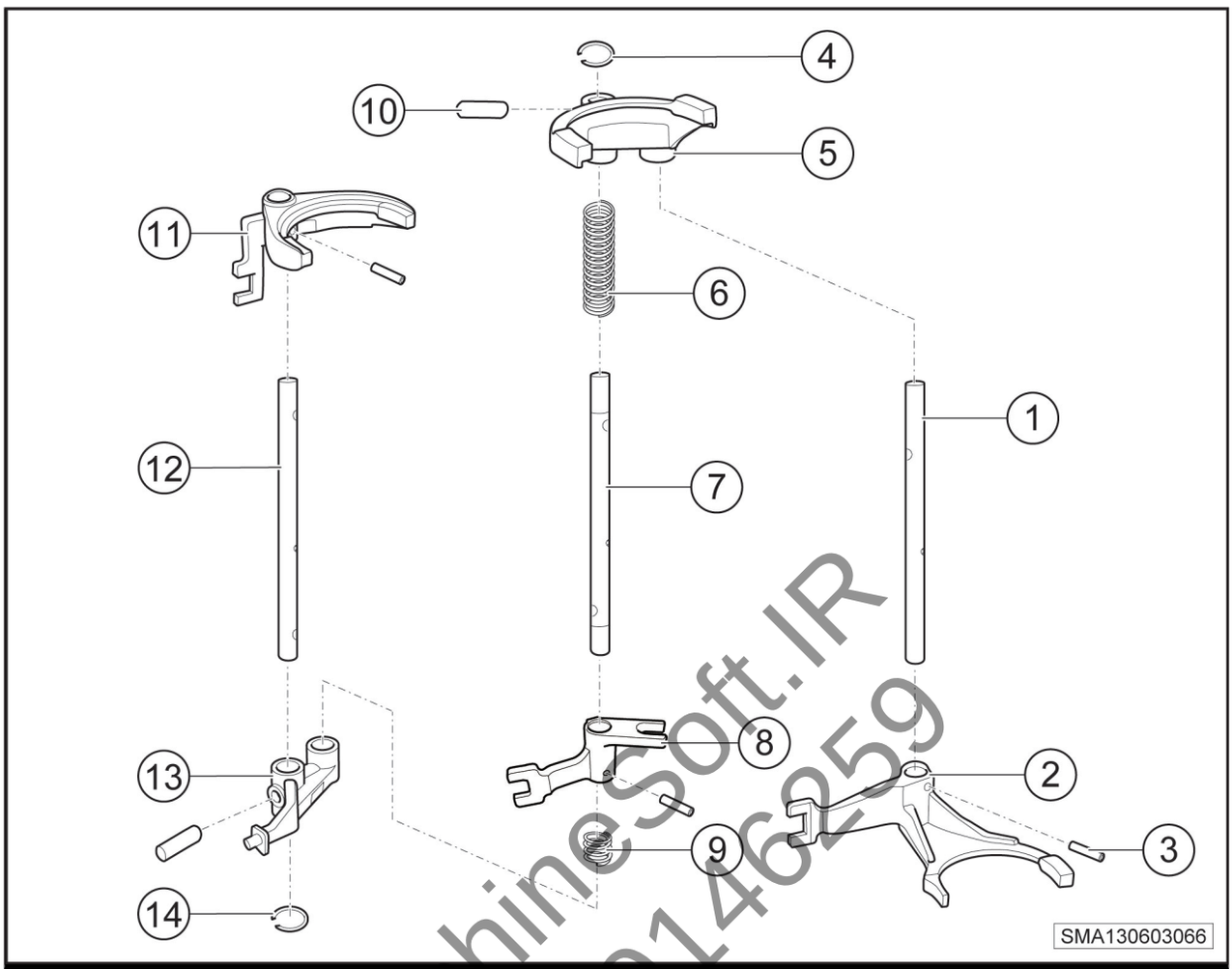
1.2 The output shaft assembly drawing



1. Output shaft rear bearing	2. Rear clamp spring
3. 5th gear driven gear	4. 4th gear driven gear
5. Gear bushing	6. 3rd gear driven gear
7. 2nd gear driven gear	8. 1st and 2nd gear synchronizer outer ring
9. 2nd gear synchronizer inner ring	10. 2nd gear synchronizer middle ring
11. 2nd gear synchronizer outer ring	12. Front clamp spring
13. 1st and 2nd gear synchronizer gear	14. 1st gear synchronizer outer ring
15. 1st gear synchronizer middle ring	16. 1st gear synchronizer inner ring
17. 1st gear driven gear	18. 1st gear needle bearing
19. Output shaft	20. Output shaft front bearing

06

1.3 The shift fork assembly drawing

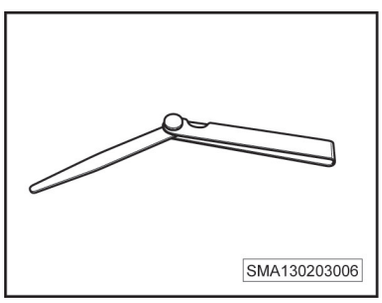


1. 1st and 2nd gear fork shaft	2. 1st and 2nd gear fork
3. Fork dowel pin	4. 5th gear fork fixing ring
5. 5th gear fork	6. 5th gear fork return spring
7. 5th and reverse gear fork shaft	8. 5th and reverse gear fork bracket
9. 5th and reverse gear fork bracket return spring	10. Interlock pin
11. 3rd and 4th gear fork	12. 3rd and 4th gear fork shaft
13. Reverse gear fork	14. Reverse gear fork fixing ring

2 Diagnosis and Inspection

2.1 Checking the synchronizing ring and gear

Maintenance tools and common equipment

	
Clearance gauge	

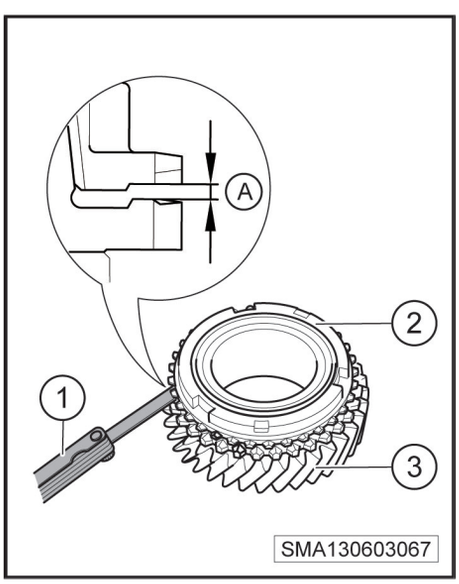
Note

- The procedures of checking the clearance of all the synchronizing rings are the same.
- If the clearance between the synchronizing ring and the synchronizing gear is less than 0.5 mm, it indicates the synchronizing ring has been excessively worn and shall be replaced.

Checking the synchronizing ring

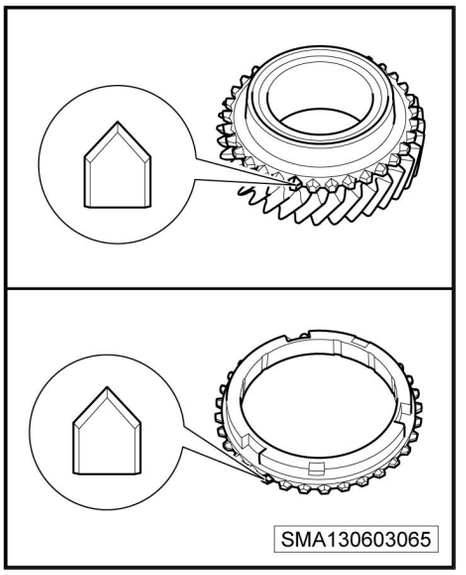
1. Check the clearance (-A-) between the synchronizing ring (-2-) and the synchronizing gear (-3-) with a clearance gauge (-1-).

Gear	Standard clearance
1st and 2nd gear synchronizing ring	1.7±0.39 mm
3rd, 4th and 5th gear synchronizing ring	1.35±0.39 mm



Checking the synchronizing gear

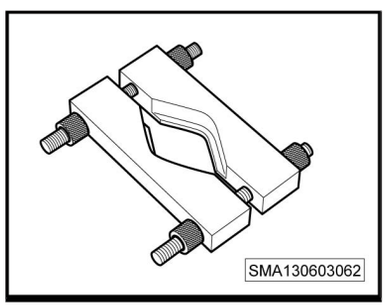
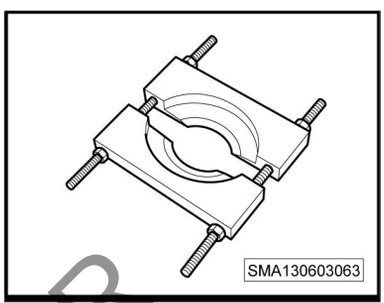
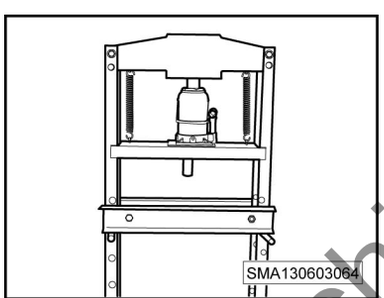
1. Check the synchronizing gear and ring of each gear for wear.
2. If the wear is serious, please replace the synchronizing gear and ring together.



3 Input Shaft

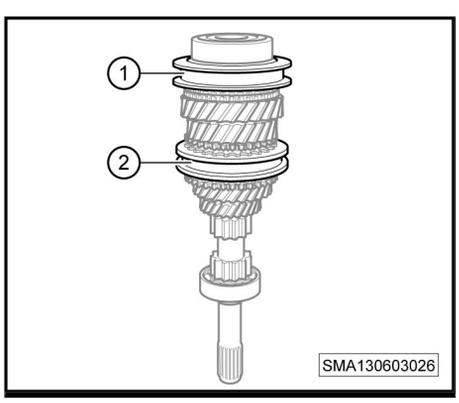
3.1 Disassembling the input shaft

Maintenance tools and common equipment

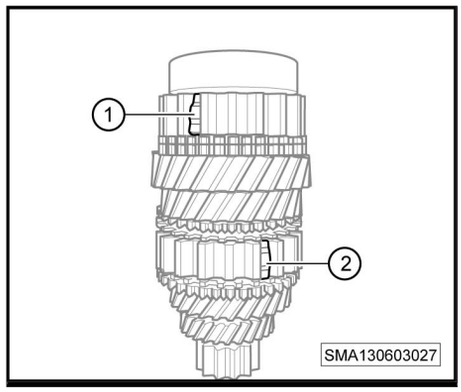
 SMA130603062	 SMA130603063
Gear retaining tool	Gear retaining tool
 SMA130603064	
Hydraulic press	

Disassembly

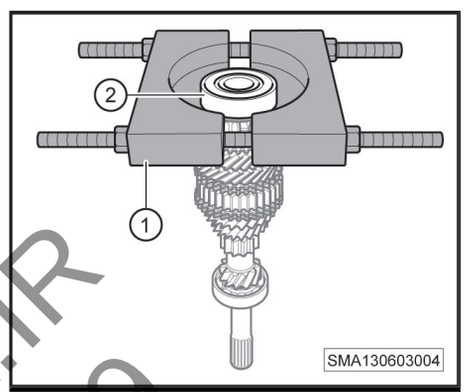
1. Remove the input shaft => refer to page 920.
2. Remove the 5th gear synchronizer outer ring (-1-).
3. Remove the 3rd and 4th gear synchronizer outer ring (-2-).



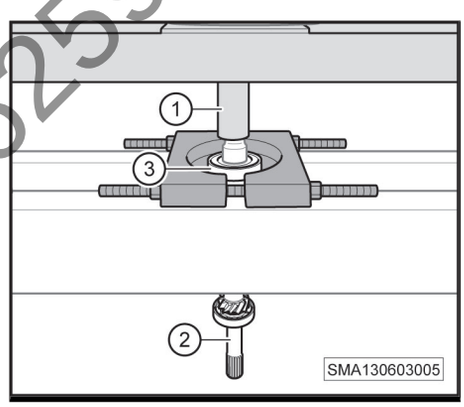
4. Remove the 5th gear synchronizer cotter (-1-).
5. Remove the 3rd and 4th gear synchronizer cotter (-2-).



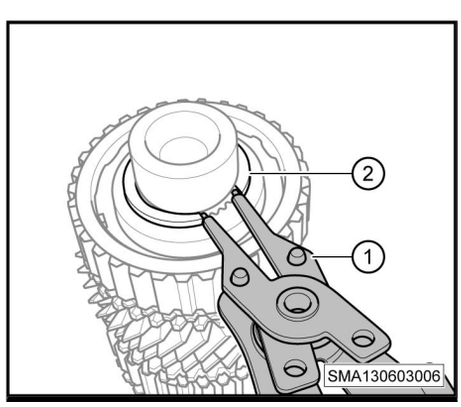
6. Fix the input shaft rear bearing (-2-) with the special tool (-1-).



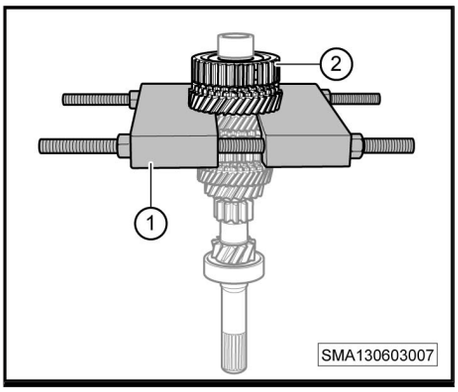
7. Press out the input shaft (-2-) with the hydraulic press (-1-).
8. Remove the input shaft rear bearing (-3-).



9. Remove the rear clamp spring (-2-) with the spring plier (-1-).

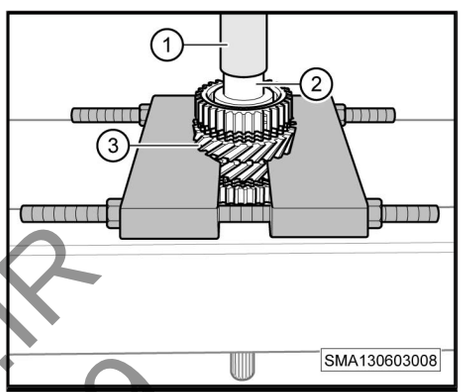


10. Fix the 5th gear driving gear (-2-) with the special tool (-1-).

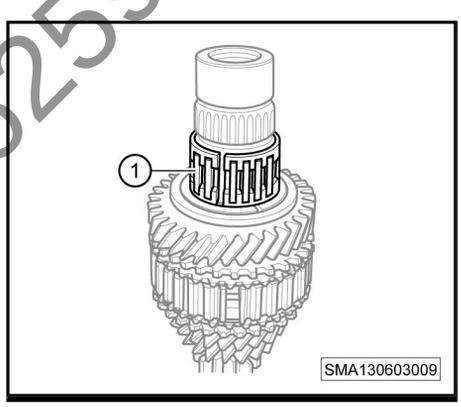


11. Press out the input shaft (-2-) with the hydraulic press (-1-).

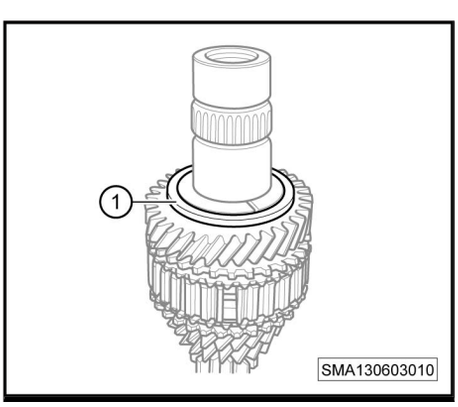
12. Remove the 5th gear driving gear and the synchronizing gear (-3-).



13. Remove the 5th gear needle bearing (-1-).

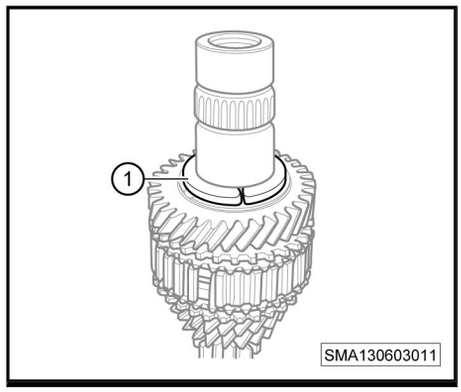


14. Remove the gear baffle clamp spring (-1-).

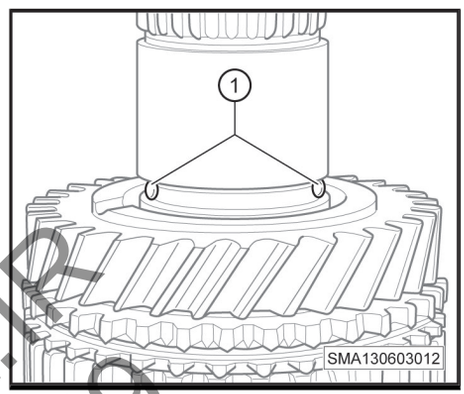


06

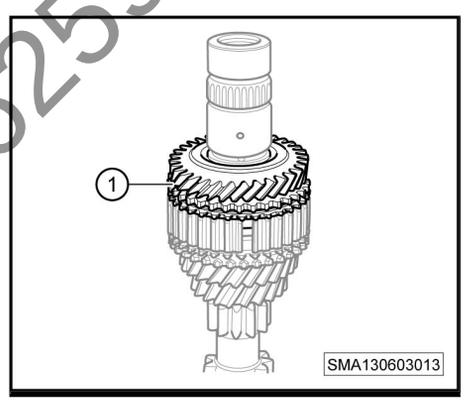
15. Remove the gear baffle (-1-).



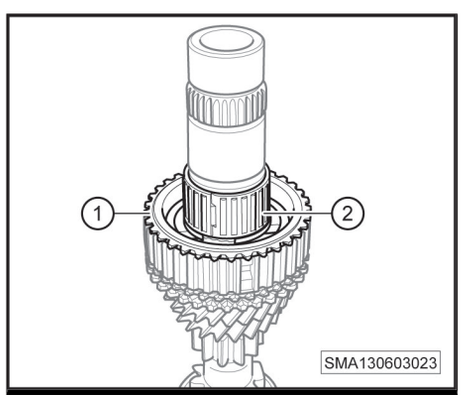
16. Remove the steel balls (-1-).



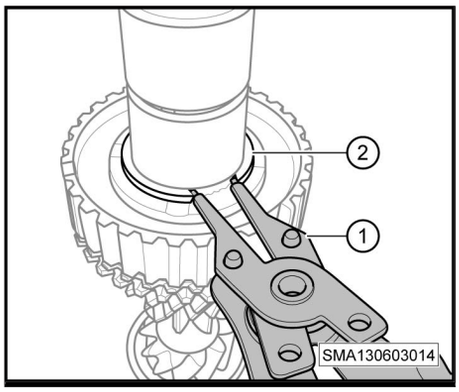
17. Remove the 4th speed gear (-1-).



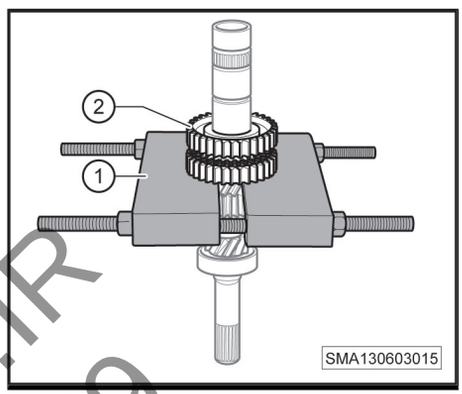
18. Remove the synchronizing ring (-1-) and the needle bearing (-2-).



19. Remove the front clamp spring (-2-) with the spring plier (-1-).

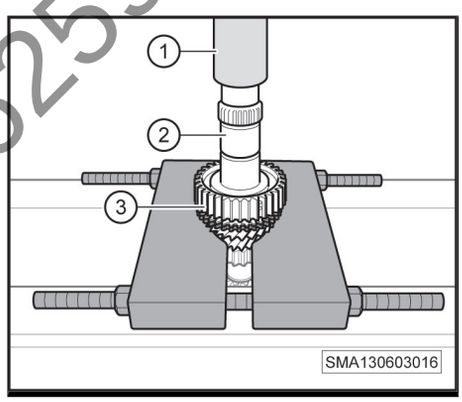


20. Fix the 3rd gear driving gear (-2-) with the special tool (-1-).

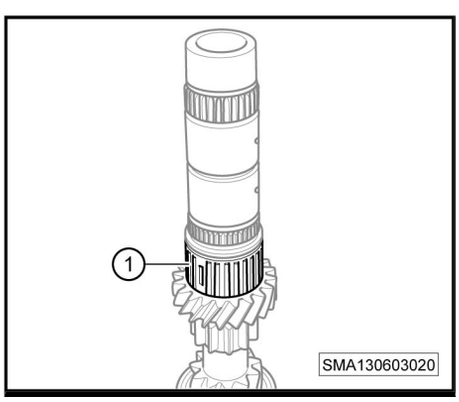


21. Press out the input shaft (-2-) with the hydraulic press (-1-).

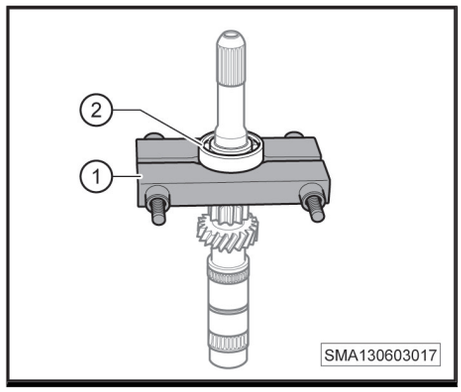
22. Remove the 3rd gear driving gear and the 3rd and 4th synchronizing gear (-3-).



23. Remove the 3rd gear needle bearing (-1-).

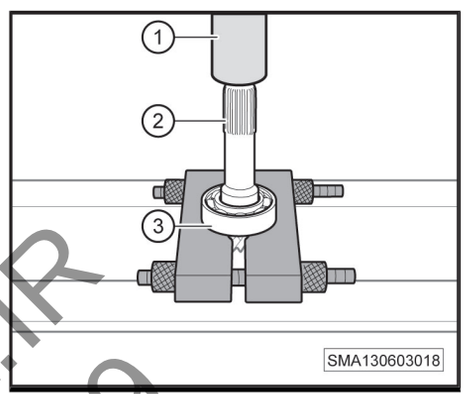


24. Fix the input shaft front bearing (-2-) with the special tool (-1-).



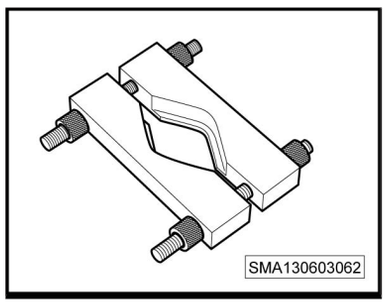
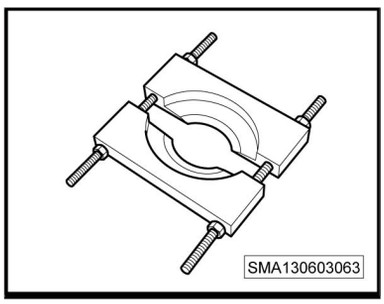
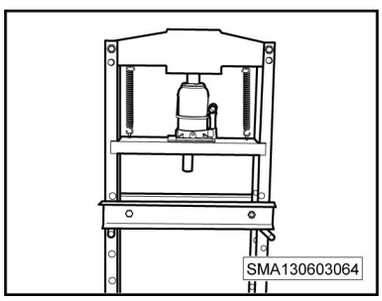
25. Press out the input shaft (-2-) with the hydraulic press (-1-).

26. Remove the input shaft front bearing (-3-).



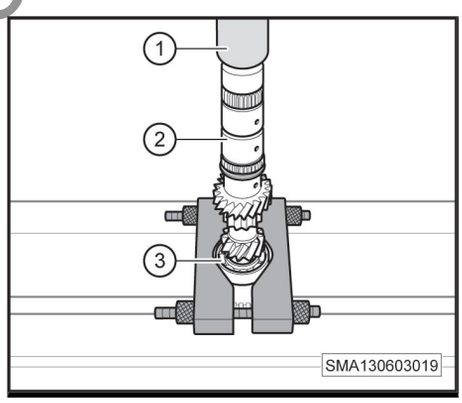
3.2 Assembling the input shaft

Maintenance tools and common equipment

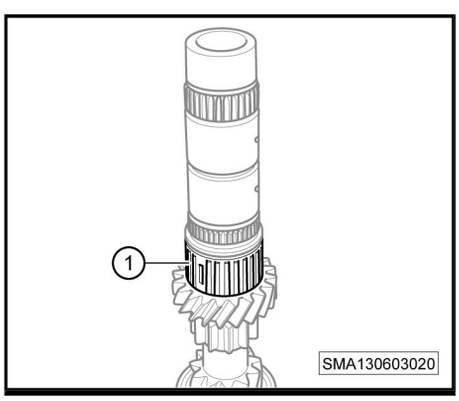
	
Gear retaining tool	Gear retaining tool
	
Hydraulic press	

Assembly

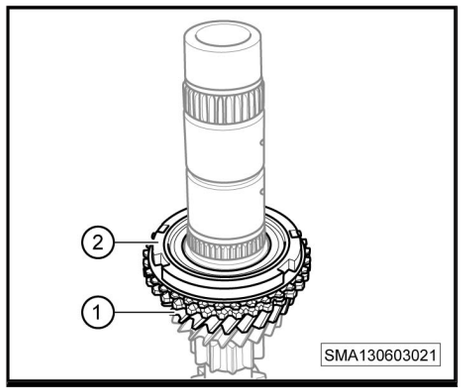
1. Press the input shaft (-2-) into the input shaft front bearing (-3-) with the press (-1-).



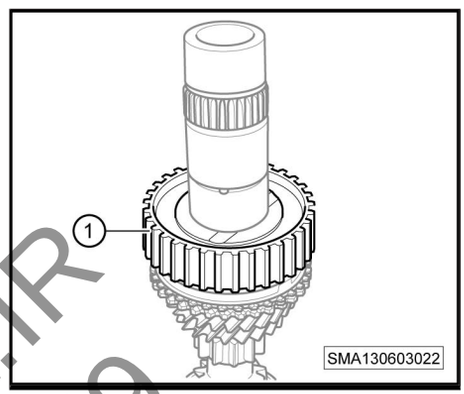
2. Install the 3rd gear needle bearing (-1-).



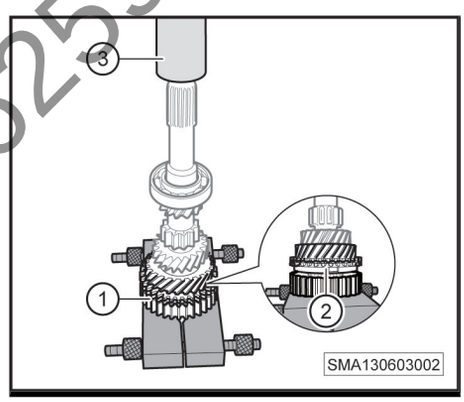
3. Install the 3rd gear driving gear (-1-) and the 3rd gear synchronizing ring (-2-).



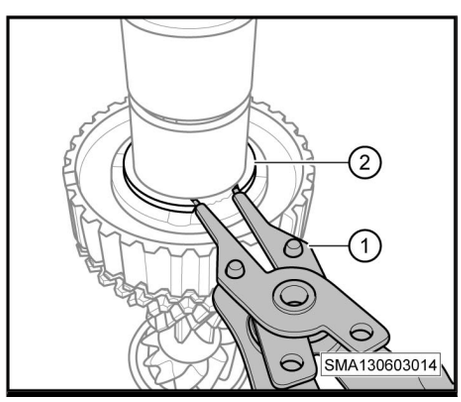
4. Install the 3rd and 4th gear synchronizing gear (-1-).



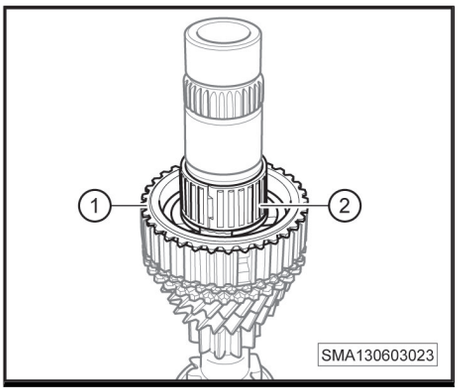
5. Press the 3rd and 4th gear synchronizing gear (-1-) into the input shaft with the hydraulic press (-3-).
6. When pressing the synchronizing gear, avoid the 3rd gear driving gear (-2-) from disengagement.



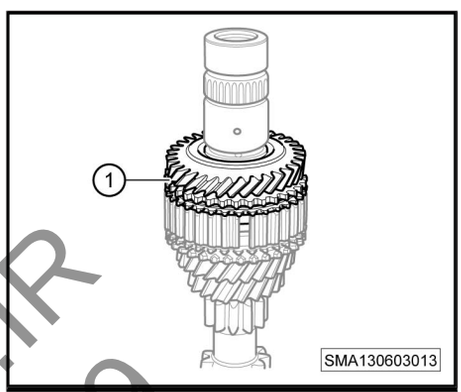
7. Install the front clamp spring (-2-) onto the input shaft with the spring plier (-1-).



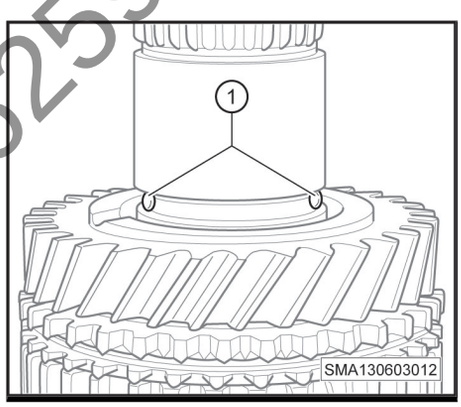
8. Install the 4th gear synchronizing ring (-1-) and the 4th gear needle bearing (-2-).



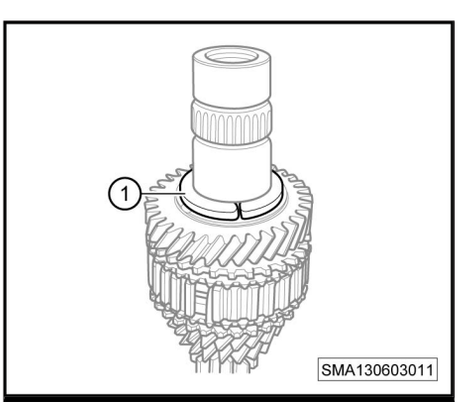
9. Install the 4th gear driving gear (-1-).



10. Install the steel balls (-1-) to the input shaft.

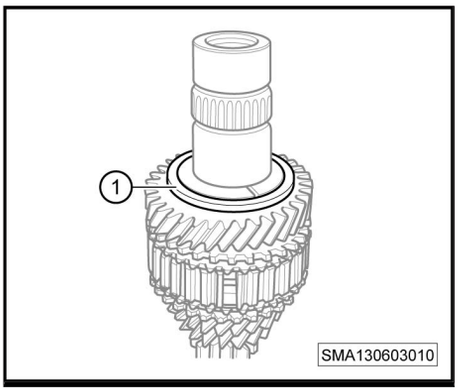


11. Install the gear baffle (-1-).

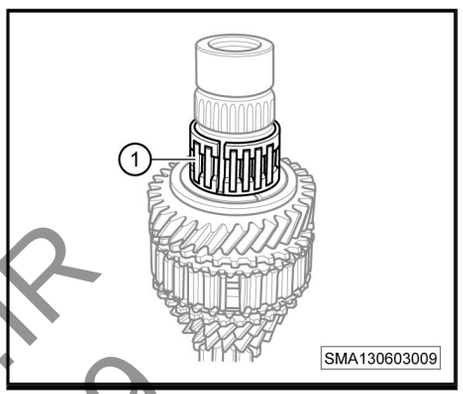


06

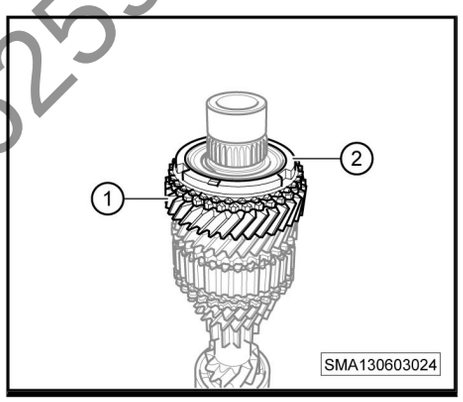
12. Install the gear baffle clamp spring (-1-).



13. Install the 5th gear needle bearing (-1-).

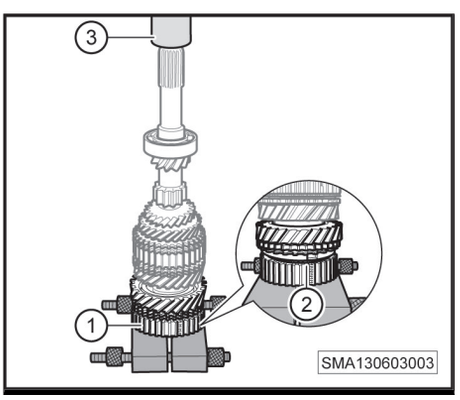


14. Install the 5th speed gear (-1-) and the 5th gear synchronizing ring (-2-).

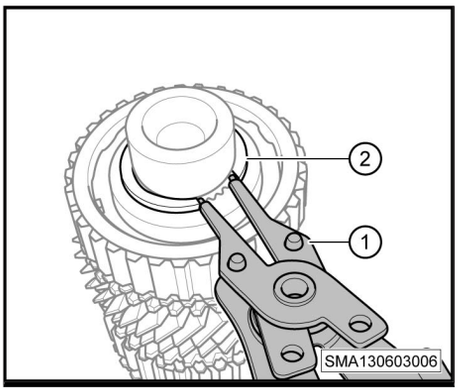


15. Press the 5th gear synchronizing gear (-1-) into the input shaft with the hydraulic press (-3-).

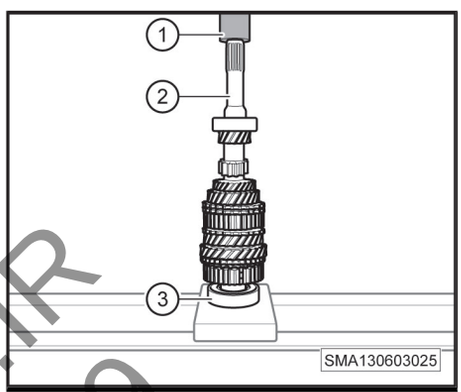
16. When pressing the synchronizing gear, avoid the 5th speed gear (-2-) from disengagement.



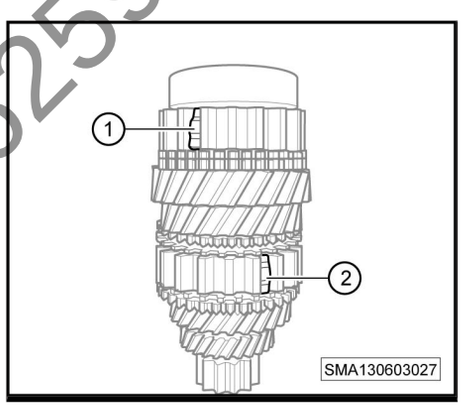
17. Install the rear clamp spring (-2-) with the spring plier (-1-).



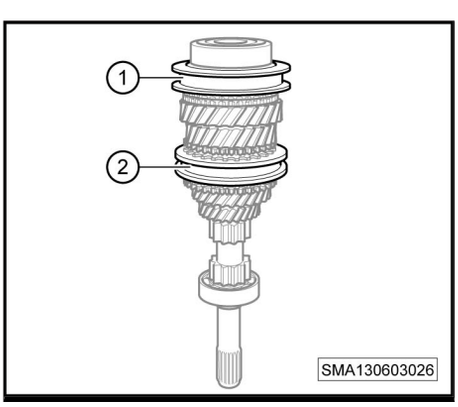
18. Press the input shaft (-2-) into the input shaft rear bearing (-3-) with the hydraulic press (-1-).



19. Install the 5th gear synchronizer cotter (-1-).
20. Install the 3rd and 4th gear synchronizer cotter (-2-).



21. Install the 5th gear synchronizer outer ring (-1-).
22. Install the 3rd and 4th gear synchronizer outer ring (-2-).



Note

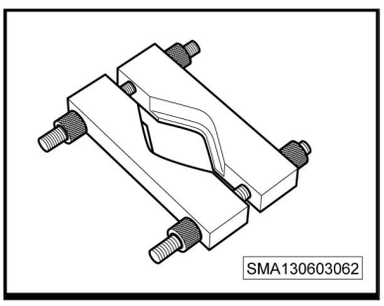
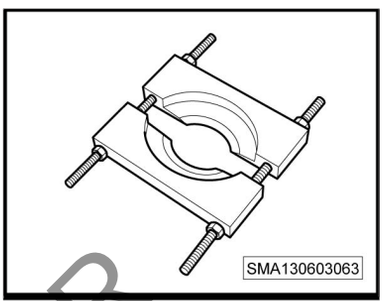
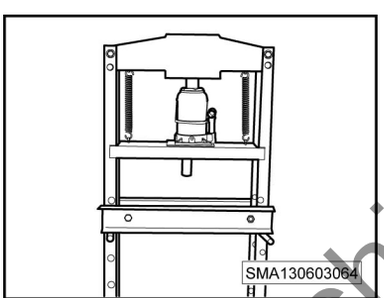
- After installation, check the gears on the input shaft for rotation smoothness.

06

4 Output Shaft

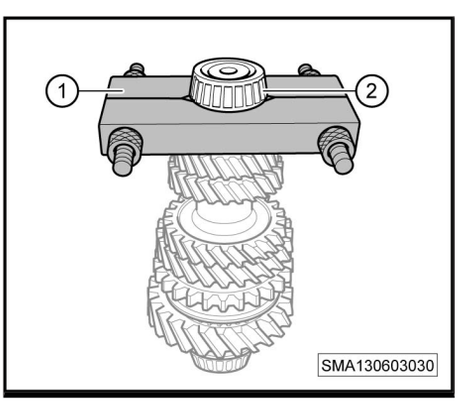
4.1 Disassembling the output shaft

Maintenance tools and common equipment

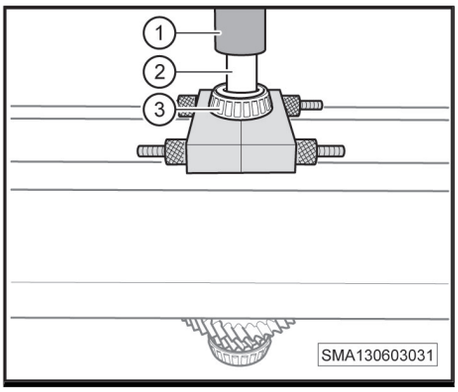
	
Gear retaining tool	Gear retaining tool
	
Hydraulic press	

Disassembly

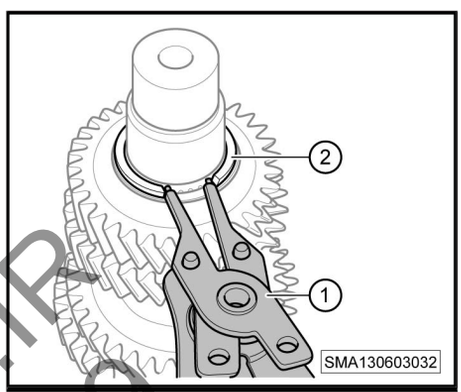
1. Remove the output shaft => refer to page 920.
2. Fix the output shaft rear bearing (-2-) with the special tool (-1-).



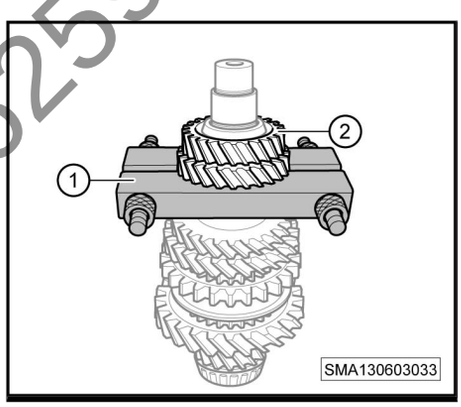
3. Press out the output shaft (-2-) with the hydraulic press (-1-) and remove the rear bearing (-3-).



4. Remove the rear clamp spring (-2-) with the spring plier (-1-).

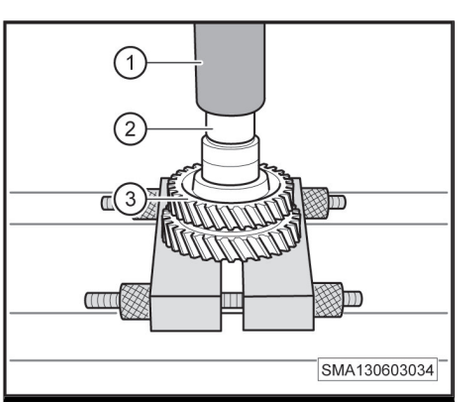


5. Fix the 4th and 5th gear driven gear set (-2-) with the special tool (-1-).

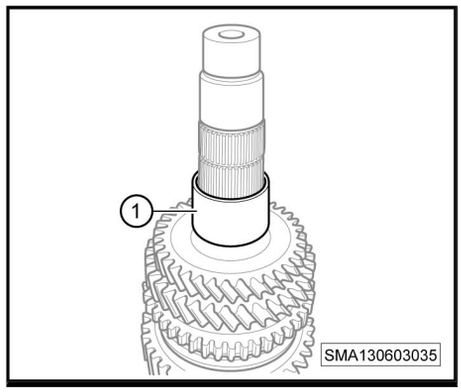


6. Press out the output shaft (-2-) with the hydraulic press (-1-).

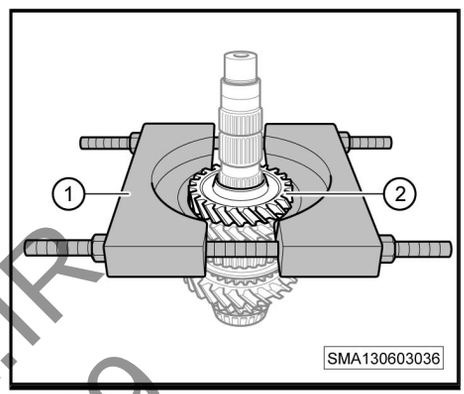
7. Remove the 5th gear driven gear and the 4th gear driven gear (-3-).



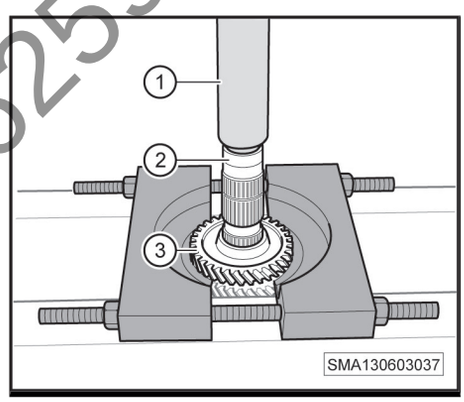
8. Remove the gear ring spacer (-1-).



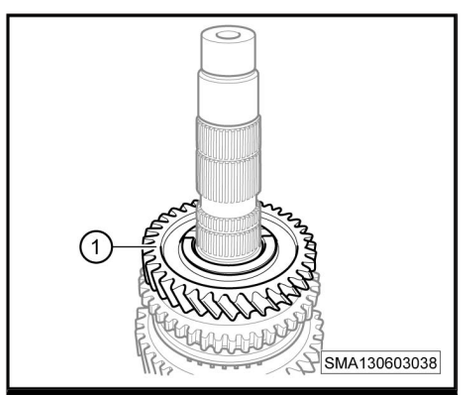
9. Fix the 3rd gear driven gear (-2-) with the special tool (-1-).



10. Press out the output shaft (-2-) with the hydraulic press (-1-).
11. Remove the 3rd gear driven gear (-3-).

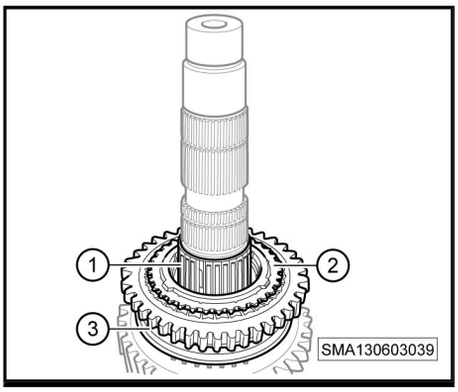


12. Remove the 2nd gear driven gear (-1-).

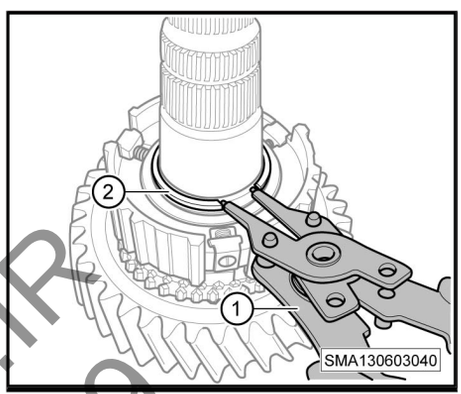


13. Remove the 2nd gear needle bearing (-1-) and the 2nd gear synchronizing ring (-2-).

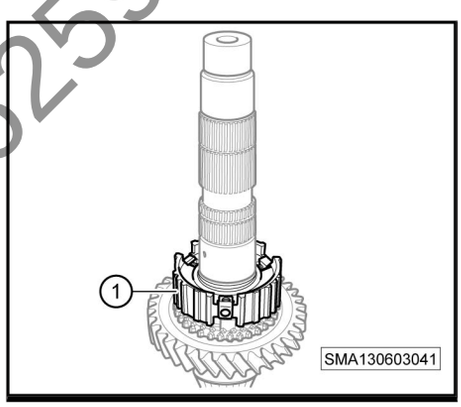
14. Remove the 1st and 2nd gear synchronizer outer ring (-3-).



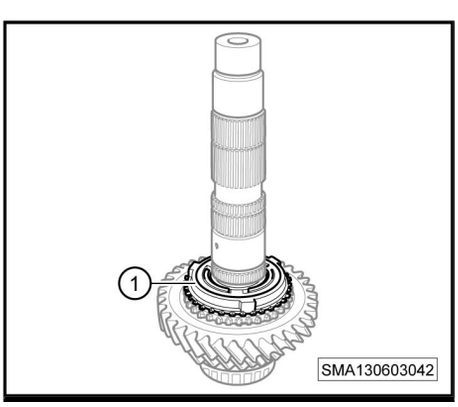
15. Remove the clamp spring (-2-) with the spring plier (-1-).



16. Remove the 1st and 2nd gear synchronizing gear (-1-).

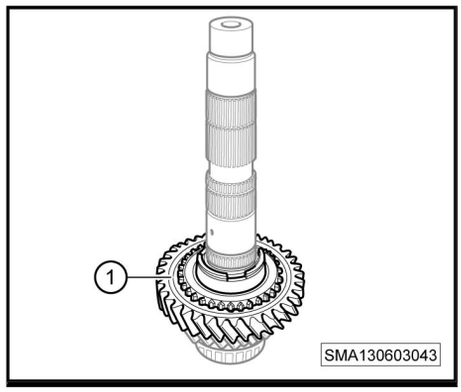


17. Remove the 1st gear synchronizing ring assembly (-1-).

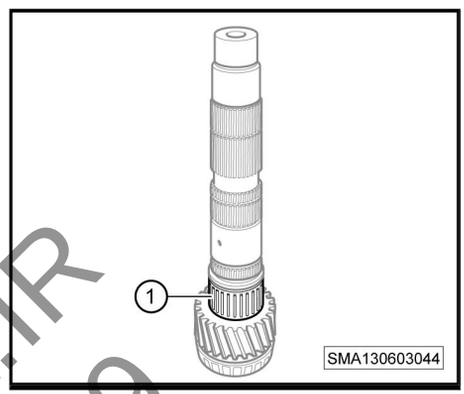


06

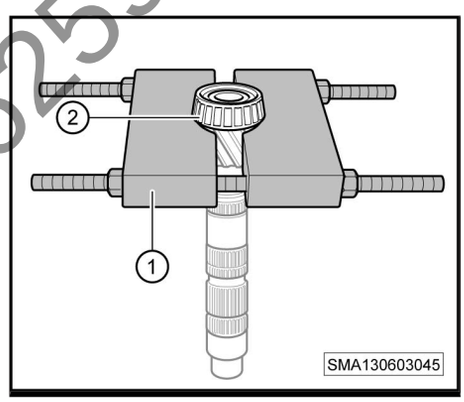
18. Remove the 1st gear driven gear (-1-).



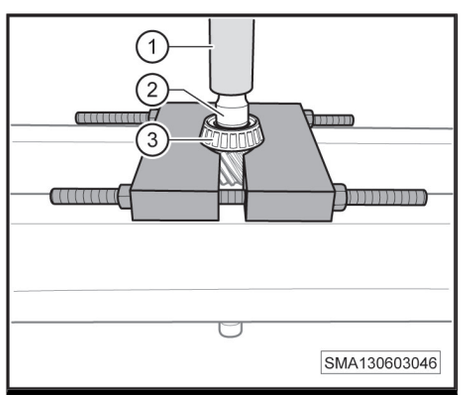
19. Remove the 1st gear needle bearing (-1-).



20. Fix the output shaft front bearing (-2-) with the tool (-1-).

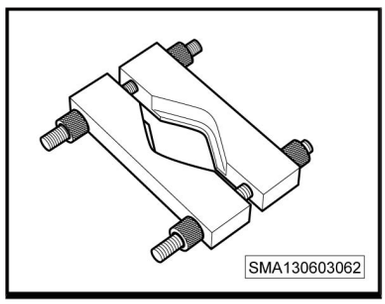
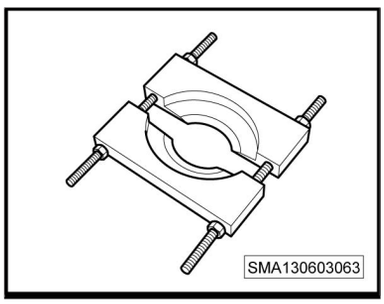
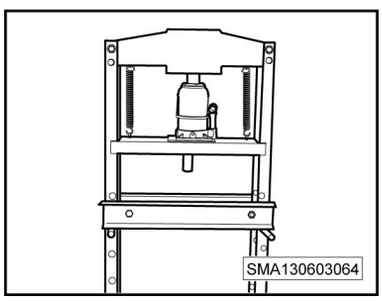


21. Press out the press tool (-2-) with the hydraulic press (-1-), and remove the front bearing (-3-).



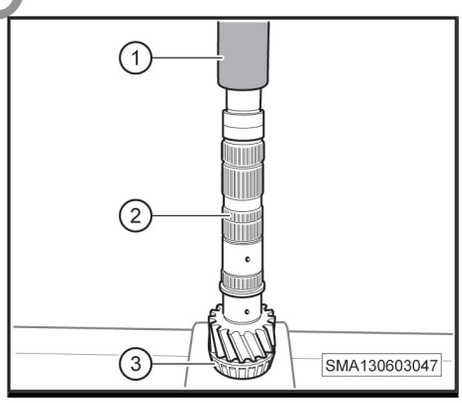
4.2 Assembling the output shaft

Maintenance tools and common equipment

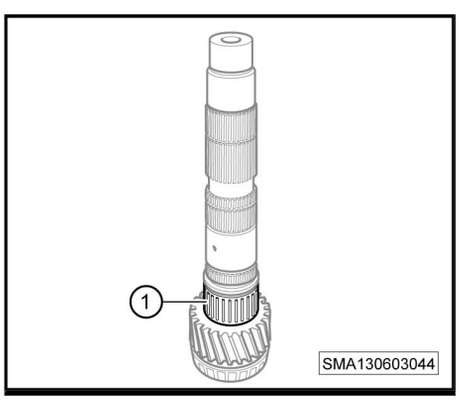
	
Gear retaining tool	Gear retaining tool
	
Hydraulic press	

Assembly

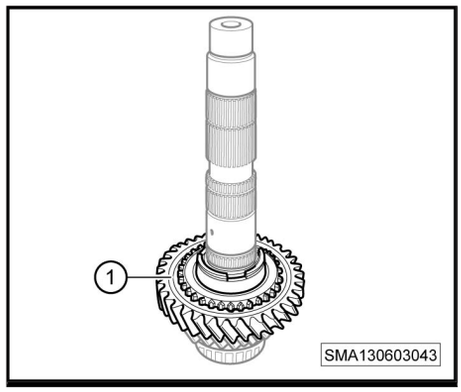
1. Install the bearing (-3-) to the output shaft (-2-) with the hydraulic press (-1-).



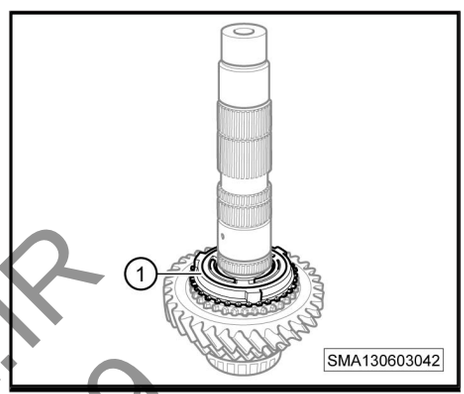
2. Install the 1st gear needle bearing (-1-).



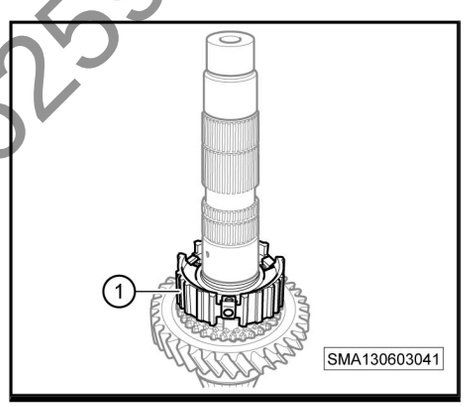
3. Install the 1st gear driven gear (-1-).



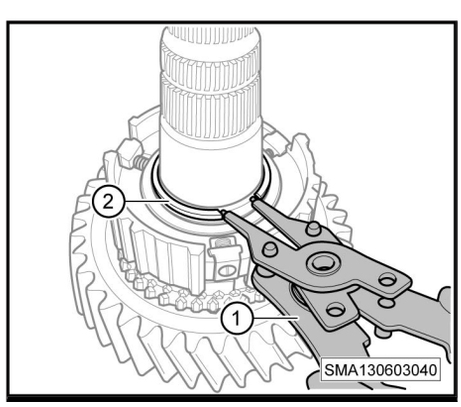
4. Install the 1st gear synchronizing ring assembly (-1-).



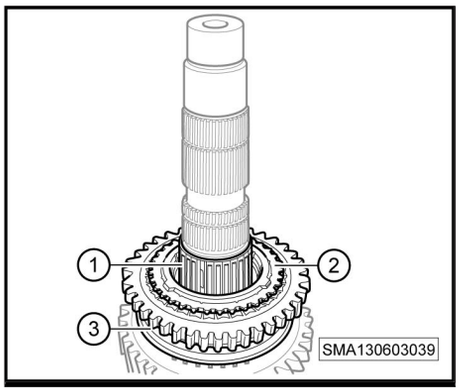
5. Install the 1st and 2nd gear synchronizing gear (-1-).



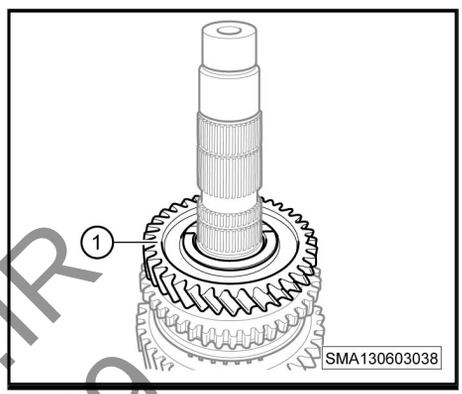
6. Install the front clamp spring (-2-) with the spring plier (-1-).



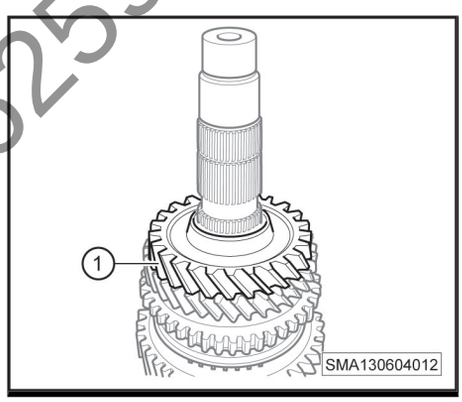
7. Install the 2nd gear needle bearing (-1-), the 2nd gear synchronizing ring assembly (-2-) and the 1st and 2nd gear synchronizer outer ring (-3-).



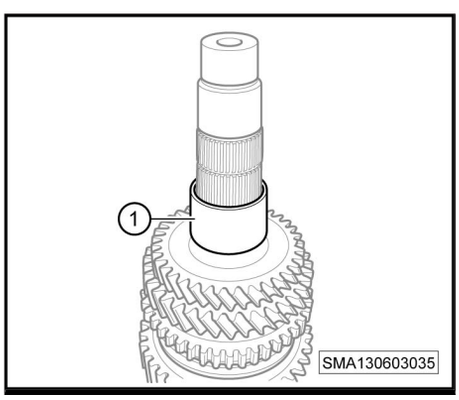
8. Install the 2nd gear driven gear (-1-).



9. Install the 3rd gear driven gear (-1-).

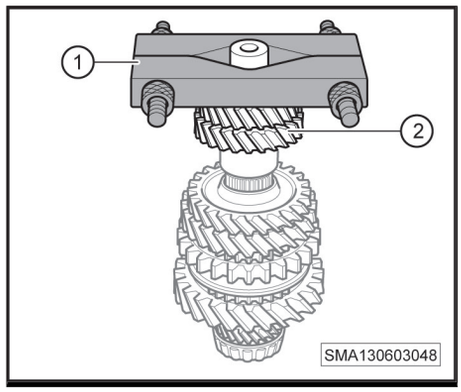


10. Install the gear bushing (-1-).

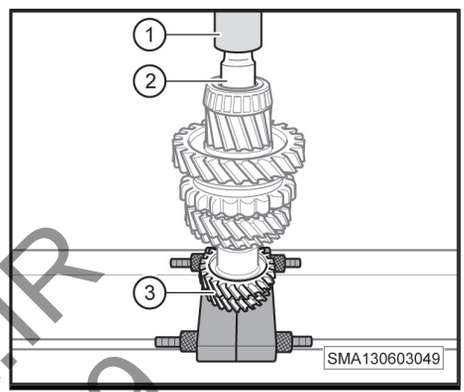


06

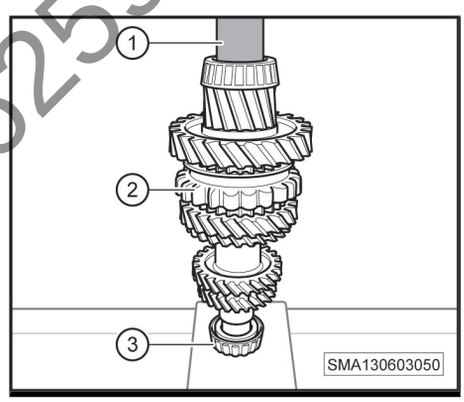
11. Install the 4th and 5th gear driven gear (-2-).
12. Fix it with the special tool (-1-).



13. Press in the output shaft (-2-) with the hydraulic press (-1-).
14. Install the 4th and 5th gear driven gear (-3-) into the output shaft.



15. Press in the output shaft (-2-) with the hydraulic press (-1-).
16. Install the output shaft rear bearing (-3-) into the output shaft.



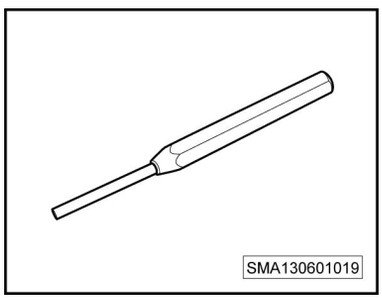
Note

- After installation, check the gears on the output shaft for rotation smoothness.

5 Shift Fork

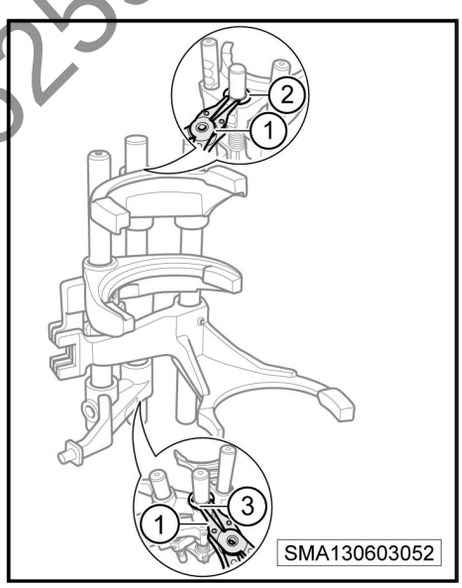
5.1 Removing and installing the shift fork

Maintenance tools and common equipment

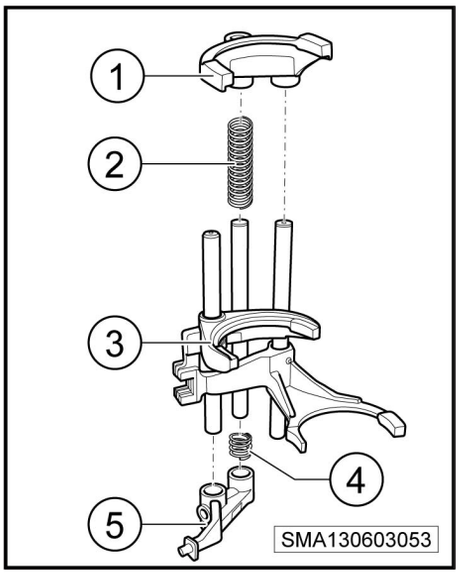
	
Punch	

Removal

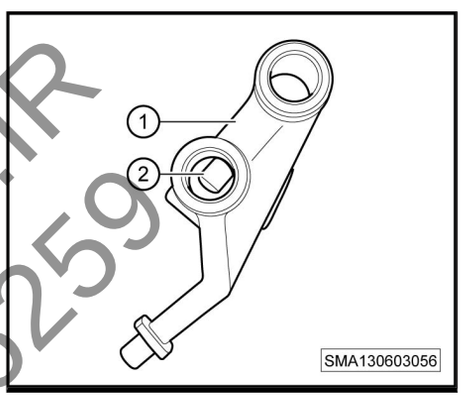
1. Remove the clamp springs (-2-) and (-3-) with the spring plier (-1-).



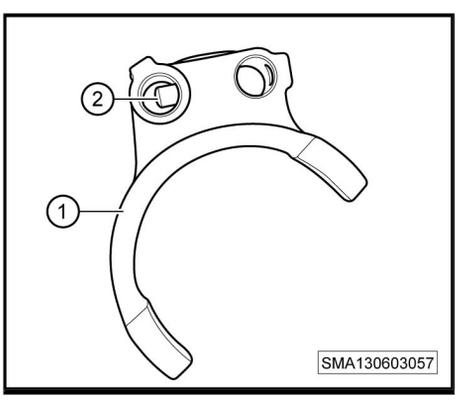
2. Remove the 5th gear fork (-1-) and the return spring (-2-).
3. Remove the reverse gear forks (-3-) and (-5-) and the return spring (-4-).



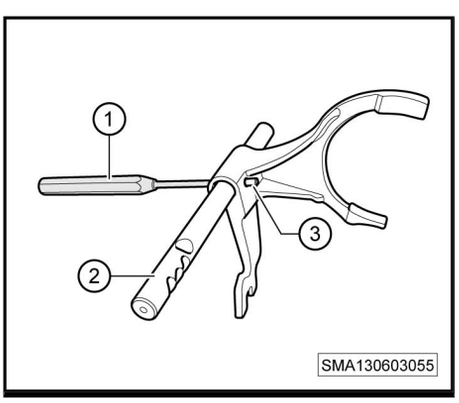
4. Remove the lock pin (-2-) from the reverse gear fork (-1-).



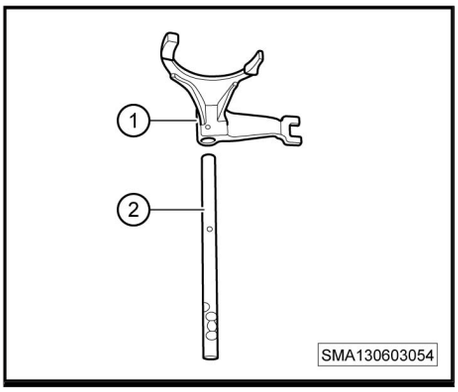
5. Remove the lock pin (-2-) from the 5th gear fork (-1-).



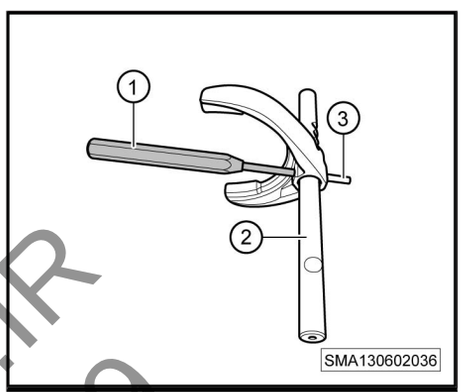
6. Knock out the dowel pin (-3-) from the shift shaft (-2-) with the punch (-1-).



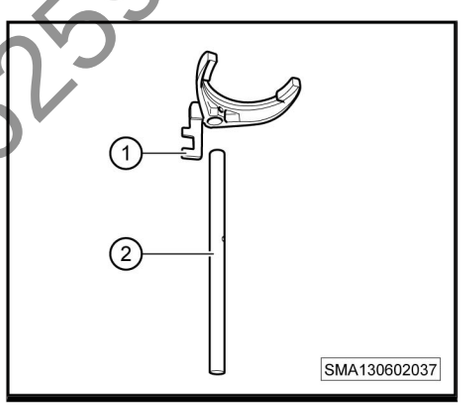
7. Separate the 3rd and 4th gear shift fork (-1-) from the shift shaft (-2-).



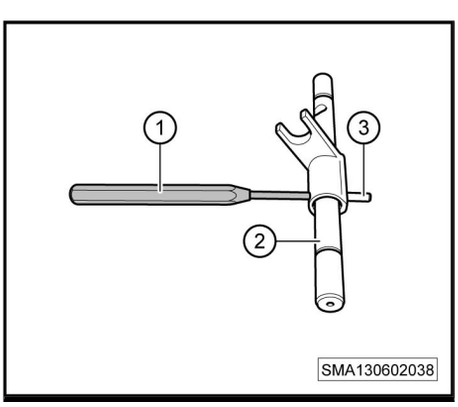
8. Knock out the dowel pin (-3-) from the shift shaft (-2-) with the punch (-1-).



9. Separate the 1st and 2nd gear shift fork (-1-) from the shift shaft (-2-).

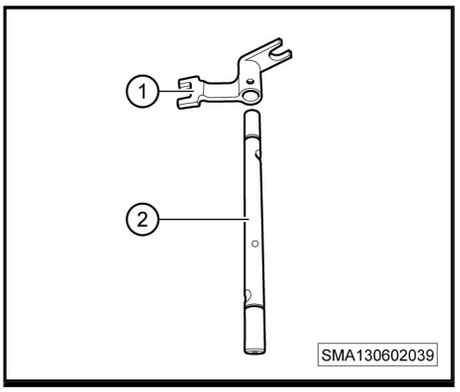


10. Knock out the dowel pin (-3-) from the shift shaft (-2-) with the punch (-1-).



06

11. Separate the fork (-1-) from the shift shaft (-2-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

0604 Differential

06

1 General Information

1.1 Important notes

- When turning, the travel distance of the outside wheels is longer than that of the inside wheels, so the speed of the outside wheels is faster, which will therefore break the balance of vehicle's drive train.
- The planetary gear mechanism in the differential can transmit the speed difference between the outside and inside wheels to the axle shaft gear via the axle shaft when turning. It can force the planetary gear to rotate, thus allowing the inside and outside wheels to spin at two different speeds in order to balance the speed difference and make the vehicle turn smoothly.
- The final drive is the major component to reduce the rotation speed and increase the torque in the drive train.
- All fixing bolts must be tightened with the specified tightening torque.
- The differential consists of the following components:

  a. Final drive gear
  b. Planetary gear
  c. Differential housing

1.2 Product specifications

Torque specifications

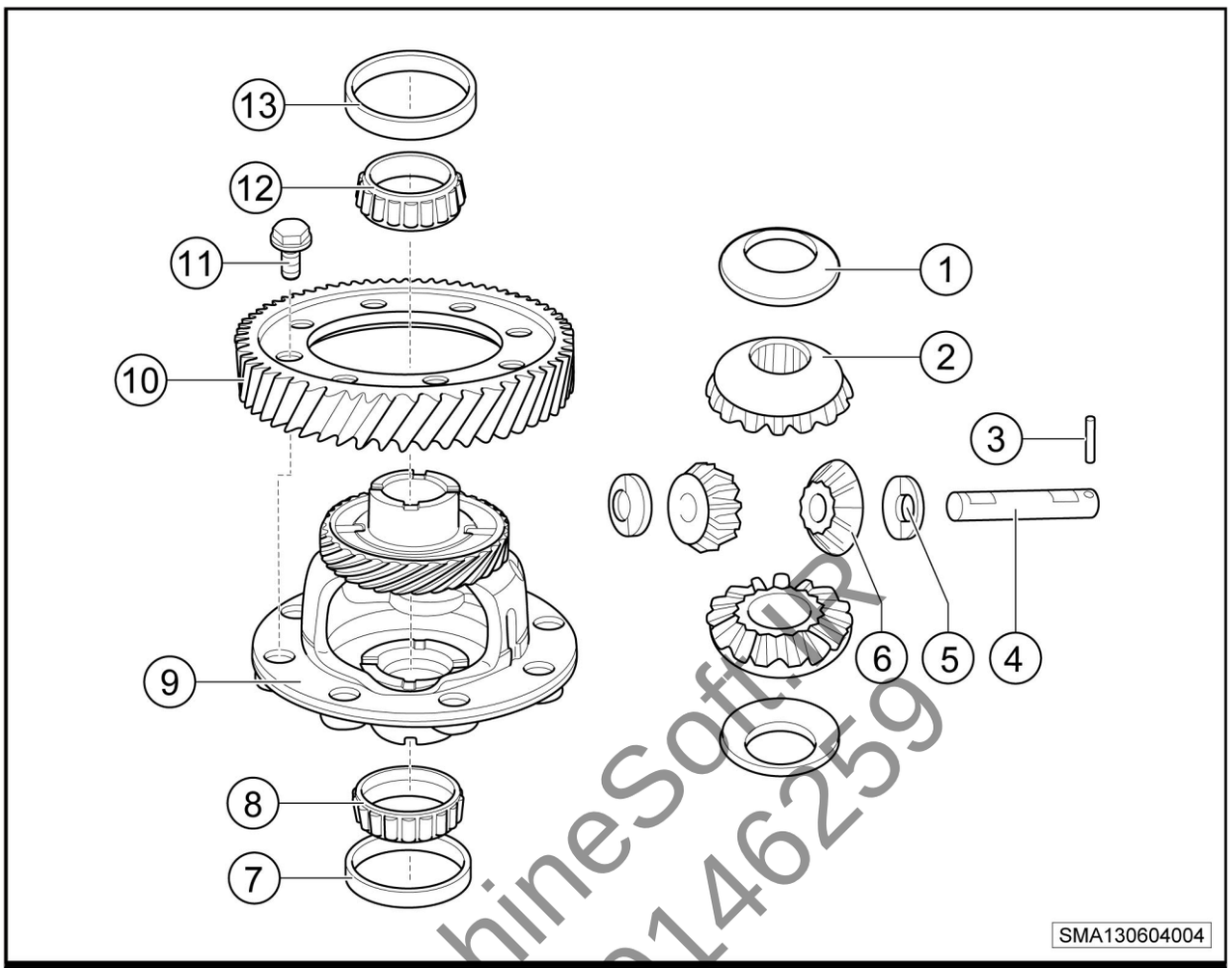
Component	Torque (N•m)
Final drive driven gear bolt	137±3

Standard parameters of differential components

Component	Inspection item	Specification (mm)
Differential	Check the differential axle shaft gear clearance	0.025～0.150

06

1.3 The differential assembly drawing

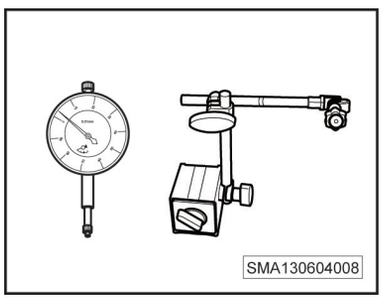


1. Axle shaft gear washer	2. Axle shaft gear
3. Dowel pin	4. Planetary gear shaft
5. Planetary gear gasket	6. Planetary gear
7. Differential tapered bearing outer ring	8. Differential tapered bearing
9. Differential housing	10. Final drive driven gear
11. Bolt	12. Differential tapered bearing
13. Differential tapered bearing outer ring	

2 Diagnosis and Inspection

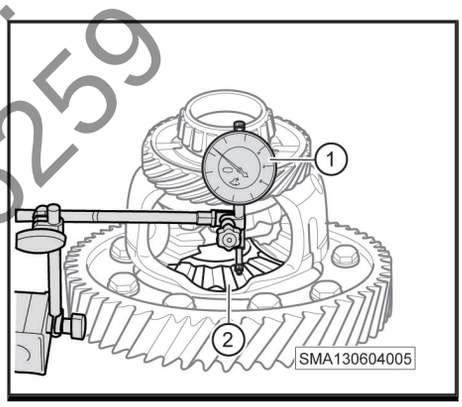
2.1 Checking the differential gear clearance

Maintenance tools and common equipment

	
Dial indicator and bracket	

Methods

1. Remove the differential => refer to page 920.
2. Check the differential axle shaft gear (-2-) clearance with the dial indicator (-1-).
   - The gear clearance: 0.025～0.150 mm



Note

- If the clearance does not meet the standard, please replace and adjust the axle shaft gear gasket.
- After replacing the axle shaft gear gasket, you shall measure and adjust the clearance again to ensure it meeting the standard.

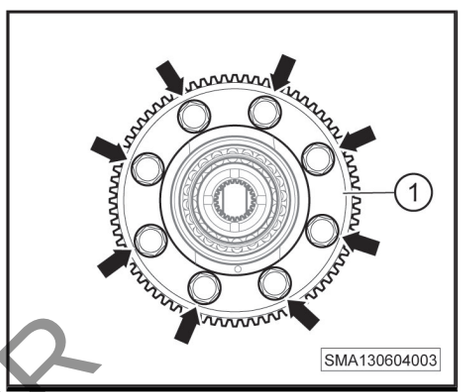
06

3 Differential

3.1 Removing and installing the final drive driven gear

Removal

1. Remove the differential => refer to page 920.
2. Unscrew the fixing bolts (-arrow-) and remove the final drive gear (-1-).
   - Tightening torque of the bolt: 137±3 N•m

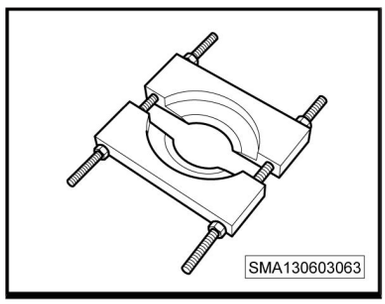
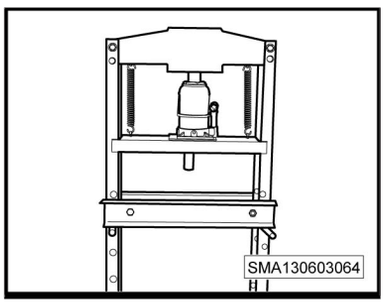


Installation

Installation shall follow the reverse sequence of the removal procedure.

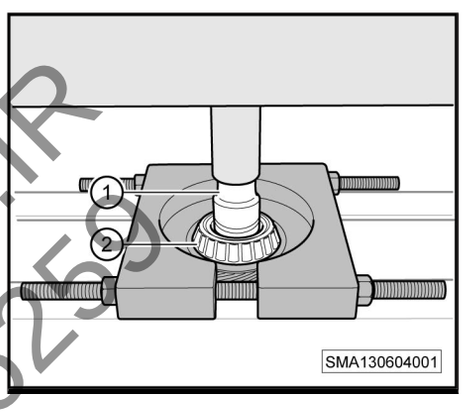
3.2 Removing and installing the differential tapered bearing

Maintenance tools and common equipment

	
Gear retaining tool	Hydraulic press

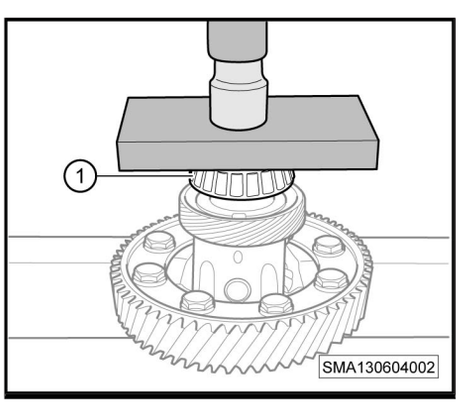
Removal

1. Remove the differential => refer to page 920.
2. Separate the bearing (-2-) from the differential with the hydraulic press (-1-).



Installation

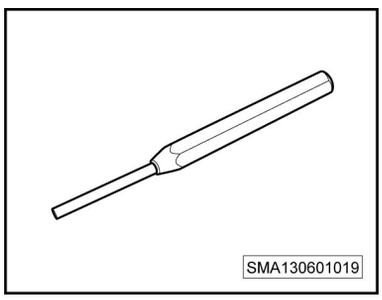
1. Press the bearing (-1-) into the differential with the hydraulic press.



06

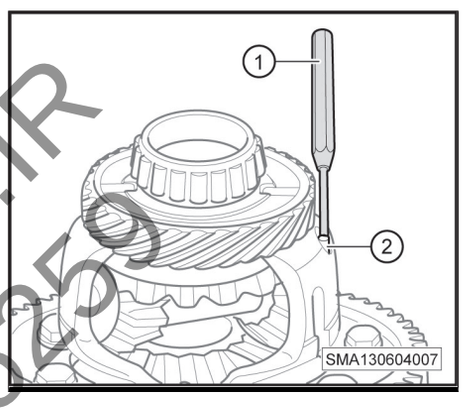
3.3 Removing and installing the differential planetary gear

Maintenance tools and common equipment

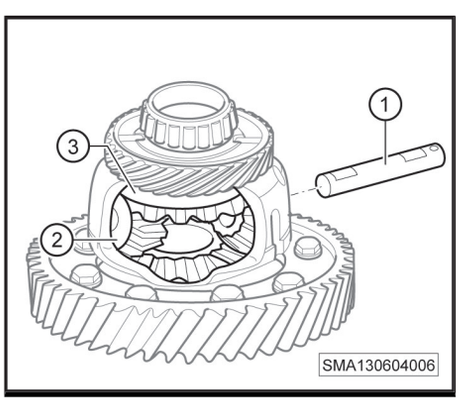
	
Punch	

Removal

1. Remove the differential => refer to page 920.
2. Knock out the dowel pin (-2-) with the punch (-1-).



3. Remove the planetary gear shaft (-1-).
4. Remove the planetary gear (-2-).
5. Remove the axle shaft gear (-3-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

0701 Electrical Equipment

1 Battery

1.1 General information

1.1.1 Description

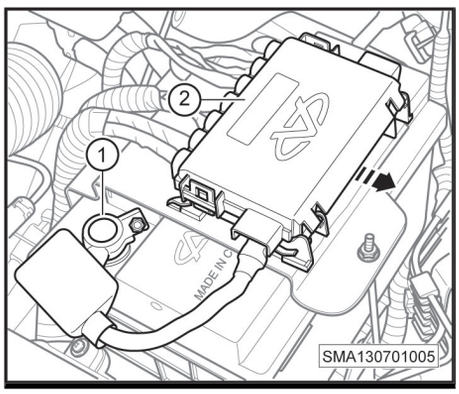
This vehicle is equipped with a 12V battery, which is located in the engine compartment and consists of the following components:

- Battery - is used to store the chemical energy converted from the electrical energy and convert it back into the electrical energy for electrical equipment when necessary.
- Battery cable - connects the positive and negative terminals of the battery and supplies power to the vehicle's electrical system.
- Battery cover - fixes the battery in place with the battery tray.
- Battery tray - is located inside the engine compartment and used to install the battery.

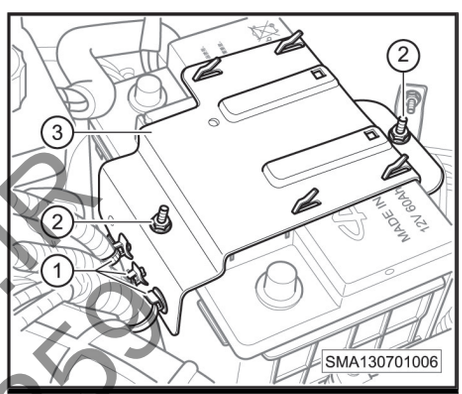
1.2 Removing and installing the battery

Removal

1. Switch off all electrical equipment and disconnect the battery negative cable.
2. Disconnect the battery positive cable (-1-) and pull out the fuse box (-2-) out of the battery cover in the (-arrow-) direction and put it aside.



3. Loosen the fixing clip (-1-) from the wiring harness.
4. Unscrew the battery cover nuts (-2-) and remove the battery cover (-3-).
5. Remove the battery.



Installation

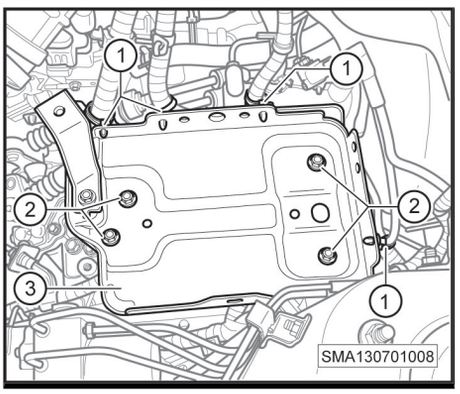
Installation shall follow the reverse sequence of the removal procedure.

07

1.3 Removing and installing the battery tray

Removal

1. Remove the battery => refer to page 975.
2. Remove the air filter assembly => refer to page 239.
3. Loosen the fixing clips (-1-) from the wiring harness.
4. Unscrew the fixing bolts (-2-) from the tray.
5. Remove the battery tray (-3-).



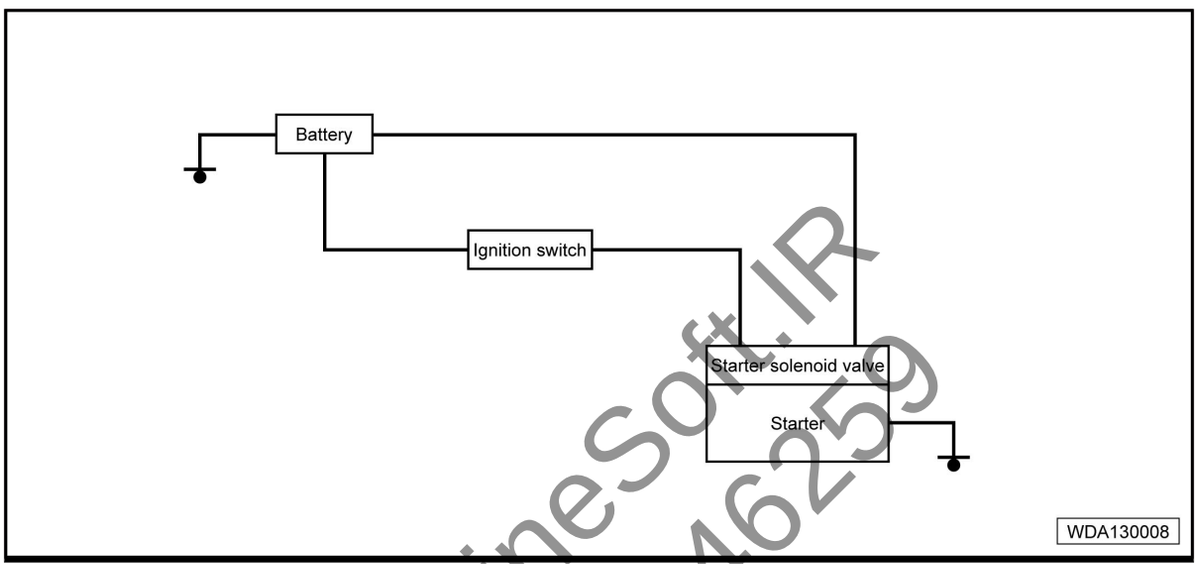
Installation

Installation shall follow the reverse sequence of the removal procedure.

2 Starting System

2.1 General information

2.1.1 Description



The battery interacts with the charging system to support the proper operation of the vehicle's electrical system. The electrical system is divided into two separate circuits: one is a heavy-current circuit, e.g. starting circuit; and the other is a low-current control circuit, such as the common operating circuit of the electrical system. The starting system consists of the following components:

- Starter
- Battery
- Battery cable
- Ignition switch
- Wiring harness

2.1.2 Product specifications

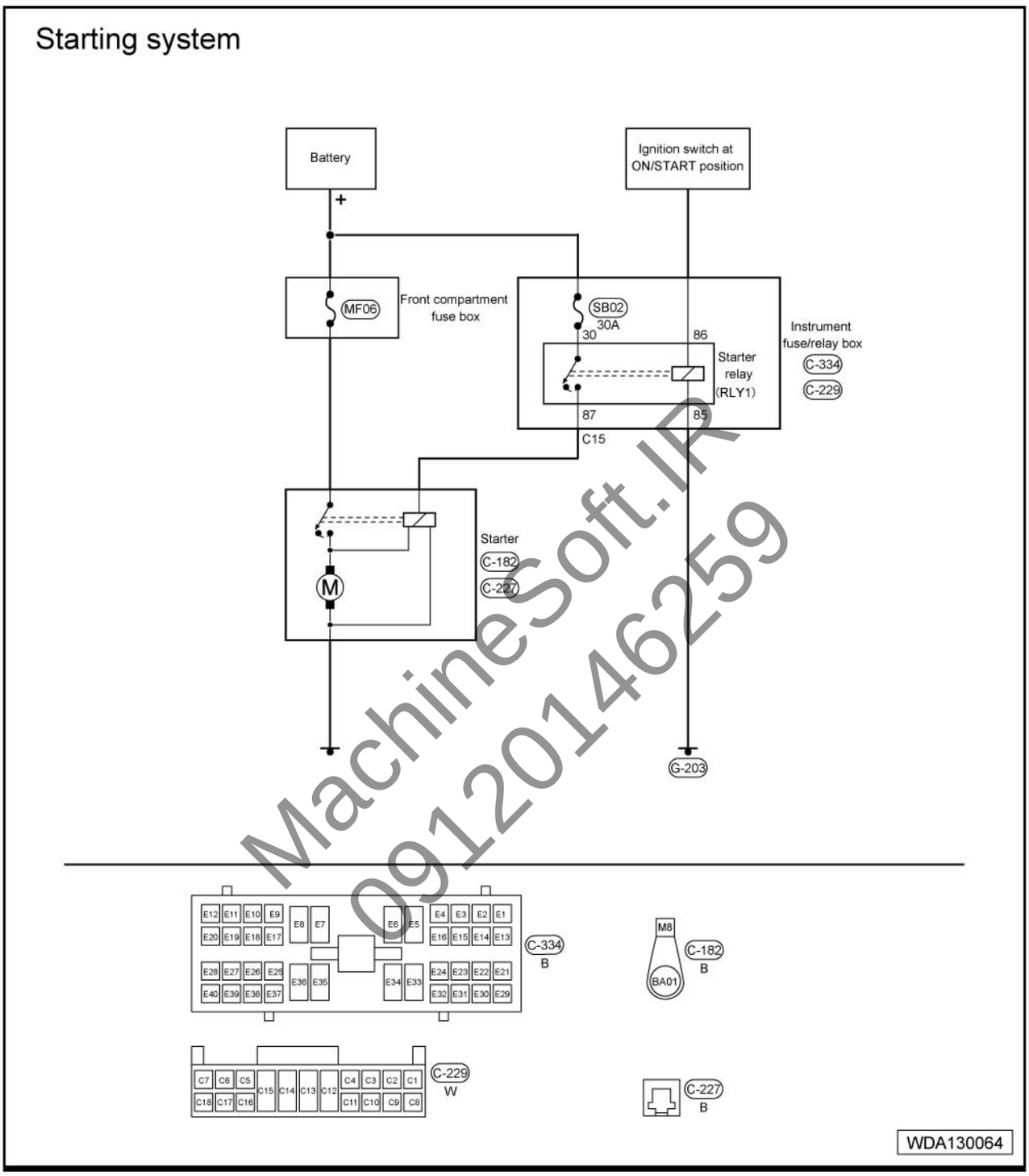
Torque specifications

Component	Torque (N·m)
Starter mounting bolt	30

2.2 Circuit diagram

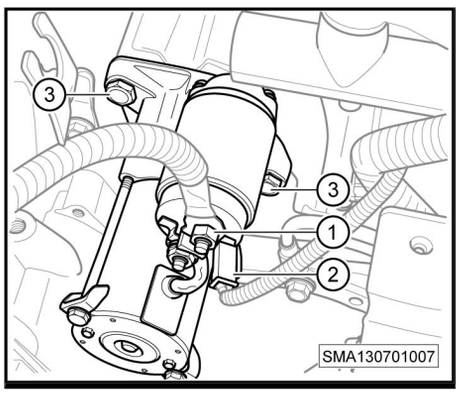
07

Starting system (page 1)



2.3 Removing and installing the starter

Removal



1. Remove the battery.=> refer to page 975
2. Remove the air filter assembly.=> refer to page 239
3. Remove the battery tray.
4. Unscrew the nut (-1-) of the starter terminal B+.
5. Disconnect the connector of the starter solenoid switch (-2-).
6. Unscrew the starter fixing bolts (-3-).
   - Tightening torque of the bolt: 30 N·m
7. Remove the starter.

Installation

Installation shall follow the reverse sequence of the removal procedure.

2.4 Diagnosis and inspection

2.4.1 Testing the starter

Warning

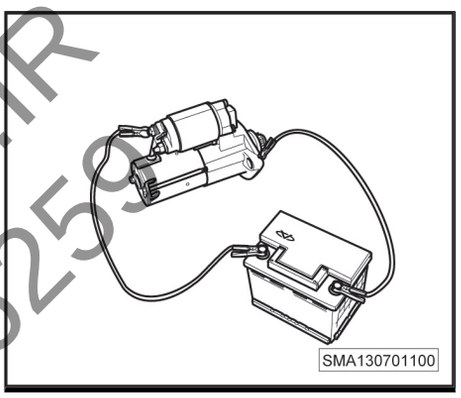
- Since it is dangerous when the starter is running at a high speed, the operators shall take precautions.
- Please familiarise yourself with the operating procedures before inspection.
- Supplying power to the starter with the battery for a long time will burn out the coil, so the given time for each test shall be within 3-5 minutes.

Note

- This test can only be applied to the starter removed from the vehicle.
- This test is intended to check the continuous starting performance of the starter.

Procedures

1. Remove the starter from the engine compartment.
2. Install the starter onto a soft-palated bench vise.
3. Connect the 12V battery to the starter by cables with the battery positive connected to the starter terminal B+ and the negative connected to the starter housing.
4. Connect the power supply terminal of the starter solenoid switch to the positive power supply terminal by leads. At this moment, the starter starts to operate. If the starter fails to run, replace the failed starter with a new one.



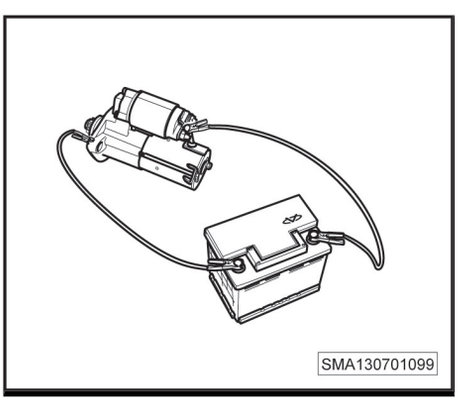
2.4.2 Testing the starter solenoid switch

Note

- This test can only be applied to the starter removed from the vehicle.

Procedures

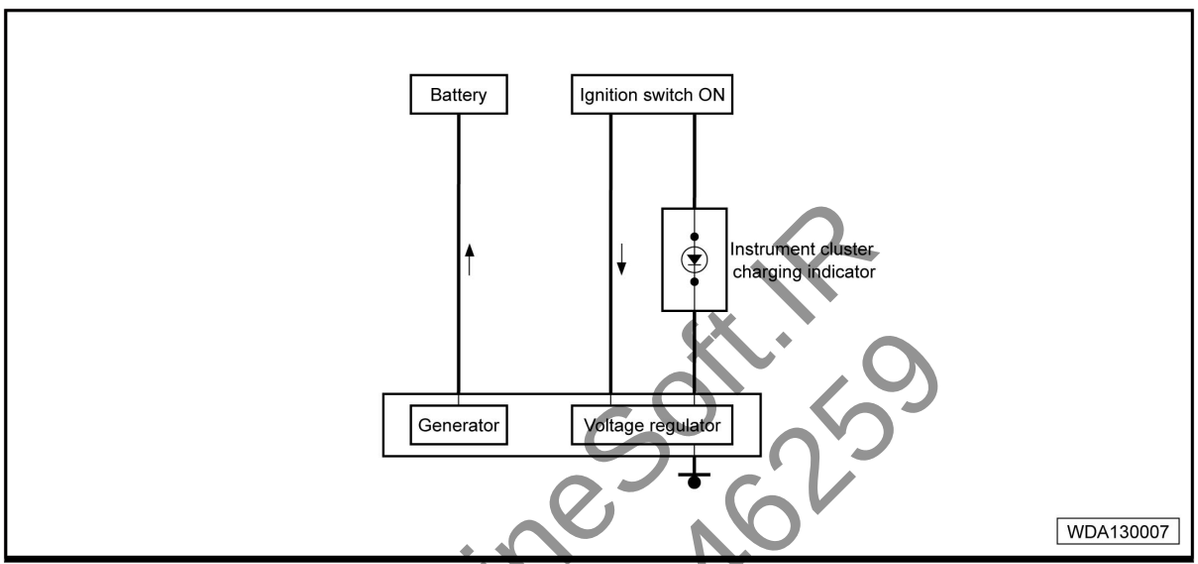
1. Remove the starter from the engine compartment.
2. Disconnect the solenoid switch terminal.
3. Connect the battery negative to the starter housing and its positive to the terminal of the starter solenoid switch. When switching on the starter, you shall hear the starter solenoid switch pushing the pinion and engaging it with the gear ring. Otherwise, replace the failed starter assembly.



3 Charging System

3.1 General information

3.1.1 Description



- The generator is a device that converts mechanical energy into electrical energy and serves as one of the main power of the vehicle. When the engine is running, it drives the generator via the poly-V belt, thereby supplying power to electrical equipment (except for the starter) and charging the battery.
- When the engine is running, it drives the energized rotor of the generator exciting winding to rotate so that the Y-shaped stator winding produces induced electromotive force, which is subsequently rectified into DC power by the electronic rectifier, thereby feeding the electricity to vehicle's electrical system. To keep the DC voltage stable, the generator is also equipped with a voltage regulator to stabilize the power voltage of the system.

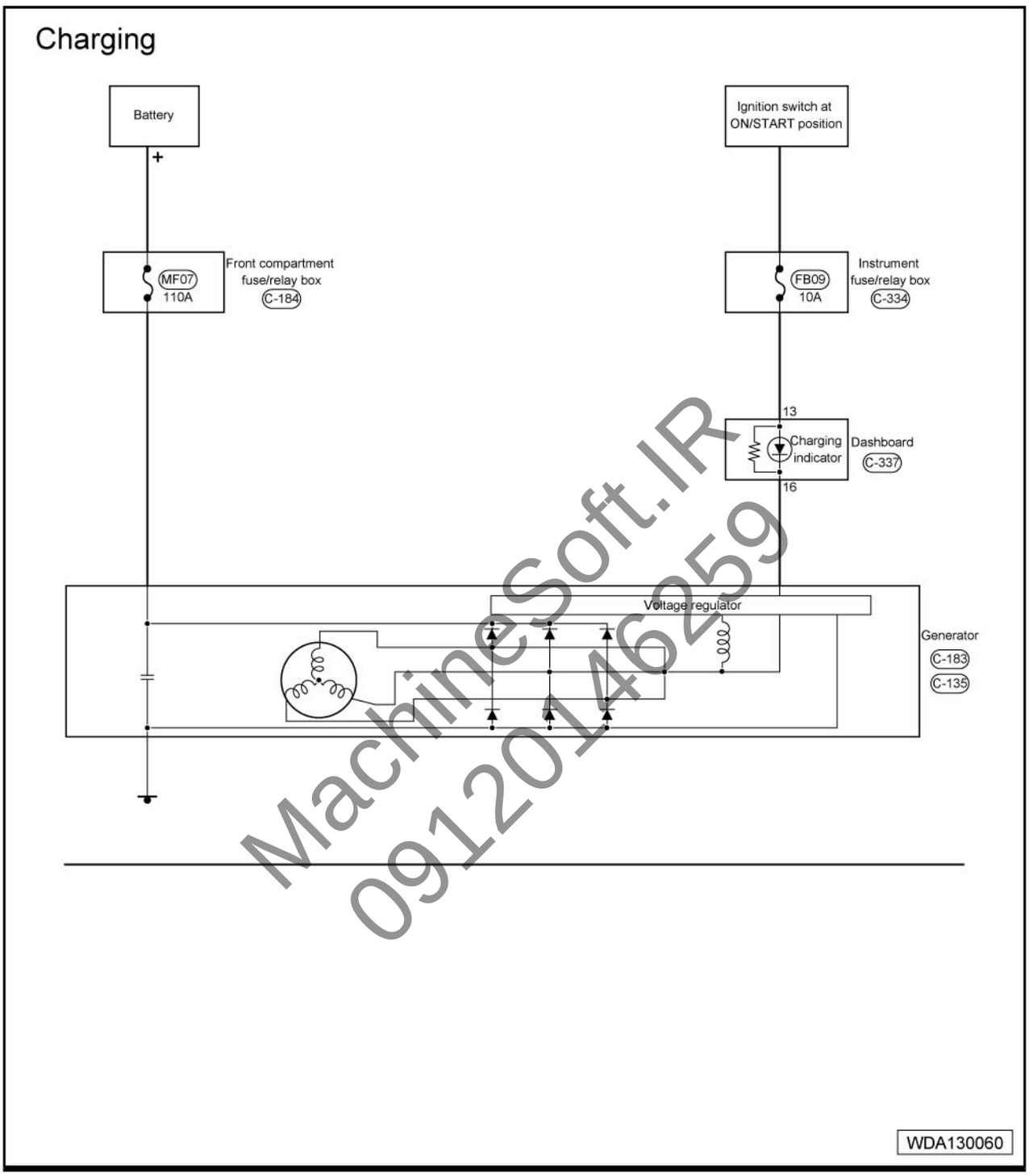
3.1.2 Product specifications

Torque specifications

Component	Torque (N·m)
Generator cable fixing nut	13
Generator mounting bolt	30

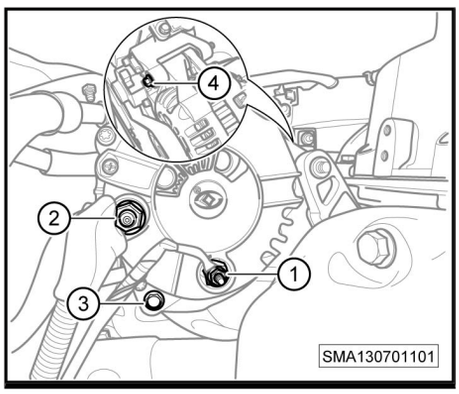
3.2 Circuit diagram

Charging system (page 1)



3.3 Removing and installing the generator

Removal



1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the poly-V belt of the generator.=> refer to page 72
4. Unscrew the fixing nut (-1-) and remove the generator cable.
5. Pull off the cable rubber sleeve, unscrew the cable fixing nut (-2-) and remove the generator cable.
6. Unscrew the generator bottom fixing bolt (-3-) and the bracket fixing bolt (-4-).
   - Tightening torque of the bolt: 30 N·m
7. Remove the generator.

Installation

Installation shall follow the reverse sequence of the removal procedure.

3.4 General troubleshooting

Symptoms	Causes	Troubleshooting
Abnormal noise of the generator	• Wear, loosening or bearing damage	• Replace the generator assembly
	• Inadequate grease	• Add grease
	• Improper installation	• Re-install as specified requirements
	• Inadequate poly-V belt tension	• Replace the tensioner
	• Disalignment between the poly-V belt pulley and the generator pulley	• Re-install as specified requirements
	• Internal damage of the generator	• Replace the generator assembly

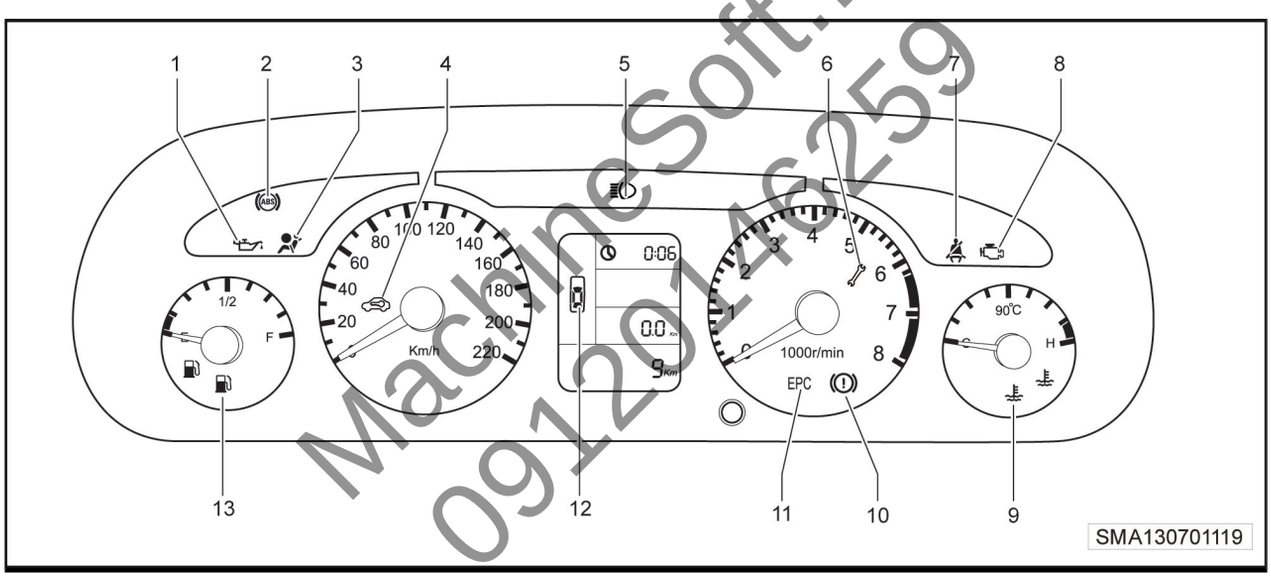
4 Instrument Cluster

4.1 General information

4.1.1 Description

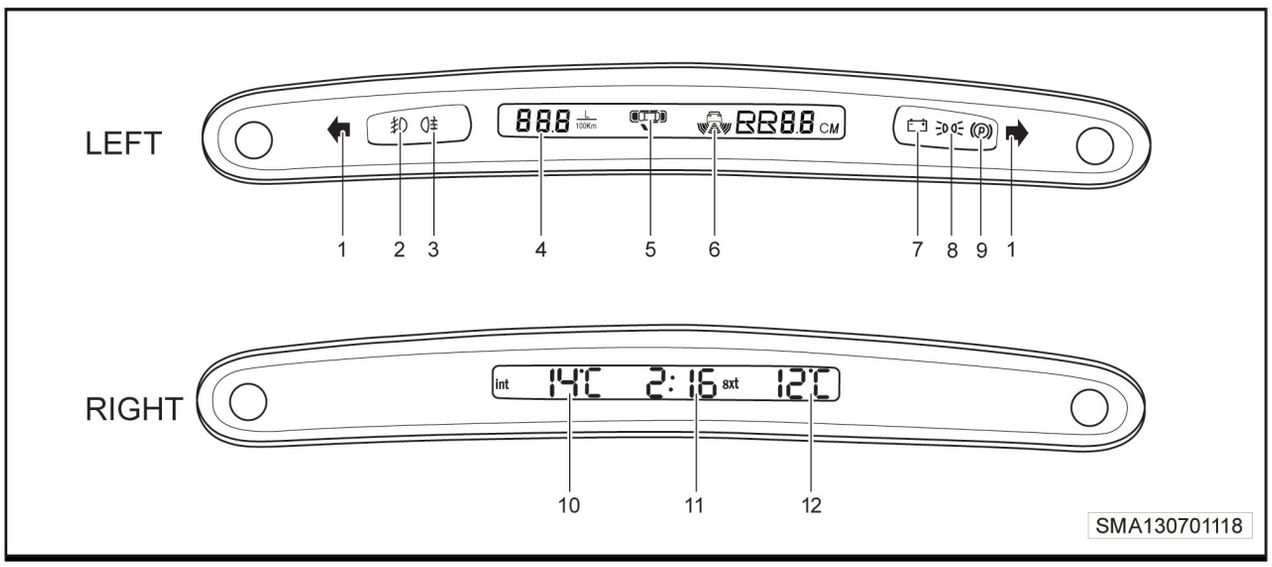
- The instrument cluster is located on the instrument console in front of the driver and used to monitor and display the operating status of vehicle's systems and parts at any time to ensure that you can drive your vehicle reliably and safely. It shows digits, pointers and indicators and reminds the driver to rectify potential faults timely via flashing lights and sound warnings to effectively prevent accidents.
- The instrument system of Chery A13/A13A has two forms of display depending on different configurations. One is the instrument cluster in combination with the auxiliary instrument, and the other is the instrument cluster independently.

The applied instrument cluster and auxiliary instrument:



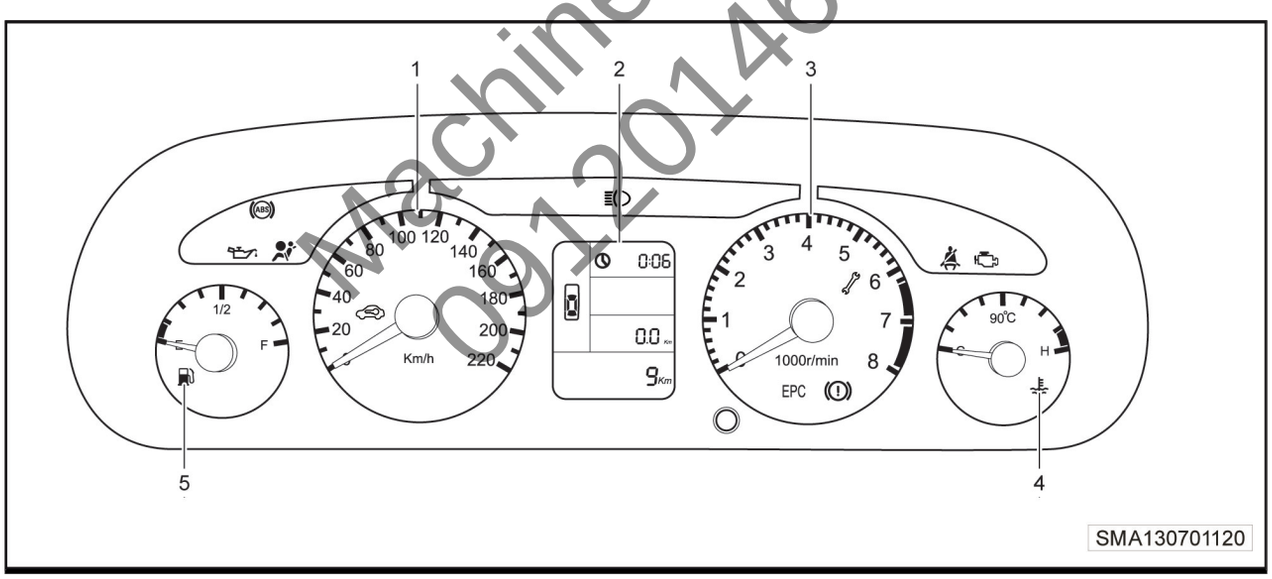
1 Engine oil pressure warning lamp	8 Engine fault indicator
2 ABS indicator (if equipped)	9 Coolant temperature indicator
3 Airbag system indicator	10 Brake system indicator
4 Anti-theft system indicator	11 Electronic throttle fault indicator
5 High beam indicator	12 Door ajar indicator
6 Vehicle service indicator	13 Fuel level indicator
7 Driver side seat belt indicator	

07



1 Turn signal indicator	7 Charging system indicator
2 Front fog lamp indicator	8 Parking/position indicator
3 Rear fog lamp indicator	9 Parking brake indicator
4 Instant fuel consumption gauge	10 Interior temperature display unit
5 Door opening status indicator	11 Clock display unit
6 Reversing radar system display unit	12 Exterior temperature display unit

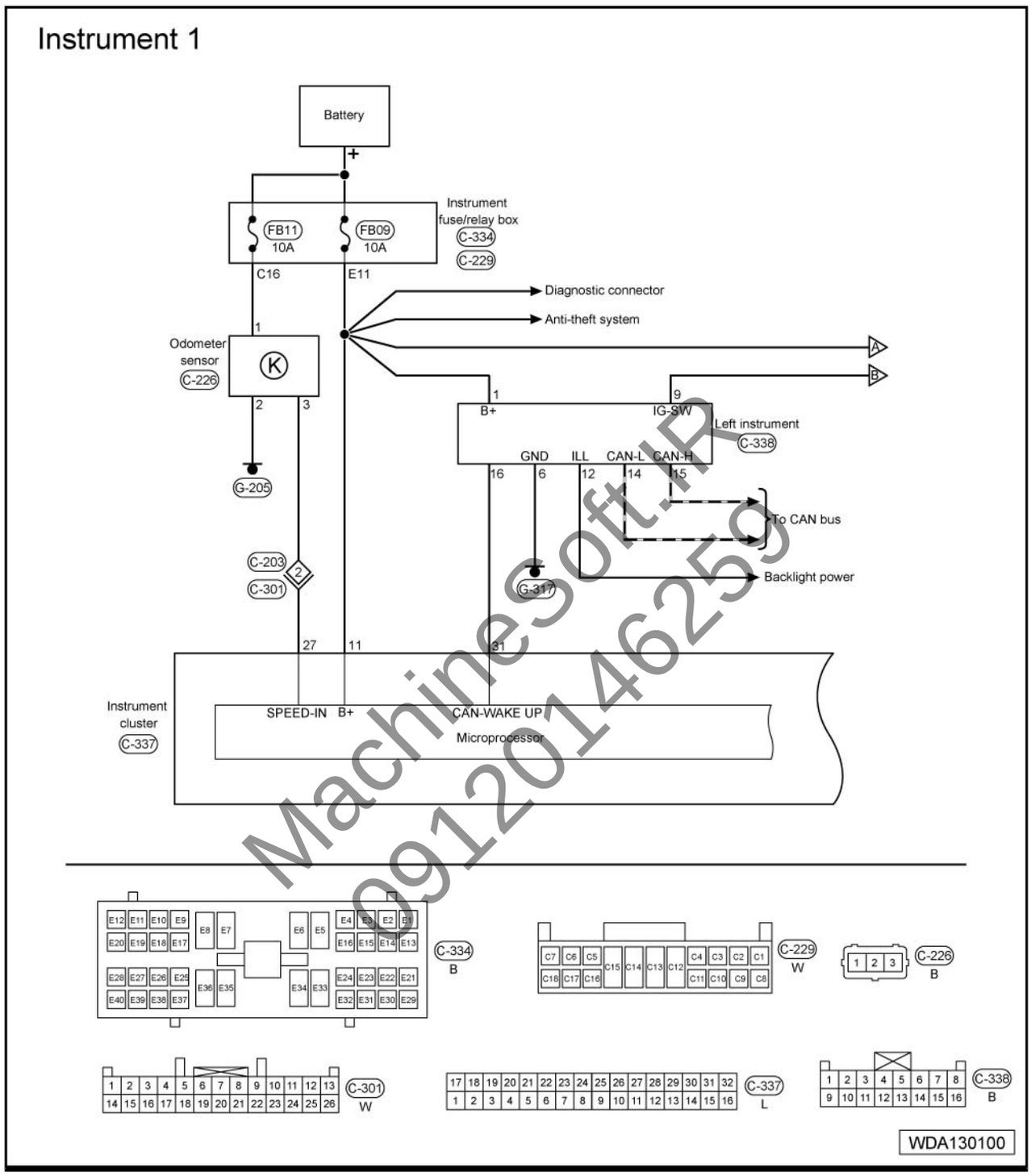
The independent instrument cluster:



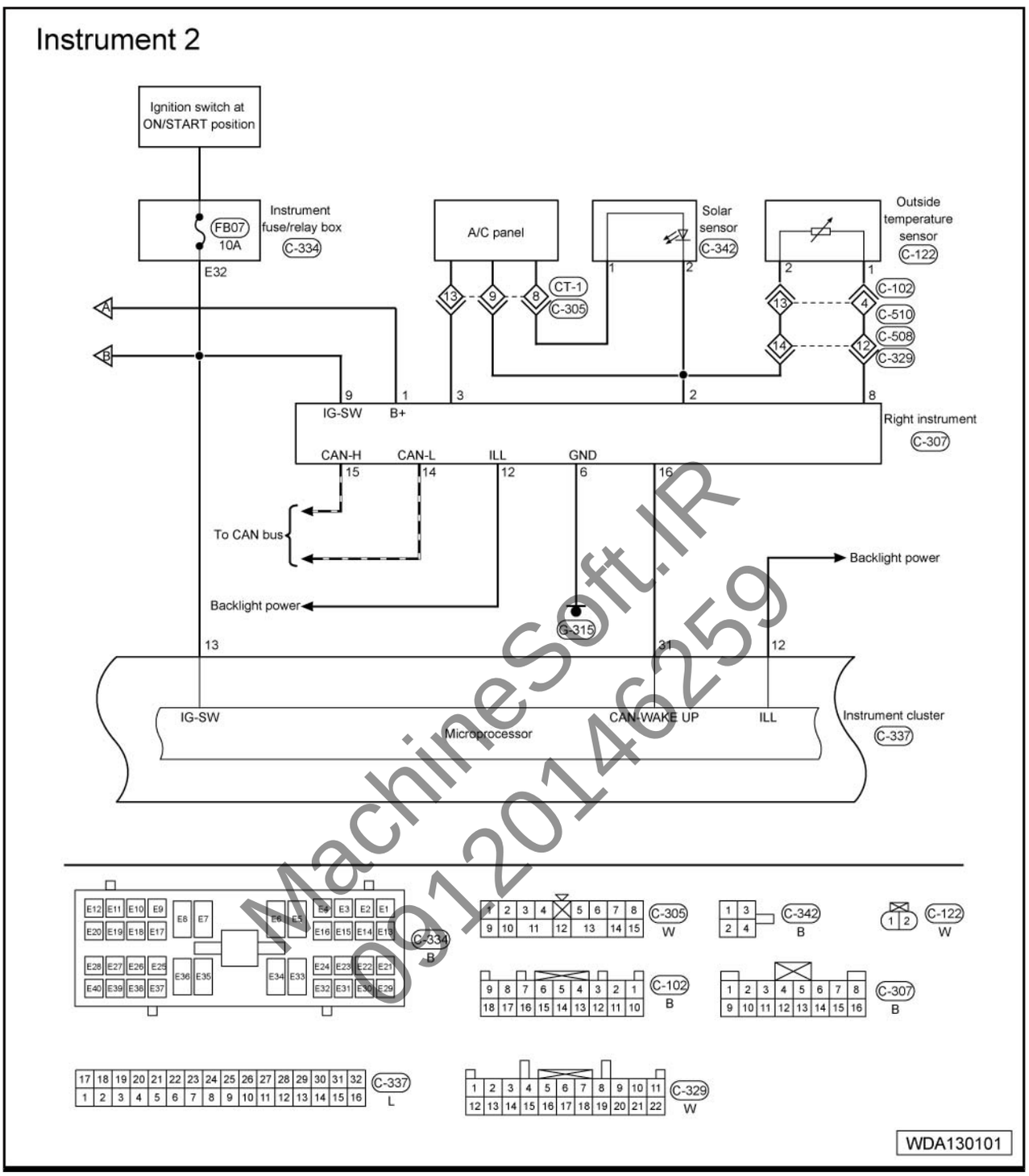
1 Speedometer	4 Coolant temperature gauge
2 LCD display	5 Fuel gauge
3 Tachometer	

4.2 Circuit diagrams

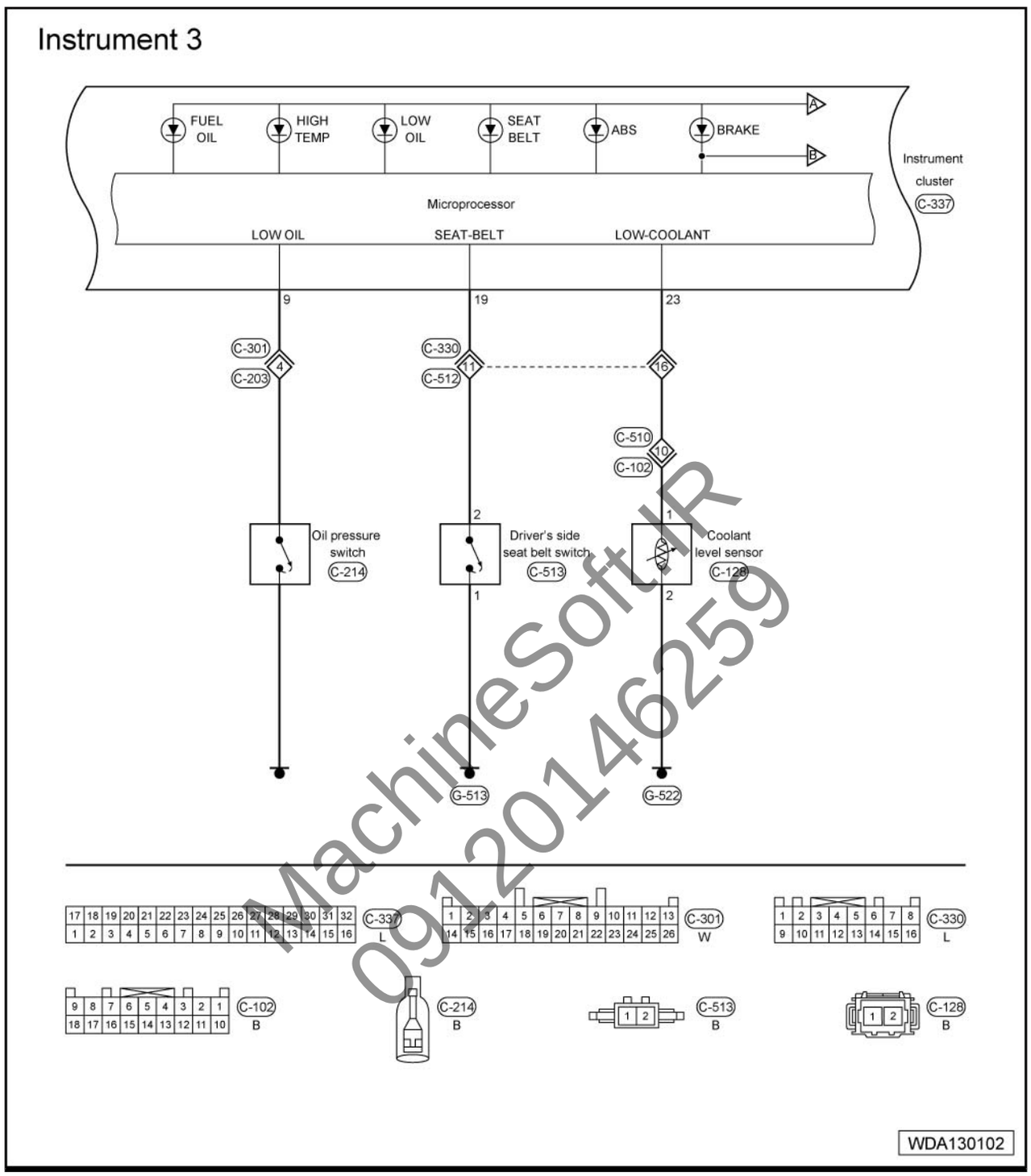
Instrument cluster (page 1)



Instrument cluster (page 2)

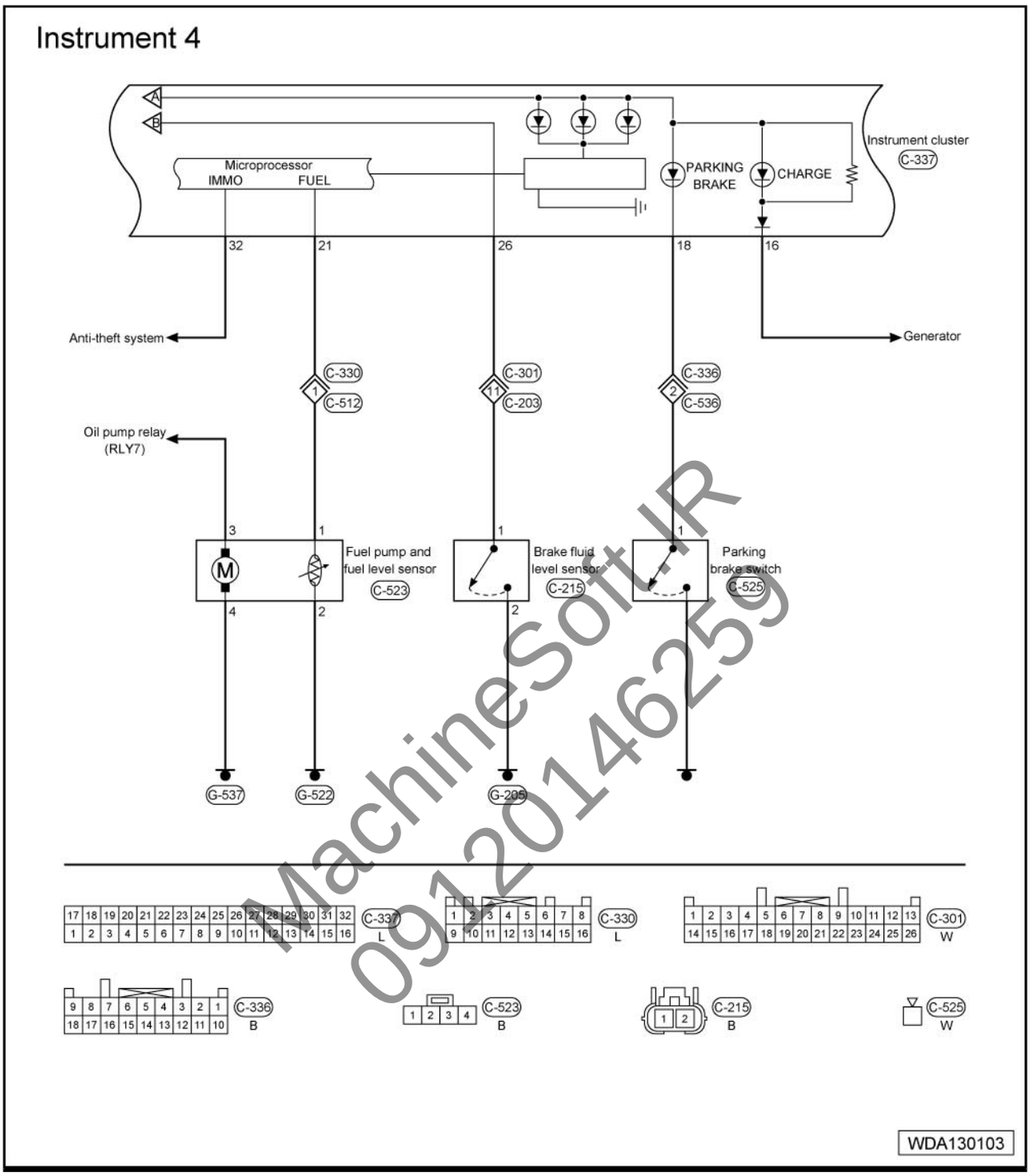


Instrument cluster (page 3)

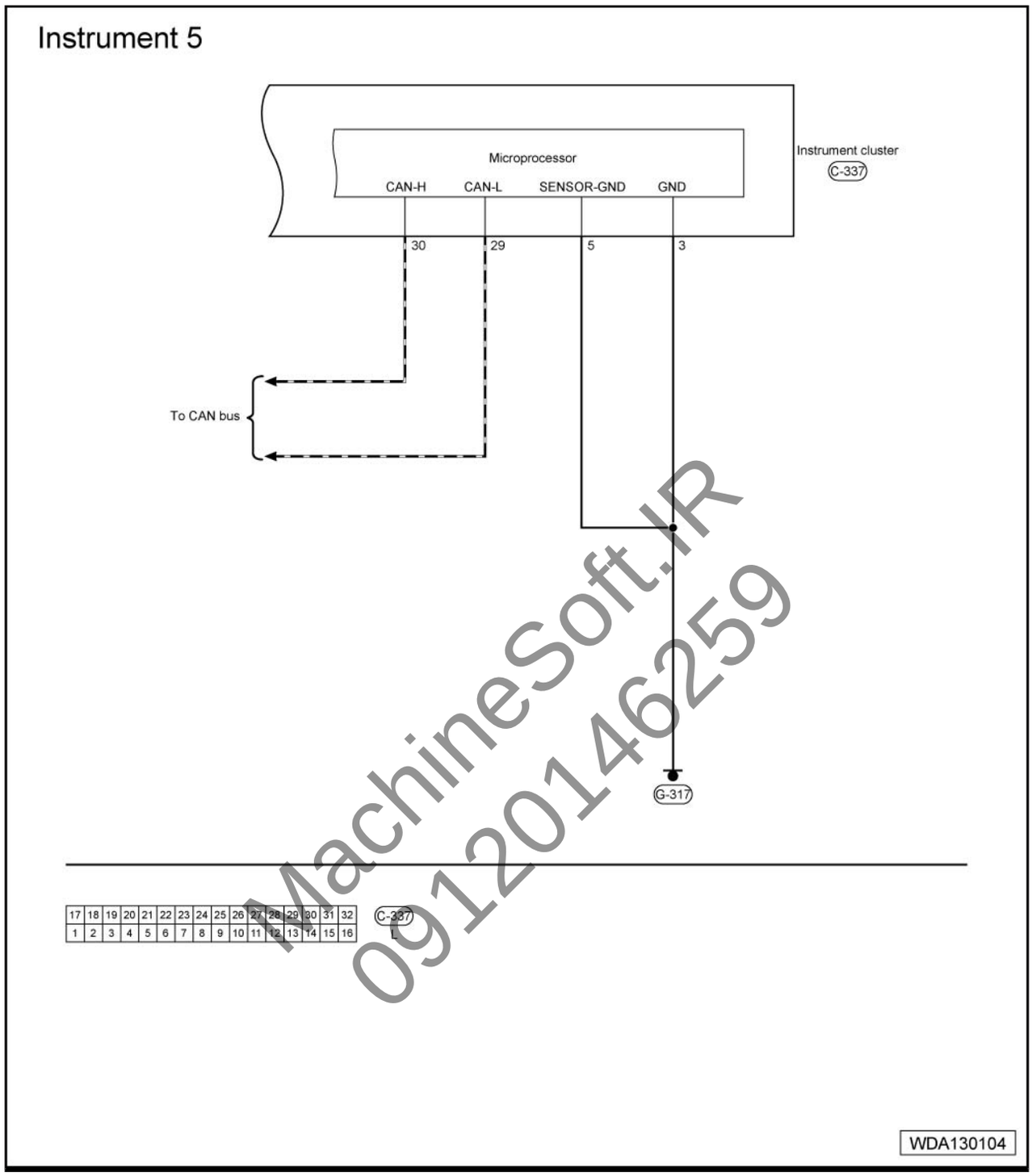


Instrument cluster (page 4)

07

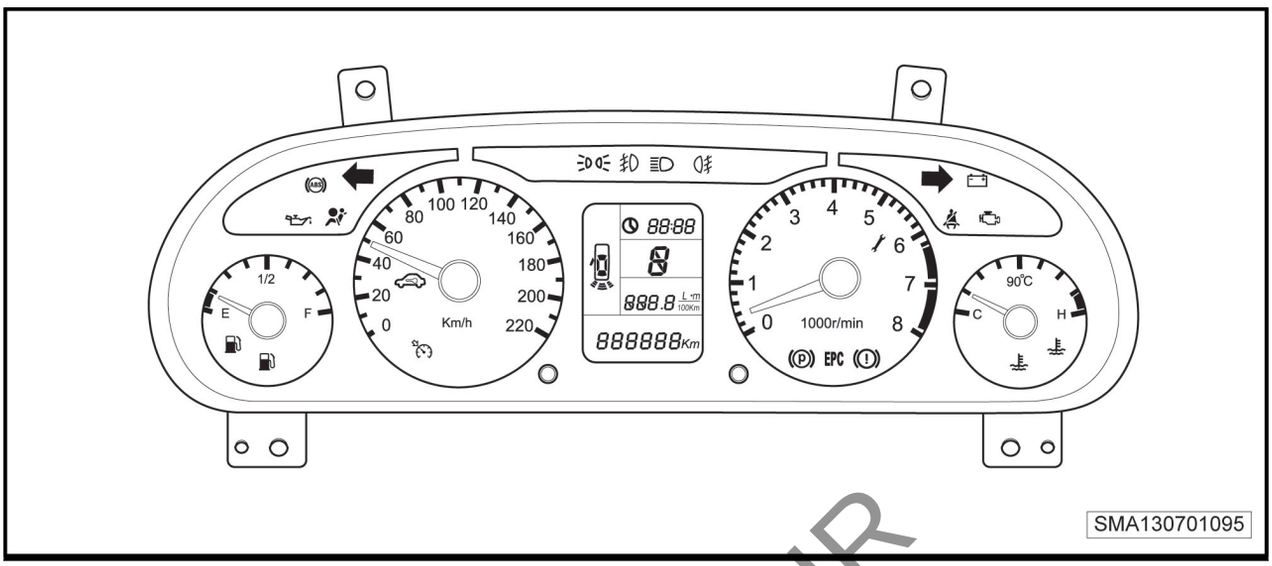


Instrument cluster (page 5)



4.3 Definition of the instrument cluster pins

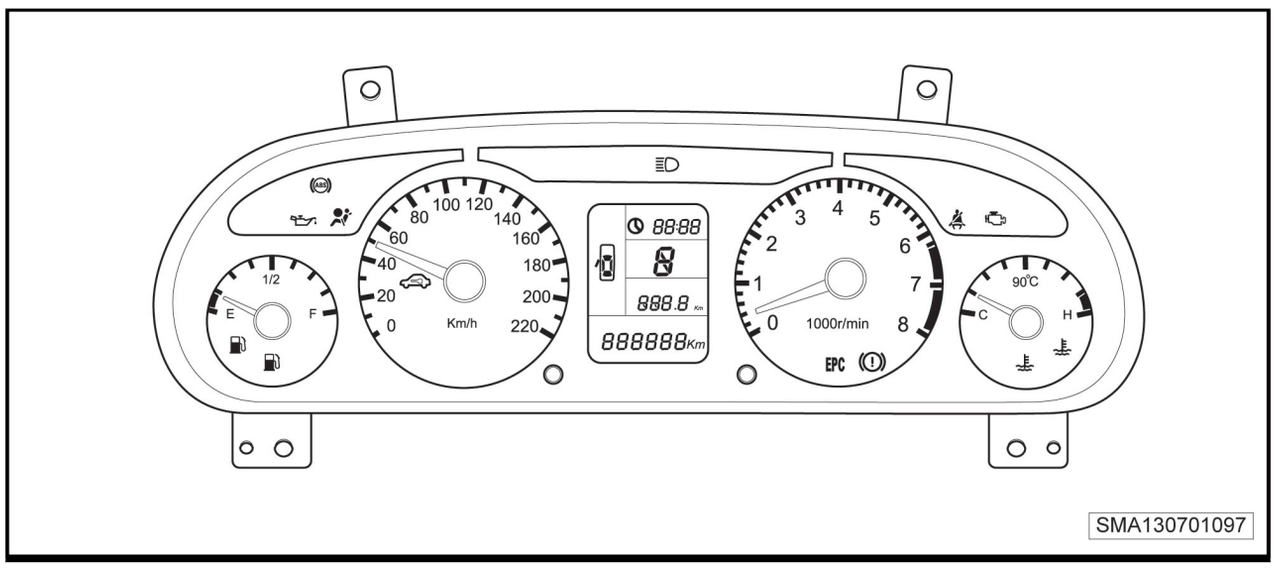
Instrument cluster (independent)



Instrument cluster 32-pin connector

Pin No.	Function	Pin No.	Function
1		17	
2		18	Parking brake signal input
3	Grounding	19	Seat belt switch input
4		20	
5	Sensor grounding	21	Fuel sensor
6		22	
7	Vehicle speed output	23	Low coolant level
8		24	
9	Low engine oil pressure	25	Low brake fluid level
10		26	
11	KL30	27	Vehicle speed input
12	Backlight	28	
13	KL15	29	CAN-L
14		30	CAN-H
15		31	Wake up signal
16	Generator charging and discharging	32	Engine theft protection

Instrument cluster (with auxiliary instrument)

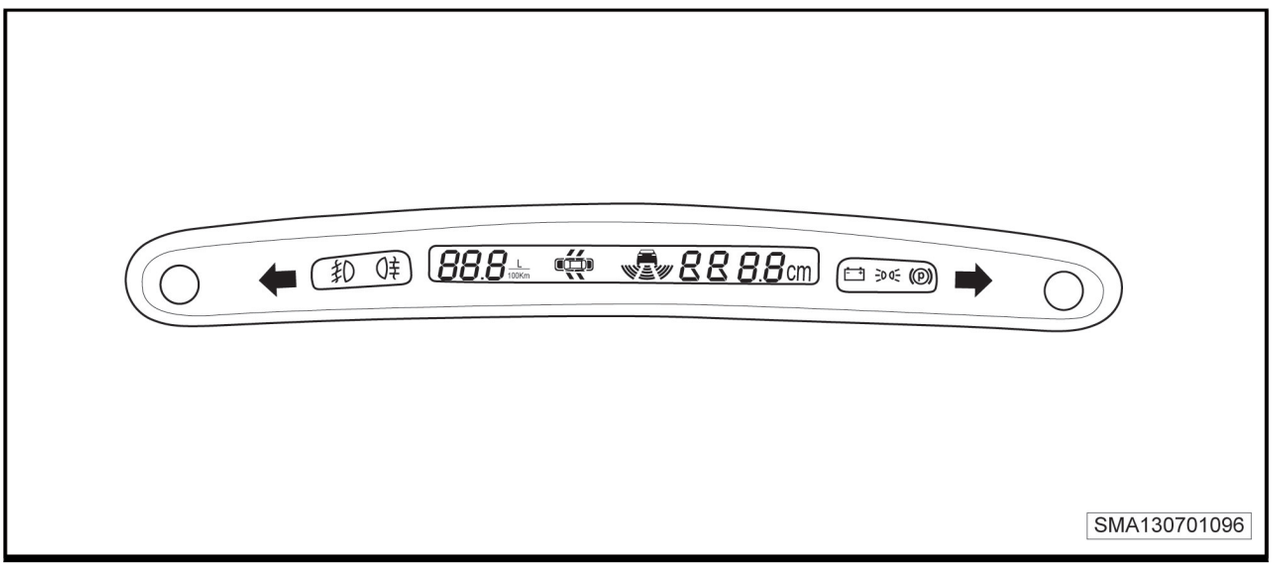


Instrument cluster 32-pin connector

Pin No.	Function	Pin No.	Function
1		17	
2		18	Parking brake signal input
3	Grounding	19	Seat belt switch input
4		20	
5	Sensor grounding	21	Fuel sensor
6		22	
7	Speed output	23	Low coolant level
8		24	
9	Low engine oil pressure	25	Low brake fluid level
10		26	
11	KL30	27	Speed input
12	Backlight	28	
13	KL15	29	CAN-L
14		30	CAN-H
15		31	Wake up signal
16	Generator charging and discharging	32	Engine theft protection

07

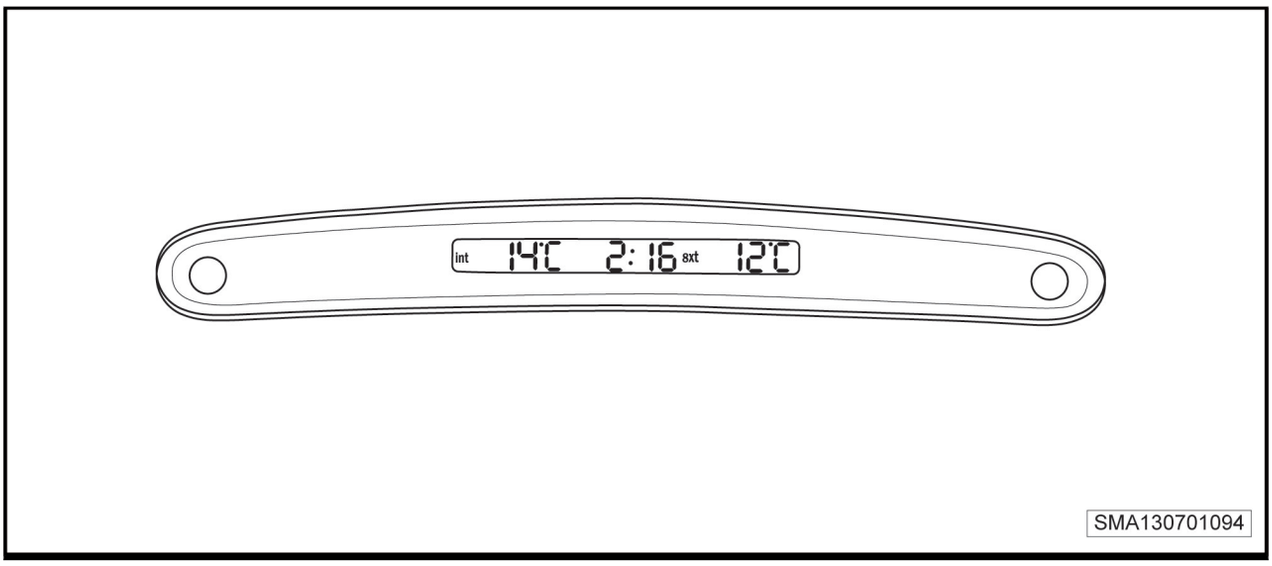
Left auxiliary instrument



16-pin connector of the left auxiliary instrument

Pin No.	Function	Pin No.	Function
1	KL30	9	KL15
2		10	
3		11	
4		12	Backlight
5		13	
6	Grounding	14	
7		15	
8		16	Wake up signal

Right auxiliary instrument



16-pin connector of the right auxiliary instrument

Pin No.	Function	Pin No.	Function
1	KL30	9	KL15
2	Solar sensor	10	
3	Air-conditioner panel	11	
4		12	Backlight
5		13	
6	Grounding	14	
7		15	
8	Exterior temperature input	16	Wake up signal

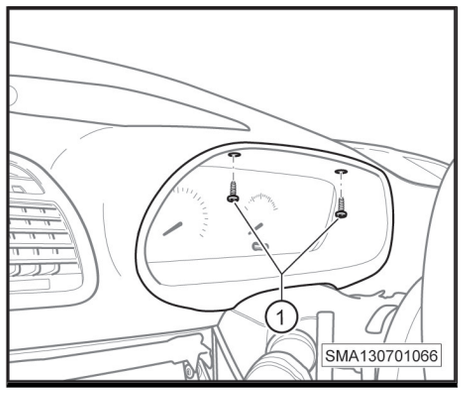
07

4.4 Assembling the instrument cluster

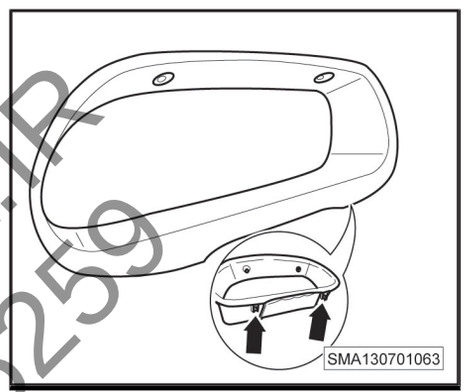
4.4.1 Removing and installing the instrument cluster

Removal

1. Unscrew the shield sleeve assembling screws (-1-) from the instrument cluster.

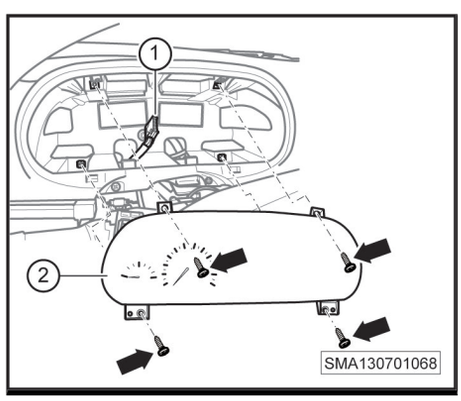


2. Lever out the fixing clips (-arrow-) of the shield sleeve carefully with a tool and remove the shield sleeve.



3. Unscrew the four fixing screws (-arrow-) from the instrument cluster.

4. Remove the instrument cluster (-2-) from the instrument console carefully and disconnect the wiring harness connector (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

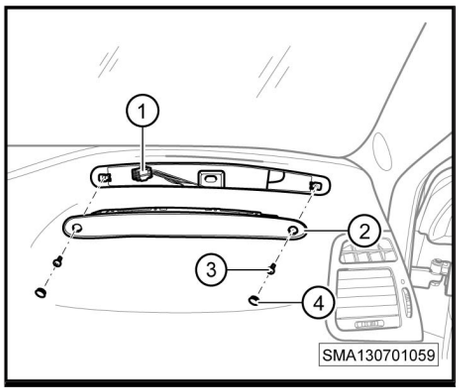
4.4.2 Removing and installing the auxiliary instrument

Note

- The removal and installation procedures of the left auxiliary instrument are the same as that of the right one. The method of removing and installing the right auxiliary instrument is taken as an example here.

Removal

1. Lever out the trim covers of the auxiliary instrument fixing screws carefully (-4-).
2. Unscrew the two fixing screws (-3-), remove the auxiliary instrument (-2-) and disconnect the wiring harness connector (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure.

5 Diagnosis and Inspection of the Instrument Cluster

5.1 Diagnosis and inspection of sporadic DTC faults

If the sporadic DTC faults occur, please check the following items:

- Check if the connector of the DTC-related actuator or sensor is properly installed.
- Check the connector pins of the actuator or sensor for leakage and corrosion.
- Check the leads for bending or squeezing.
- Check the sensor for dirt or damage.
- Check if the routing of wiring harness is correct and proper.

5.2 Checking earth connection

A good earth connection is prerequisite for ensuring the normal operation of the circuit. If the earth terminal of the circuit is always exposed to the wet and dusty environment, the metal of the earth terminal will corrode and affect the circuit smoothness, thus causing various electrical system malfunctions. As the control circuit is very sensitive, the loosened or corroded wires may significantly affect the transmission of various signals in the electronic control circuit. Therefore, please note the followings when inspecting:

- Replace the earth bolts or nuts.
- Check the earth terminal and coil for corrosion.
- Clean and polish the earth terminal and coil when necessary to ensure good contact.
- Check if there is any accessory interfering with the earth circuit.

07

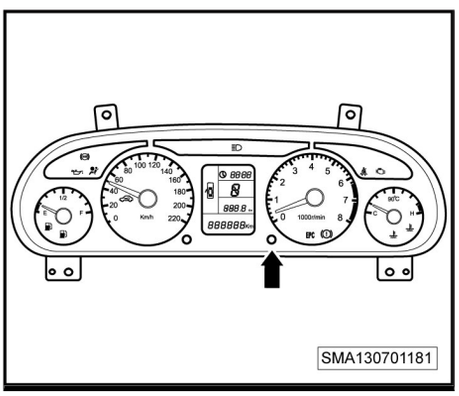
5.3 Canceling the vehicle service indicator

The vehicle service indicator can be canceled by the following two ways:

1. Cancel via the diagnostic device.
2. Cancel via the adjusting knob.

The procedure of clearing the service indicator via the adjusting knob is as follows:

- Turn off the ignition switch.
- Press and hold the adjusting knob (-arrow-) and turn on the ignition switch.
- Press and rotate the adjusting knob for no more than 2 seconds within 30 seconds after releasing it.
- Release the adjusting knob when the indicator goes out to cancel the service indicator.



5.4 Special tools

- X-431 diagnostic device
- Digital multimeter
- Adapter cable

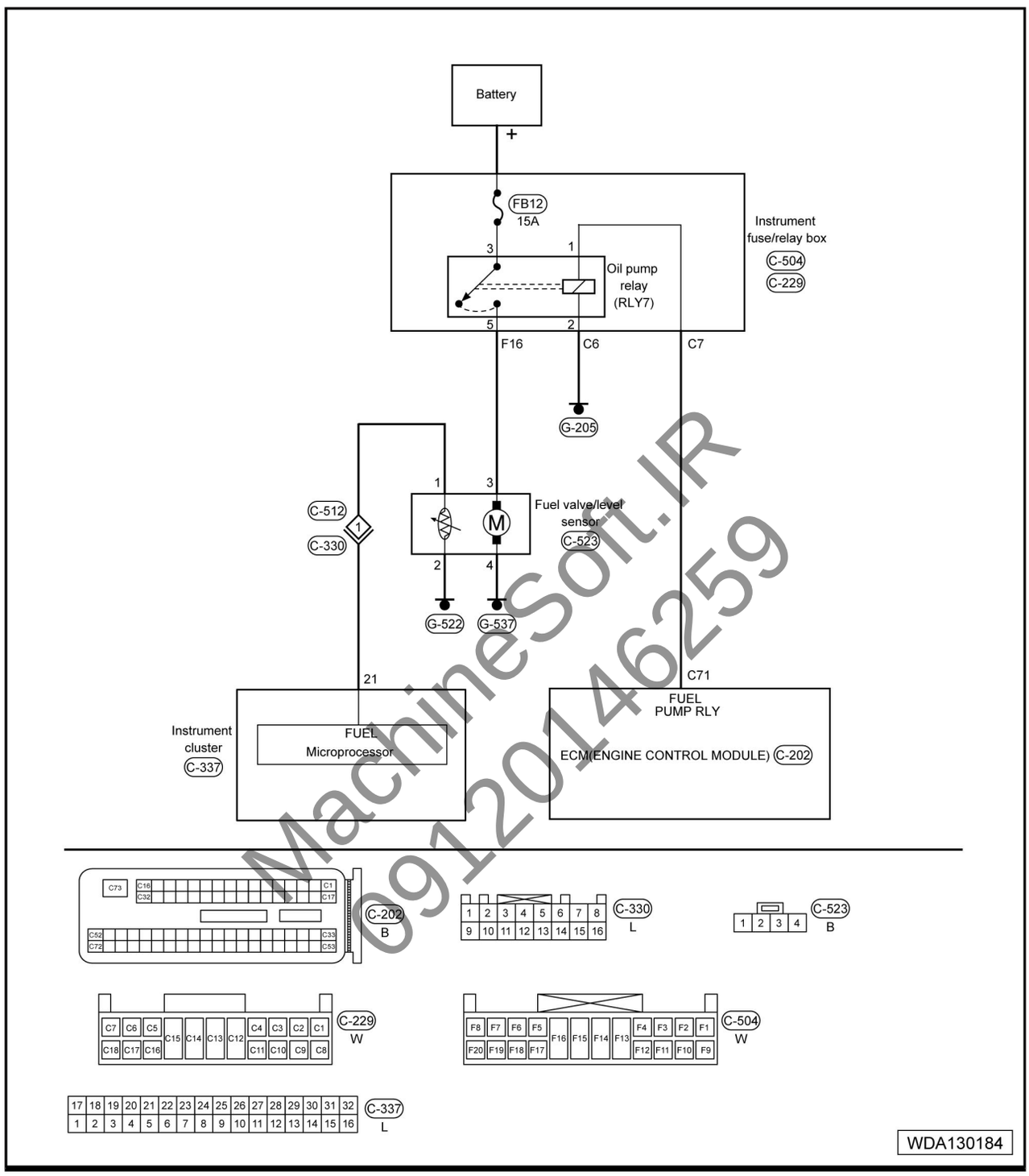
5.5 Fault diagnosis (DTC)

5.5.1 Instrument cluster DTC fault list

DTC	Definition
B1701	Fuel sensor open circuit/short to battery
B1702	Fuel sensor short to ground
B1709	Failure of the ABS warning lamp
B1713	Failure of the parking warning lamp
U1701	Failure of the instrument and BCM CAN communication
U1702	Failure of the instrument and the engine CAN communication
U1705	Failure of the instrument and ABS CAN communication
U1710	Failure of the instrument and the airbag module CAN communication

5.5.2 B1701 Fuel sensor open circuit/short to battery

B1702 Fuel sensor short to ground



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1701	Fuel sensor open circuit/short to battery	The ignition switch in the ON/START position	Wiring harness between the instrument cluster and the fuel sensor open/short circuit	• Failure of the wiring harness or the connector • Failure of the fuel sensor

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the instrument cluster
B1702	Fuel sensor short to ground	The ignition switch in the ON/START position	Wiring harness of the fuel sensor short circuit	• Failure of the wiring harness or the connector • Failure of the fuel sensor • Failure of the instrument cluster

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

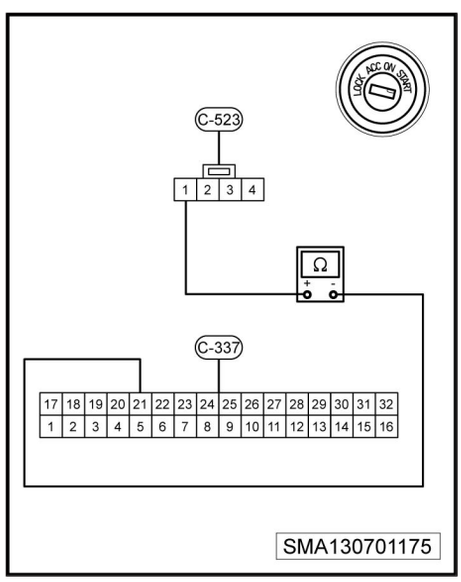
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

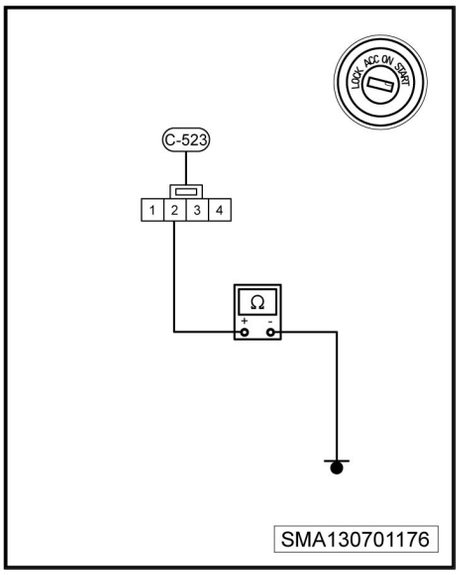
1. Turn the ignition switch to the LOCK position, check if the lead between the pin 1 of the fuel sensor connector C-523 and the pin 21 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 2.
- If not, check if the lead between the pin 1 of the fuel sensor connector C-523 and the pin 21 of the instrument cluster connector C-337 is open/short circuit. And repair the lead. ■



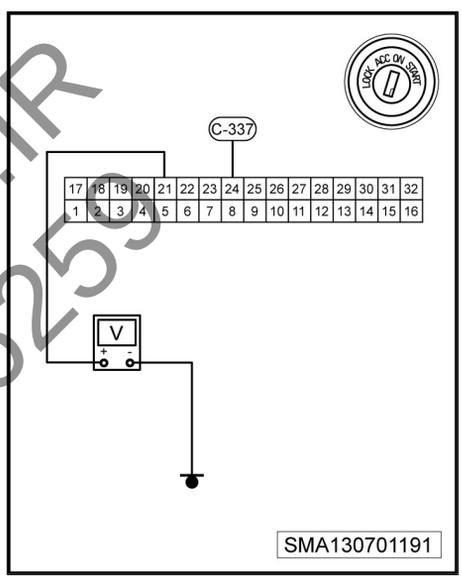
2. Turn the ignition switch to the LOCK position and check if the pin 2 of the fuel sensor connector C-523 is grounded properly.

- If yes, go to step 3.
- If not, check if the lead between the pin 2 of the fuel sensor connector C-523 and the ground is open circuit. And repair the lead. ■



3. Test if the voltage between the pin 21 of the instrument connector C-337 and the ground is 0-5V.

- If yes, check the fuel sensor for failure. And repair or replace the fuel sensor. ■
- If not, go to step 4.



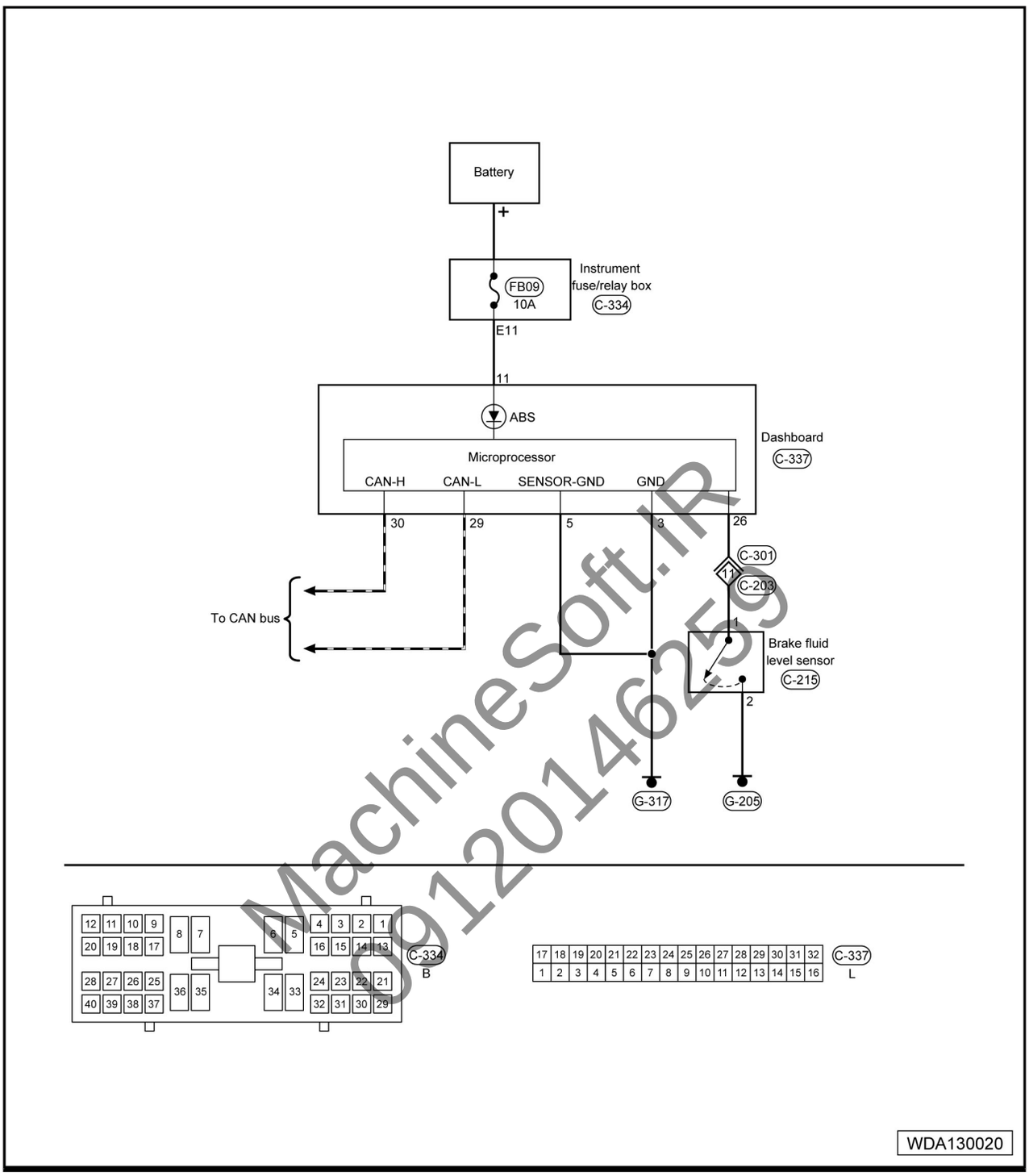
4. Check if the power supply line and the ground line of instrument cluster are normal.

- If yes, go to step 5.
- If not, repair the faulty line. ■

5. Replace the instrument cluster, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

5.5.3 B1709 Failure of the ABS warning lamp



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1709	Failure of the ABS warning lamp	The ignition switch in the ON position	Brake fluid level switch open/short circuit detected by the instrument cluster	• Failure of the wiring harness or the connector • Failure of the instrument cluster • Failure of the brake fluid level switch

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

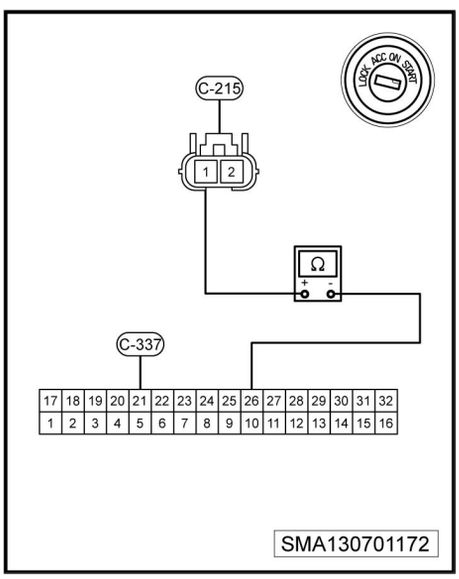
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the fluid level in the brake fluid reservoir is normal.

- If yes, go to step 2.
- If not, check if the brake fluid level has dropped to low and add adequate brake fluid until it reaches the proper level if necessary. ■

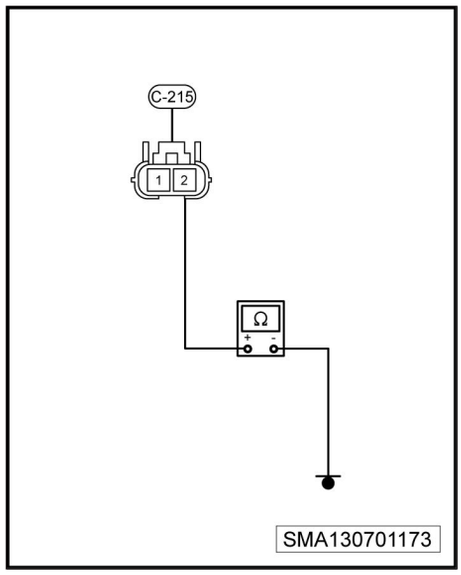
2. Turn the ignition switch to the LOCK position, check if the lead between the pin 1 of the brake fluid level switch connector C-215 and the pin 26 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 3.
- If not, check if the lead between the pin 1 of the brake fluid level switch connector C-215 and the pin 26 of the instrument cluster connector C-337 is open/short circuit. And repair the lead. ■



3. Turn the ignition switch to the LOCK position, check if the pin 2 of the brake fluid level switch connector C-215 is grounded properly.

- If yes, go to step 4.
- If not, check if the lead between the pin 2 of the brake fluid level switch connector C-215 and the ground is open/short circuit. And repair the lead. ■



4. Check the fault in the brake fluid level switch and confirm if the brake fluid level switch is normal.

- If yes, go to step 5.
- If not, replace the brake fluid level switch. ■

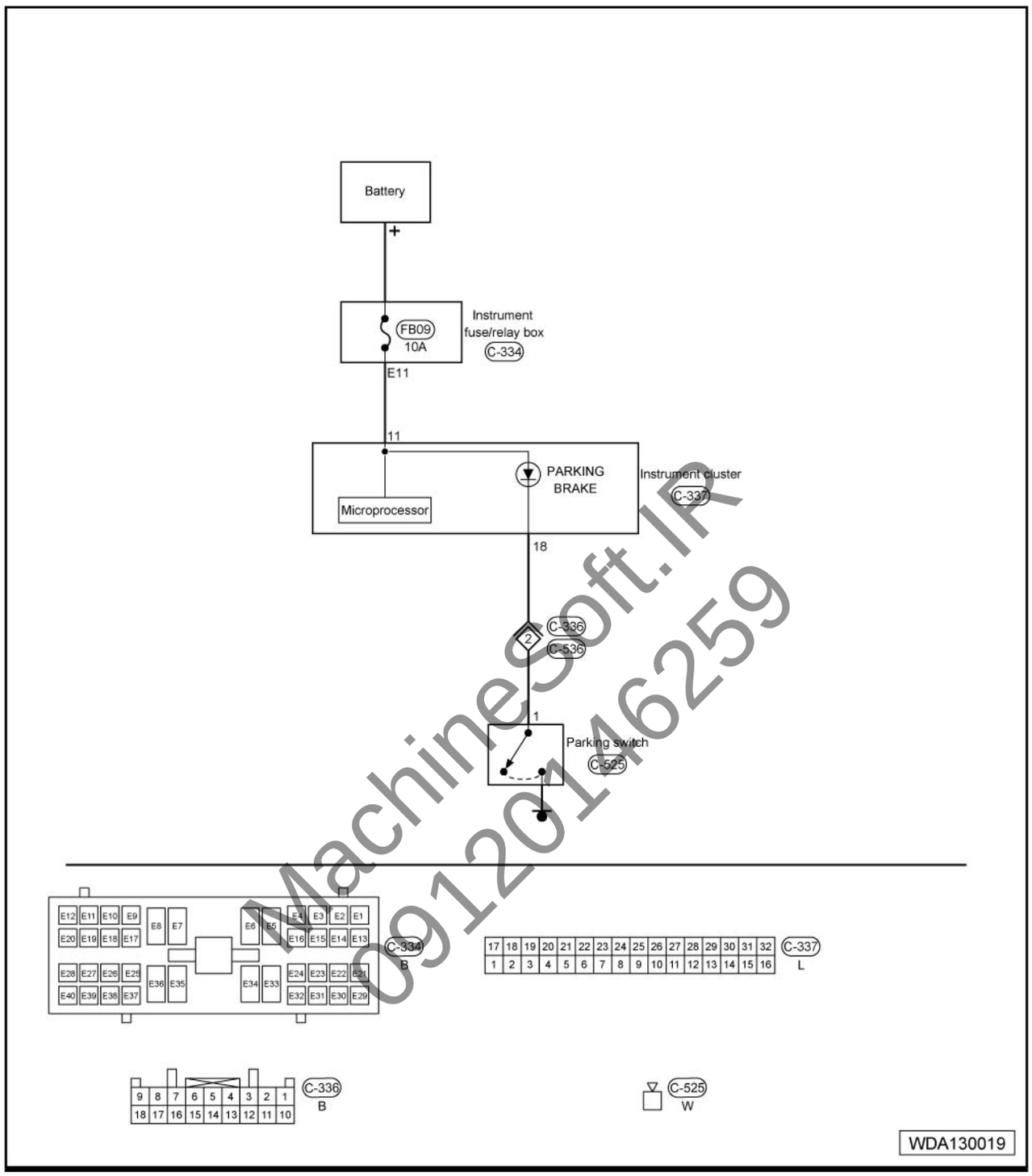
5. Check if the power supply line and ground line of the instrument cluster are normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

6. Replace the instrument cluster, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

5.5.4 B1713 Failure of the parking warning lamp



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1710	Failure of the parking warning lamp	The ignition switch in the ON/START position	Parking switch short/open circuit detected by the instrument cluster	• Failure of the wiring harness or the connector • Failure of the instrument cluster • Failure of the parking switch

07

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

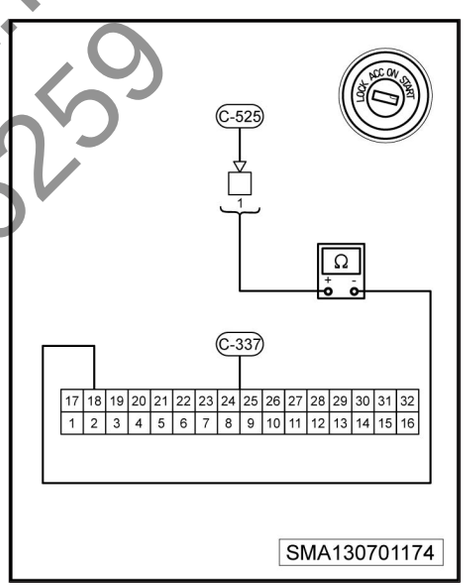
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the LOCK position, check if the lead between the pin 1 of the parking switch connector C-525 and the pin 18 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 2.
- If not, check if the lead between the pin 1 of the parking switch connector C-525 and the pin 18 of the instrument cluster connector C-337 is open/short circuit. And repair the defective lead. ■



2. Check if the parking switch is normal.。

- If yes, go to step 3.
- If not, replace the parking switch. ■

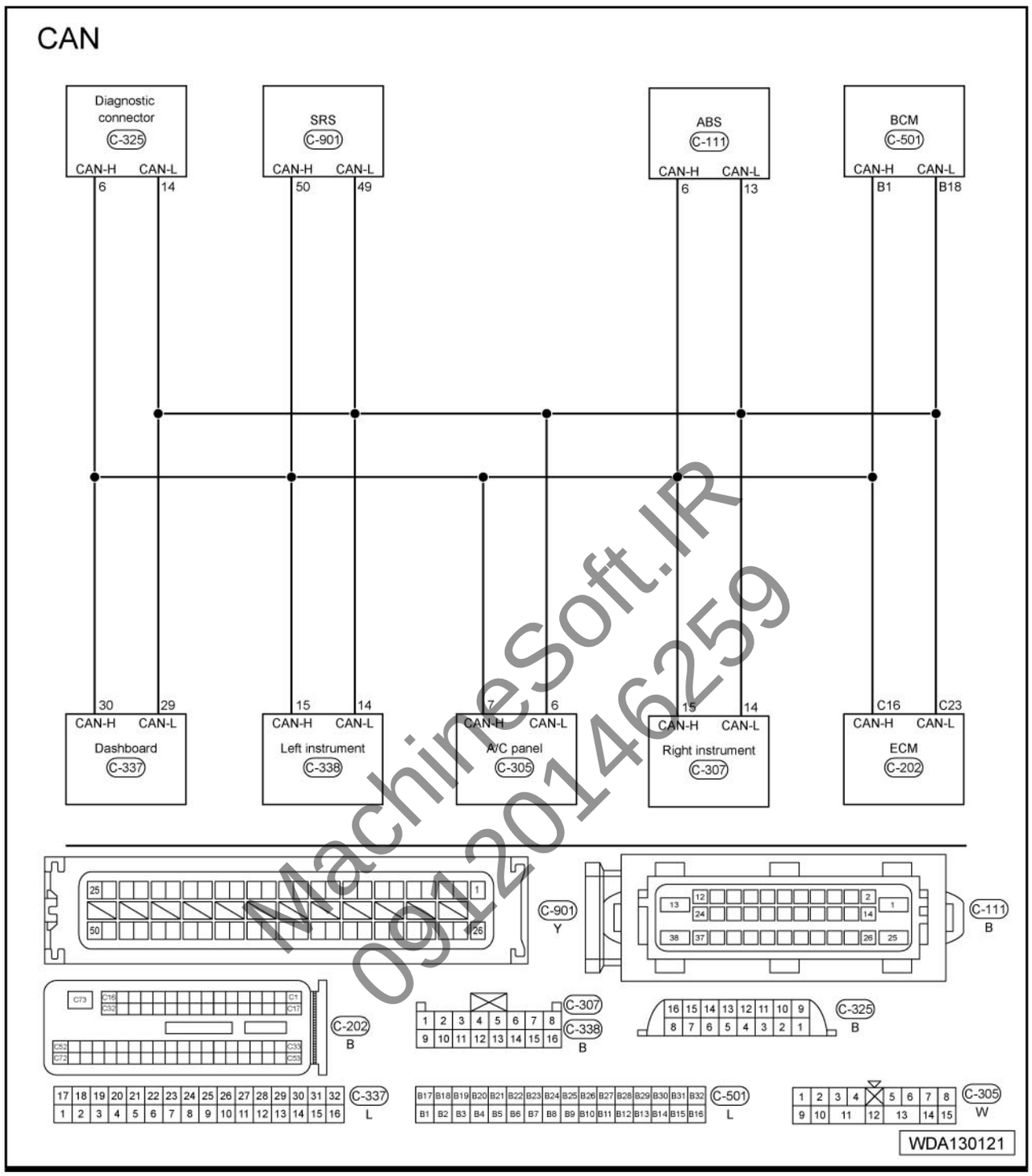
3. Check if the power supply line and ground line of the instrument cluster are normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

4. Replace the instrument cluster, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

5.5.5 U1701 Failure of the instrument and BCM CAN communication



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
U1701	Failure of the instrument and BCM CAN communication	The ignition switch in the ON/START position	Wires between the instrument and the BCM CAN communication open/short circuit	• Failure of the wiring harness or the connector • Failure of the BCM (Body Control Module) • Failure of the instrument cluster

07

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

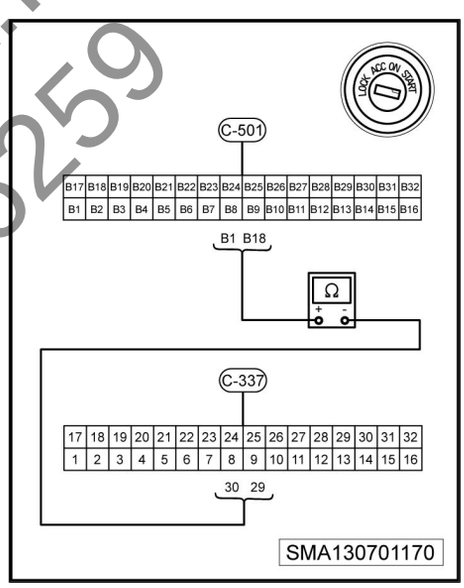
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the LOCK position, check if the lead between the pin B1 of the BCM connector C-501 and the pin 30 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 3.
- If not, check if the lead between the pin B1 of the BCM connector C-501 and the pin 30 of the instrument cluster connector C-337 is open/short circuit. And repair or replace the defective lead. ■



2. Turn the ignition switch to the LOCK position, check if the lead between the pin B18 of the BCM connector C-501 and the pin 29 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 4.
- If not, check if the lead between the pin B18 of the BCM connector C-501 and the pin 29 of the instrument cluster connector C-337 is open/short circuit. And repair or replace the defective lead. ■

3. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 4.
- If not, repair the faulty line. ■

4. Check if the power supply line and ground line of the instrument cluster are normal.

- If yes, go to step 5.

- If not, repair the faulty line. ■

5. Access other control modules via the diagnostic device to check if it can read the fault in the system module normally.

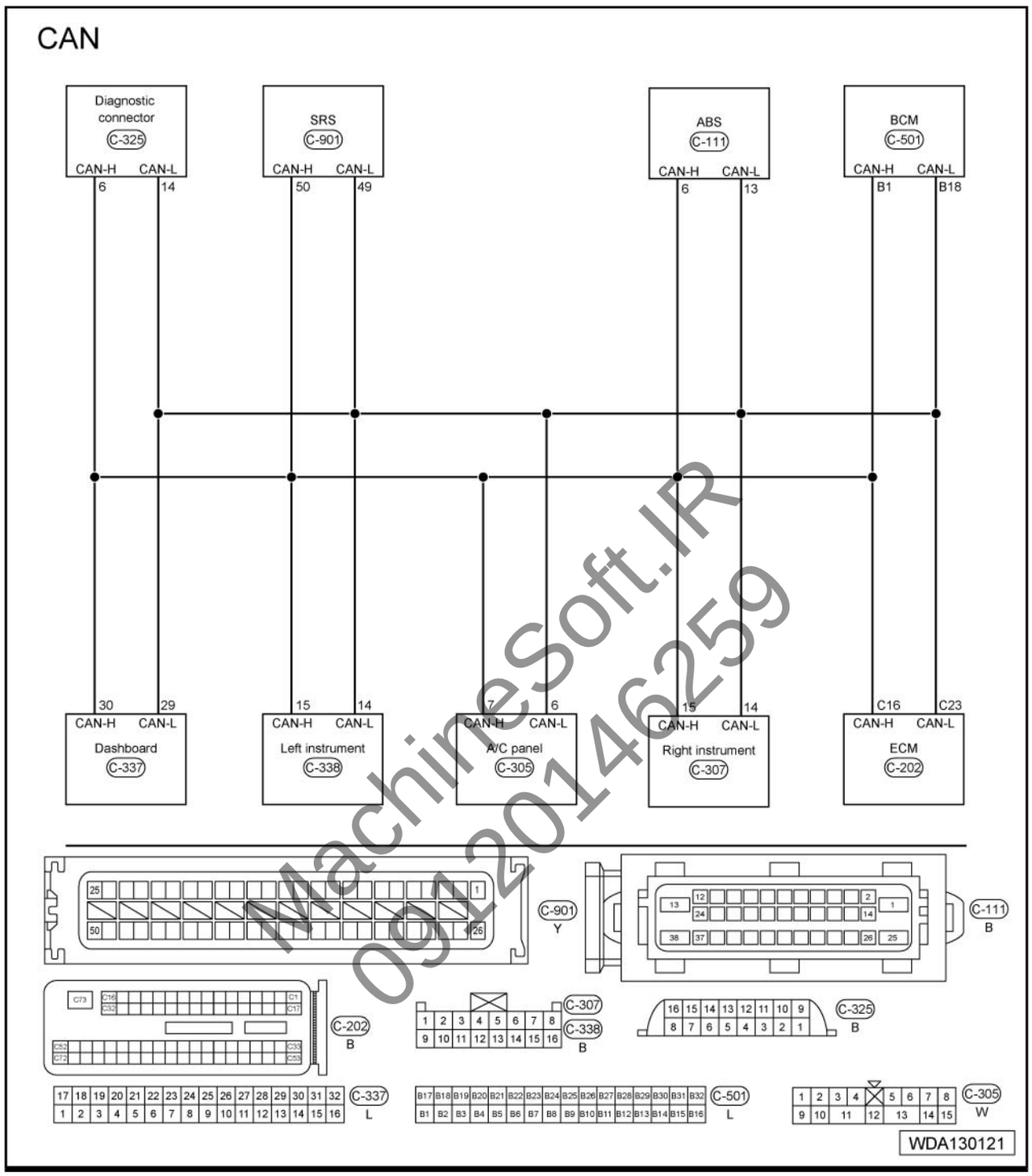
- If yes, go to step 6.
- If not, the body control module fails and please replace it. ■

5. Replace the instrument cluster, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

07

5.5.6 U1702 Failure of the instrument and the engine CAN communication



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
U1702	Failure of the instrument and the engine CAN communication	The ignition switch in the ON/START position	Wires between the instrument and the engine CAN communication short/open circuit	• Failure of the wiring harness or the connector • Failure of the BCM (Body Control Module)

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the engine control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

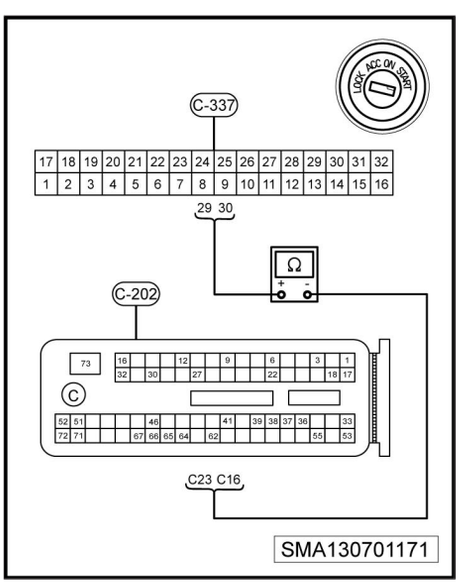
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the LOCK position, check if the lead between the pin C16 of the ECM connector C-202 and the pin 30 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 2.
- If not, check if the lead between the pin C16 of the ECM connector C-202 and the pin 30 of the instrument cluster connector C-337 is open/short circuit. And repair or replace the defective lead. ■



2. Turn the ignition switch to the LOCK position, check if the lead between the pin C23 of the ECM connector C-202 and the pin 29 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 3.
- If not, check if the lead between the pin C23 of the ECM connector C-202 and the pin 29 of the instrument cluster connector C-337 is open/short circuit. And repair or replace the defective lead. ■

3. Check if the power supply line and ground line of the instrument cluster are normal.

- If yes, go to step 4.

- If not, repair the faulty line. ■

4. Check if the power supply line and the ground line of ECM control module are normal.

- If yes, go to step 5.
- If not, repair the faulty line. ■

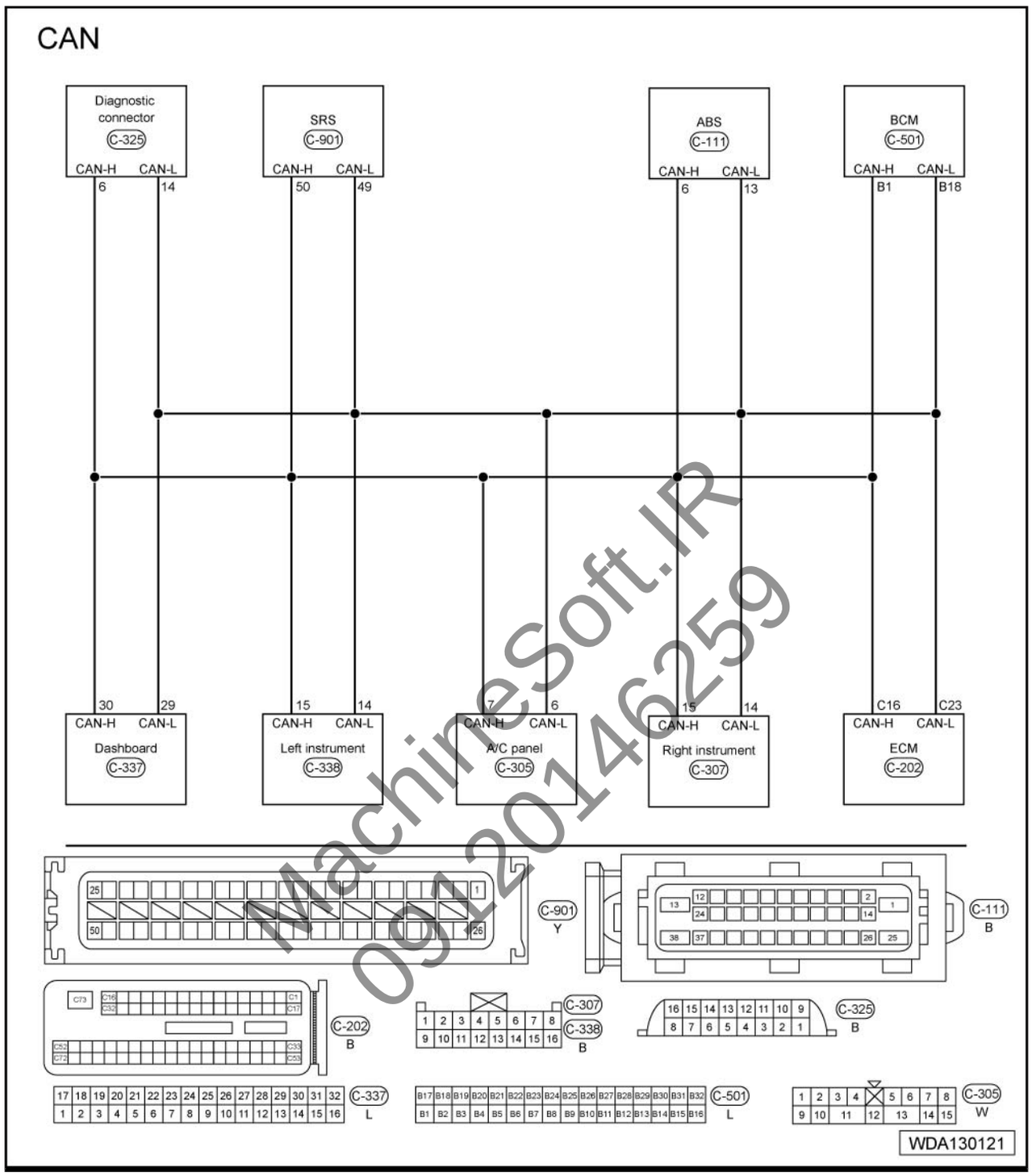
5. Access other control modules via the diagnostic device to check if it can read the fault in the system module normally.

- If yes, go to step 6.
- If not, the engine control module fails and please replace it. ■

6. Replace the instrument cluster, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

5.5.7 U1705 Failure of the instrument and the ABS CAN communication



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1705	Failure of the instrument and ABS CAN communication	The ignition switch in the ON/START position	Wires between the instrument and the ABS CAN communication short/open circuit	• Failure of the wiring harness or the connector • Failure of the ABS control unit • Failure of the instrument cluster

07

DTC test procedures:

Please confirm that the battery voltage is normal prior to performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

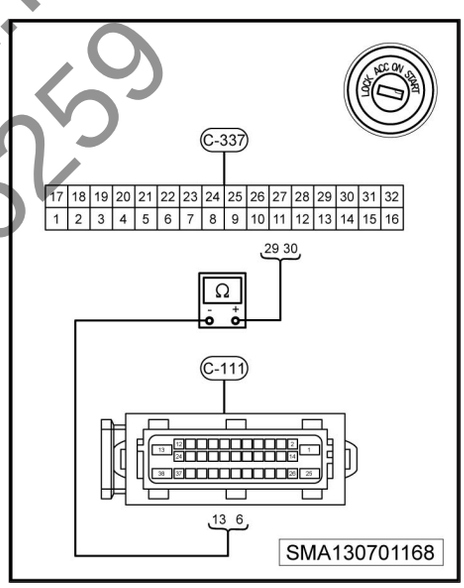
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the LOCK position, check if the lead between the pin 6 of the ABS control module connector C-111 and the pin 30 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 2.
- If not, check if the lead between the pin 6 of the ABS control module connector C-111 and the pin 30 of the instrument cluster connector C-337 is open/short circuit. And repair or replace the defective lead. ■



2. Turn the ignition switch to the LOCK position, check if the lead between the pin 13 of the ABS control module connector C-111 and the pin 29 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 3.
- If not, check if the lead between the pin 13 of the ABS control module connector C-111 and the pin 29 of the instrument cluster connector C-337 is open/short circuit. And repair or replace the defective lead. ■

3. Check if the power supply line and ground line of the instrument cluster are normal.

- If yes, go to step 4.
- If not, repair the faulty line. ■

4. Check if the power supply line and the ground line of ABS control module are normal.

- If yes, go to step 5.
- If not, repair the faulty line. ■

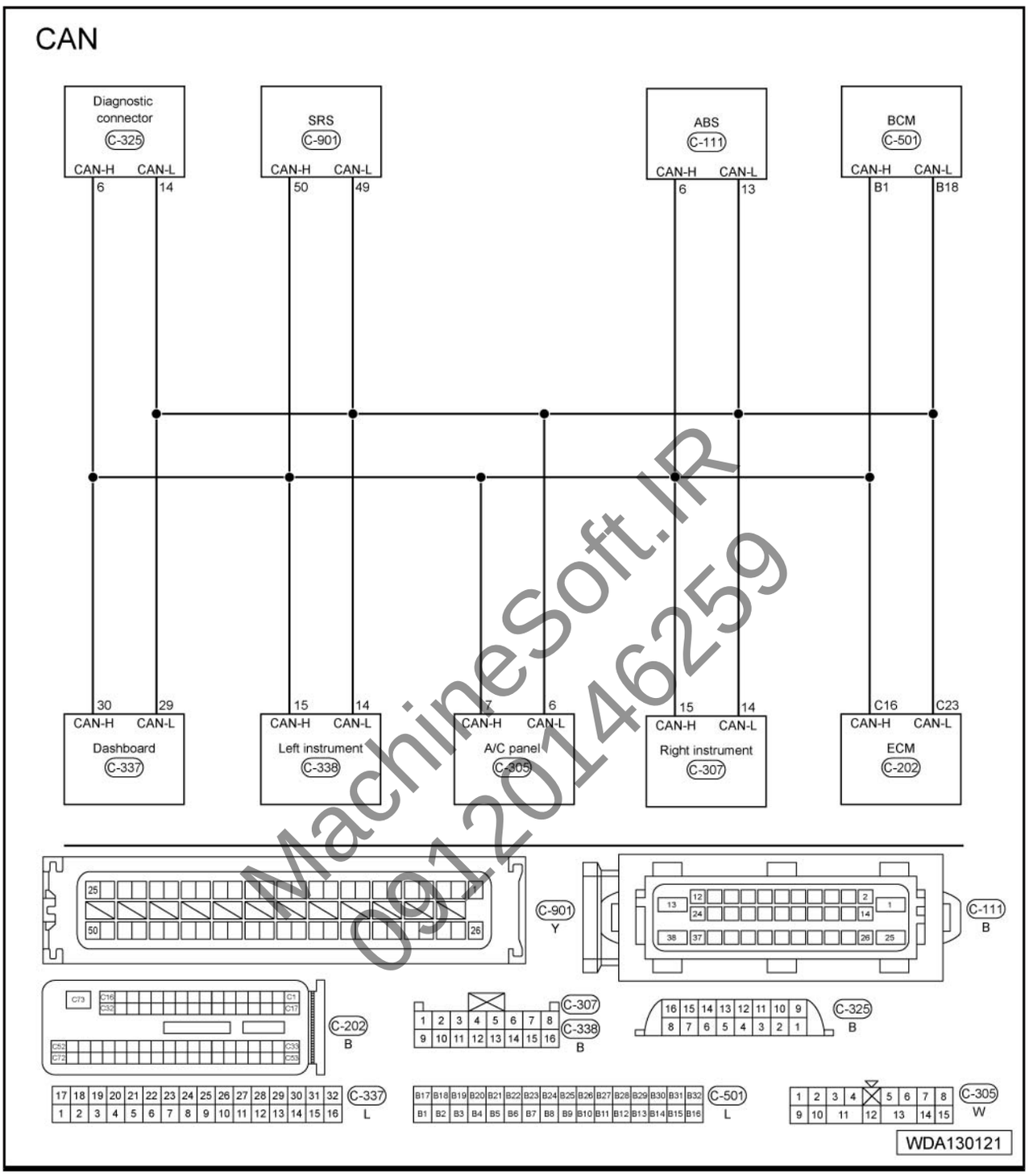
5. Access other control modules via the diagnostic device to check if it can read the fault in the system module normally.

- If yes, go to step 6.
- If not, the ABS control module fails and please replace it. ■

6. Replace the instrument cluster, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

5.5.8 U1710 Failure of the instrument and the airbag module CAN communication



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
U1710	Failure of the instrument and the airbag module CAN communication	The ignition switch in the ON/START position	Wires between the instrument and the airbag module CAN communication open/short circuit	• Failure of the wiring harness or the connector • Failure of the airbag control module

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
				• Failure of the instrument cluster

DTC test procedures:

Please confirm that the battery voltage is normal prior to performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

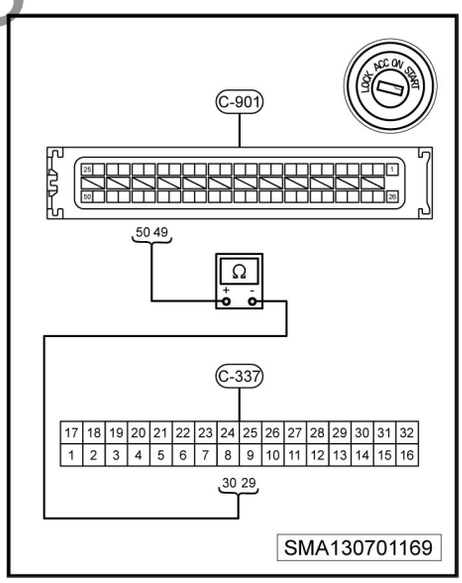
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the LOCK position, check if the lead between the pin 50 of the ABS control module connector C-901 and the pin 30 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 2.
- If not, check if the lead between the pin 50 of the airbag control module connector C-901 and the pin 30 of the instrument cluster connector C-337 is open/short circuit. ■



2. Turn the ignition switch to the LOCK position, check if the lead between the pin 49 of the airbag control module connector C-901 and the pin 29 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 3.
- If not, check if the lead between the pin 49 of the airbag control module connector C-901 and the pin 29 of the instrument cluster connector C-337 is open/short circuit. And repair or replace the defective lead. ■

3. Check if the power supply line and ground line of the instrument cluster are normal.

- If yes, go to step 4.
- If not, repair the faulty line. ■

4. Check if the power supply line and the ground line of airbag control module are normal.

- If yes, go to step 5.
- If not, repair the faulty line. ■

5. Access other control modules via the diagnostic device to check if it can read the fault in the system module normally.

- If yes, go to step 6.
- If not, the airbag control module fails and please replace it. ■

6. Replace the instrument cluster, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

6 Body Control Module (BCM)

6.1 General information

6.1.1 Description

The body control module (BCM) is installed under the left side of the dashboard. It controls many electrical elements and control systems in the vehicle and serves as the the main control module and information processing centre of the vehicle. It has the following functions:

- Power windows and door lock system control
- Exterior mirror and rear window heating
- Wiper and washer control
- Vehicle lighting
- Light off delay
- Backlight adjustment
- Body theft protection
- Horn
- Warning of not removing the key or switching off the parking light/position lamp
- Alarm and radio receiver system
- Battery saving protection
- Intelligent overload protection
- Failure logging and diagnosis
- BCM wake up signal
- Automatic door unlocking after a crash
- Gateway

The body control module (BCM) receives the input signals from all sensors and switches of the vehicle, and also outputs signals to relevant components. The BCM receives input signals from the following components:

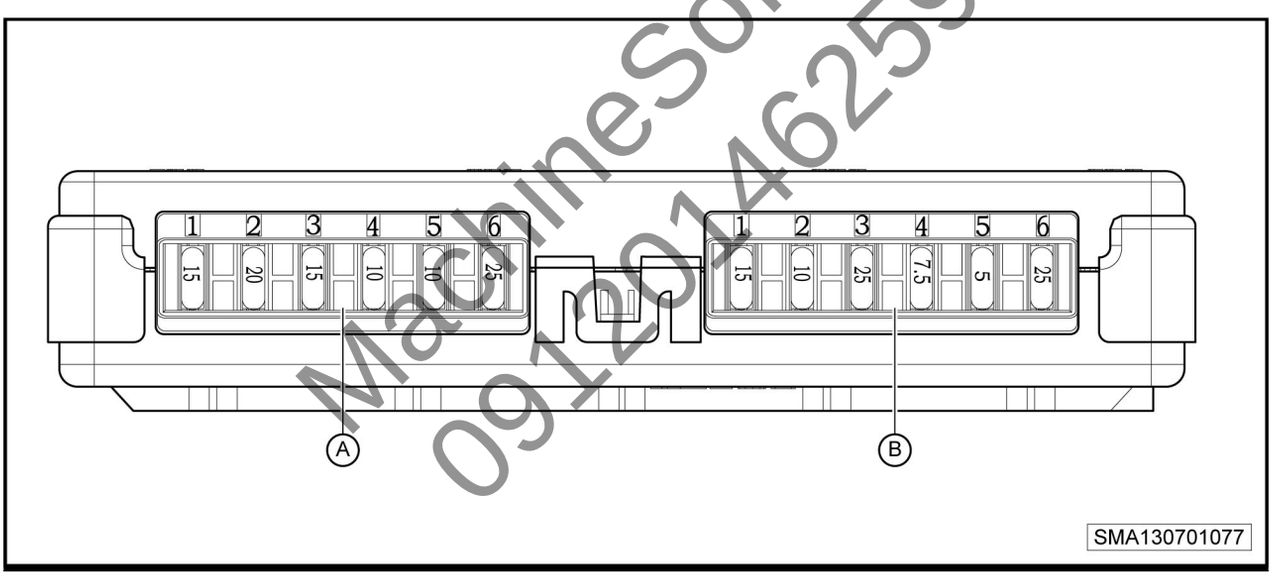
- Key switch
- Rear window defroster switch
- Hazard warning lamp switch
- Power window switch
- Door lock control switch
- Door ajar switch
- Front fog lamp switch
- Trunk lamp switch
- Horn switch
- Lighting and turn signal switch

- Exterior mirror switch
- Wiper and washer switch

The BCM outputs signals to the following components:

- High/low beam relays
- Exterior mirror/rear window defroster heater
- Front combination light
- Tail light
- Backlight adjusting switch output
- Turn signals
- Anti-theft horn/compound horn
- Parking light/position lamp/turn signal
- Front/rear power window motors
- Door lock motor
- Washer motor
- Wiper motor

6.1.2 Functions of the body control module (BCM) fuses



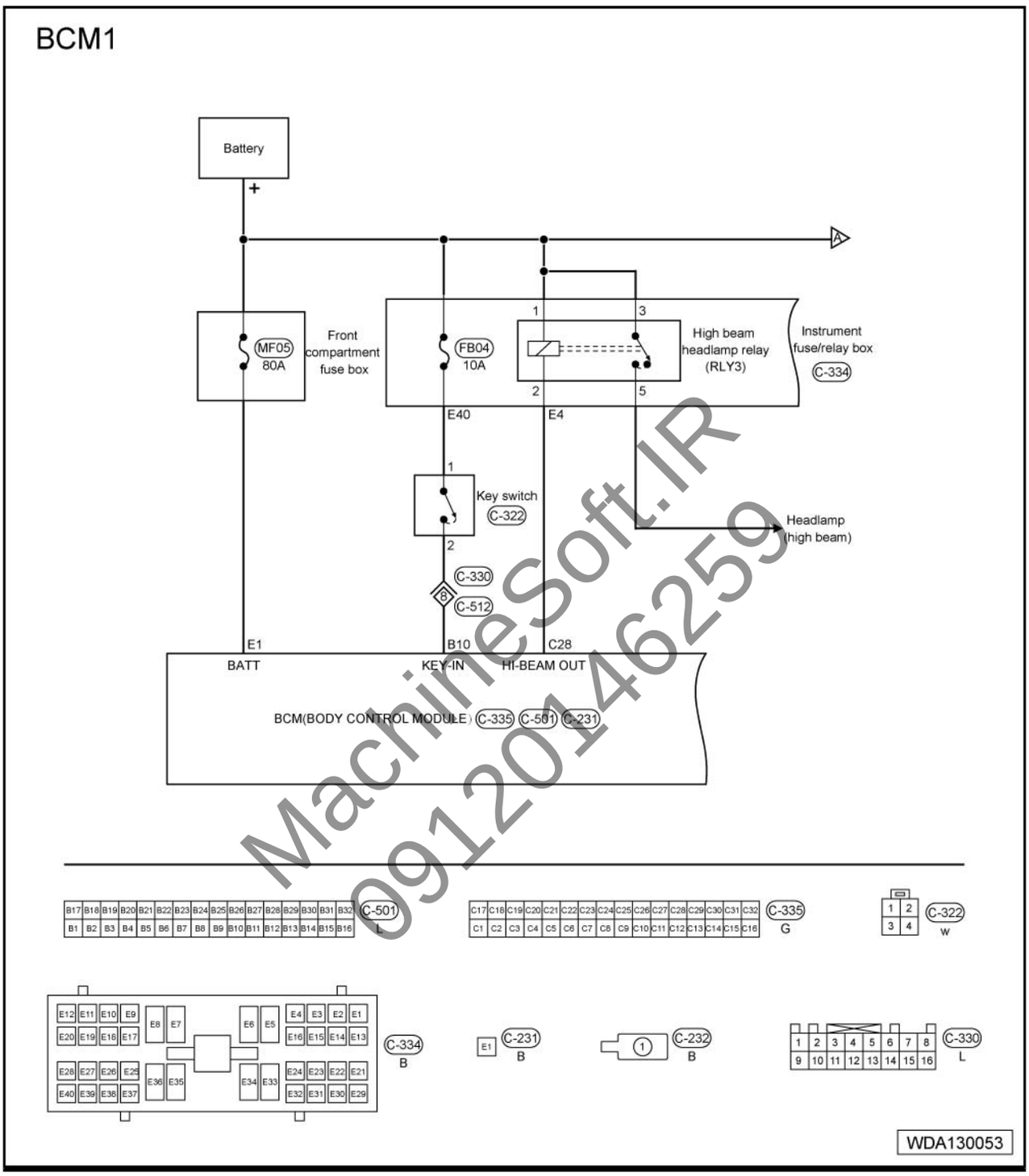
Position code	No.	Ampere (A)	Function
A	1	15A	Central door lock
	2	10A	Rear fog lamp
	3	25A	Rear window lifter
	4	7.5A	Backlight and right position lamp
	5	5A	Left position lamp
	6	25A	Front window lifter
B	1	15A	Warning lamp
	2	20A	Rear window defroster
	3	15A	Fog lamp

Position code	No.	Ampere (A)	Function
	4	10A	Horn
	5	10A	Battery saving protection
	6	25A	Wiper

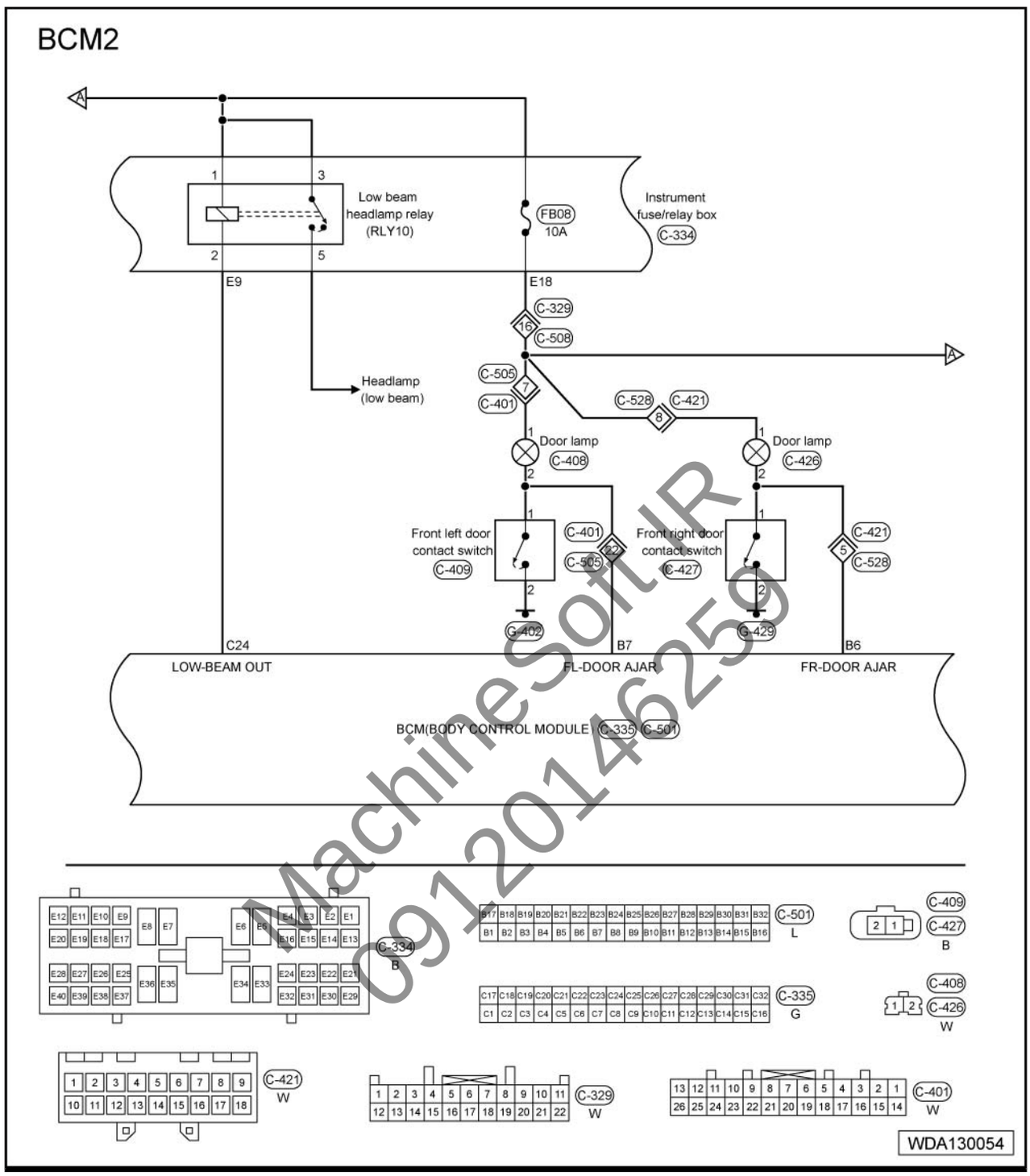
6.2 Circuit diagrams

07

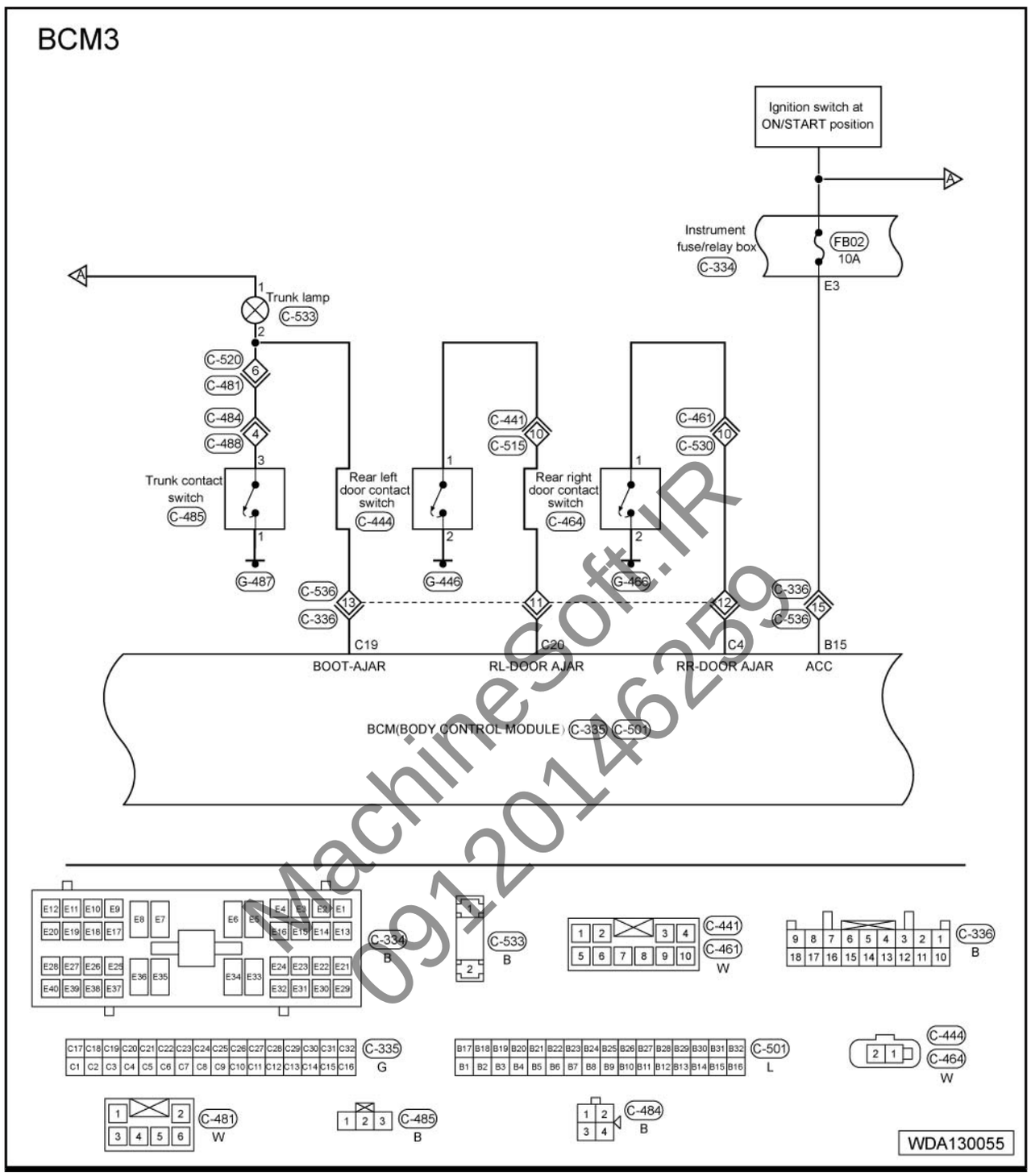
Body control module (BCM) circuit diagrams (page 1)



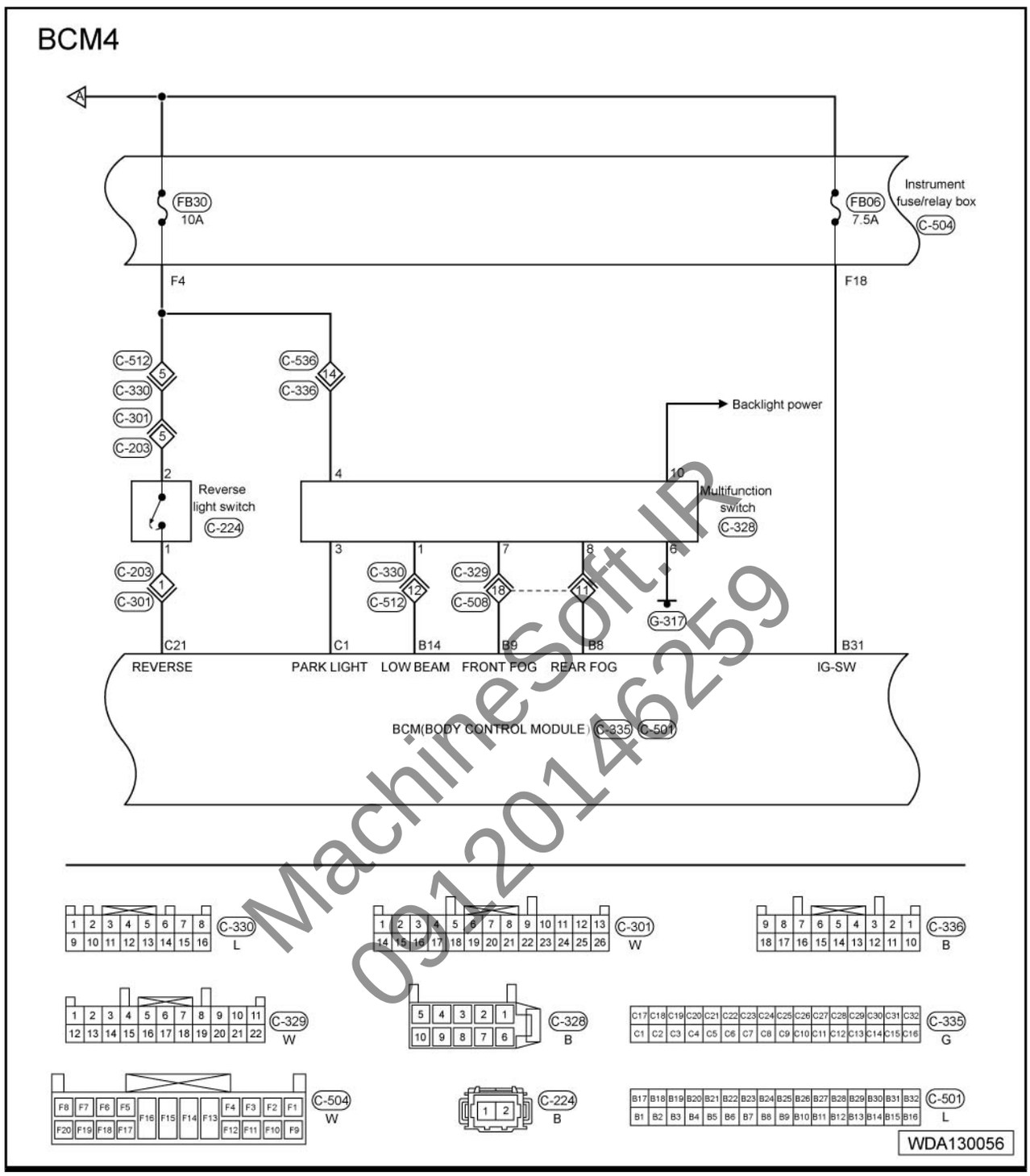
Body control module (BCM) circuit diagrams (page 2)



Body control module (BCM) circuit diagrams (page 3)

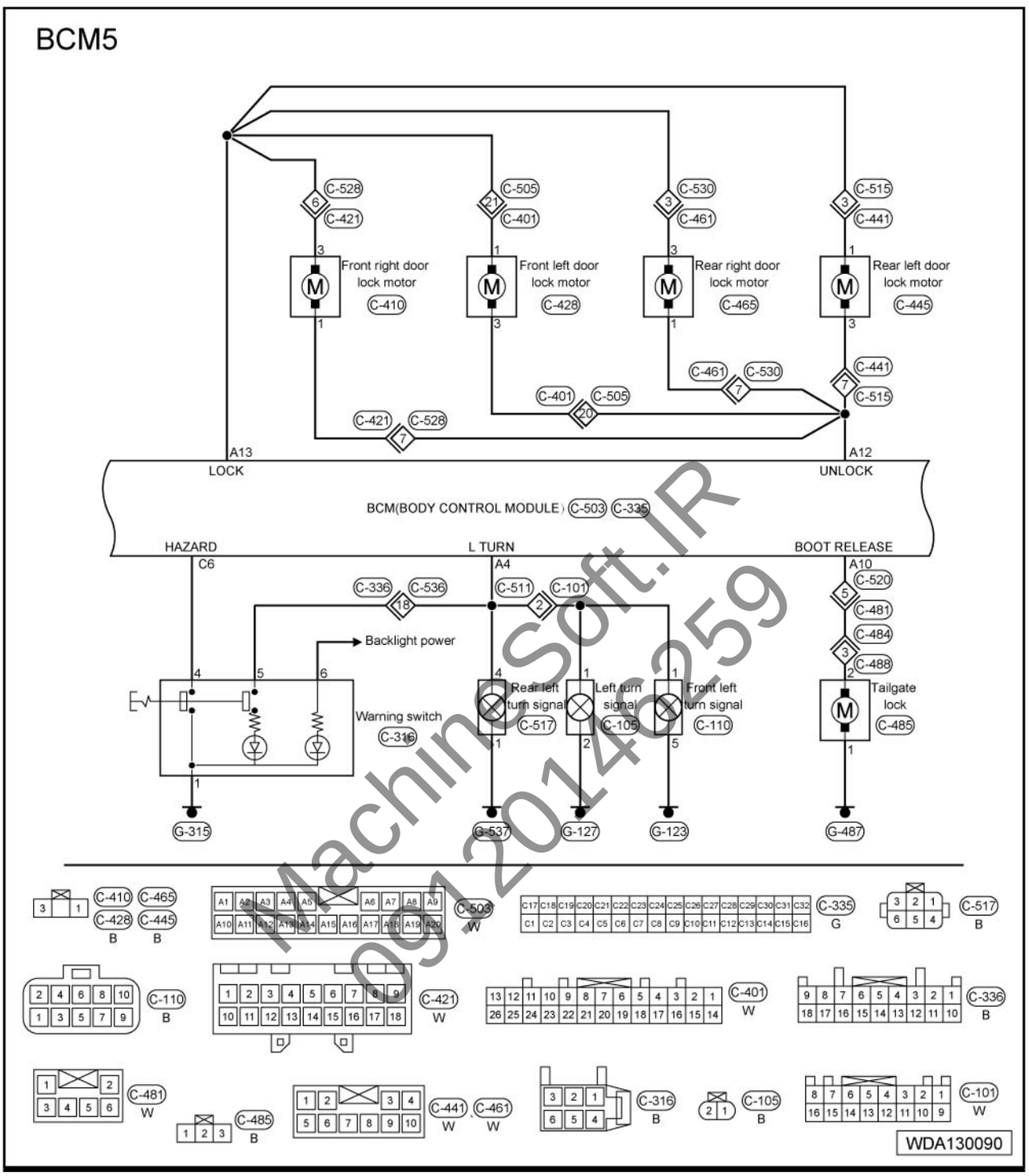


Body control module (BCM) circuit diagrams (page 4)

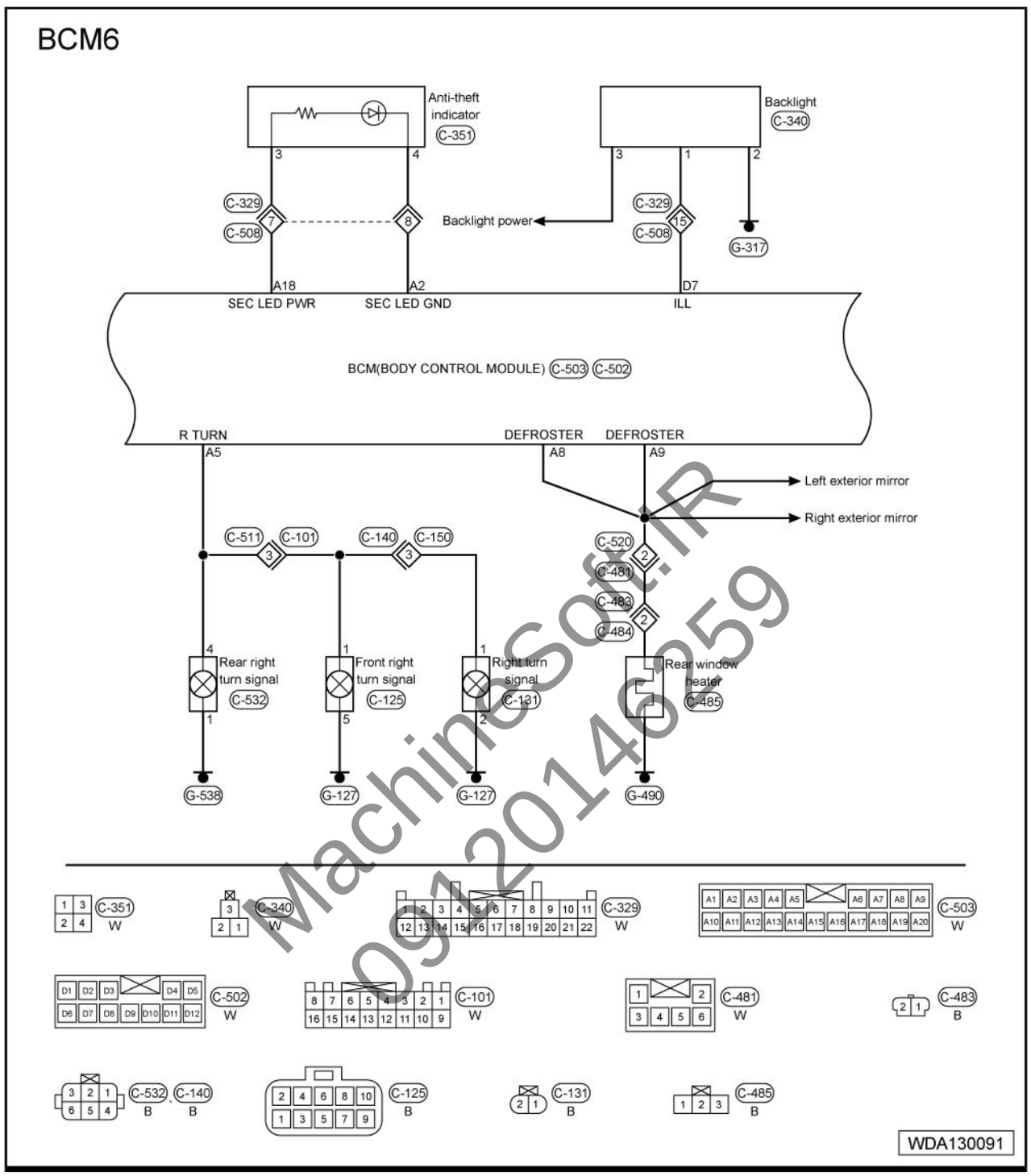


Body control module (BCM) circuit diagrams (page 5)

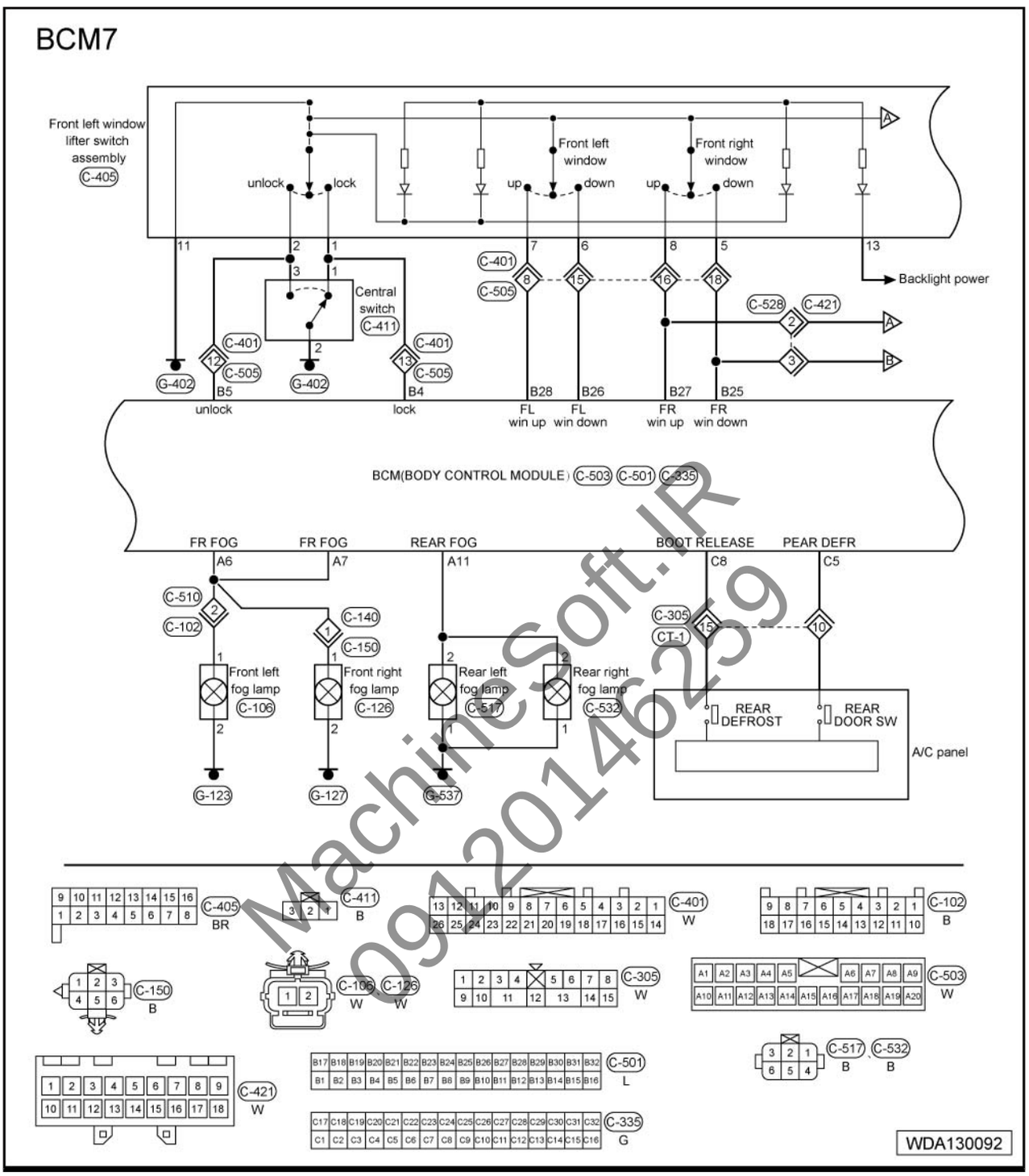
07



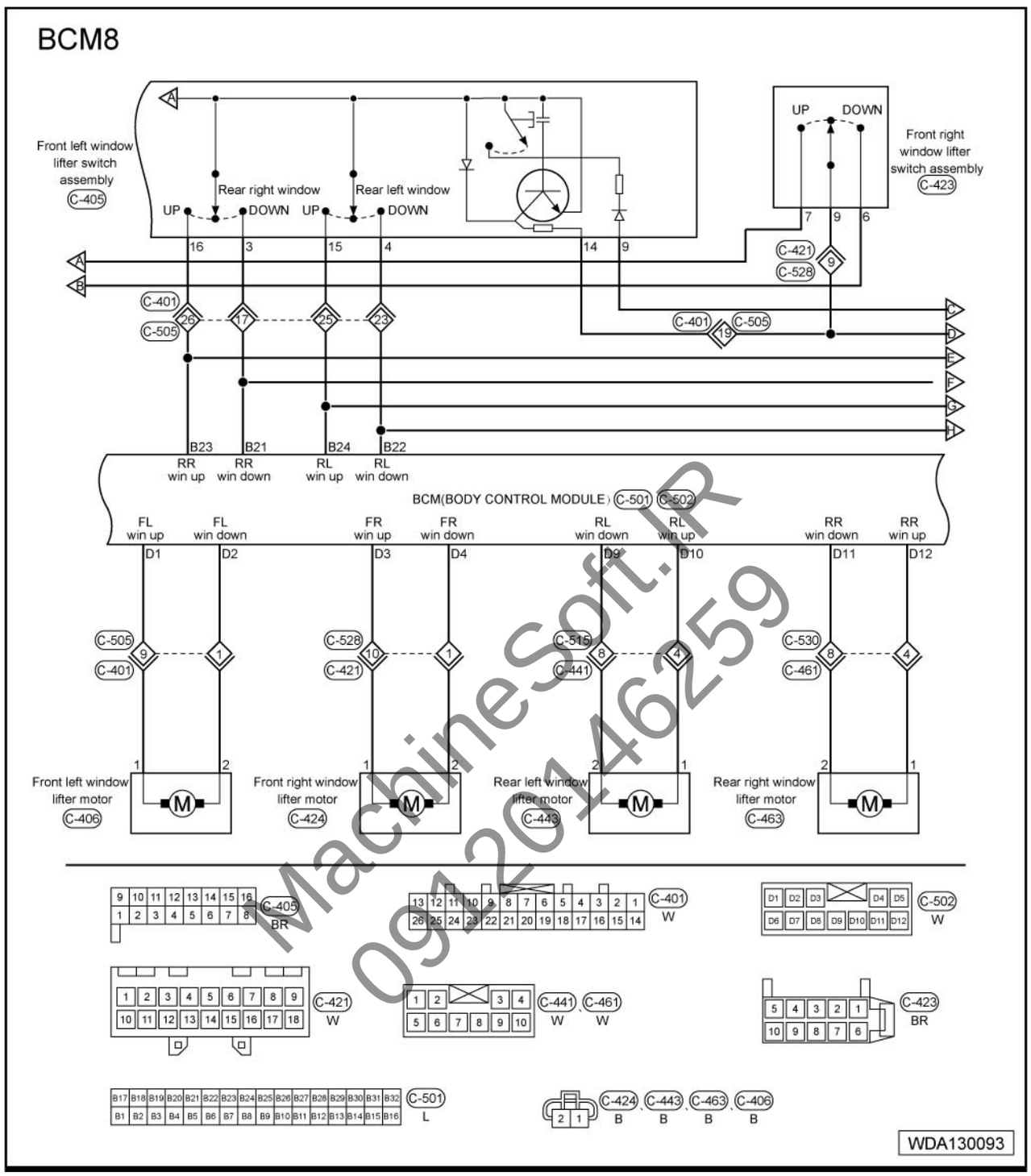
Body control module (BCM) circuit diagrams (page 6)



Body control module (BCM) circuit diagrams (page 7)

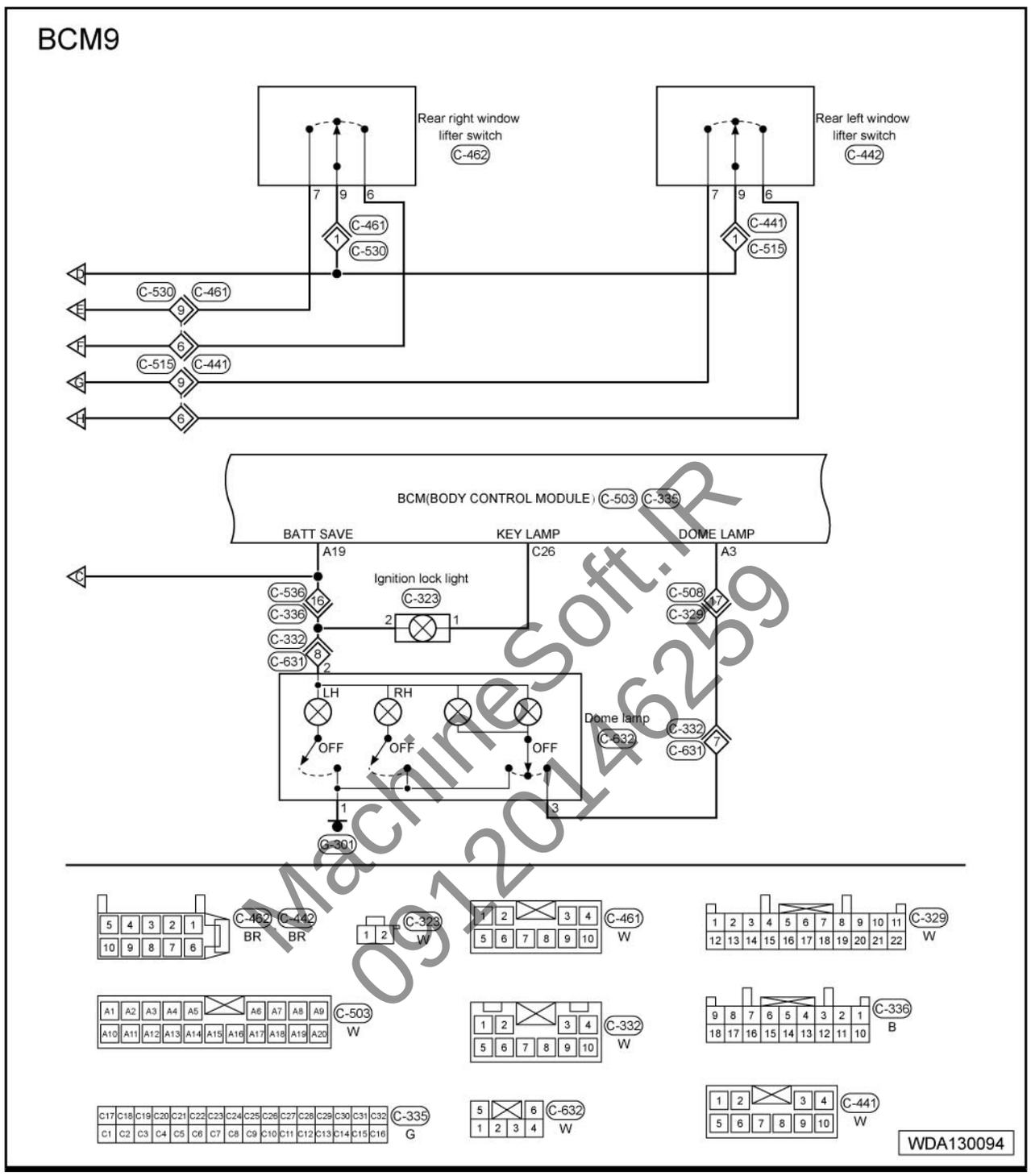


Body control module (BCM) circuit diagrams (page 8)

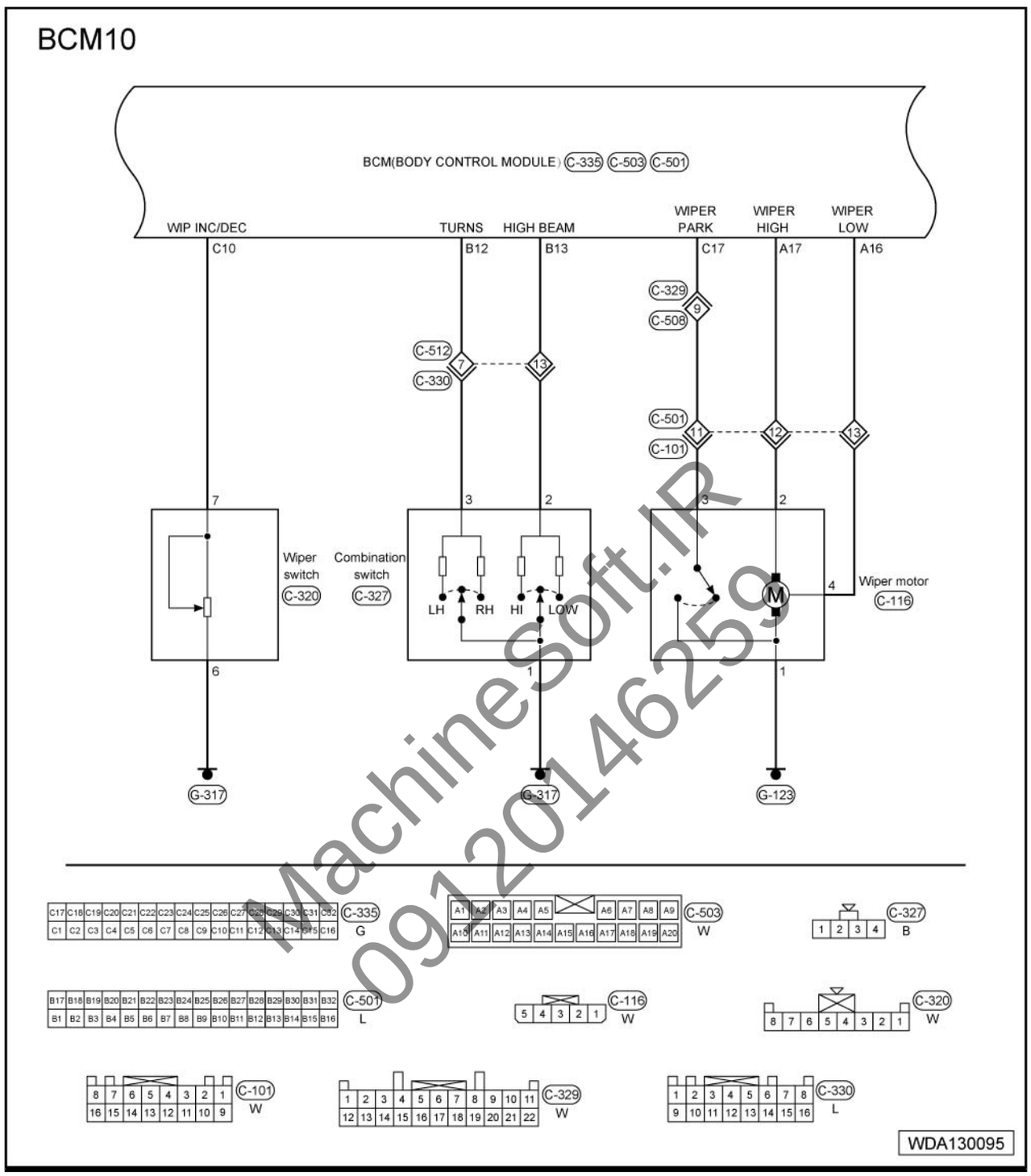


Body control module (BCM) circuit diagrams (page 9)

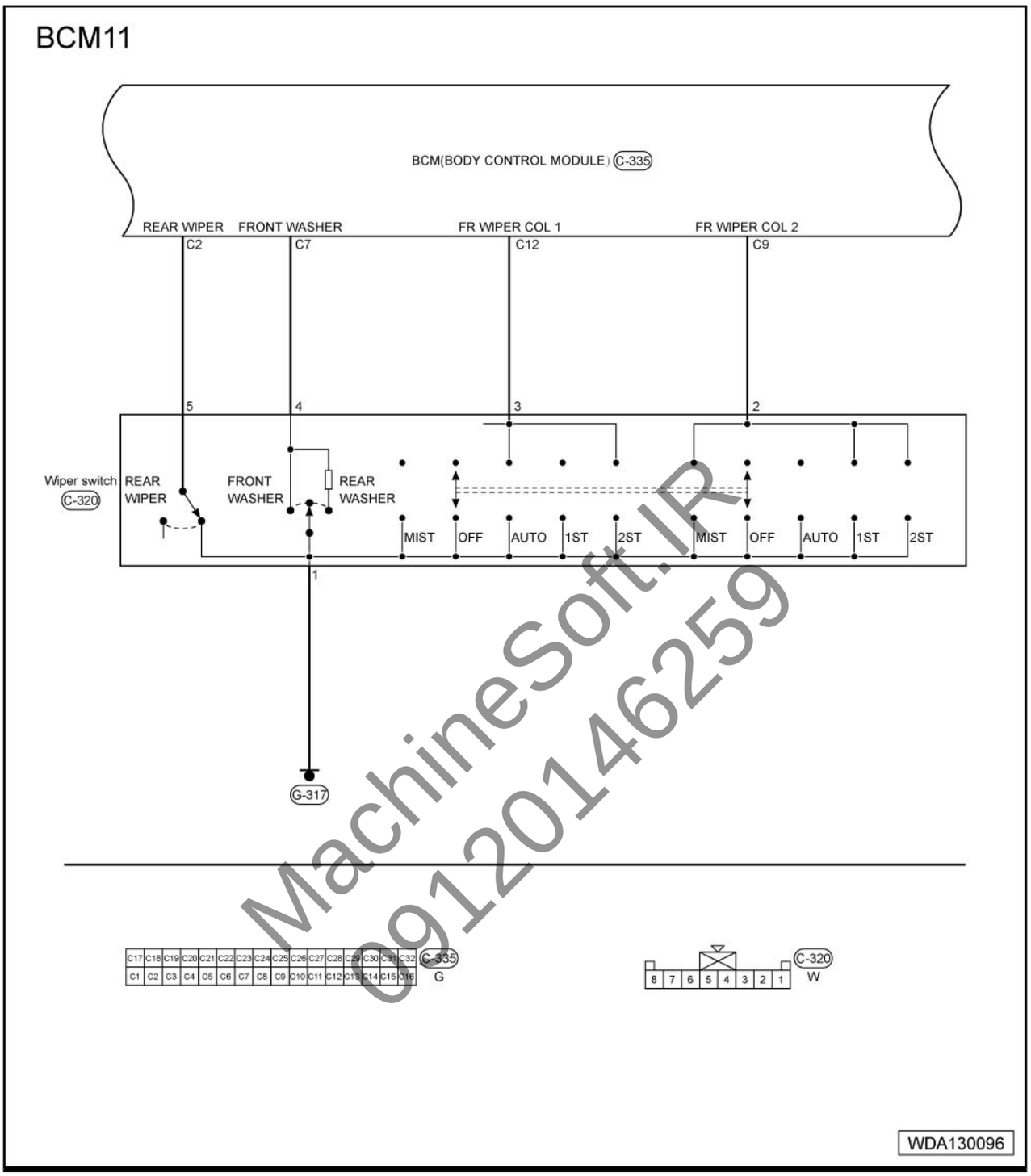
07



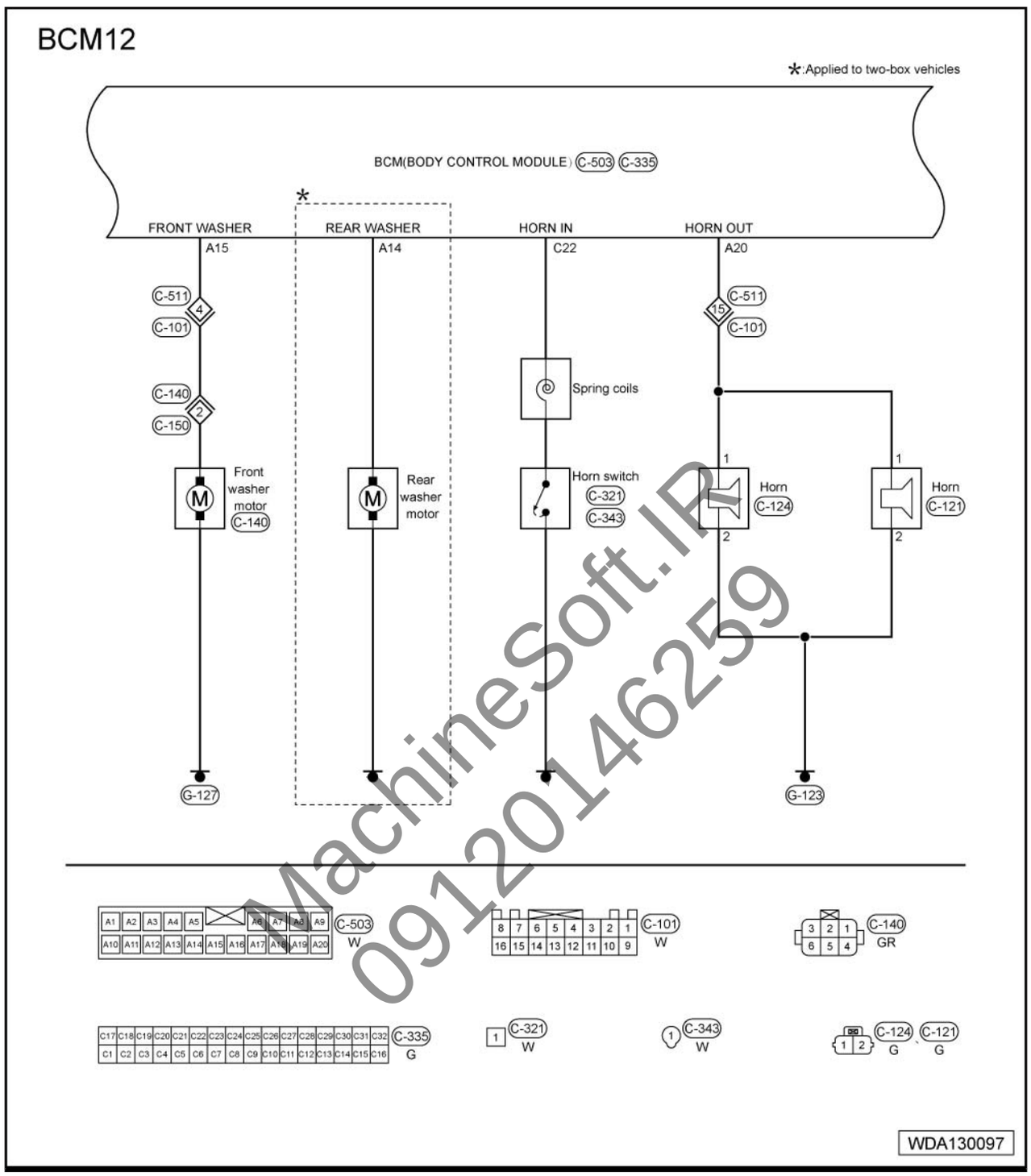
Body control module (BCM) circuit diagrams (page 10)



Body control module (BCM) circuit diagrams (page 11)

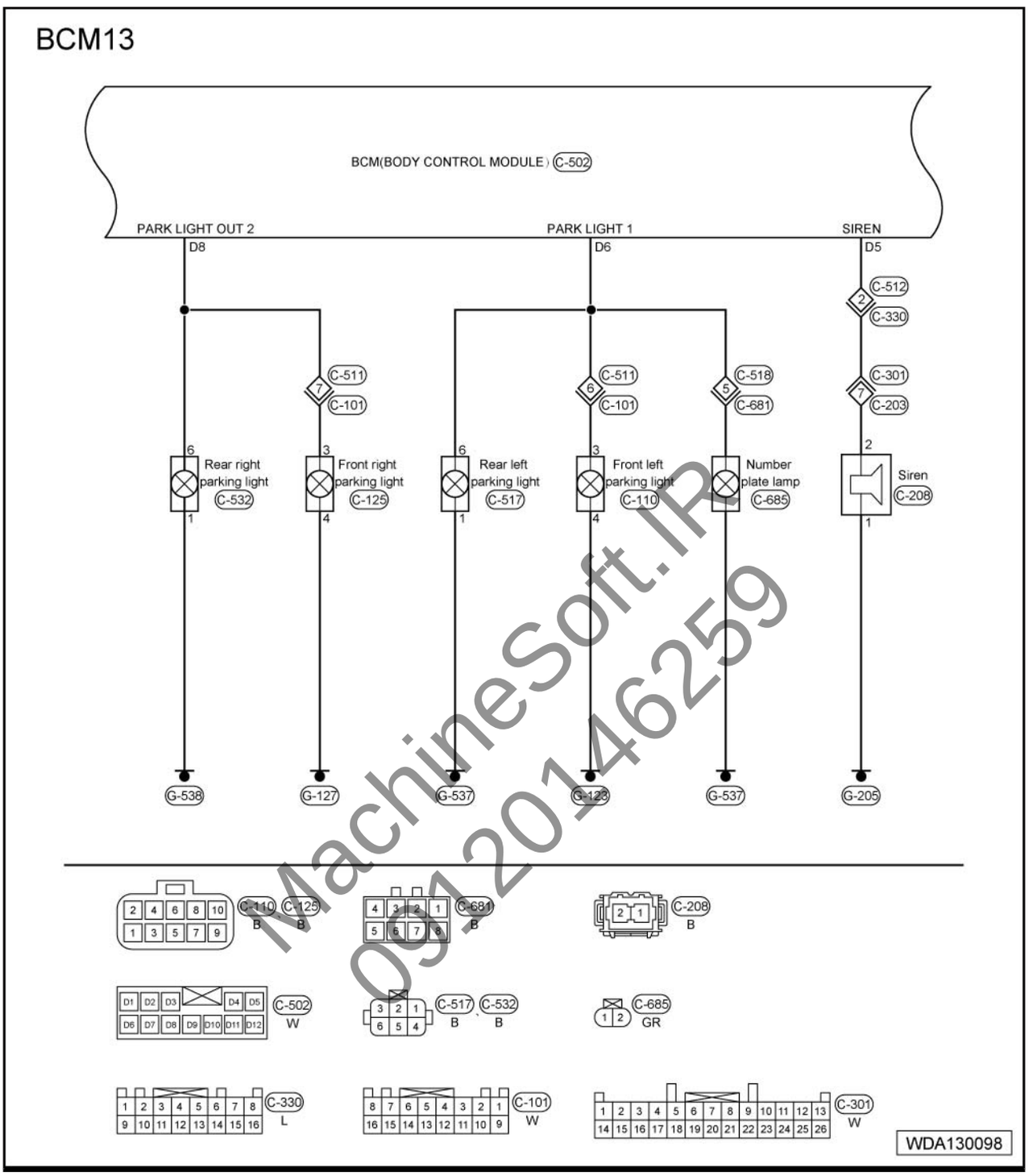


Body control module (BCM) circuit diagrams (page 12)

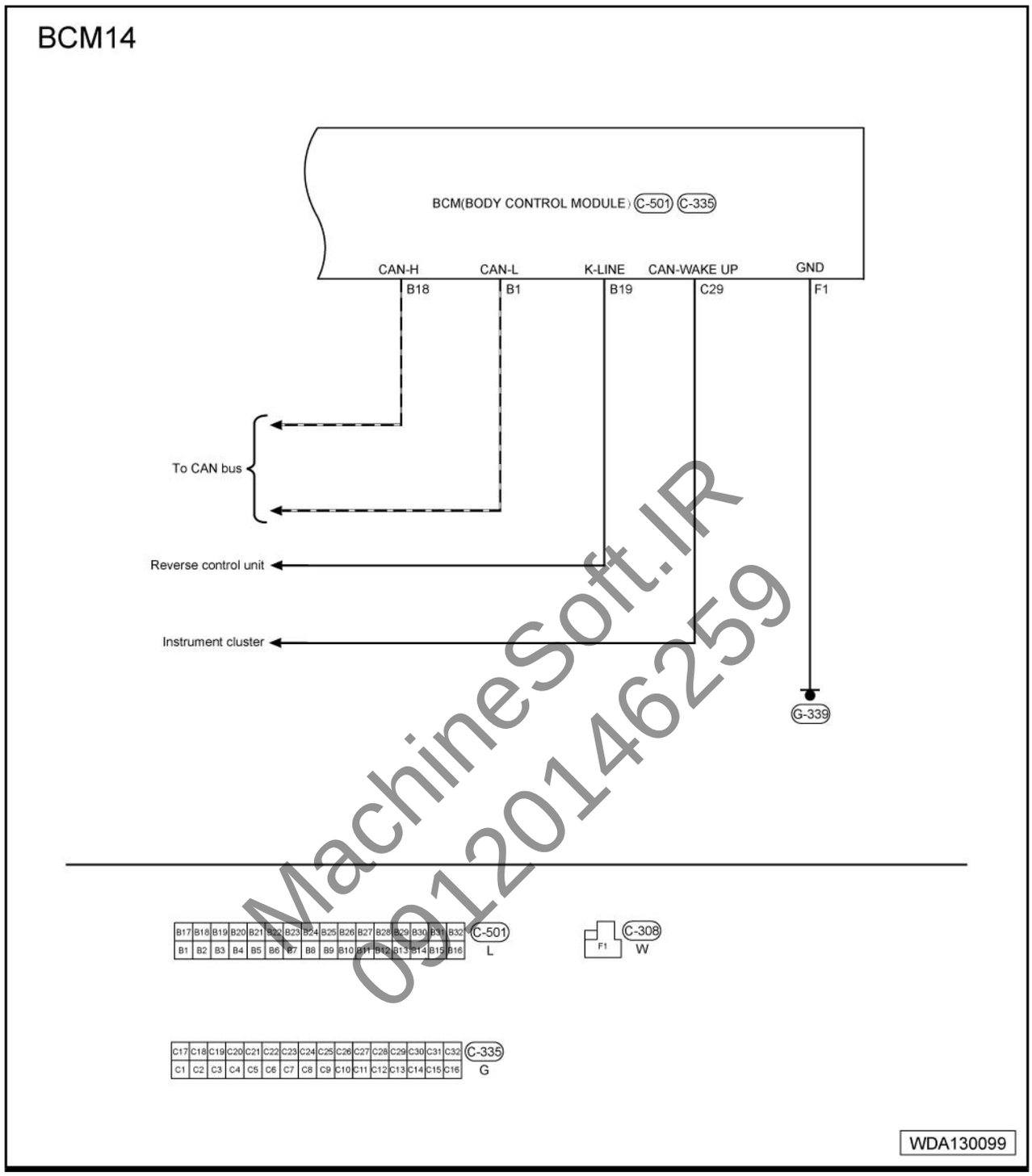


Body control module (BCM) circuit diagrams (page 13)

07

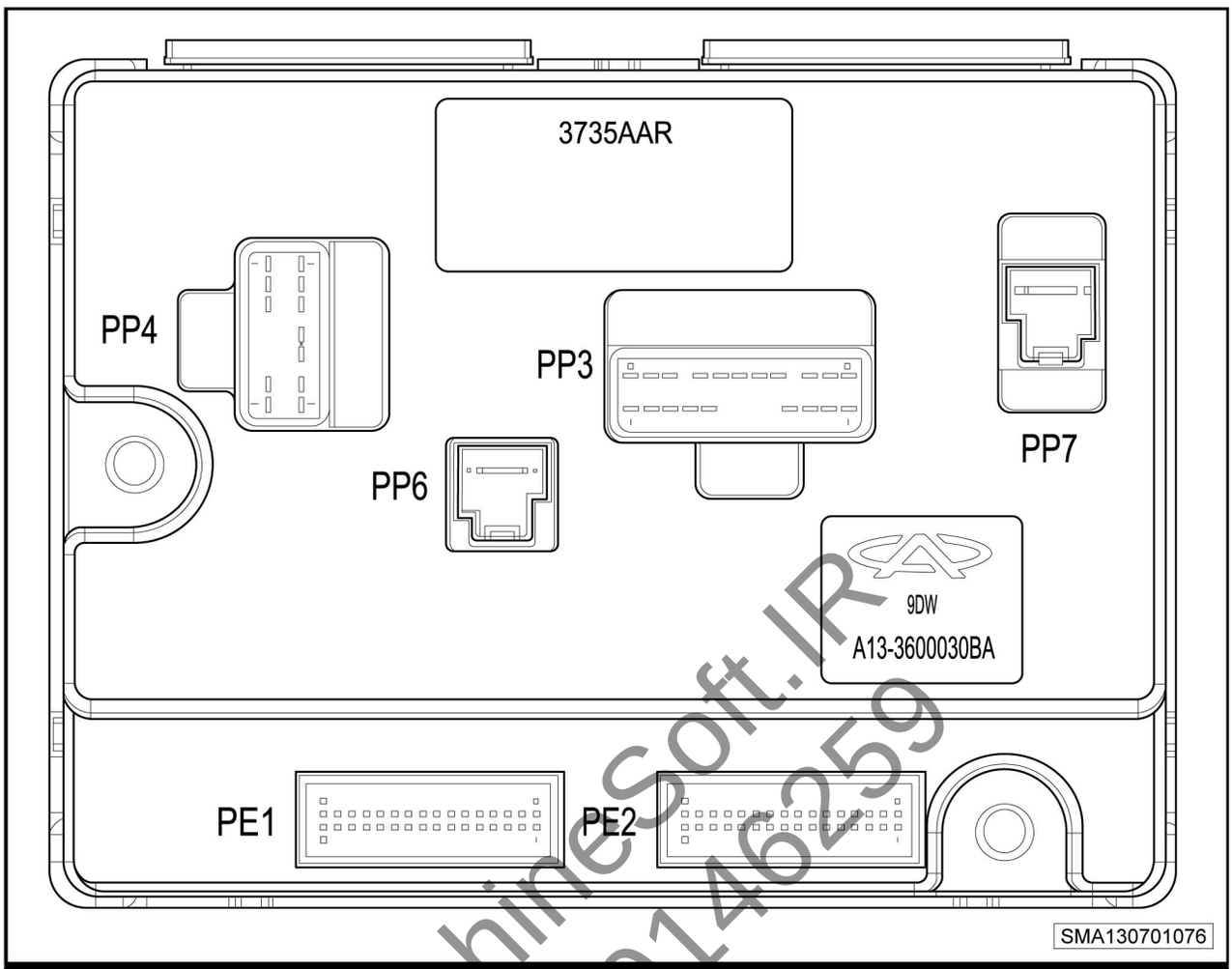


Body control module (BCM) circuit diagrams (page 14)



07

6.3 Definition of the body control module (BCM) pins



PP3: 20-pin connector of the body control module (BCM)

Pin No.	Function	Pin No.	Function
A1	Rear wiper output	A11	Rear fog lamp output
A2	Safety indicator output	A12	Unlock output
A3	Interior light output	A13	Lock output
A4	Left turn signal output	A14	Rear washer output
A5	Right turn signal output	A15	Front washer output
A6	Fog lamp output	A16	Wiper low speed output
A7	Fog lamp output	A17	Wiper high speed output
A8	Defroster output	A18	Safety indicator output
A10	Trunk releasing signal output	A20	Horn output

PP4: 12-pin connector of the body control module (BCM)

Pin No.	Function	Pin No.	Function
D1	Front left window up output	D7	Instrument lighting output
D2	Front left window down output	D8	Parking light/position lamp output

Pin No.	Function	Pin No.	Function
D3	Front right window up output	D9	Rear left window down output
D4	Front right window down output	D10	Rear left window up output
D5	Anti-theft horn output	D11	Rear right window down output
D6	Parking light/position lamp output	D12	Rear right window up output

PE1: 32-pin connector of the body control module (BCM)

Pin No.	Function	Pin No.	Function
C1	Parking light/position lamp input	C17	Wiper stop position input
C2	Rear wiper input	C18	—
C3	—	C19	Trunk contact switch input
C4	Rear right door open input	C20	Rear left door ajar switch input
C5	Rear defroster input	C21	Reverse gear input
C6	Hazard warning lamp input	C22	Horn input
C7	Front washer input	C23	Key lock output
C8	Trunk releasing input	C24	Low beam output
C9	Front wiper input	C25	Rear wiper stop position input
C10	Wiper intermittent regulator input	C26	Key lighting output
C11	—	C27	—
C12	Front wiper input	C28	High beam output
C13	—	C29	CAN wake up
C14	—	C30	—
C15	—	C31	—
C16	—	C32	—

PE2: 32-pin connector of the body control module (BCM)

Pin No.	Function	Pin No.	Function
B1	CAN (low speed)	B17	—
B2	—	B18	CAN (high speed)
B3	—	B19	LIN
B4	Lock input	B20	LIN
B5	Unlock input	B21	Rear right window down input
B6	Front passenger's side door ajar switch input	B22	Rear left window down input

Pin No.	Function	Pin No.	Function
B7	Driver's side door ajar switch input	B23	Rear right window up input
B8	Rear fog lamp input	B24	Rear left window up input
B9	Front fog lamp input	B25	Front right window down input
B10	Key insertion	B26	Front left window down input
B11	Front wiper stop position input	B27	Front right window up input
B12	Steering input	B28	Front left window up input
B13	High beam input	B29	—
B14	Low beam input	B30	—
B15	ACC input	B31	IGN input
B16	—	B32	—

PP6: 1 pin connector of the body control module (BCM)

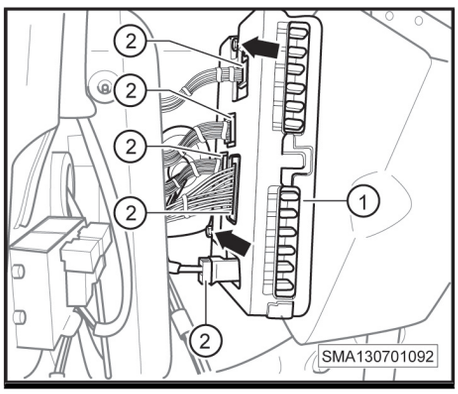
Pin No.	Function
E1	Grounding

PP7: 1 pin connector of the body control module (BCM)

Pin No.	Function
F1	BCM power supply

6.4 Removing and installing the body control module(BCM)

Removal



1. Switch off all electrical equipment and disconnect the battery negative cable.
2. Remove the base guard from the driver's side dashboard.=> refer to page 764
3. Disconnect the BCM connectors (-2-).
4. Remove the BCM fixing bolts (-arrow-).
5. Remove the BCM (-1-).

Installation

Installation shall follow the reverse sequence of the removal procedure.

7 Diagnosis and inspection of the body control module (BCM)

7.1 Diagnosis and inspection of sporadic DTC faults

If the sporadic DTC faults occur, please check the following items:

- Check if the connector of the DTC-related actuator or sensor is properly installed.
- Check the connector pins of the actuator or sensor for leakage and corrosion.
- Check the leads for bending or squeezing.
- Check the sensor for dirt or damage.
- Check if the routing of wiring harness is correct and proper.

7.2 Checking earth connection

A good earth connection is prerequisite for ensuring the normal operation of the circuit. If the earth terminal of the circuit is always exposed to the wet and dusty environment, the metal of the earth terminal will corrode and affect the circuit smoothness, thus causing various electrical system malfunctions. As the control circuit is very sensitive, the loosened or corroded wires may significantly affect the transmission of various signals in the electronic control circuit. Therefore, please note the followings when inspecting:

- Replace the earth bolts or nuts.
- Check the earth terminal and coil for corrosion.
- Clean and polish the earth terminal and coil when necessary to ensure good contact.
- Check if there is any accessory interfering with the earth circuit.

7.3 Special tools

- X-431 diagnostic device
- Digital multimeter
- Adapter cable

7.4 Fault diagnosis (DTC)

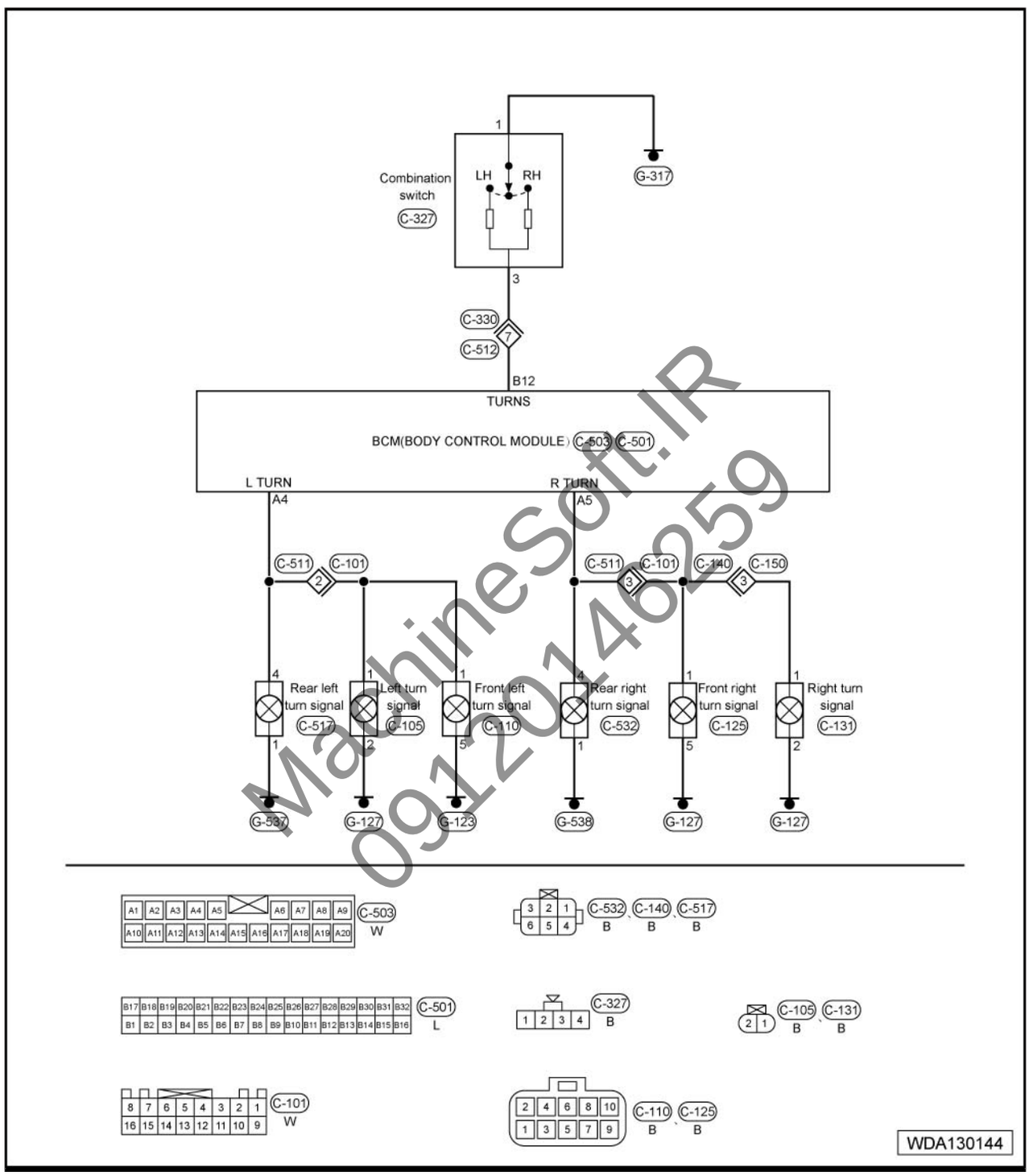
7.4.1 Body control module (BCM) fault diagnosis (DTC) list

DTC	Definition
B1001	Low current in the left turn output control circuit
B1002	Left turn output control circuit short to ground
B1004	Low current in the right turn output control circuit
B1005	Right turn output control circuit short to ground
B1045	Front fog lamp output control circuit open circuit
B1046	Low voltage in the front fog lamp output control circuit B
B1047	High voltage in the front fog lamp output control circuit
B1048	Rear fog lamp output control circuit open circuit
B1049	Low voltage in the rear fog lamp output control circuit
B1050	High voltage in the rear fog lamp output control circuit
B1063	Parking light/position lamp output control circuit open circuit
B1064	Low voltage in the parking light /position lamp output control circuit
B1065	High voltage in the parking light /position lamp output control circuit
B1102	Low voltage in the front roof lamp output control circuit
B1103	High voltage in the front roof lamp output control circuit
B1220	Low current in the central locking output control circuit
B1221	High current in the central locking output control circuit B1
B1224	High current in the central unlocking output control circuit
B1276	Front wiper high speed output control circuit open circuit
B1277	Low voltage in the front wiper high speed output control circuit
B1278	High voltage in the front wiper high speed output control circuit
B1279	Front wiper low speed output control circuit open circuit
B1280	Low voltage in the front wiper low speed output control circuit
B1281	High voltage in the front wiper low speed output control circuit
B1283	Low voltage in the front washer output control circuit
B1284	High voltage in the front washer output control circuit
B1285	Horn output control circuit open circuit
B1286	Low voltage in the horn output control circuit
B1287	High voltage in the horn output control circuit

DTC	Definition
B1288	Rear defroster output control circuit open circuit
B1289	Low voltage in the rear defroster output control circuit
B1290	High voltage in the rear defroster output control circuit
B1350	Low current in the front left window up output control circuit
B1353	Low current in the front left window down output control circuit
B1356	Low current in the front right window up output control circuit
B1359	Low current in the front right window down output control circuit
B1361	Low current in the rear left window up output control circuit
B1363	Low current in the rear left window down output control circuit
B1365	Low current in the rear right window up output control circuit
B1367	Low current in the rear right window down output control circuit
B1397	Low voltage in the anti-theft horn output control circuit
B1398	High voltage in the anti-theft horn output control circuit
B1400	Low battery voltage
B1401	High battery voltage
B2311	Trunk releasing output control circuit open circuit
B2312	High voltage in the trunk releasing output control circuit
B2313	Low voltage in the trunk releasing output control circuit

7.4.2 B1001 - Low current in the left turn output control circuit

B1002 - Left turn output control circuit short to ground
B1004 - Low current in the right turn output control circuit
B1005 - Right turn output control circuit short to ground



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A4	Left turn signal output	The ignition switch in the ON position with the left turn signal switched on	Intermittent change between 0V and 12V

BCM pin	Function	Condition	Value (DC voltage range)
A5	Right turn signal output	The ignition switch in the ON position with the right turn signal switched on	Intermittent change between 0V and 12V

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1001	Low current in the left turn output control circuit	The ignition switch in the OFF position - push the front roof lamp switch to the "DOOR" position, close all the doors and press the "lock/unlock" button on the remote key entry (RKE)	Left turn signal control circuit short or open circuit detected by the BCM	• Failure of the left turn signal • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the turn signal switch
B1002	Left turn output control circuit short to ground			
B1004	Low current in the right turn output control circuit		Right turn signal control circuit short or open circuit detected by the BCM	• Failure of the right turn signal • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the turn signal switch
B1005	Right turn output control circuit short to ground			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures. If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power supply line of the turn signal connector is normal.

- If yes, go to step 2.
- If not, go to step 4.

2. Check if the ground line of the turn signal electrical connector is normal.

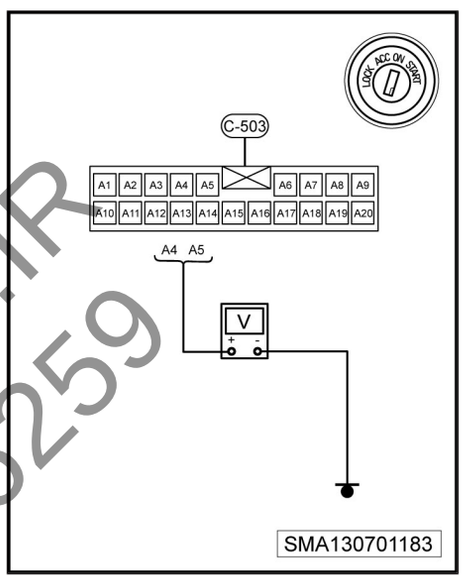
- If yes, go to step 3.
- If not, repair the ground line. ■

3. Measure the resistance values of the turn signal bulbs and verify if the rated voltage and power of the turn signal bulbs are normal.

- If yes, go to step 4.
- If not, replace the turn signal bulbs. ■

4. Turn on the turn signal switch and check if the voltage between the pins A4/A5 of the BCM connector C-503 and the ground is battery voltage.

- If yes, check if the power circuit between the BCM and the turn signal has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
- If not, go to step 5.



5. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 6. ■
- If not, repair the faulty line.

6. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

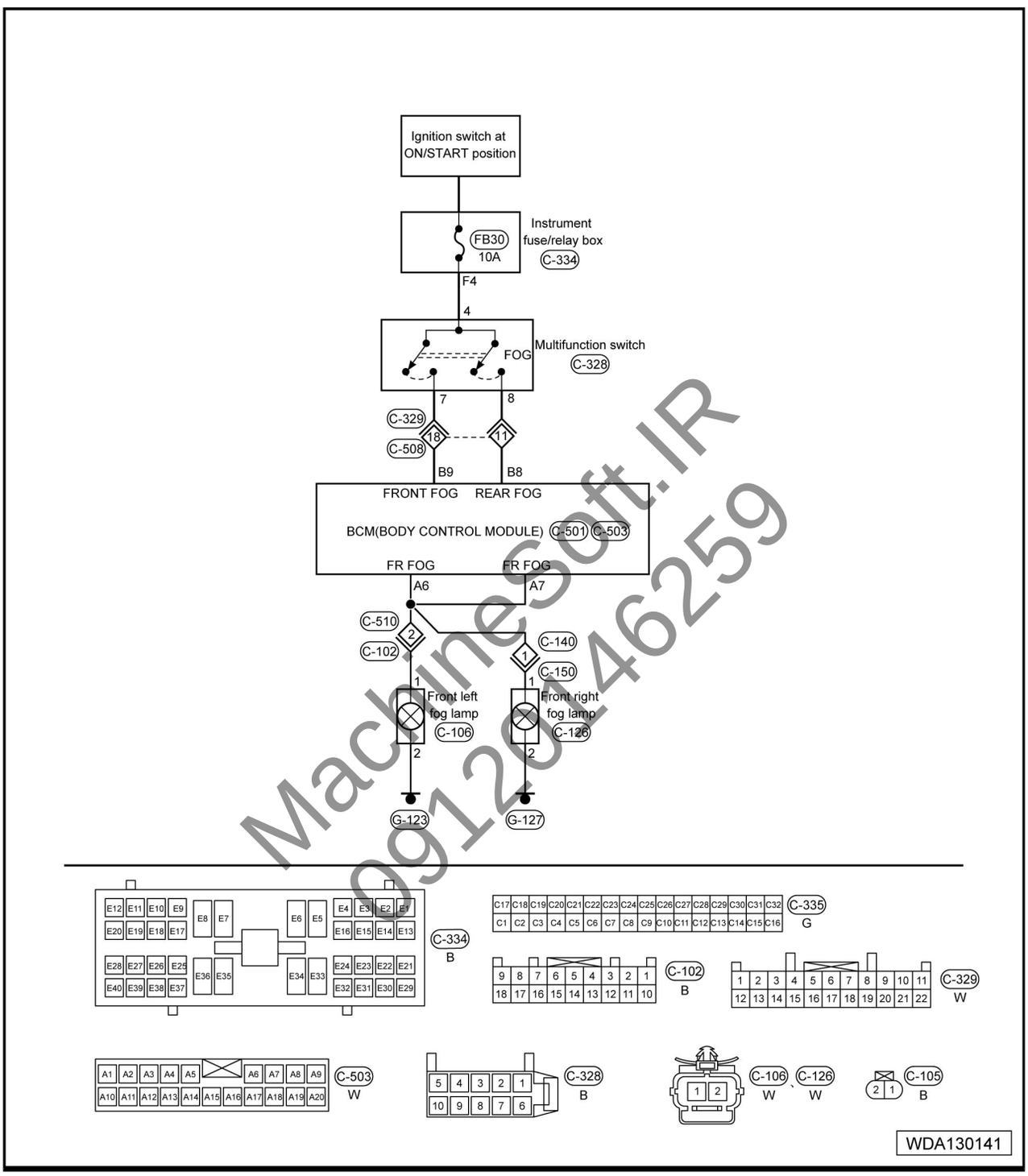
- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

07

7.4.3 B1045 - Front fog lamp output control circuit open circuit

B1046 - Low voltage in the front fog lamp output control circuit

B1047 - High voltage in the front fog lamp output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A6	Fog lamp output	The ignition switch in the ON position with the fog lamp switched on	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
A7	Fog lamp output	The ignition switch in the ON position with the fog lamp switched on	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1045	Front fog lamp output control circuit open circuit	The ignition switch in the ON position The front fog lamp switch in the ON position	Front fog lamp control circuit short or open circuit detected by the BCM	• Failure of the fog lamp • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the fog lamp switch
B1046	Low voltage in the front fog lamp output control circuit			
B1047	High voltage in the front fog lamp output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the fog lamp line of the front fog lamp connector is normal.

- If yes, go to step 2.
- If not, go to step 4.

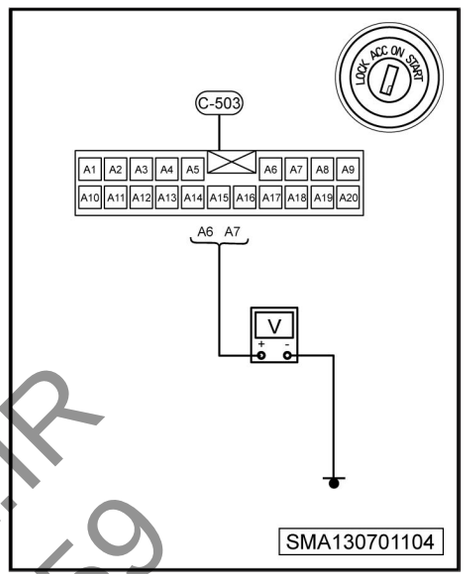
2. Check if the ground line of the front fog lamp connector is normal.

- If yes, go to step 3.
- If not, repair the fault such as short circuit or virtual connection existing in the front fog lamp ground line. ■

07

3. Measure the resistance values of the front fog lamp bulbs and verify if the rated voltage and power of the front fog lamp bulbs are normal.
   - If yes, go to step 4.
   - If not, replace the front fog lamp bulbs. ■

4. Turn on the front fog lamp switch and check if the voltage between the pins A6/A7 of the BCM connector C-503 and the ground is battery voltage.
   - If yes, check if the power circuit between the BCM and the front fog lamp has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
   - If not, go to step 5.

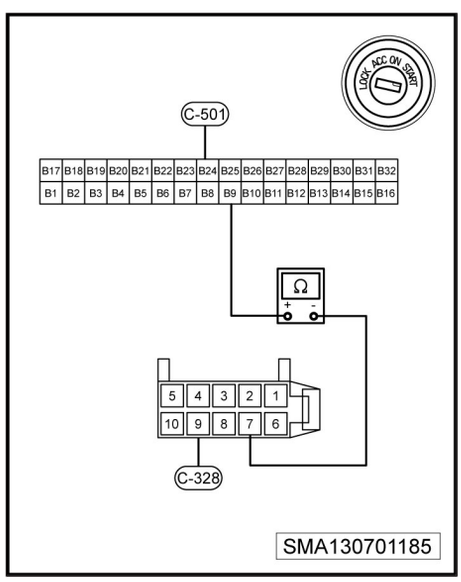


5. Check if the front fog lamp fuse FB30 is damaged.
   - If yes, replace the fuse with the same specification. ■
   - If not, go to step 6.

6. Check if the circuit between the pin 4 of the multi-functional switch connector C-328 and the power supply terminal is normal.
   - If yes, go to step 7.
   - If not, repair the faulty line. ■

7. Check if the line between the pin B9 of the BCM connector C-501 and the pin 7 of the multi-functional switch connector C-328 is normal.
   - If yes, go to step 8.
   - If not, repair the faulty line. ■

8. Check if the multi-functional switch is normal.
   - If yes, go to step 9.
   - If not, repair or replace the multi-functional switch. ■



9. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 10.
- If not, repair the faulty line. ■

10. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

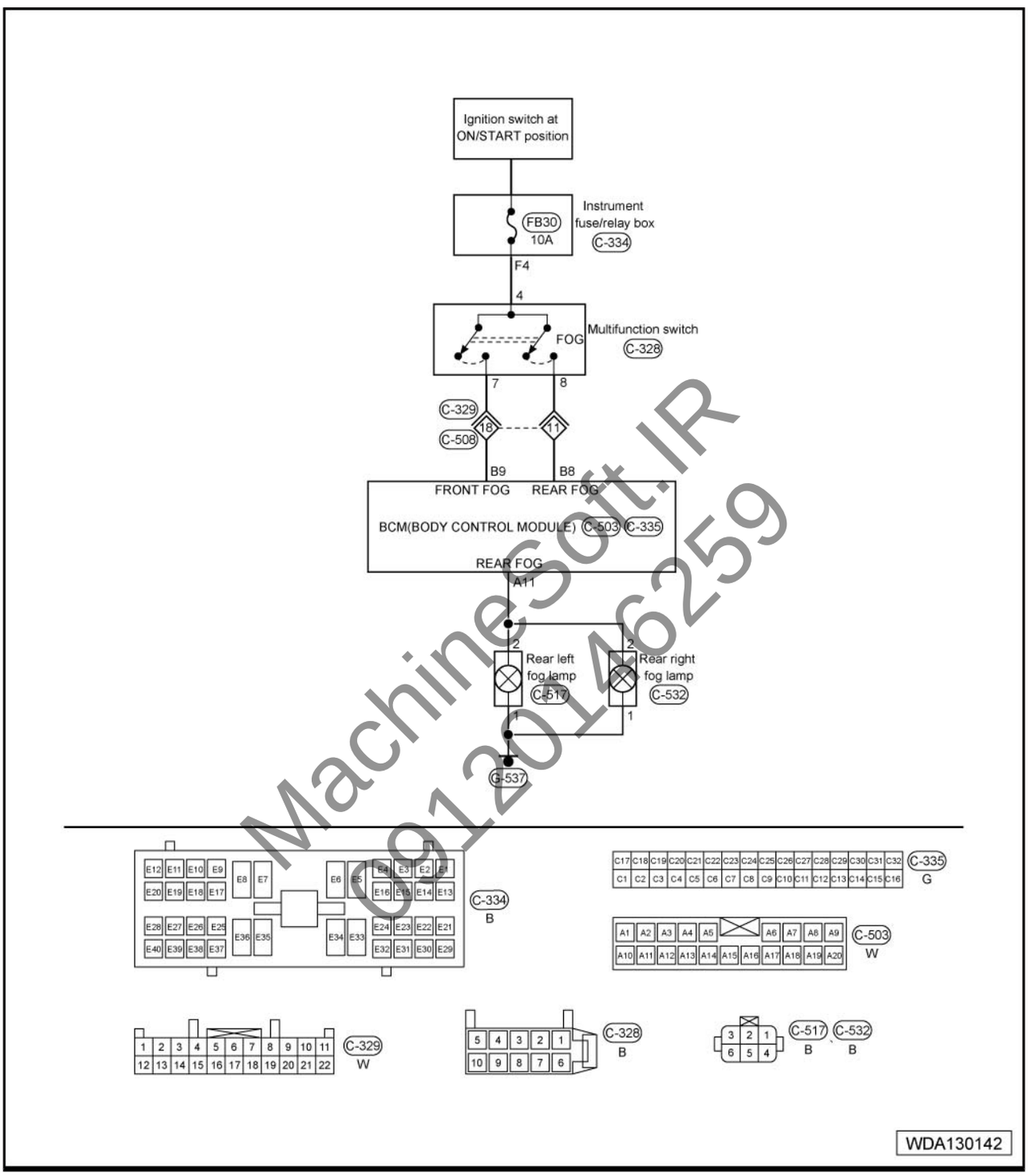
- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

07

7.4.4 B1048 - Rear fog lamp output control circuit open circuit

B1049 - Low voltage in the rear fog lamp output control circuit

B1050 - High voltage in the rear fog lamp output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A011	Fog lamp output	The ignition switch in the ON position with the rear fog lamp switched on	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1048	Rear fog lamp output control circuit open circuit	The ignition switch in the ON position The rear fog lamp switch in the ON position	Rear fog lamp control circuit short or open circuit detected by the BCM	• Failure of the fog lamp • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the fog lamp switch
B1049	Low voltage in the rear fog lamp output control circuit			
B1050	High voltage in the rear fog lamp output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

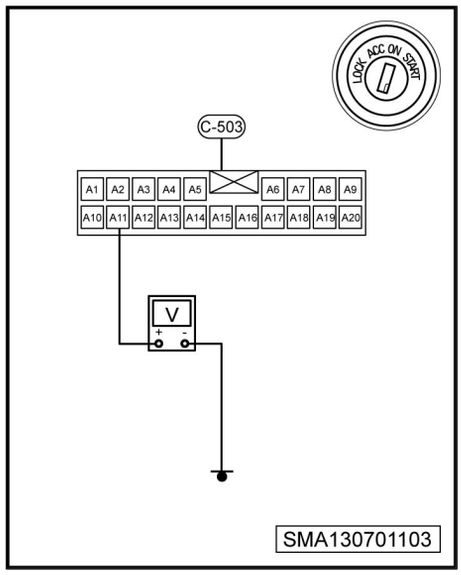
1. Check if the fog lamp line of the rear fog lamp connector is normal.
   - If yes, go to step 2.
   - If not, go to step 4.

2. Check if the ground line of the rear fog lamp connector is normal.
   - If yes, go to step 3.
   - If not, repair the fault such as short circuit or virtual connection existing in the rear fog lamp ground line. ■

3. Measure the resistance values of the rear fog lamp bulbs and verify if the rated voltage and power of the rear fog lamp bulbs are normal.
   - If yes, go to step 4.
   - If not, replace the rear fog lamp bulbs. ■

4. Turn on the rear fog lamp switch and check if the voltage between the pin A11 of the BCM connector C-503 and the ground is battery voltage.

- If yes, check if the power circuit between the BCM and the rear fog lamp has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
- If not, go to step 5.



5. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

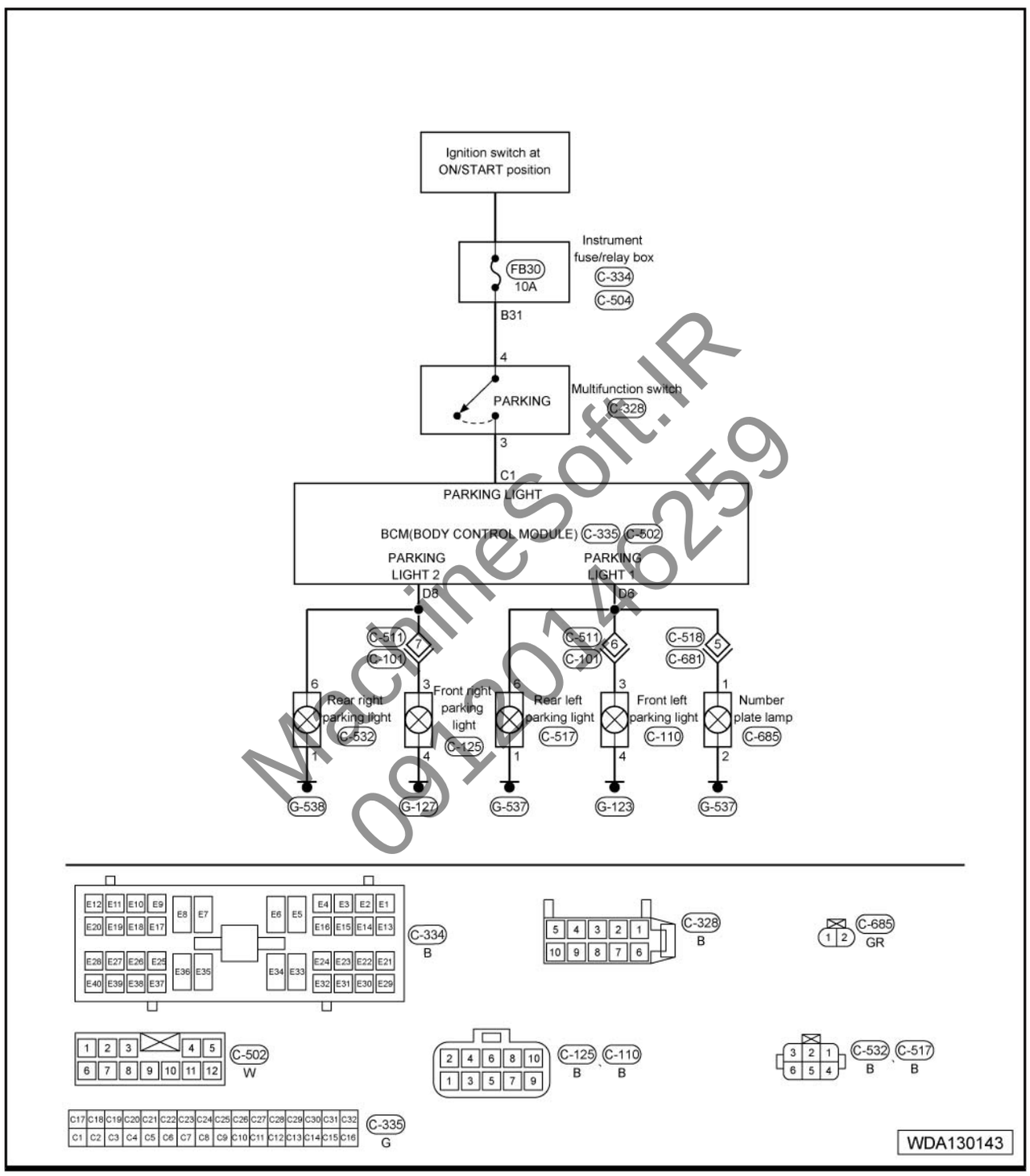
6. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

7.4.5 B1063 - Parking light/position lamp output control circuit open circuit

B1064 - Low voltage in the parking light/position lamp output control circuit

B1065 - High voltage in the parking light/position lamp output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
D6	Parking light/position lamp output	The ignition switch in the ON position with the	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
D8	Parking light/position lamp output	parking light/position lamp switched on	

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1063	Parking light/position lamp output control circuit open circuit	The ignition switch in the ON position The parking light/position lamp switch in the ON position	Parking light control circuit short or open circuit detected by the BCM	• Failure of the parking light/position lamp • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the parking light/position lamp switch
B1064	Low voltage in the parking light /position lamp output control circuit			
B1065	High voltage in the parking light /position lamp output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the parking light/position lamp line of its connector is normal.
   - If yes, go to step 2.
   - If not, go to step 4.

2. Check if the ground line of the parking light/position lamp connector is normal.
   - If yes, go to step 3.

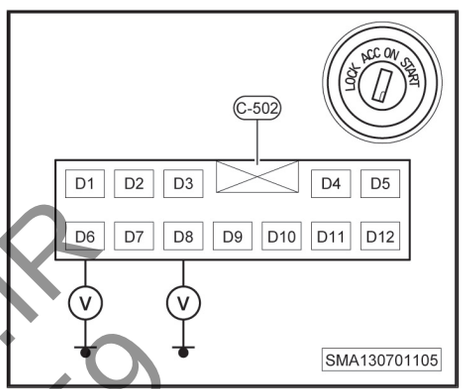
- If not, repair the fault such short circuit or virtual connection existing in the parking light/position lamp ground line. ■

3. Measure the resistance values of the parking light/position lamp bulbs and verify if the rated voltage and power of the parking light/position lamp bulbs are normal.

- If yes, go to step 4.
- If not, replace the parking light/position lamp bulbs. ■

4. Turn on the parking light/position lamp switch and check if the voltage between the pins D6/D8 of the BCM connector C-502 and the ground is battery voltage.

- If yes, check if the power circuit between the BCM and the parking light/position lamp has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
- If not, go to step 5.



5. Check if the front fog lamp fuse FB30 is damaged.

- If yes, replace the fuse with the same specification. ■
- If not, go to step 6.

6. Check if the circuit between the pin 4 of the multi-functional switch connector C-328 and the power supply terminal is normal.

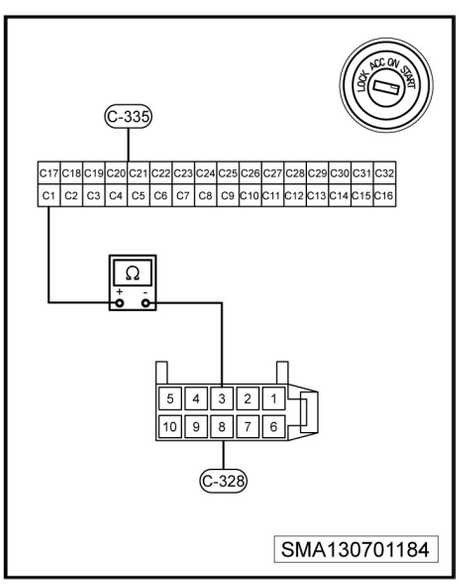
- If yes, go to step 7.
- If not, repair the faulty line. ■

7. Check if the line between the pin C1 of the BCM connector C-335 and the pin 3 of the multi-functional switch connector C-328 is normal.

- If yes, go to step 8.
- If not, repair the faulty line. ■

8. Check if the multi-functional switch is normal.

- If yes, go to step 9.
- If not, repair or replace the multi-functional switch. ■



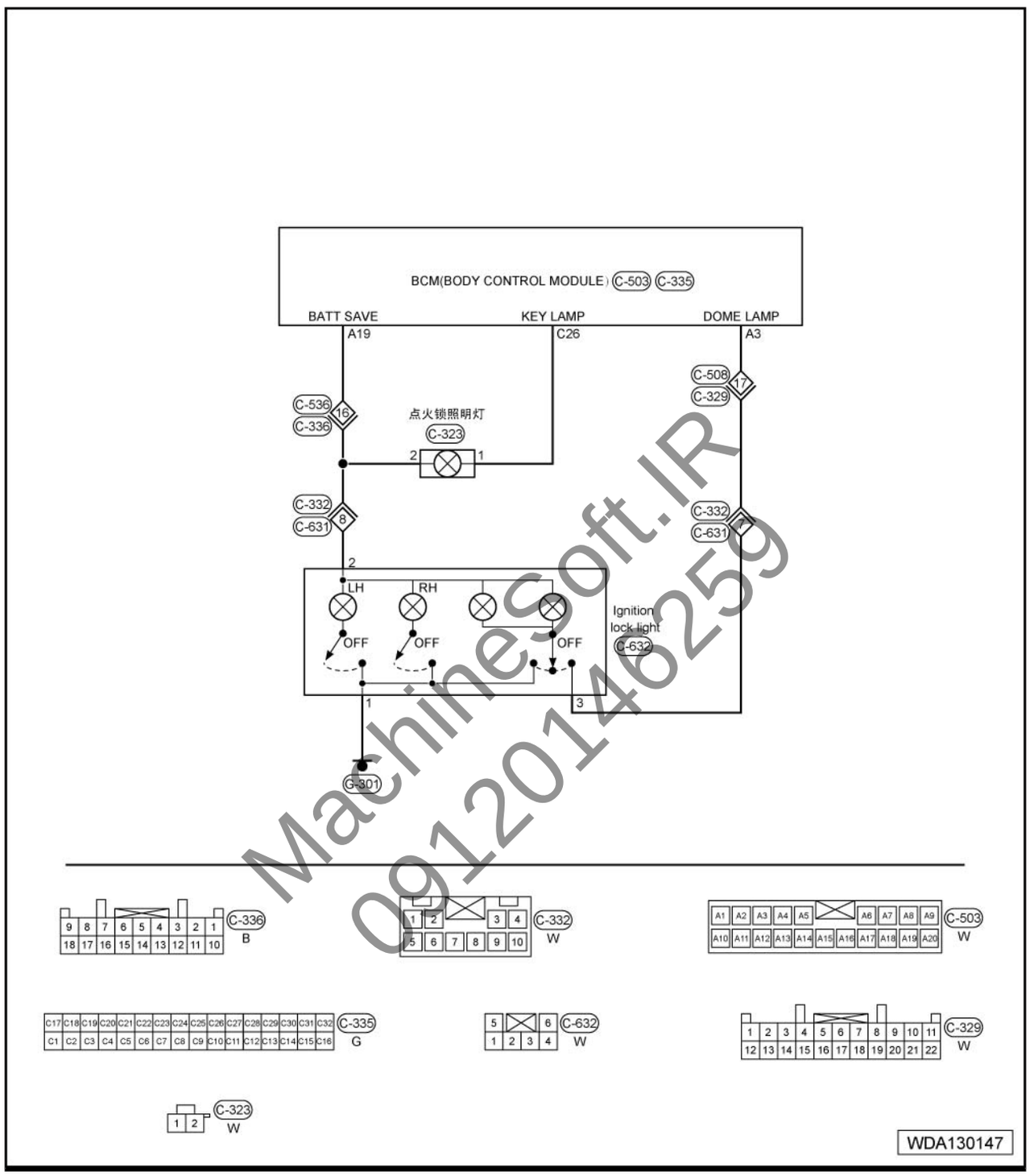
9. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 10.
- If not, repair the faulty line. ■

10. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

7.4.6 B1102 - Low voltage in the roof lamp output control circuit
B1103 - High voltage in the roof lamp output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A19	Battery energy-saving protection output	The ignition switch in the ON position with the roof lamp switched on	Battery voltage
A3	Interior light output	The ignition switch in the ON position with the roof	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
		lamp switched on and door open	

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1102	Low voltage in the roof lamp output control circuit	The ignition switch in the ON position The roof lamp switch in the "DOOR" position The door(s) open	Roof lamp control circuit short or open circuit detected by the BCM	• Failure of the roof lamp • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the roof lamp switch
B1103	High voltage in the roof lamp output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the line between the pin 2 of the roof lamp connector C-632 and the pin A19 of the BCM connector C-503 is conducted.

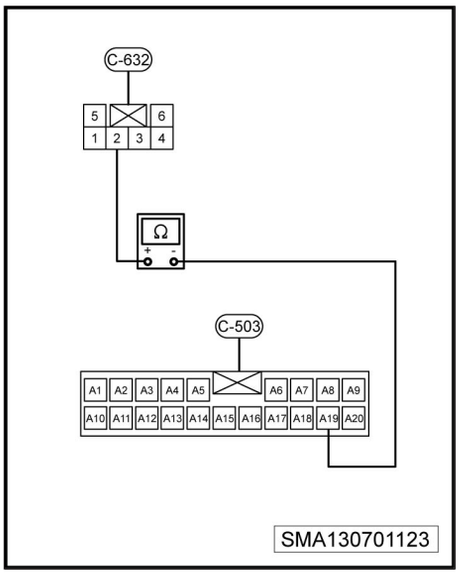
- If yes, go to step 2.
- If not, go to step 4.

2. Check if the ground line of the roof lamp connector is normal.

- If yes, go to step 3.
- If not, repair the fault such as short circuit or virtual connection existing in the roof lamp ground line. ■

3. Measure the resistance values of the roof lamp bulbs and verify if the rated voltage and power of the roof lamp bulbs are normal.

- If yes, go to step 4.
- If not, replace the roof lamp bulbs. ■



4. Check if the voltage between the pin A19 of the BCM connector C-503 and the ground is battery voltage. Open the doors and check if the voltage between the pin A3 of the BCM connector C-503 and the ground is battery voltage.

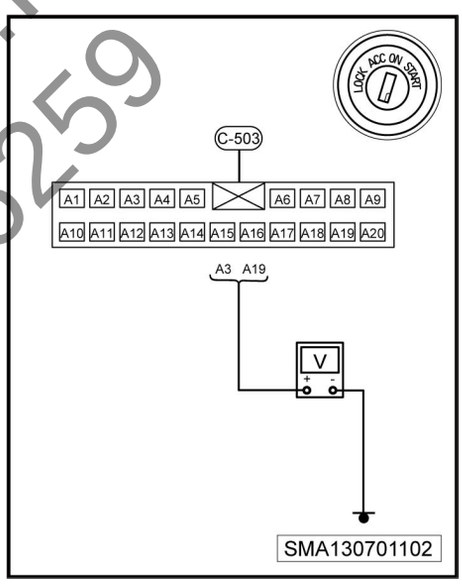
- If yes, check if the power circuit between the BCM and the roof lamp has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
- If not, go to step 5.

5. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

6. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

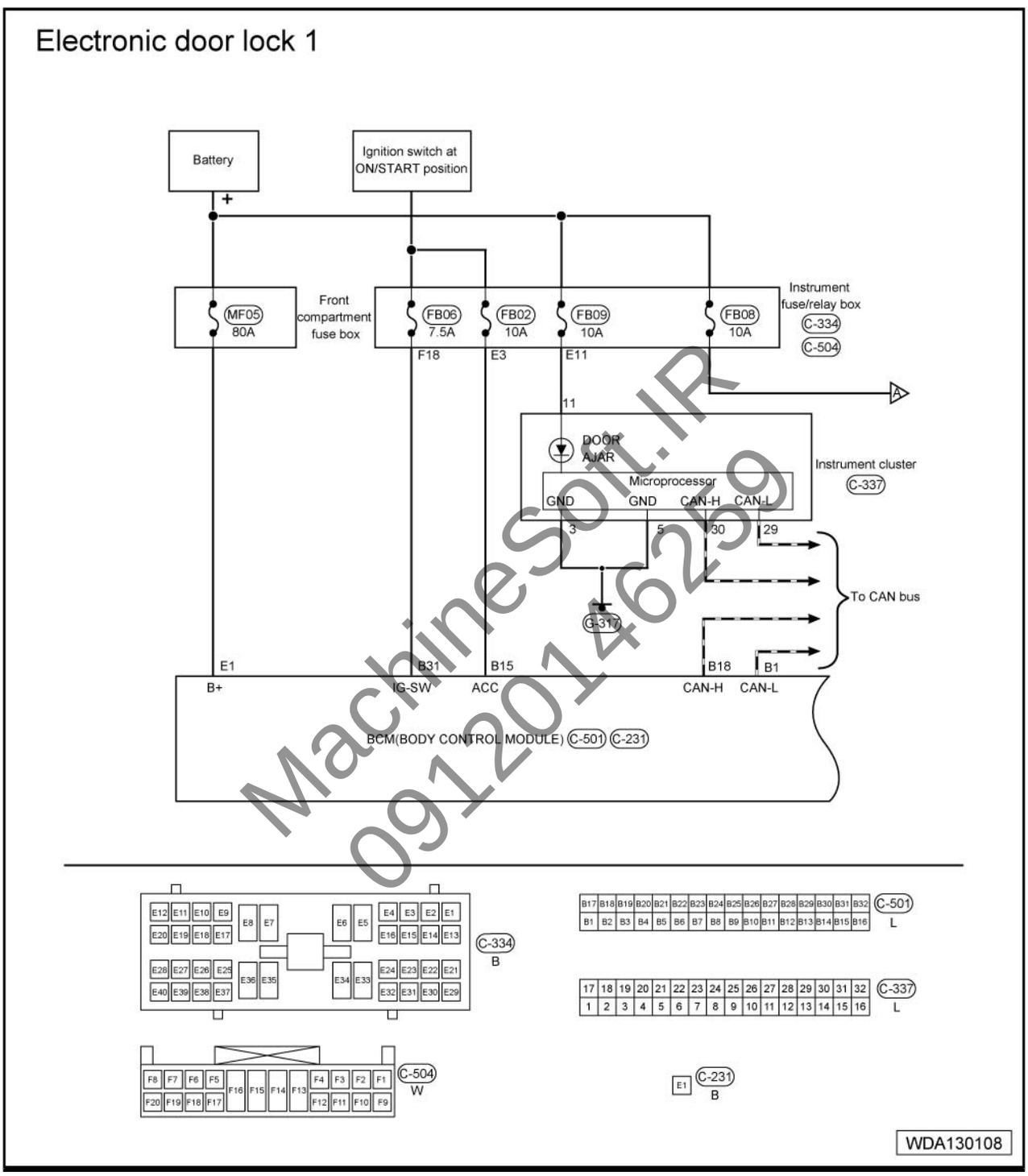
- If yes, locate fault causes from other symptoms.
- If not, the fault has been rectified. ■

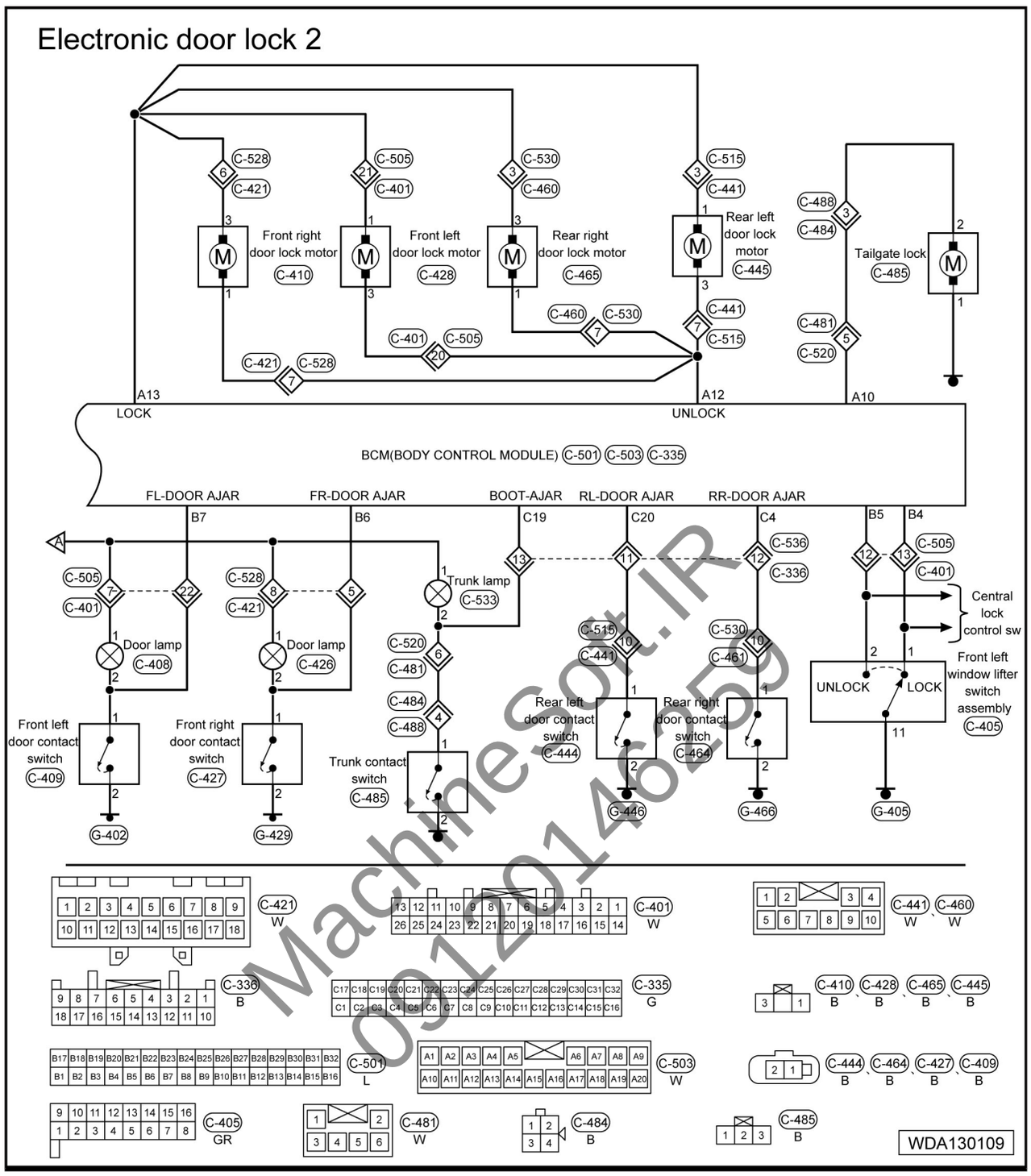


07

7.4.7 B1220 - Low current in the central locking output control circuit

B1221 - High current in the central locking output control circuit
B1223 - Low current in the central unlocking output control circuit
B1224 - High current in the central unlocking output control circuit





Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A12	Unlock output	The central door lock switch or key switch in the UNLOCK position	Battery voltage
A13	Lock output	The central door lock switch or key switch in the LOCK position	Battery voltage
B4	Lock input	Electrical system energized	Battery voltage
B5	Unlock input		Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1220	Low current in the central locking output control circuit	The central door lock switch or key switch in the LOCK position	Central door lock control circuit short or open circuit detected by the BCM	• Failure of the door lock motor • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the central door lock switch or key switch
B1221	High current in the central locking output control circuit			
B1223	Low current in the central unlocking output control circuit	The central door lock switch or key switch in the UNLOCK position		
B1224	High current in the central unlocking output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

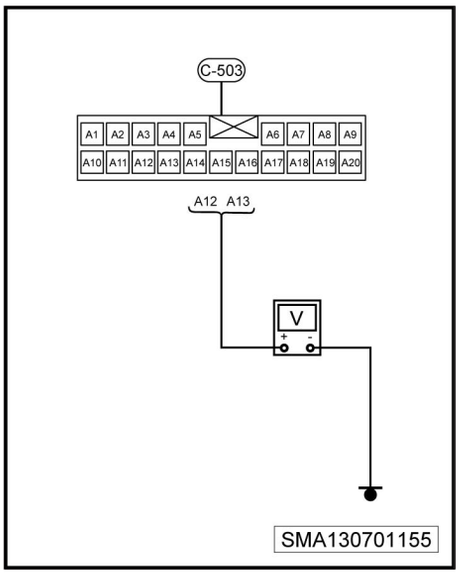
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power supply line and the ground line (locking and unlocking have opposite electrodes) of the central lock connector are normal when the central lock switch is locked and unlocked respectively.
   - If yes, go to step 2.
   - If not, go to step 3.

2. Measure the resistance values of the central lock motors of the four doors and check if the power supply line is normal.
   - If yes, go to step 3.
   - If not, replace the central lock motors. ■

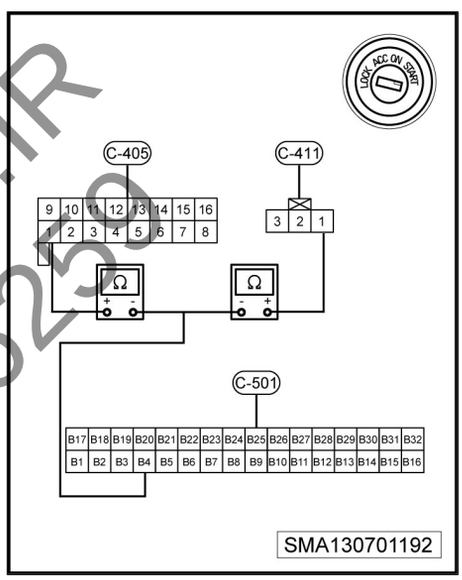
3. Check if the power supply line and the ground line of the pins A12 and A13 of the BCM connector C-503 are normal when the central lock switch is locked and unlocked respectively.

- If yes, check if the line between the pins A12 and A13 of the BCM connector C-503 and the central lock motors of the four doors has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
- If not, go to step 4.



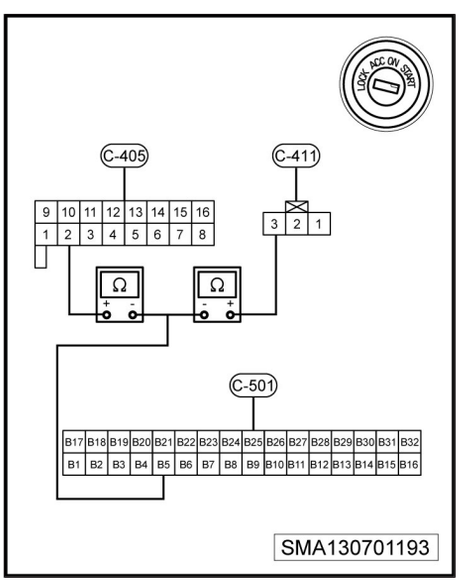
4. Check if the line between the pin B4 of the BCM connector C-501 and the pin 1 of the central door lock key switch connector C-411 and the pin 1 of the central door lock connector C-405 is normal.

- If yes, go to step 5.
- If not, go to step 7.



5. Check if the line between the pin B5 of the BCM connector C-501 and the pin 3 of the central door lock key switch connector C-411 and the pin 2 of the central door lock connector C-405 is normal.

- If yes, go to step 6.
- If not, go to step 7.



6. Check if the ground line between the the central door lock key switch connector and the central door lock switch is normal.

- If yes, check if the central door lock key switch and the central door lock switch have any malfunctions. ■
- If not, go to step 7.

7. Check if the power supply line and the ground line of the BCM are normal.

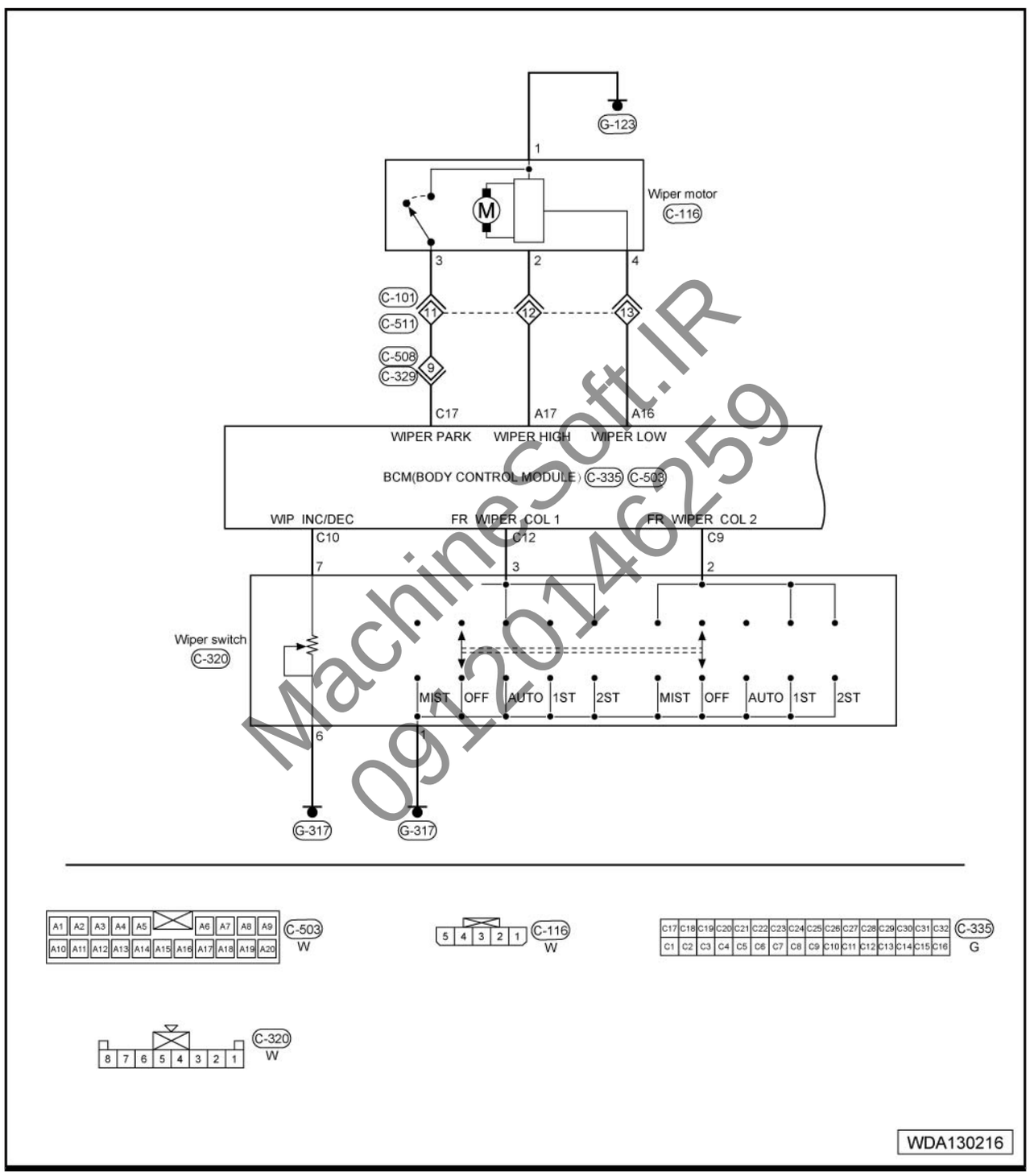
- If yes, go to step 8.
- If not, repair the faulty line. ■

8. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

7.4.8 B1276 - Front wiper high speed output control circuit open circuit

B1277 - Low voltage in the front wiper high speed output control circuit
B1278 - High voltage in the front wiper high speed output control circuit
B1279 - Front wiper low speed output control circuit open circuit
B1280 - Low voltage in the front wiper low speed output control circuit
B1281 - High voltage in the front wiper low speed output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A16	Wiper low speed output	The ignition switch in the	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
		ACC/ON position The wiper switch in the ON position	
A17	Wiper high speed output	The ignition switch in the ACC/ON position The wiper switch in the ON position	Battery voltage

Checking the line between the body control module (BCM) and the wiper switch

BCM pin	Function	Condition	Value (DC voltage range)
C9	Front wiper input	The ignition switch in the ACC/ON position	Battery voltage
C12	Front wiper input		Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1276	Front wiper high speed output control circuit open circuit	The ignition switch in the ACC/ON position The front wiper switch in the ON position	Front wiper output control circuit short or open circuit detected by the BCM	• Failure of the wiper motor • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the wiper switch
B1277	Low voltage in the front wiper high speed output control circuit			
B1278	High voltage in the front wiper high speed output control circuit			
B1279	Front wiper low speed output control circuit open circuit			
B1280	Low voltage in the front wiper low speed output control circuit			
B1281	High voltage in the front wiper low speed output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.

- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

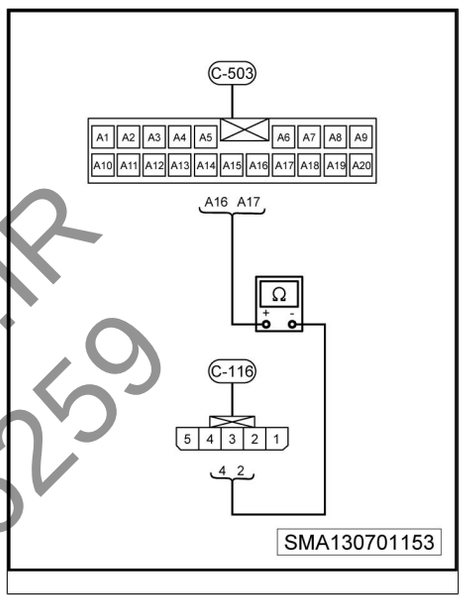
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the line between the pins 2 and 4 of the wiper motor connector C-116 and the pins A17 and A16 of the BCM connector C-503 is normal.

- If yes, go to step 2.
- If not, go to step 4.



2. Check if the ground line of the wiper motor connector is normal.

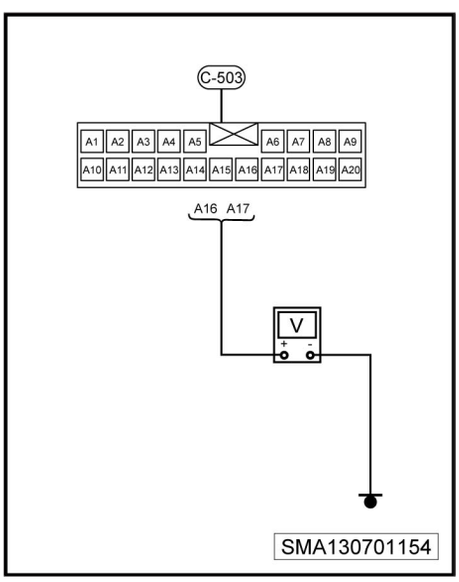
- If yes, go to step 3.
- If not, repair the fault such as short circuit or virtual connection existing in the wiper motor ground line. ■

3. Measure the resistance value of the front wiper motor and check if the high speed and low speed of the motor are normal.

- If yes, go to step 4.
- If not, replace the front wiper motor. ■

4. Check if the voltage between the pin A17 of the BCM connector C-503 and the ground is battery voltage. Check if the voltage between the pin A16 of the BCM connector C-503 and the ground is battery voltage.

- If yes, check if the power circuit between the BCM and the roof lamp has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
- If not, go to step 5.



5. Check if the line between the pin C9 of the BCM connector C-335 and the pin 2 of the wiper switch connector C-320 is normal. Check if the line between the pin C12 of the BCM connector C-335 and the pin 3 of the wiper switch connector C-320 is normal.

- If yes, go to step 6.
- If not, go to step 7.

6. Check if the ground line of the wiper switch is normal.

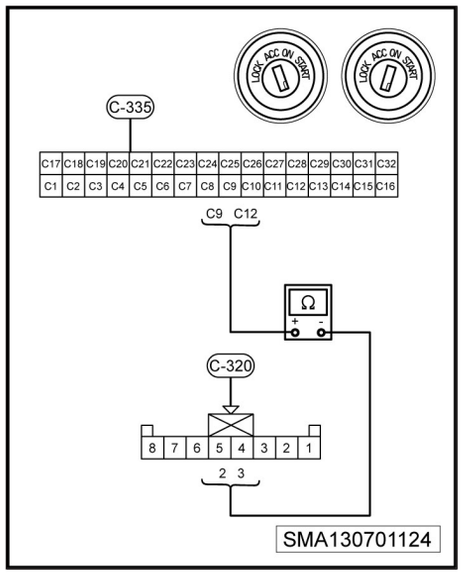
- If yes, check if the wiper switch is faulty. ■
- If not, go to step 7.

7. Check if the power supply line and the ground line of the BCM are normal.

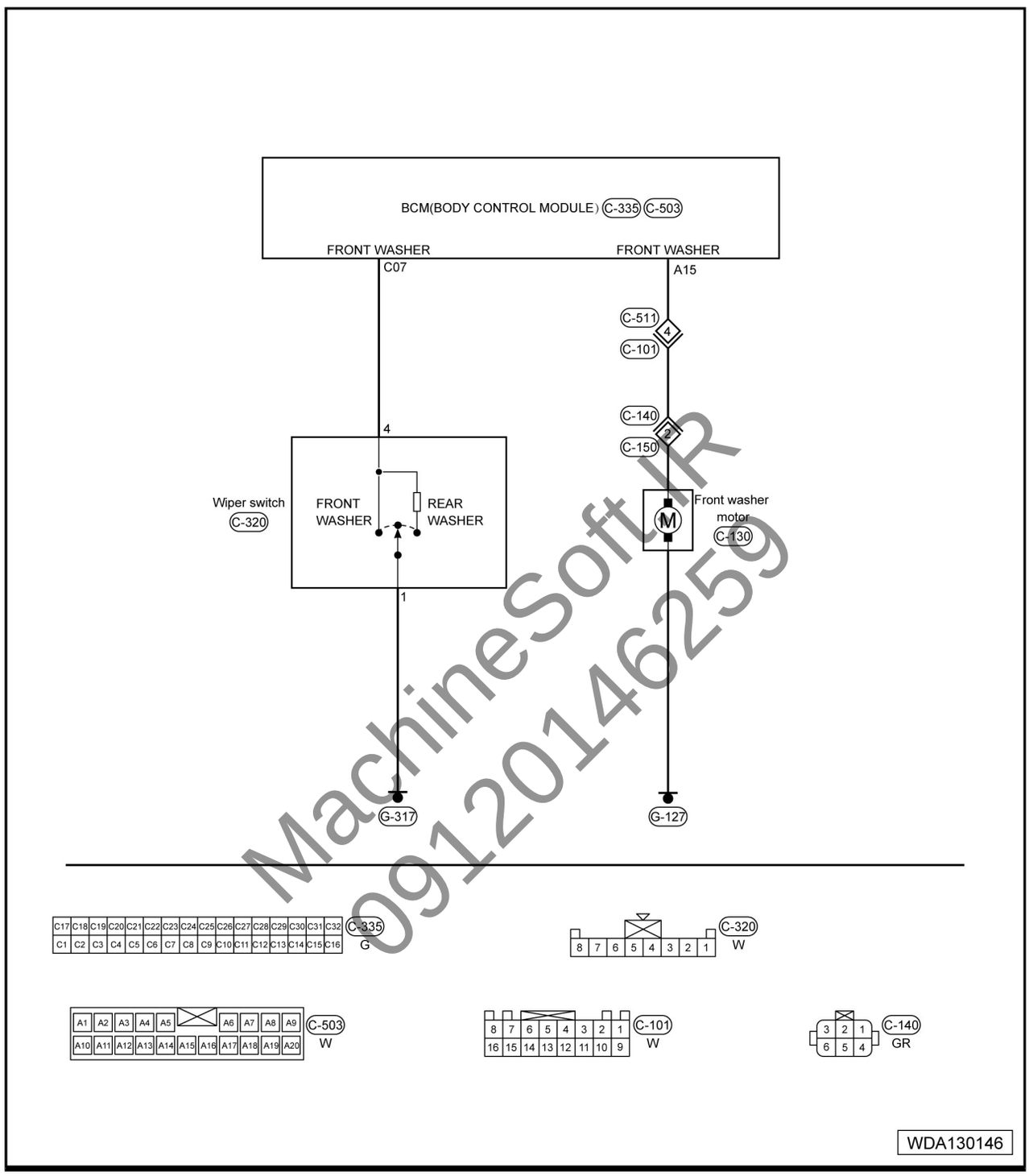
- If yes, go to step 8.
- If not, repair the faulty line. ■

8. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■



7.4.9 B1283 - Low voltage in the front washer output control circuit
B1284 - Hight voltage in the front washer output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A15	Front washer output	The ignition switch in the ACC/ON position The washer switch in the ON position	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
C7	Front washer input	The ignition switch in the ACC/ON position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1283	Low voltage in the front washer output control circuit	The ignition switch in the ACC/ON position The washer switch in the ON position	Washer output control circuit short or open circuit detected by the BCM	• Failure of the washer motor • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the washer switch
B1284	High voltage in the front washer output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

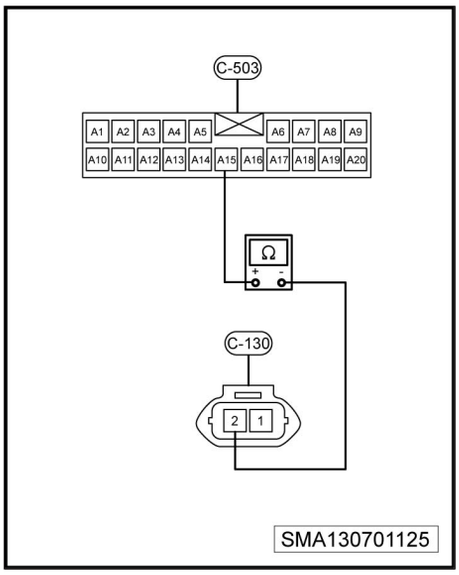
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

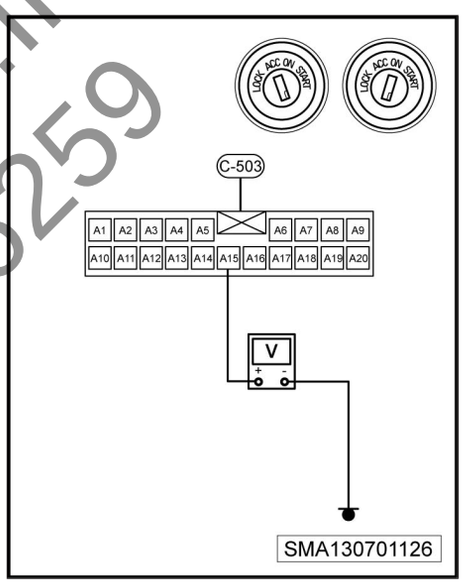
1. Check if the line between the pin A15 of the BCM connector C-503 and the pin 2 of the washer motor connector C-130 is normal.
   - If yes, go to step 2.
   - If not, go to step 4.

2. Check if the ground line of the washer motor is normal.
   - If yes, go to step 3.
   - If not, repair the fault such as short circuit or virtual connection existing in the washer motor ground line. ■

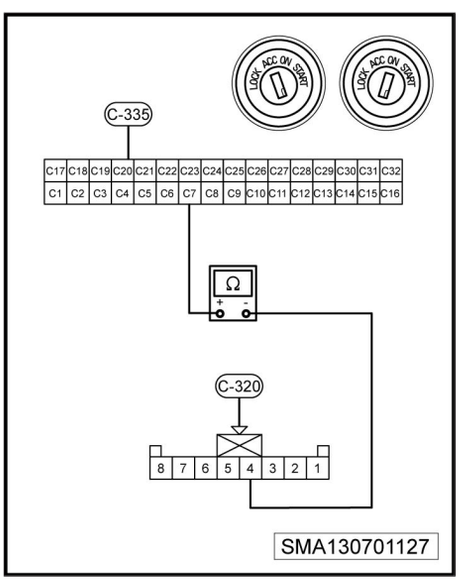
3. Measure the resistance value of the washer motor and check if the motor is normal.
   - If yes, go to step 4.
   - If not, replace the washer motor. ■



4. Turn on the washer switch and check if the voltage between the pin A15 of the BCM connector C-503 and the ground is battery voltage.
   - If yes, check if the power circuit between the BCM and the washer motor has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
   - If not, go to step 5.



5. Check if the line between the pin C7 of the BCM connector C-335 and the pin 4 of the washer switch connector C-320 is normal.
   - If yes, go to step 6.
   - If not, repair the faulty line. ■



6. Check if the ground line of the washer switch is normal.

- If yes, go to step 7.
- If not, repair the fault such as short circuit or virtual connection existing in the washer switch ground line. ■

7. Check if the washer switch is normal.

- If yes, go to step 8.
- If not, repair or replace the washer switch. ■

8. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 9.
- If not, repair the faulty line. ■

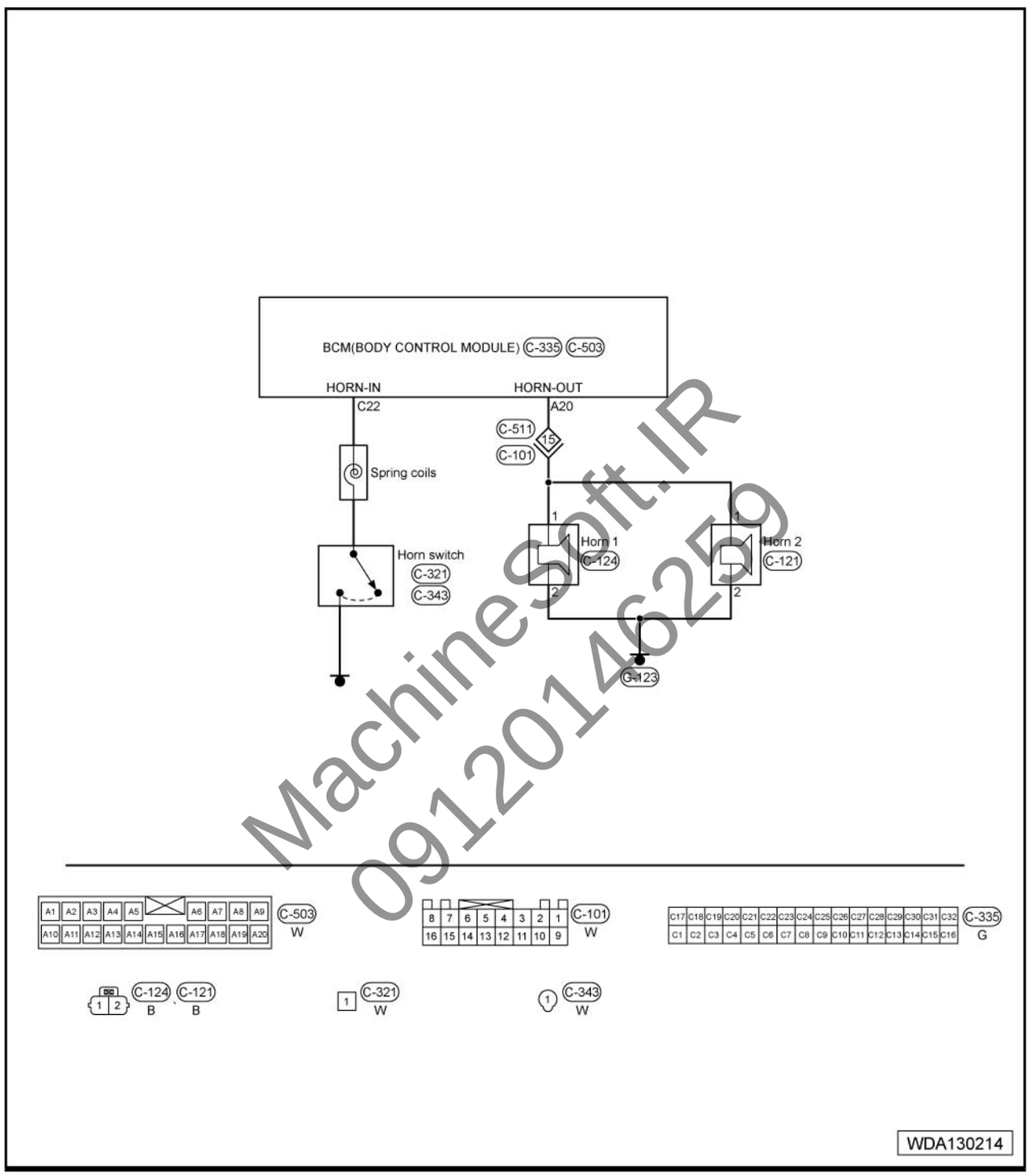
9. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

7.4.10 B1285 - Horn output control circuit open circuit

B1286 - Low voltage in the horn output control circuit

B1287 - High voltage in the horn output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A20	Horn output	The horn switch in the ON position	Battery voltage
C22	Horn input	Electrical equipment energized	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1285	Horn output control circuit open circuit	The horn switch in the ON position	Horn output control circuit short or open circuit detected by the BCM	• Failure of the horn • Failure of the wiring harness or the connector • Failure of the BCM • Failure of the horn switch
B1286	Low voltage in the horn output control circuit			
B1287	High voltage in the horn output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds and carry out the respective function tests.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the line between the pin A20 of the BCM connector C-503 and the pin 1 of the horn switch connector C-121 is normal.

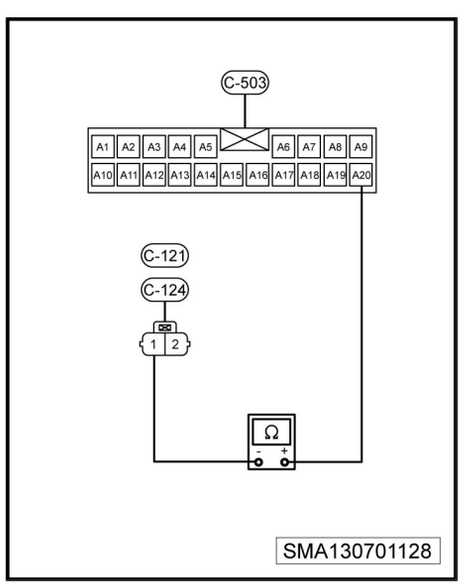
- If yes, go to step 2.
- If not, go to step 4.

2. Check if the ground line of the horn is normal.

- If yes, go to step 3.
- If not, repair the fault such as short circuit or virtual connection existing in the horn ground line. ■

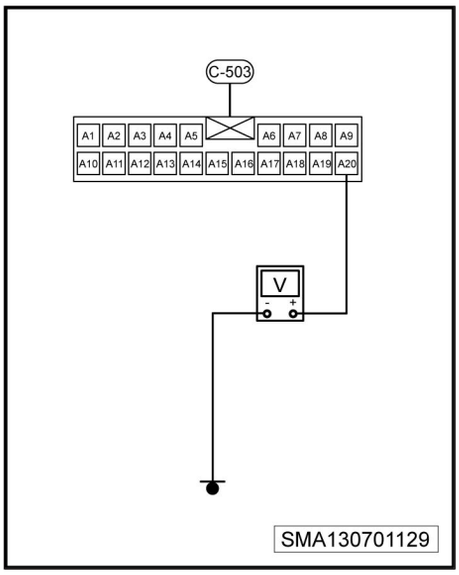
3. Measure the resistance value of the horn and check if the horn is normal.

- If yes, go to step 4.
- If not, replace the horn. ■



4. Turn on the horn switch and check if the voltage between the pin A20 of the BCM connector C-503 and the ground is battery voltage.

- If yes, check if the power circuit between the BCM and the horn has the failures of earthing, short circuit, open circuit, over resistance value and virtual connection. ■
- If not, go to step 5.



5. Check if the line between the pin C22 of the BCM connector C-335 and the horn switch connector C-321 is normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

6. Check if the horn switch is normal.

- If yes, go to step 7.
- If not, repair or replace the horn switch. ■

7. Check if the spring coil is normal.

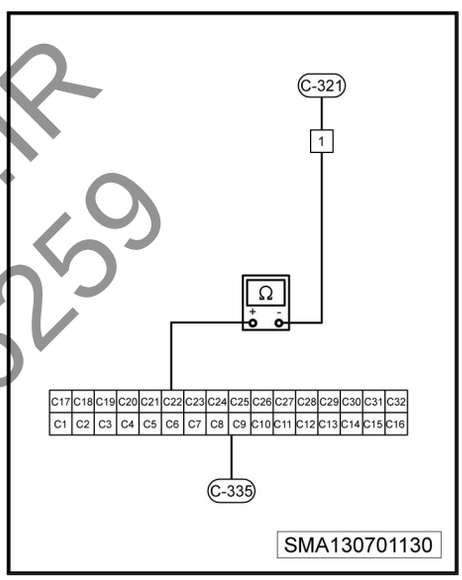
- If yes, go to step 8.
- If not, repair or replace the spring coil. ■

8. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 9.
- If not, repair the faulty line. ■

9. Replace the BCM, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

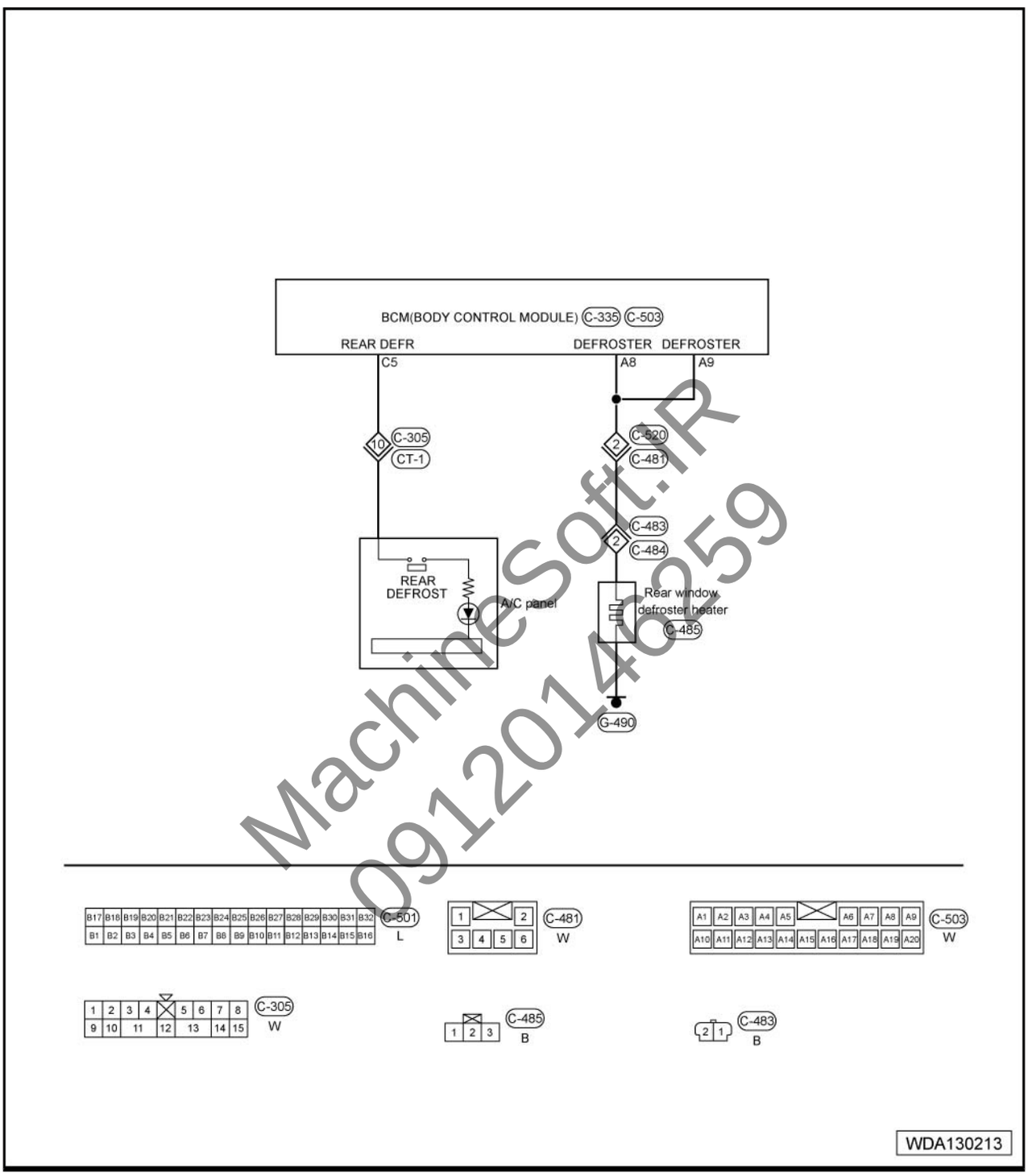


07

7.4.11 B1288 - Rear defroster output control circuit open circuit

B1289 - Low voltage in the rear defroster output control circuit

B1290 - High voltage in the rear defroster output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A8	Defroster output	The ignition switch in the ACC or ON position The washer switch in the ON position	Battery voltage
A9	Defroster output		Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
C5	Rear defroster input	The ignition switch in the ACC or ON position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1288	Rear defroster output control circuit open circuit	The ignition switch in the ACC or ON position The defroster switch in the ON position	The rear defroster output control circuit short or open circuit detected by the body control module (BCM)	• Failure of the wiring harnesses or connector • Failure of BCM • Failure of the defroster switch
B1289	Low voltage in the rear defroster output control circuit			
B1290	High voltage in the rear defroster output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch, turn it on again after 3 to 5 seconds, and carry out the corresponding function test.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

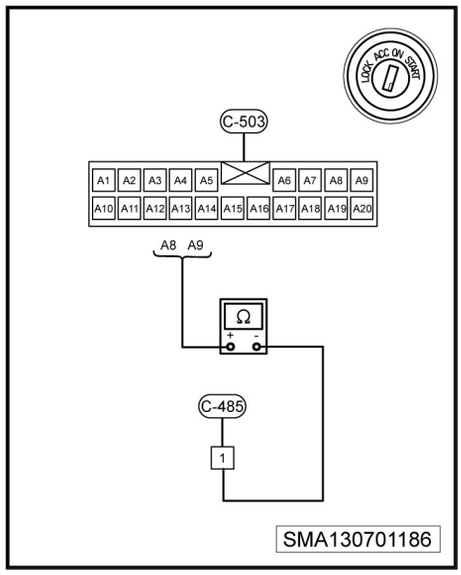
Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

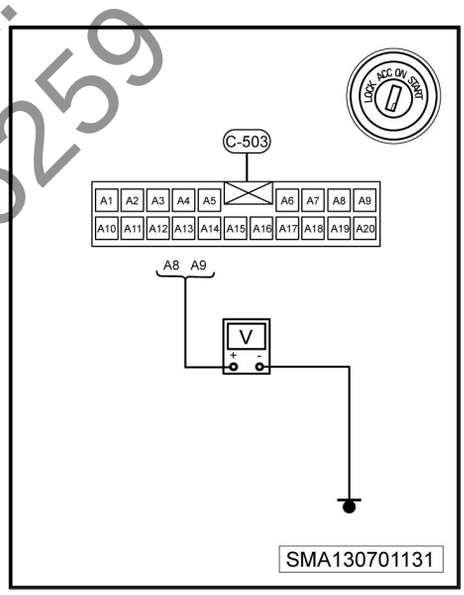
1. Check if the line between the pins A8, A9 of the body control module connector C-503 and the pin 1 of the rear window defroster heater connector C-485 is normal.
   - If yes, go to step 2.
   - If not, go to step 4.

2. Check if the rear window defroster heater ground line is normal.
   - If yes, go to step 3.
   - If not, repair the fault such as short circuit or virtual connection existing in the rear window defroster heater ground line. ■

3. Measure the resistance value of the rear window defroster heater and check if the rear window defroster heater has any breakpoint.
   - If yes, repair or replace it. ■
   - If not, go to step 4.

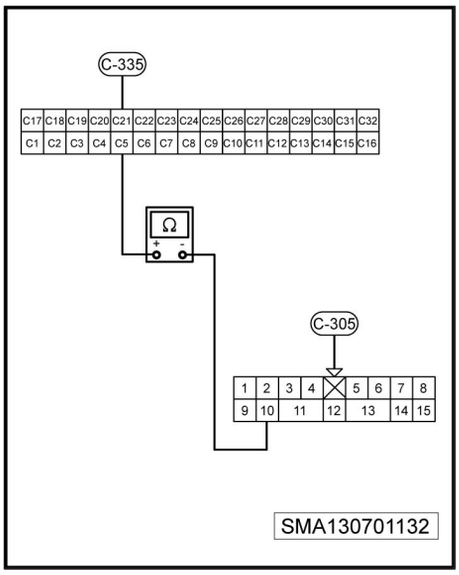


4. Turn on the defroster switch and check if the voltage between the pins A8, A9 of body control module connector C-503 and the ground is the battery voltage.
   - If yes, check if the power lines between the body control module and the rear window defroster heater have the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
   - If not, go to step 5.



5. Check if the line between the pin C5 of the body control module connector C-335 and the pin 10 of the A/C control module connector C-305 is normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■



6. Turn on the defroster switch and check if the pin 10 of the A/C control module connector C-305 has voltage output.

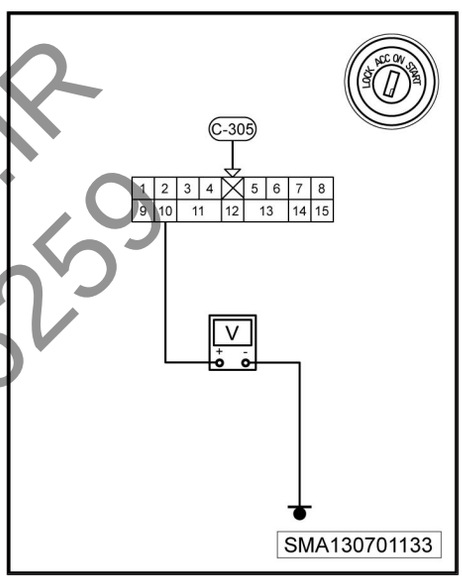
- If yes, go to step 7.
- If not, replace the A/C control module. ■

7. Check if the power supply line and the ground line of the BCM are normal.

- If yes, go to step 8.
- If not, repair the faulty line. ■

8. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

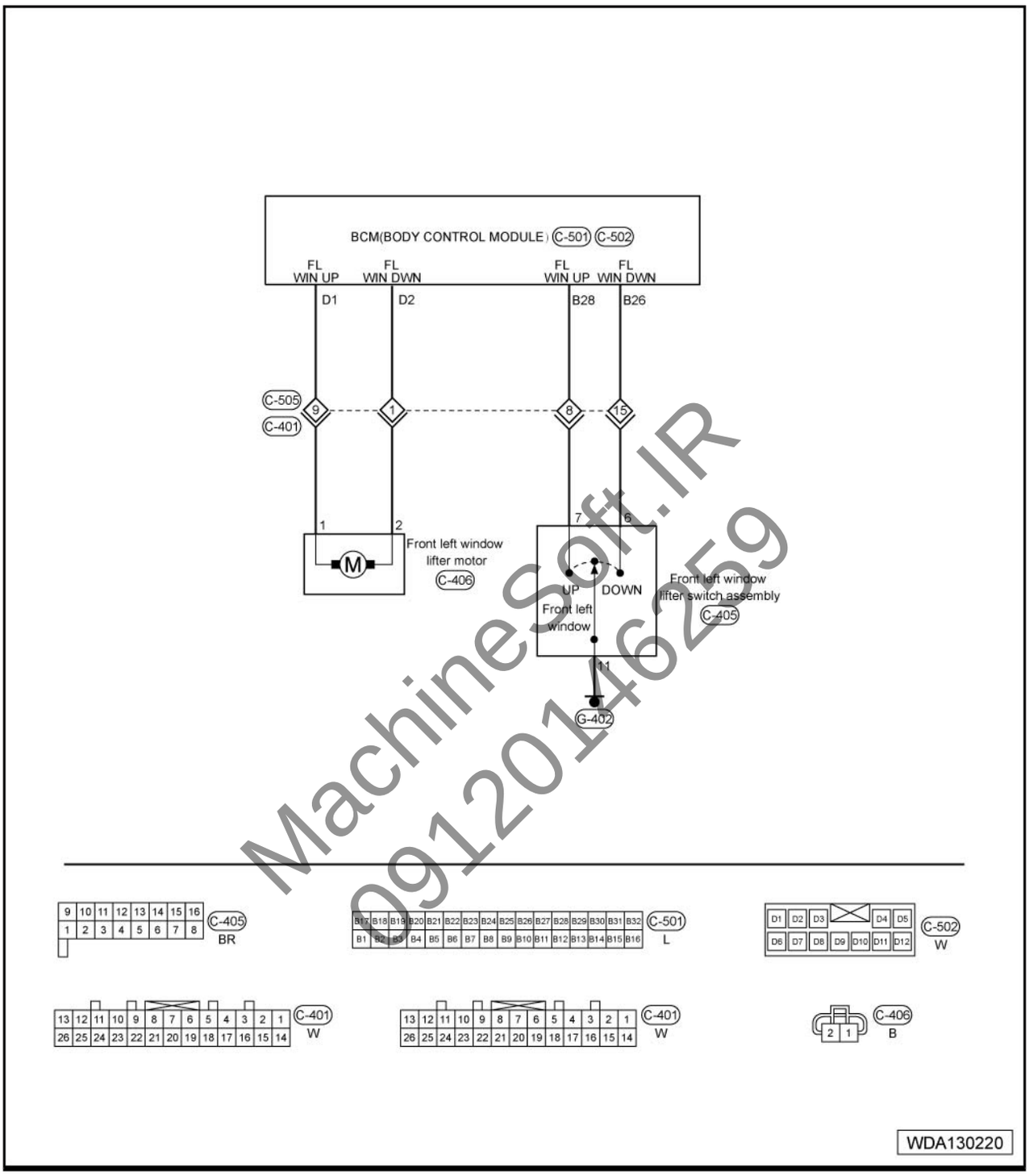
- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■



07

7.4.12 B1350 – Low current in the front left window up output control circuit

B1353 – Low current in the front left window down output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
D1	Front left window up output	The ignition switch in the ACC or ON position The window lifter switch in the UP position	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
D2	Front left window down output	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position	
B26	Front Left window down input	The ignition switch in the ACC or ON position	Battery voltage
B28	Front left window up input	The ignition switch in the ACC or ON position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1350	Low current in the front left window up output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the UP position	The front left window output control circuit short or open circuit detected by the body control module (BCM)	• Failure of the wiring harnesses or connector • Failure of BCM • Failure of the window lifter switch • Failure of the window lifter motor
B1353	Low current in the front left window down output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position		

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch, turn it on again after 3 to 5 seconds, and carry out the corresponding function test.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

07

Note

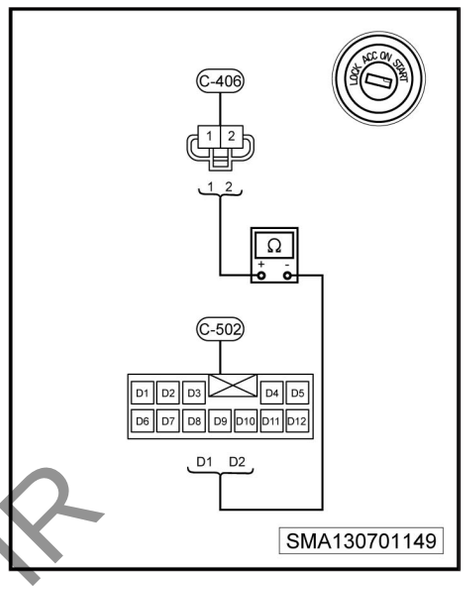
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the lines between the pins D1, D2 of the body control module connector C-502 and the pins 1, 2 of the front left window lifter motor connector C-406 are normal.

- If yes, go to step 2.
- If not, go to step 3 and 4.

2. Measure the resistance value of the window lifter motor and carry out the power supply test (up and down operations have opposite electrodes) to check if the window lifter motor is normal.

- If yes, go to step 3.
- If not, replace the front left window lifter motor. ■

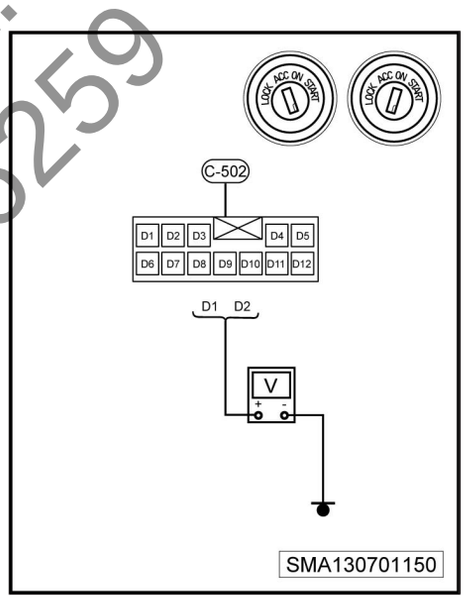


3. Turn the front left window lifter switch to the UP position and check if the voltage between the pin D1 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D1 of the body control module connector C-502 and the front left window lifter motor has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 5.

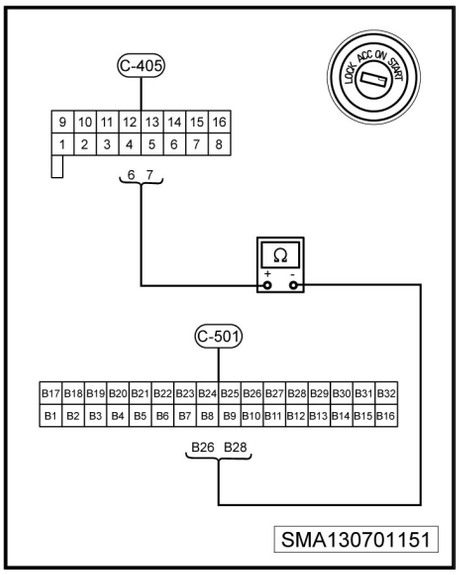
4. Turn the front left window lifter switch to the DOWN position and check if the voltage between the pin D2 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D2 of the body control module connector C-502 and the front left window lifter motor has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 6.



5. Check if the line between the pin B28 of the body control module connector C-501 and the pin 7 of the front left window lifter switch assembly connector C-405 is normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

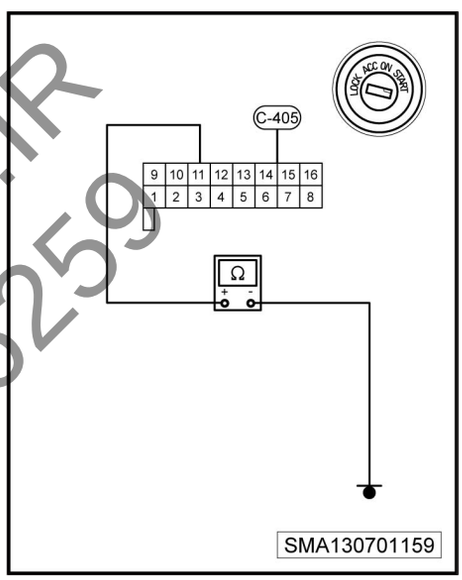


6. Check if the line between the pin B26 of the body control module connector C-501 and the pin 6 of the front left window lifter switch assembly connector C-405 is normal.

- If yes, go to step 7.
- If not, repair the faulty line. ■

7. Check if the line between the pin 11 of the front left window lifter switch assembly connector C-405 and the ground is normal.

- If yes, go to step 8.
- If not, repair the faulty line. ■



8. Check if the front left window lifter switch assembly is normal.

- If yes, repair or replace the front left window lifter switch assembly. ■
- If not, go to step 9.

9. Check if the power supply line and the ground line of BCM are normal.

- If yes, go to step 10.
- If not, repair the faulty line. ■

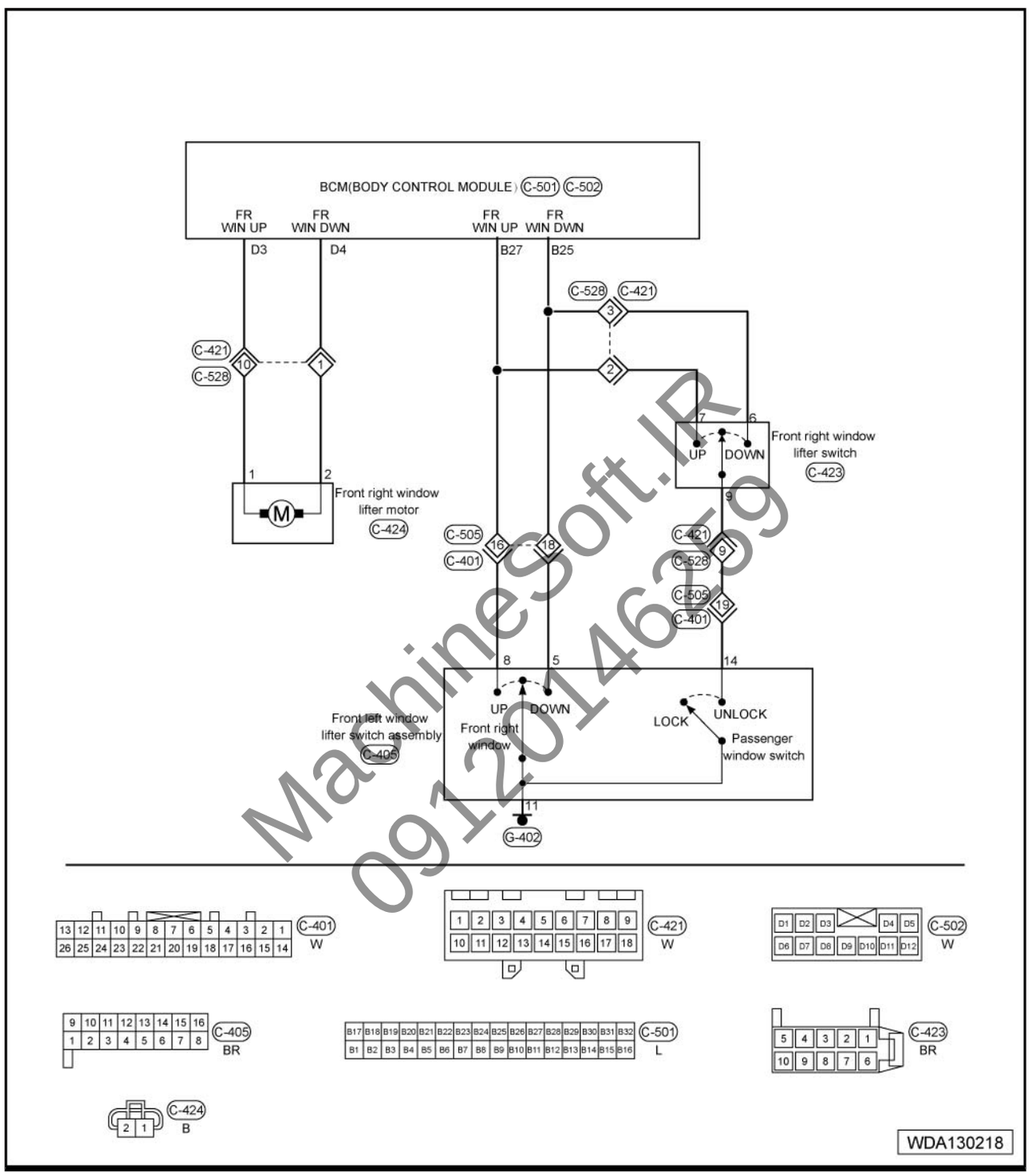
10. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

07

7.4.13 B1356 – Low current in the front right window up output control circuit

B1359 – Low current in the front right window down output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
D3	Front right window up output	The ignition switch in the ACC or ON position	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
		The window lifter switch in the UP position	
D4	Front right window down output	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position	
B25	Front right window down input	The ignition switch in the ACC or ON position	Battery voltage
B27	Front right window up input	The ignition switch in the ACC or ON position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1356	Low current in the front right window up output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the UP position	The front right window output control circuit short or open circuit detected by the body control module (BCM)	• Failure of the wiring harnesses or connector • Failure of BCM • Failure of the window lifter switch • Failure of the window lifter motor
B1359	Low current in the front right window down output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position		

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch, turn it on again after 3 to 5 seconds, and carry out the corresponding function test.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

07

Note

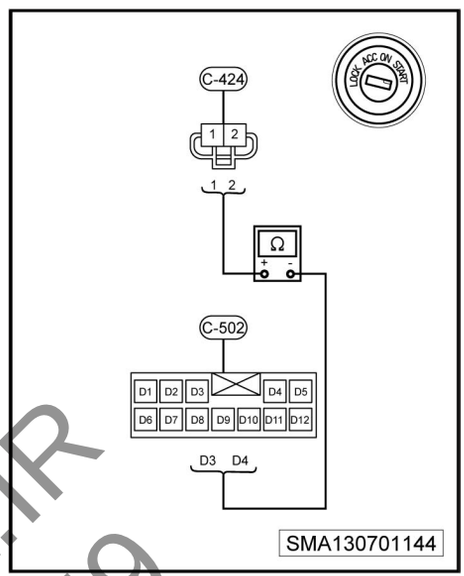
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the lines between the pins D3, D4 of the body control module connector C-502 and the pins 1, 2 of the front left window lifter motor connector C-424 are normal.

- If yes, go to step 2.
- If not, go to step 3 and 4.

2. Measure the resistance value of the window lifter motor and carry out the power supply test (up and down operations have opposite electrodes) to check if the window lifter motor is normal.

- If yes, go to step 3.
- If not, replace the front right window lifter motor. ■

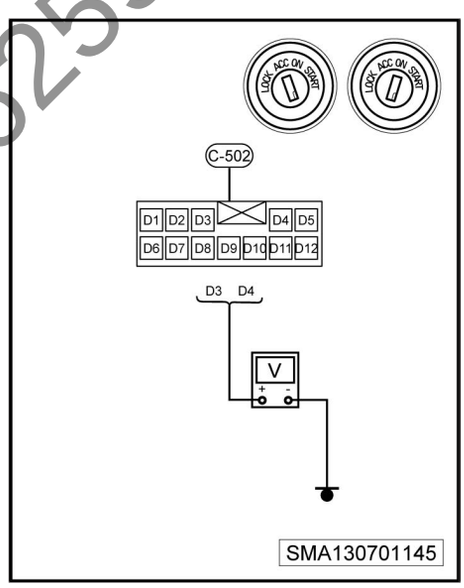


3. Turn the front right window lifter switch to the UP position and check if the voltage between the pin D3 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D3 of the body control module connector C-502 and the front right window lifter motor has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 5.

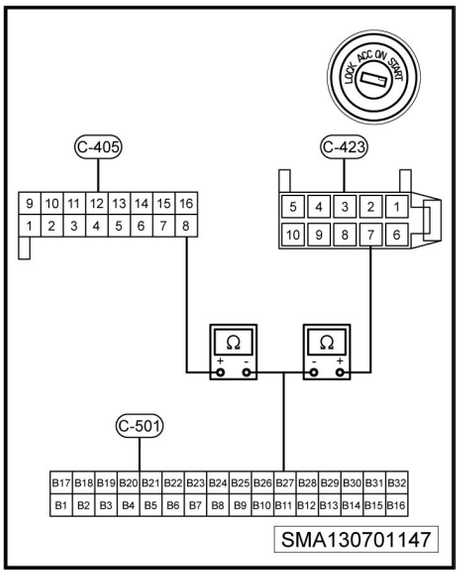
4. Turn the front right window lifter switch to the DOWN position and check if the voltage between the pin D4 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D4 of the body control module connector C-502 and the front right window lifter motor has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 6.



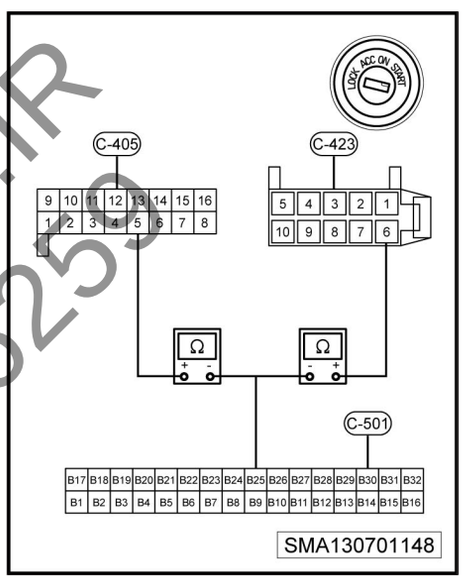
5. Check if the lines between the pin B27 of the body control module connector C-501 and the pin 8 of the front left window lifter switch assembly connector C-405 and the pin 7 of the front right window lifter switch connector C-423 are normal.

- If yes, go to step 7.
- If not, repair the faulty line. ■



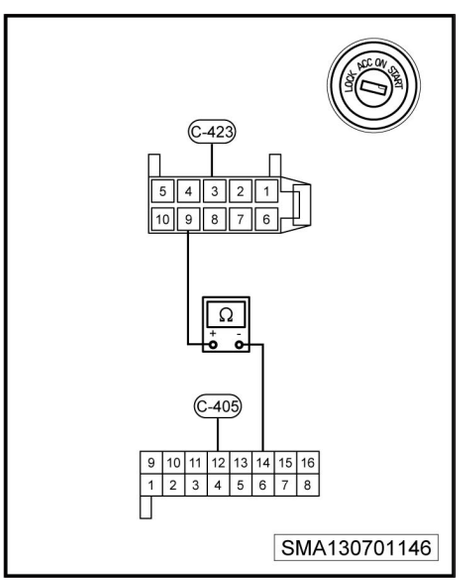
6. Check if the lines between the pin B25 of the body control module connector C-501 and the pin 5 of the front left window lifter switch assembly connector C-405 and the pin 6 of the front right window lifter switch connector C－423 are normal.

- If yes, go to step 7.
- If not, repair the faulty line. ■



7. Check if the line between the pin 14 of the front left window lifter switch assembly connector C-405 and the pin 9 of the front right window lifter switch assembly connector C-423 is normal.

- If yes, go to step 8.
- If not, repair the faulty line. ■



8. Check if the line between the pin 11 of the front left window lifter switch assembly connector C-405 and the ground is normal.

- If yes, go to step 9.
- If not, repair the faulty line. ■

9. Check if the front left window lifter switch assembly is normal.

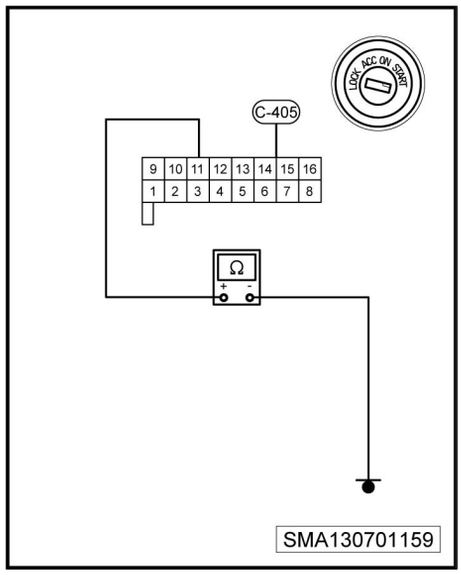
- If yes, repair or replace the front left window lifter switch assembly. ■
- If not, go to step 10.

10. Check if the power supply line and the ground line of BCM are normal.

- If yes, go to step 11.
- If not, repair the faulty line. ■

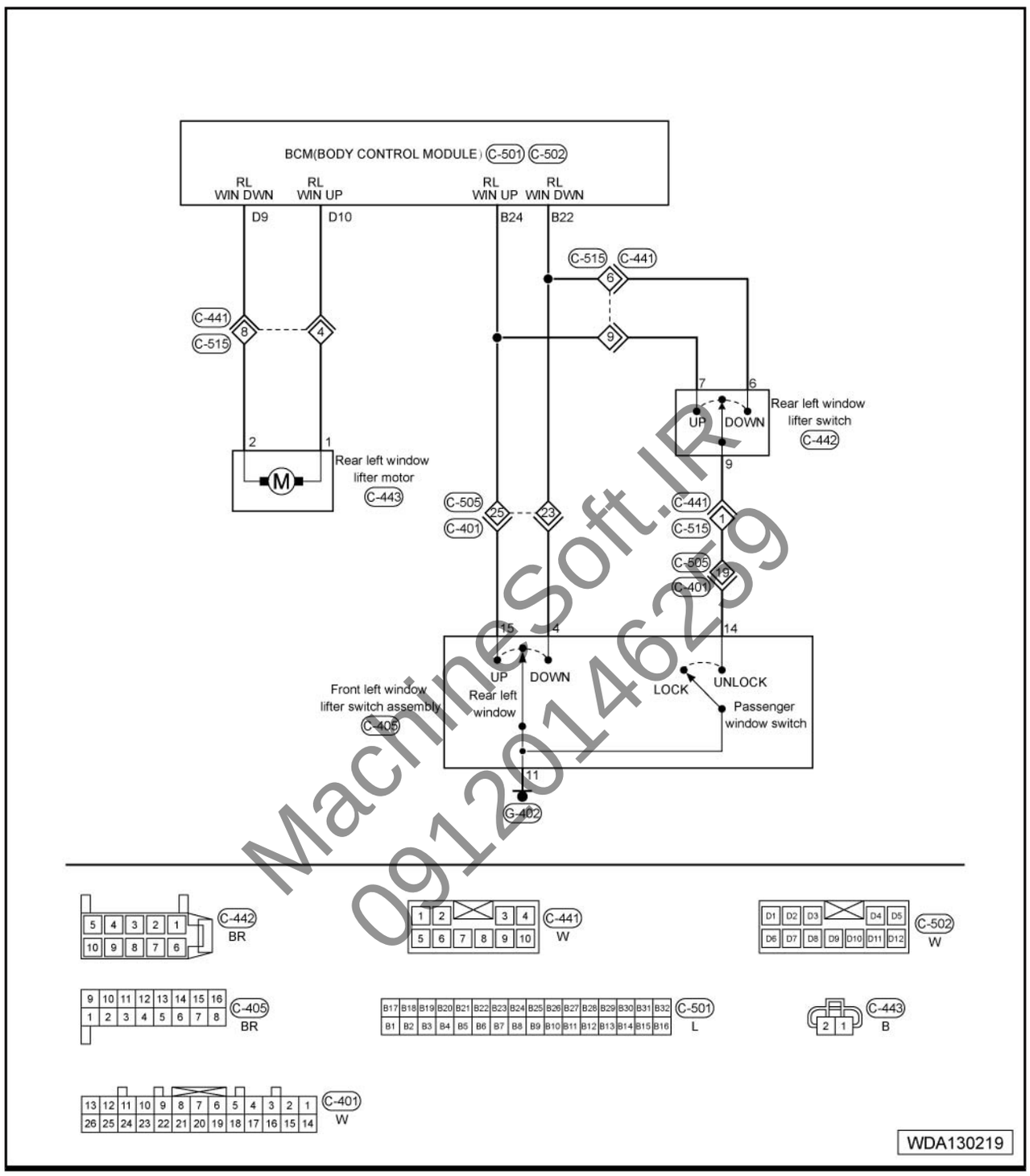
11. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■



7.4.14 B1361 – Low current in the rear left window up output control circuit

B1363 – Low current in the rear left window down output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
D9	Rear left window up output	The ignition switch in the ACC or ON position The window lifter switch in the UP position	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
D10	Rear left window down output	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position	
B22	Rear left window down input	The ignition switch in the ACC or ON position	Battery voltage
B24	Rear left window up input	The ignition switch in the ACC or ON position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1351	Low current in the rear left window up output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the UP position	The rear left window output control circuit short or open circuit detected by the body control module (BCM)	• Failure of the wiring harnesses or connector • Failure of BCM • Failure of the window lifter switch • Failure of the window lifter motor
B1353	Low current in the rear left window down output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position		

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch, turn it on again after 3 to 5 seconds, and carry out the corresponding function test.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

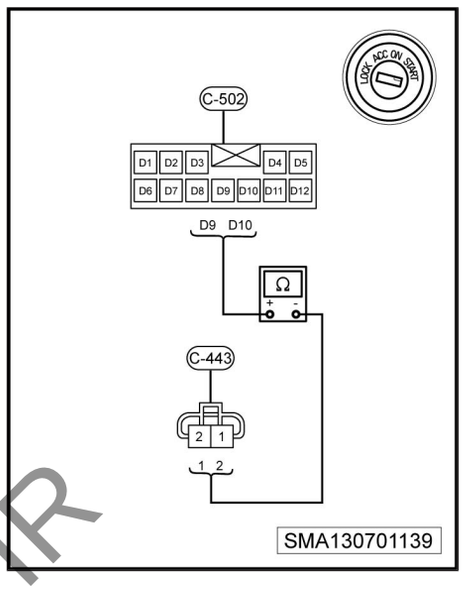
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the lines between the pins D9, D10 of the body control module connector C-502 and the pins 1, 2 of the rear left window lifter motor connector C-443 are normal.

- If yes, go to step 2.
- If not, go to step 3 and 4.

2. Measure the resistance value of the window lifter motor and carry out the power supply test (up and down operations have opposite electrodes) to check if the window lifter motor is normal.

- If yes, go to step 3.
- If not, replace the rear left window lifter motor. ■

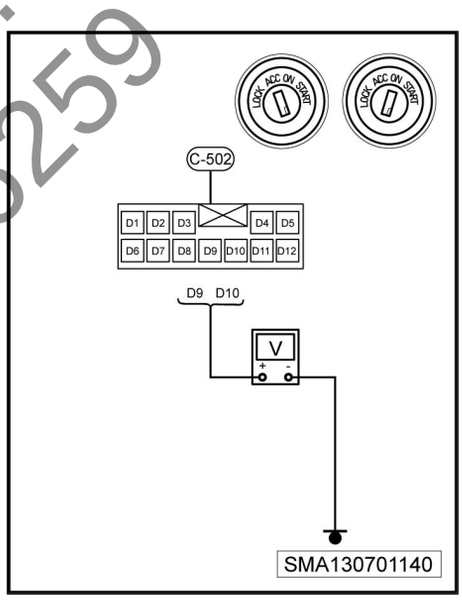


3. Turn the rear left window lifter switch to the UP position and check if the voltage between the pin D10 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D10 of the body control module connector C-502 and the rear left window lifter motor connector C-443 has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 5.

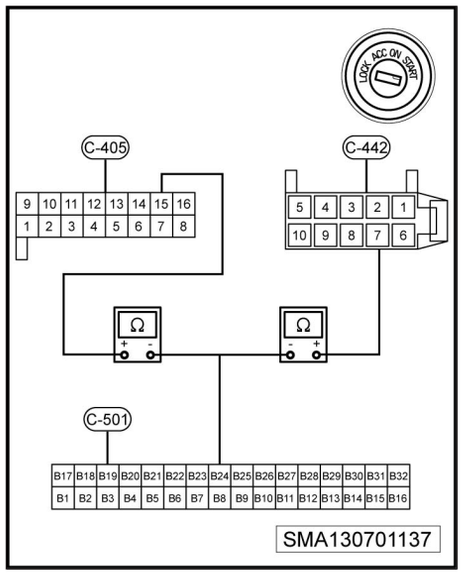
4. Turn the rear left window lifter switch to the DOWN position and check if the voltage between the pin D9 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D9 of the body control module connector C-502 and the rear left window lifter motor connector C-443 has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 6.



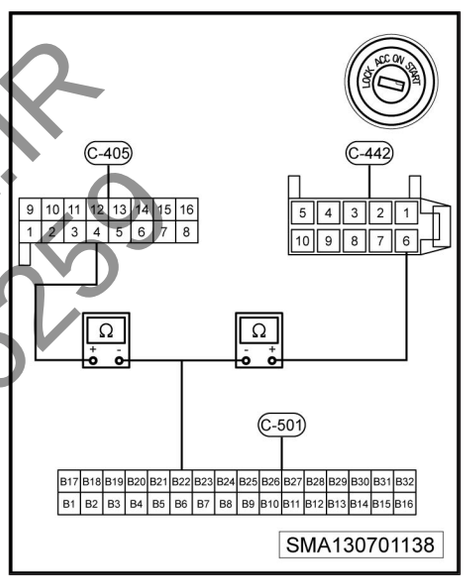
5. Check if the lines between the pin B24 of the body control module connector C-501 and the pin 15 of the front left window lifter switch assembly connector C-442 and the pin 7 of the rear left window lifter switch connector C－462 are normal.

- If yes, go to step 7.
- If not, repair the faulty line. ■



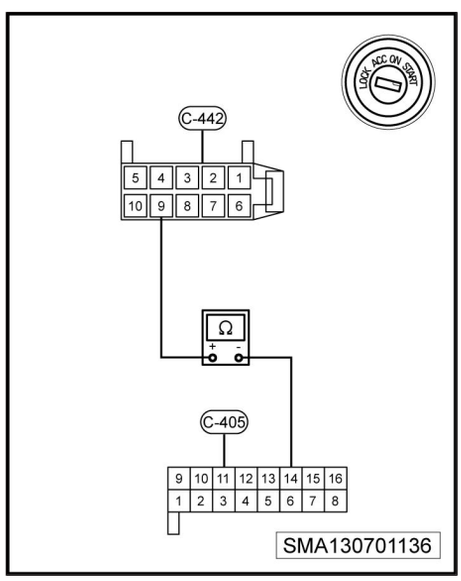
6. Check if the lines between the pin B22 of the body control module connector C-501 and the pin 4 of the front left window lifter switch assembly connector C-405 and the pin 6 of the rear left window lifter switch connector C－422 are normal.

- If yes, go to step 7.
- If not, repair the faulty line. ■



7. Check if the line between the pin 14 of the front left window lifter switch assembly connector C-405 and the pin 9 of the rear left window lifter switch assembly connector C-442 is normal.

- If yes, go to step 8.
- If not, repair the faulty line. ■



8. Check if the line between the pin 11 of the front left window lifter switch assembly connector C-405 and the ground is normal.

- If yes, go to step 9.
- If not, repair the faulty line. ■

9. Check if the front left window lifter switch assembly is normal.

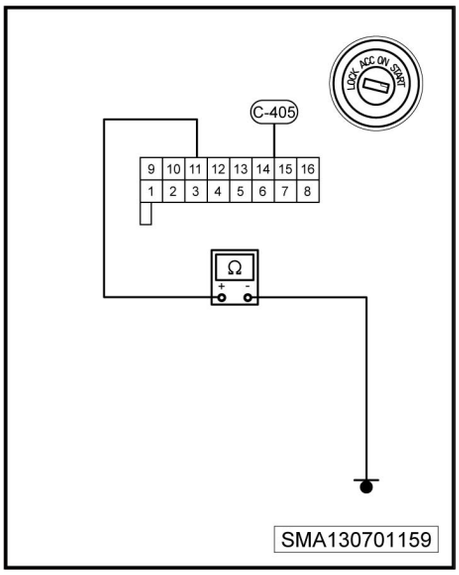
- If yes, repair or replace the front left window lifter switch assembly. ■
- If not, go to step 10.

10. Check if the power supply line and the ground line of BCM are normal.

- If yes, go to step 11.
- If not, repair the faulty line. ■

11. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

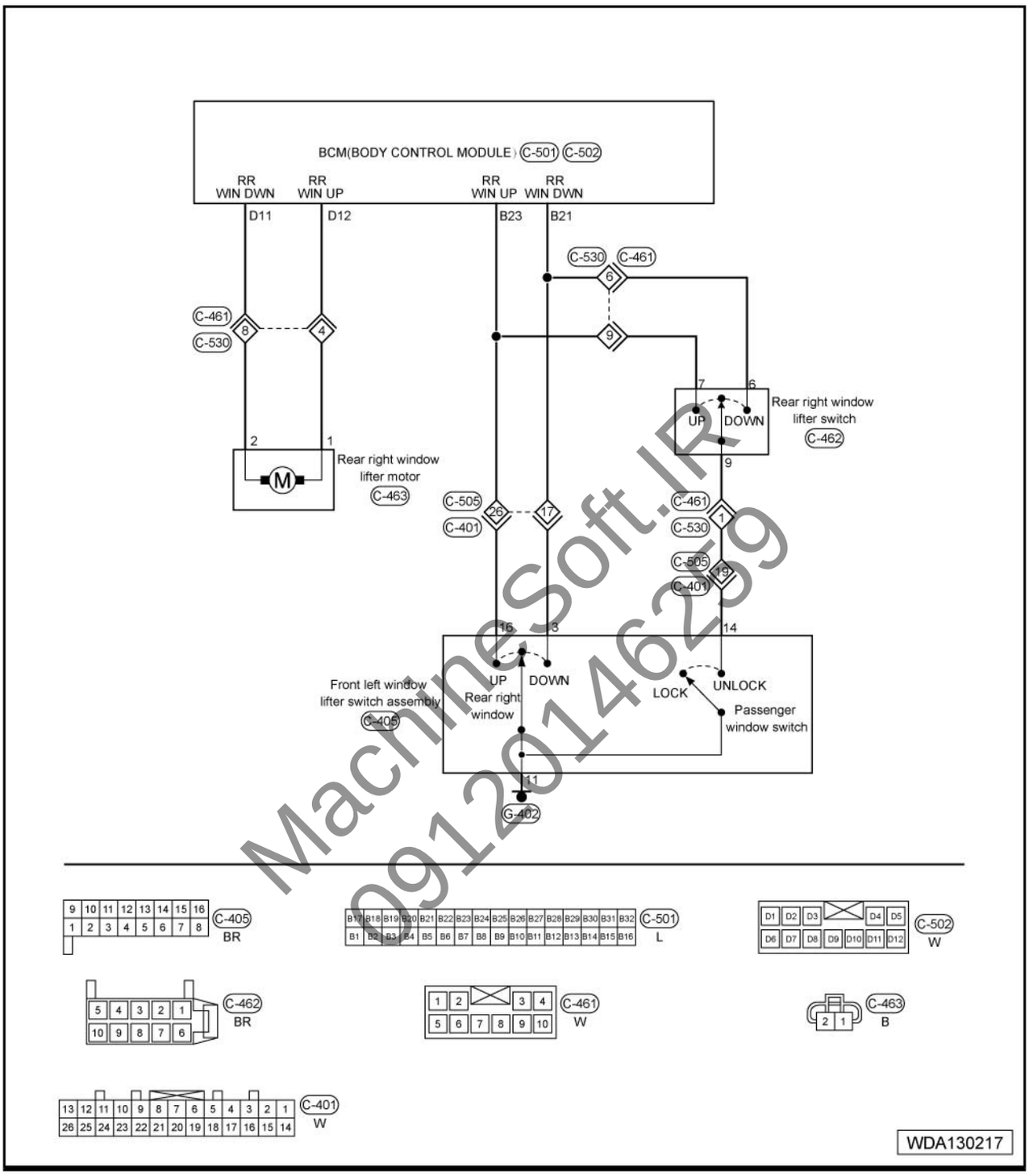
- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■



7.4.15 B1365 – Low current in the rear right window up output control circuit

B1367 – Low current in the rear right window down output control circuit

07



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
D11	Rear right window up output	The ignition switch in the ACC or ON position The window lifter switch in the UP position	Battery voltage

BCM pin	Function	Condition	Value (DC voltage range)
D12	Rear right window down output	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position	
B21	Rear right window down input	The ignition switch in the ACC or ON position	Battery voltage
B23	Rear right window up input	The ignition switch in the ACC or ON position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1365	Low current in the rear right window up output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the UP position	The rear right window output control circuit short or open circuit detected by the body control module (BCM)	• Failure of the wiring harnesses or connector • Failure of BCM • Failure of the window lifter switch • Failure of the window lifter motor
B1367	Low current in the rear right window down output control circuit	The ignition switch in the ACC or ON position The window lifter switch in the DOWN position		

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch, turn it on again after 3 to 5 seconds, and carry out the corresponding function test.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

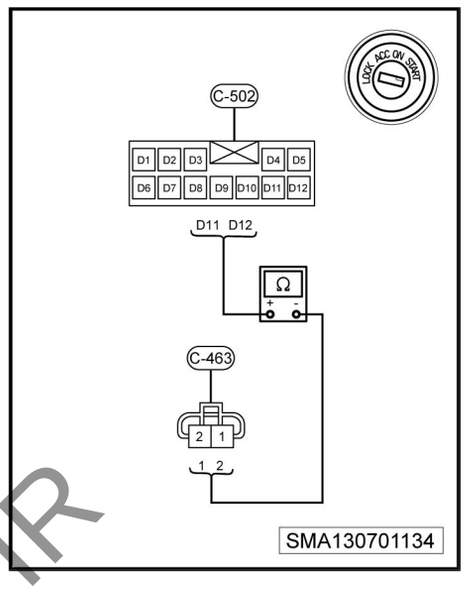
07

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the lines between the pins D11, D12 of the body control module connector C-502 and the pins 1, 2 of the rear right window lifter motor connector C-463 are normal.

- If yes, go to step 2.
- If not, go to step 3 and 4.

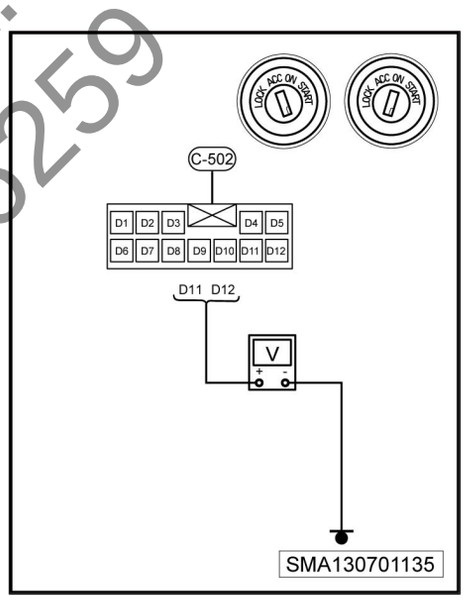


2. Measure the resistance value of the window lifter motor and carry out the power supply test (up and down operations have opposite electrodes) to check if the window lifter motor is normal.

- If yes, go to step 3.
- If not, replace the rear right window lifter motor. ■

3. Turn the rear right window lifter switch to the UP position and check if the voltage between the pin D12 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D12 of the body control module connector C-502 and the rear right window lifter motor connector C-463 has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 5.

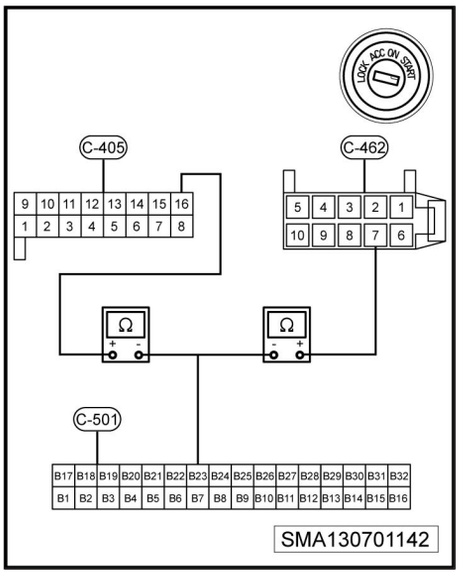


4. Turn the rear right window lifter switch to the DOWN position and check if the voltage between the pin D11 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D11 of the body control module connector C-502 and the rear right window lifter motor connector C-463 has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 6.

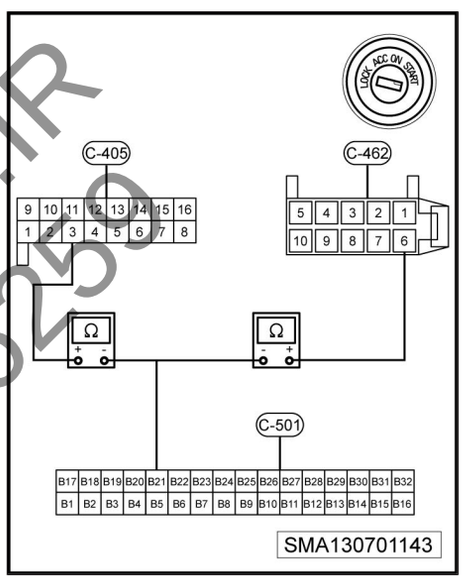
5. Check if the lines between the pin B23 of the body control module connector C-501 and the pin 16 of the front left window lifter switch assembly connector C-405 and the pin 7 of the rear right window lifter switch connector C-462 are normal.

- If yes, go to step 7.
- If not, repair the faulty line. ■



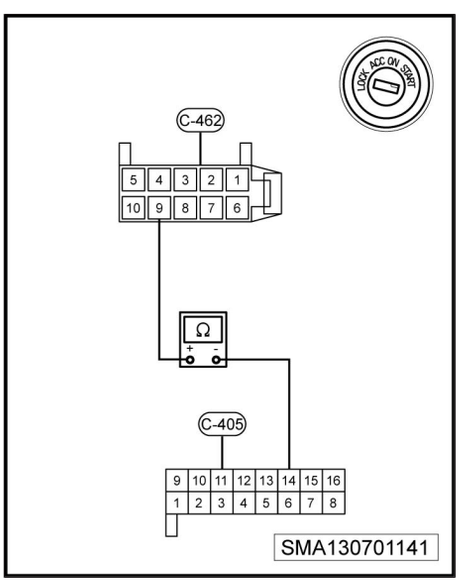
6. Check if the lines between the pin B21 of the body control module connector C-501 and the pin 3 of the front left window lifter switch assembly connector C-405 and the pin 6 of the rear right window lifter switch connector C-462 are normal.

- If yes, go to step 7.
- If not, repair the faulty line. ■



7. Check if the line between the pin 14 of the front left window lifter switch assembly connector C-405 and the pin 9 of the rear right window lifter switch assembly connector C-462 is normal.

- If yes, go to step 8.
- If not, repair the faulty line. ■



8. Check if the line between the pin 11 of the front left window lifter switch assembly connector C-405 and the ground is normal.

- If yes, go to step 9.
- If not, repair the faulty line. ■

9. Check if the front left window lifter switch assembly is normal.

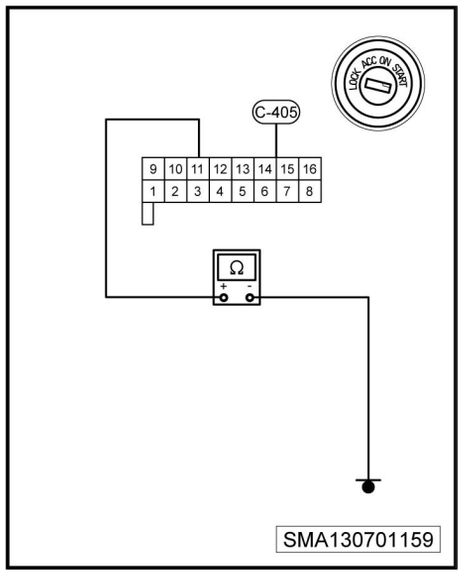
- If yes, repair or replace the front left window lifter switch assembly. ■
- If not, go to step 10.

10. Check if the power supply line and the ground line of BCM are normal.

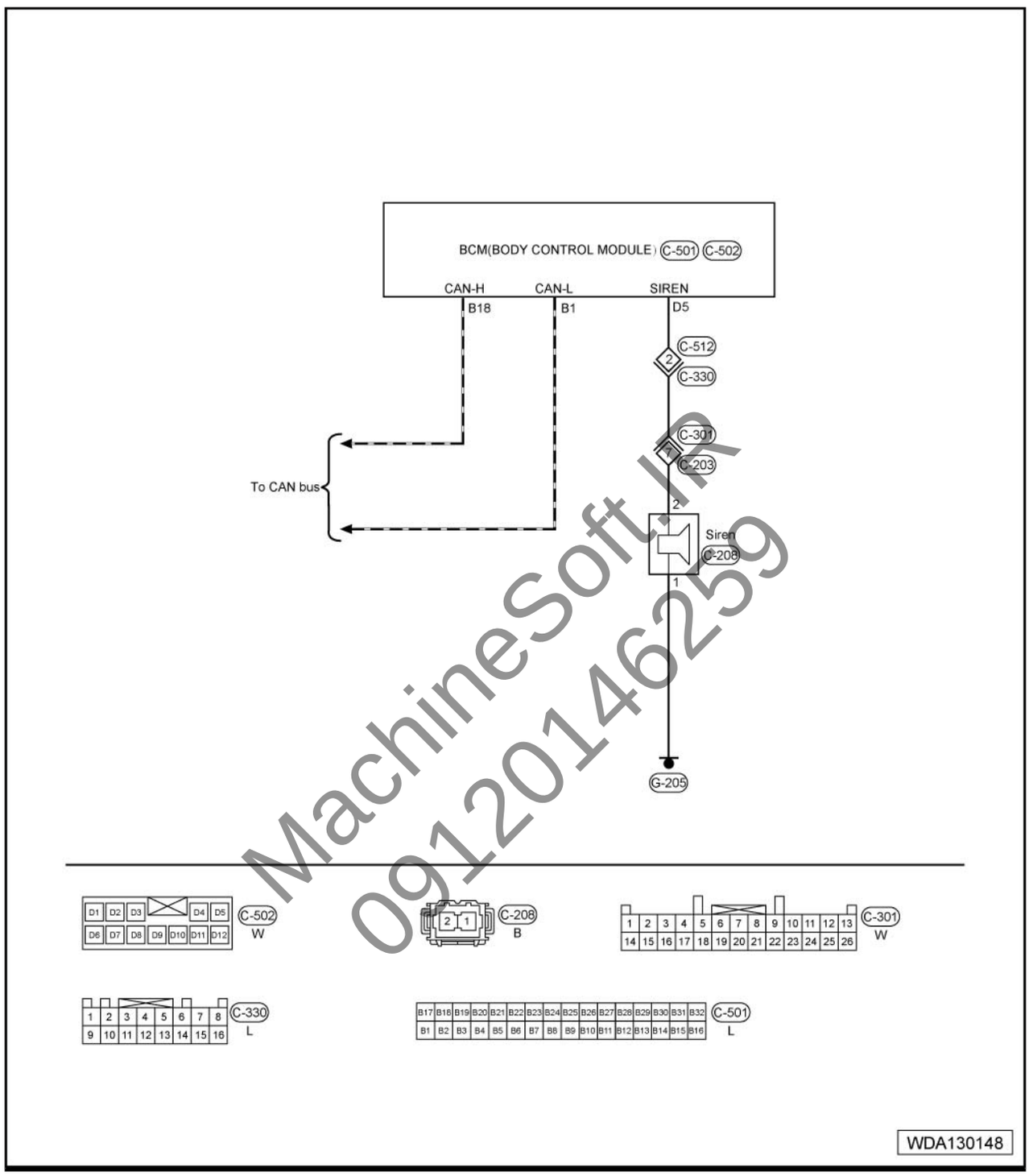
- If yes, go to step 11.
- If not, repair the faulty line. ■

11. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■



7.4.16 B1397 - Low voltage in the anti-theft horn output control circuit
B1398 - High voltage in the anti-theft horn output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
D5	Anti-theft horn output	The ignition switch in the ACC or ON position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1397	Low voltage in the anti-theft horn output control circuit	The ignition switch in the ACC or ON position	The anti-theft horn output control circuit short or open circuit detected by the body control module (BCM)	• Failure of the wiring harnesses or connector • Failure of BCM • Failure of the anti-theft horn
B1398	High voltage in the anti-theft horn output control circuit	The ignition switch in the ACC or ON position		

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch, turn it on again after 3 to 5 seconds, and carry out the corresponding function test.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the line between the pin D5 of the body control module connector C-502 and the pin 2 of the anti-theft horn connector C-208 is normal.

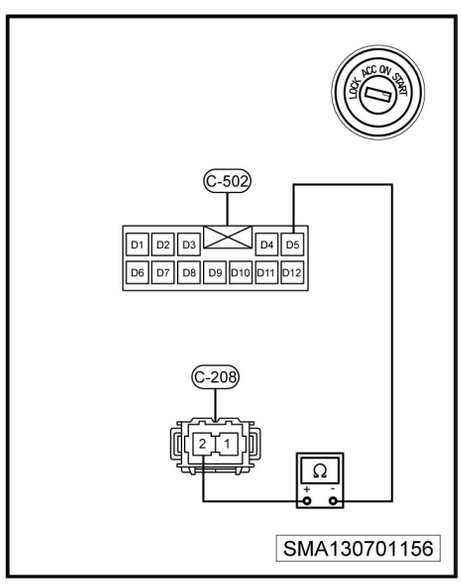
- If yes, go to step 2.
- If not, go to step 3.

2. Check if the line between the pin 1 of the anti-theft horn connector C-208 and the ground is normal.

- If yes, go to step 3.
- If not, repair the faulty line. ■

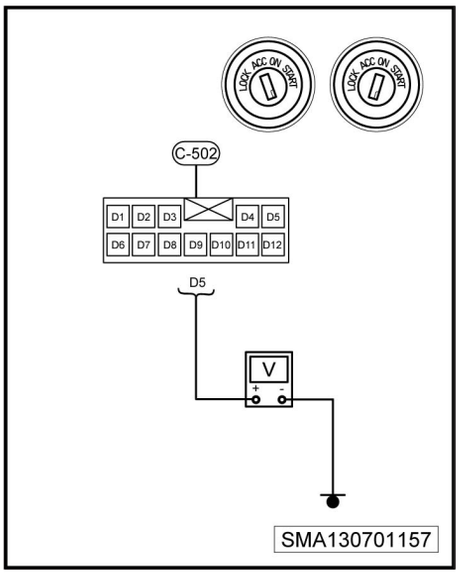
3. Measure the resistance value of the anti-theft horn and carry out the power supply test to check if the anti-theft horn is normal.

- If yes, go to step 4.
- If not, replace the anti-theft horn. ■



4. Check if the voltage between the pin D5 of body control module connector C-502 and the ground is the battery voltage.

- If yes, check if the line between the pin D5 of the body control module connector C-502 and the anti-theft horn has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 5.



5. Check if the power supply line and the ground line of BCM are normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

6. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

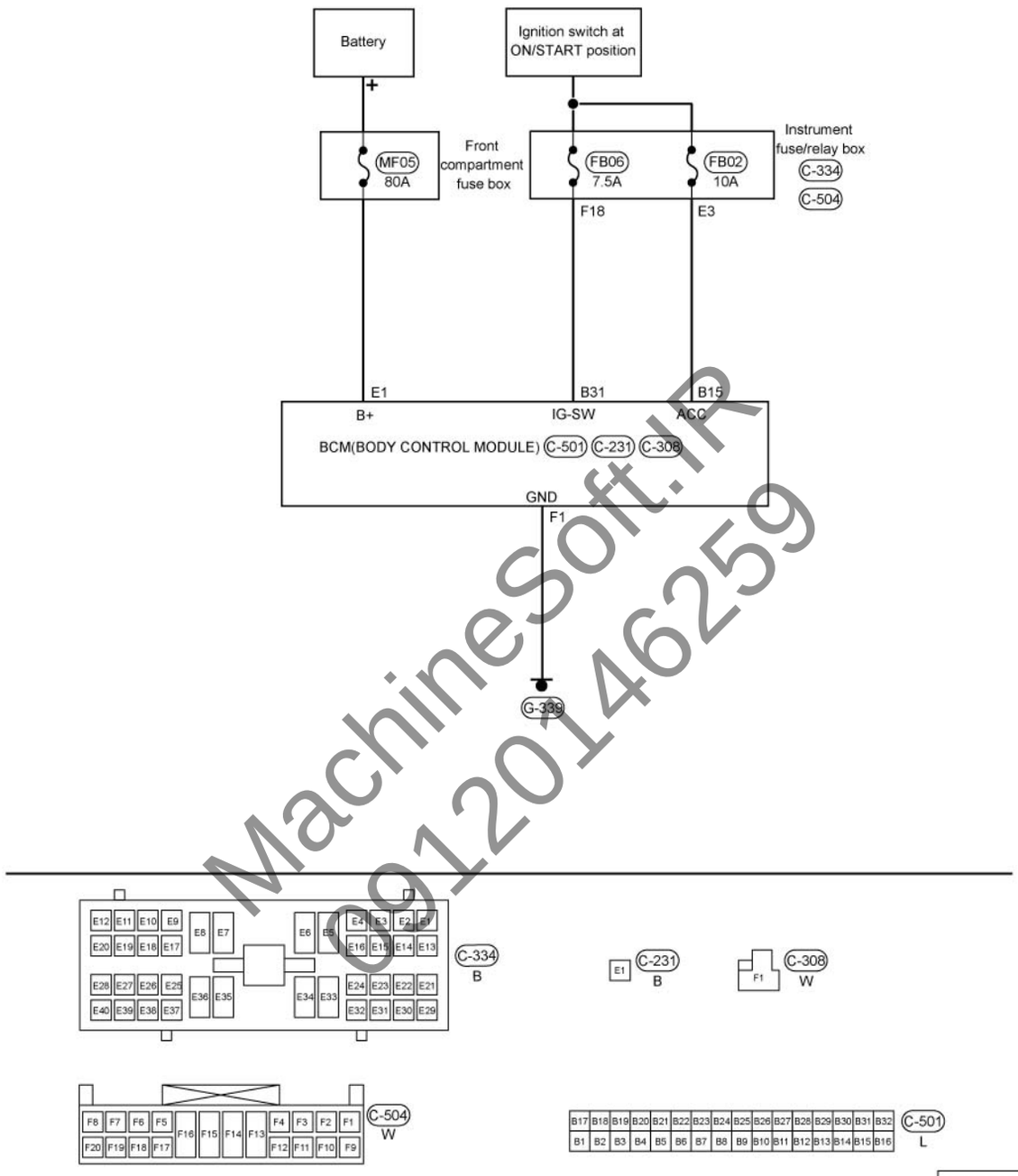
- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

7.4.17 B1400 Low battery voltage

B1401 High battery voltage

07

Circuit diagram



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1400	Low battery voltage	Power on	Low or high body control module (BCM) output voltage detected	• Failure of the wiring harnesses or connector • Failure of BCM
B1401	High battery voltage			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

Diagnosis procedures:

Note

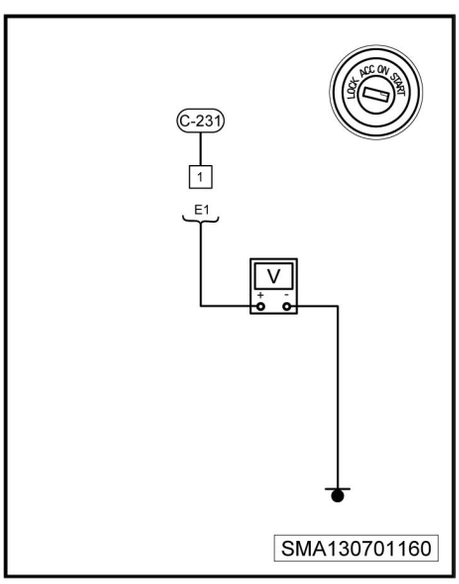
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. When the body control module has a fault, check if the battery voltage is excessive or not.

- If yes, check if the fault is caused by the battery or the charging system. ■
- If not, go to step 3.

2. Check if the voltage between the pin E1 of body control module connector C-231 and the ground is the battery voltage.

- If yes, go to step 3.
- If not, check if the line between the pin E1 of the body control module connector C-231 and the battery power supply has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■



3. Check if the ground line of BCM is normal.

- If yes, go to step 4.
- If not, repair the faulty line. ■

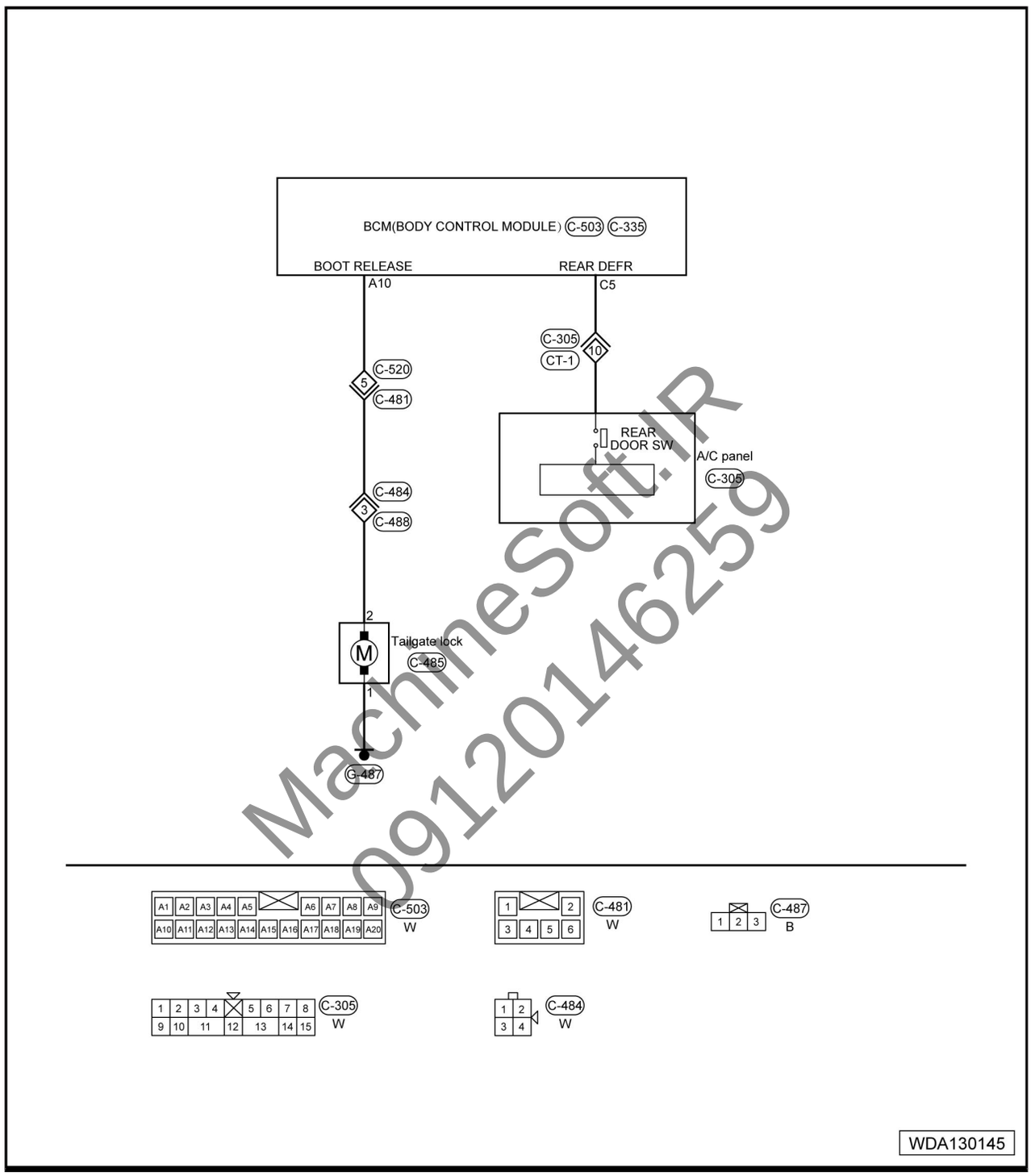
4. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

7.4.18 B2311 – Trunk releasing output control circuit open circuit

B2313 – Low voltage in the trunk releasing output control circuit

B2312 – High voltage in the trunk releasing output control circuit



Checking the voltage between the body control module (BCM) and the grounding

BCM pin	Function	Condition	Value (DC voltage range)
A10	Body control module energized	Power on	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B2311	Trunk releasing output control circuit open circuit	The ignition switch in the ACC or ON position Trunk lid lock switch in the ON position	The trunk releasing output control circuit short or open circuit detected by the body control module (BCM)	• Failure of the wiring harnesses or connector • Failure of BCM • Failure of the luggage compartment motor
B2312	High voltage in the trunk releasing output control circuit			
B2313	Low voltage in the trunk releasing output control circuit			

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

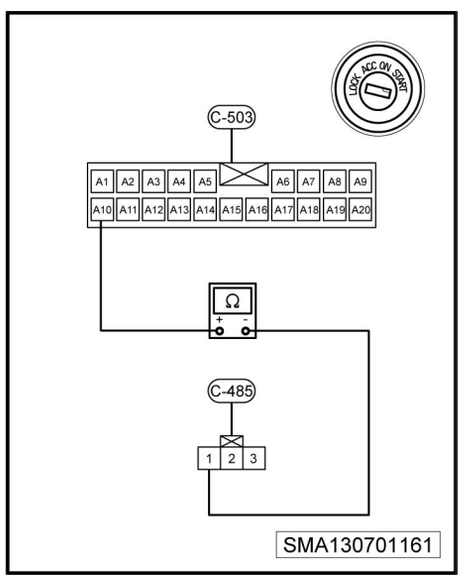
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the line between the pin A10 of the body control module connector C-503 and the pin 1 of the trunk lid lock motor connector C-485 is normal.

- If yes, go to step 2.
- If not, go to step 3.



2. Check if the line between the trunk lid lock motor connector C-485 and the ground is normal.

- If yes, go to step 3.

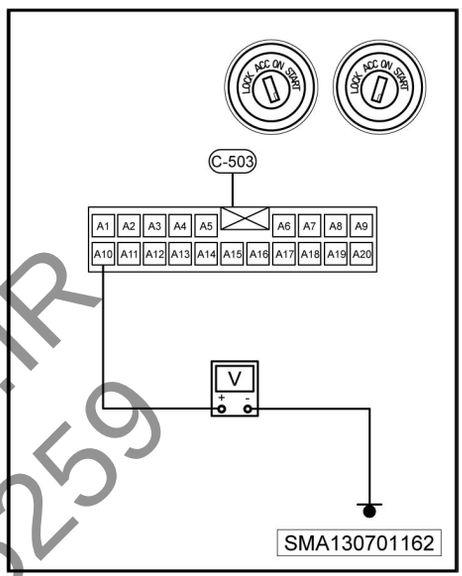
- If not, repair the faulty line. ■

3. Measure the resistance value of the trunk lid lock motor and carry out the power supply test to check if the trunk lid lock motor is normal.

- If yes, go to step 4.
- If not, replace the trunk lid lock motor. ■

4. Turn on the trunk lid lock switch and check if the voltage between the pin A10 of body control module connector C-503 and the ground is the battery voltage.

- If yes, check if the line between the pin A10 of the body control module connector C-503 and the trunk lid lock motor has the following faults such as grounding, short circuit, open circuit, excessive resistance and virtual connection. ■
- If not, go to step 5.



5. Check if the ground line of BCM is normal.

- If yes, go to step 6.
- If not, repair the faulty line. ■

6. Replace the body control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

8 Alarm System

8.1 General information

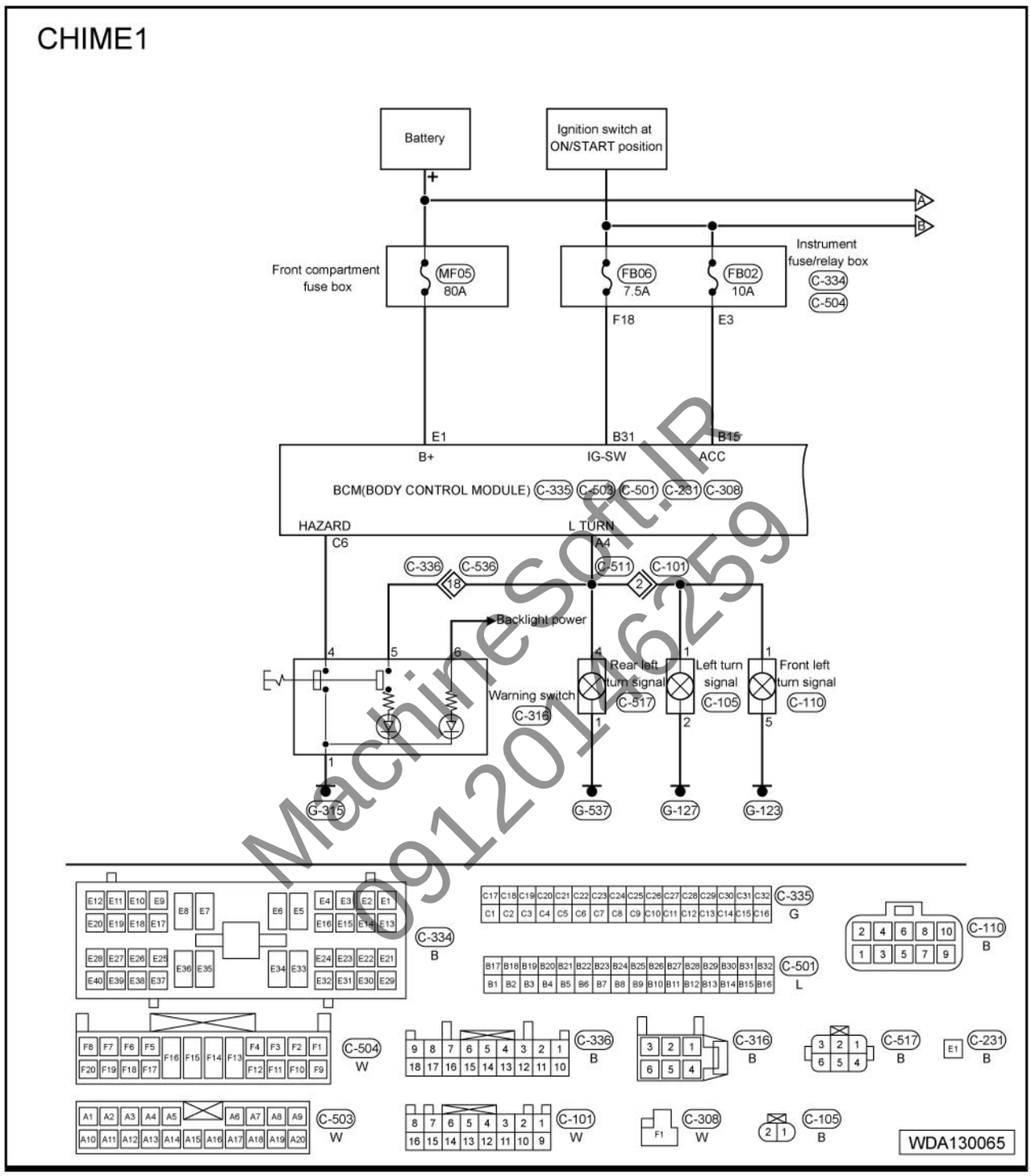
8.1.1 Description

The alarm system warns the driver with flashing lights and audible alarms in case of any malfunction or problem occurring to the vehicle. It checks the vehicle conditions through sensors and switches and activates the indicators on the instrument cluster to flash and the buzzer to produce warning tones. The buzzer is integrated into the instrument cluster. The system will give the corresponding warnings under the following conditions:

- The turn signal turned on
- The hazard warning lamp switch pressed
- Unfastened seat belt
- Low fuel level
- Low oil pressure
- Low brake fluid level
- Unlocked door
- Failure of the charging system
- Failure of the engine
- Failure of the airbag system
- Low coolant level
- Failure of the anti-theft control module
- Engine overheating

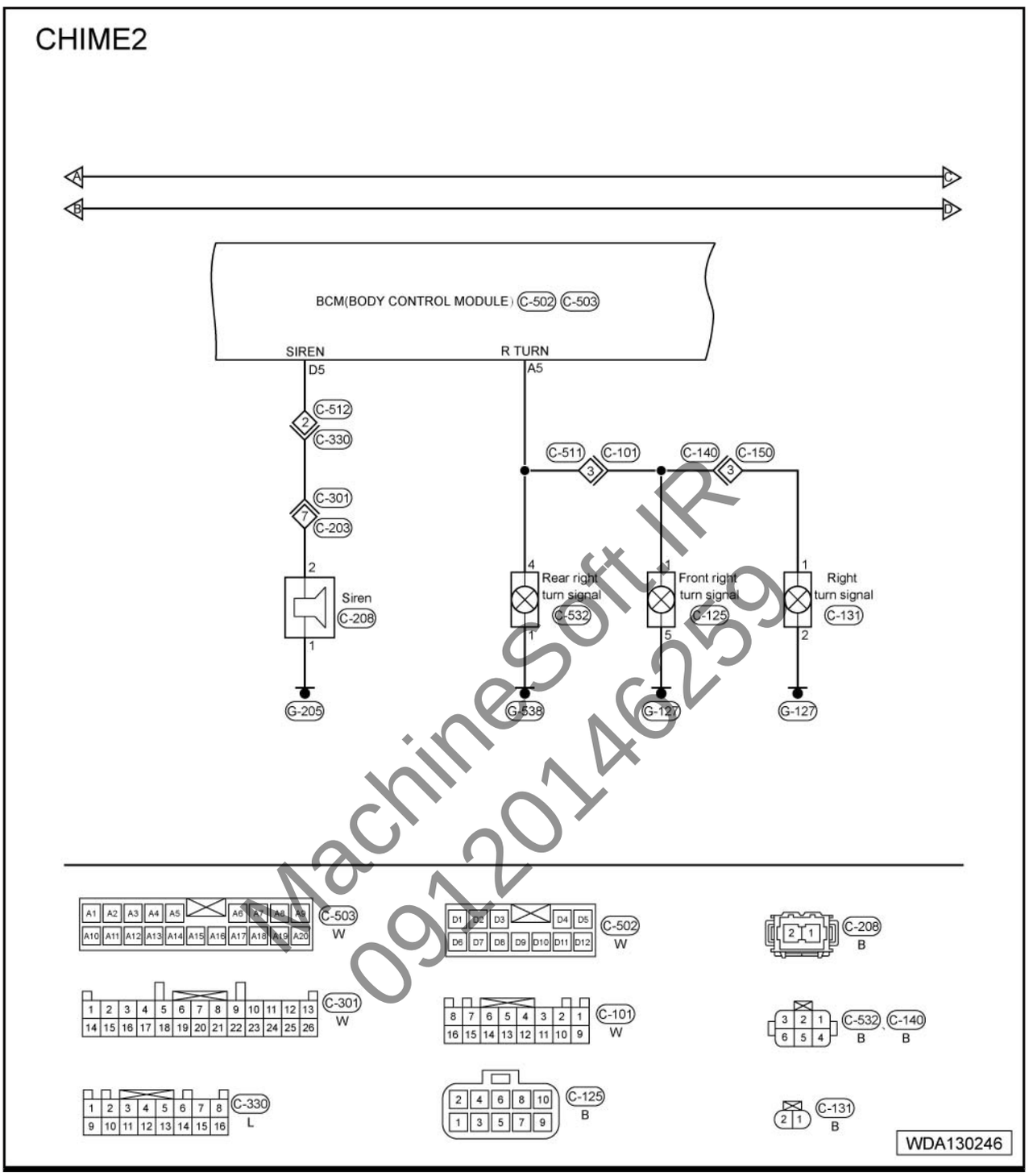
8.2 Circuit diagrams

Alarm system (page 1)

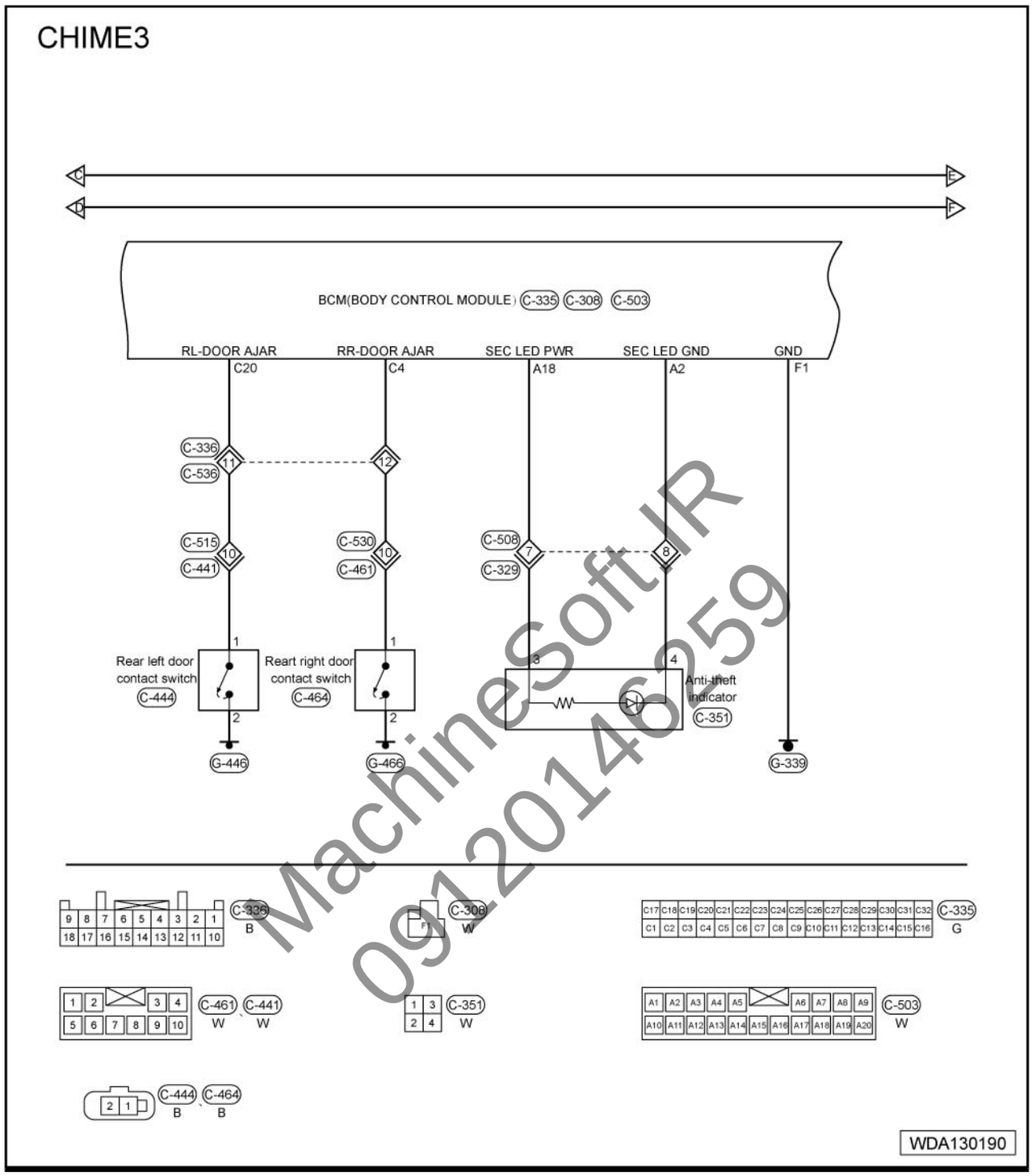


Alarm system (page 2)

07

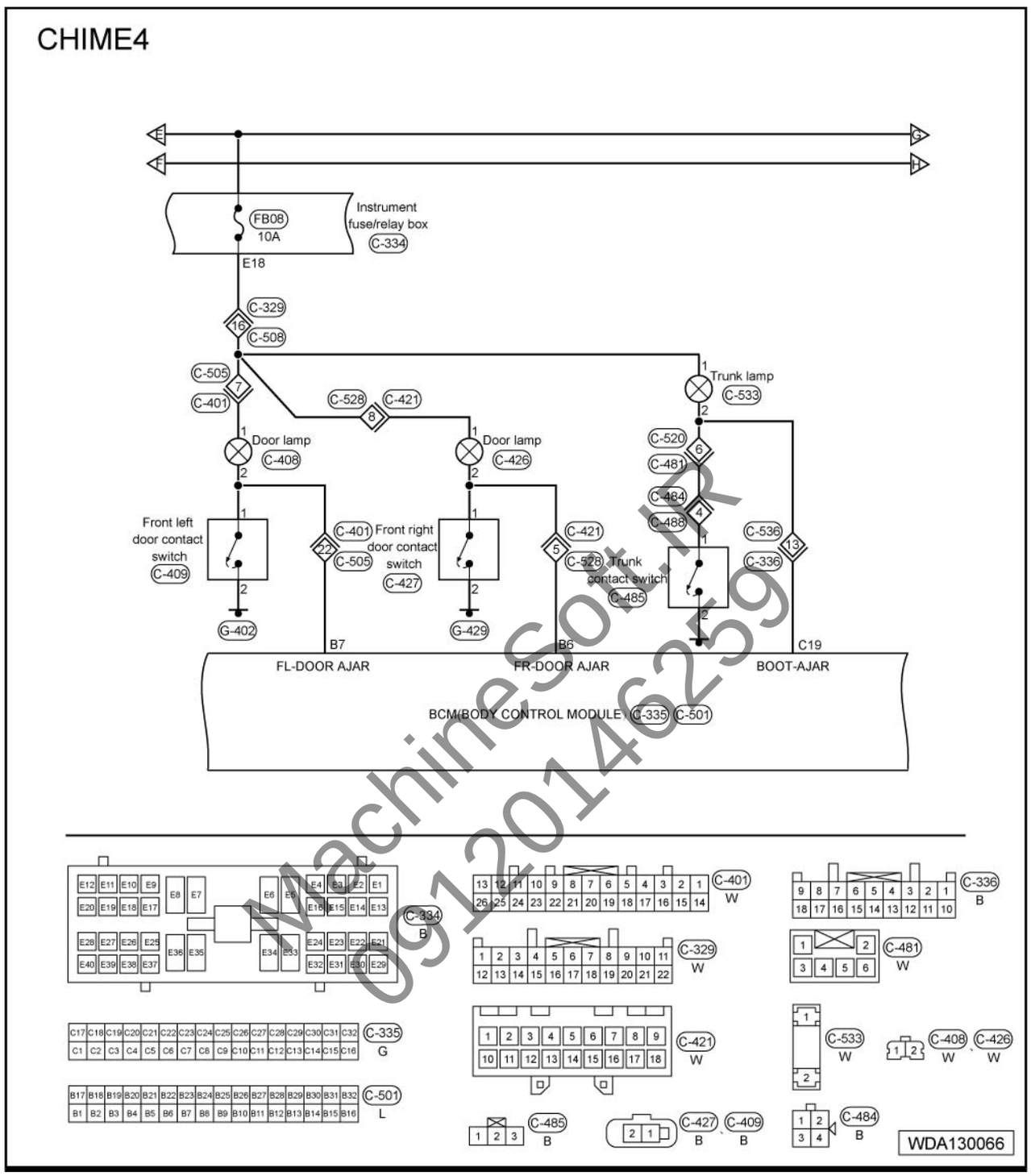


Alarm system (page 3)

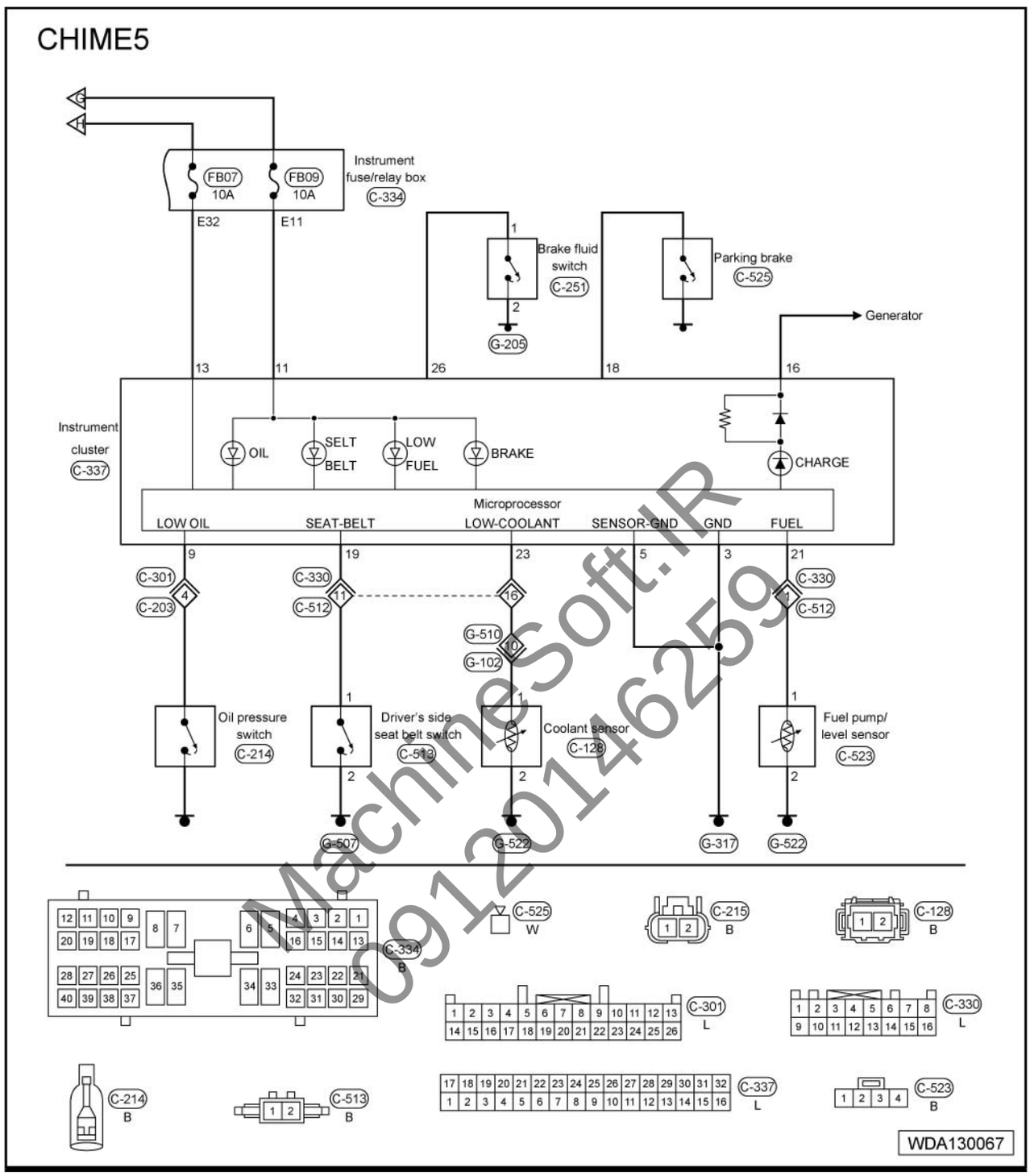


Alarm system (page 4)

07



Alarm system (page 5)



9 Interior Lights

9.1 General information

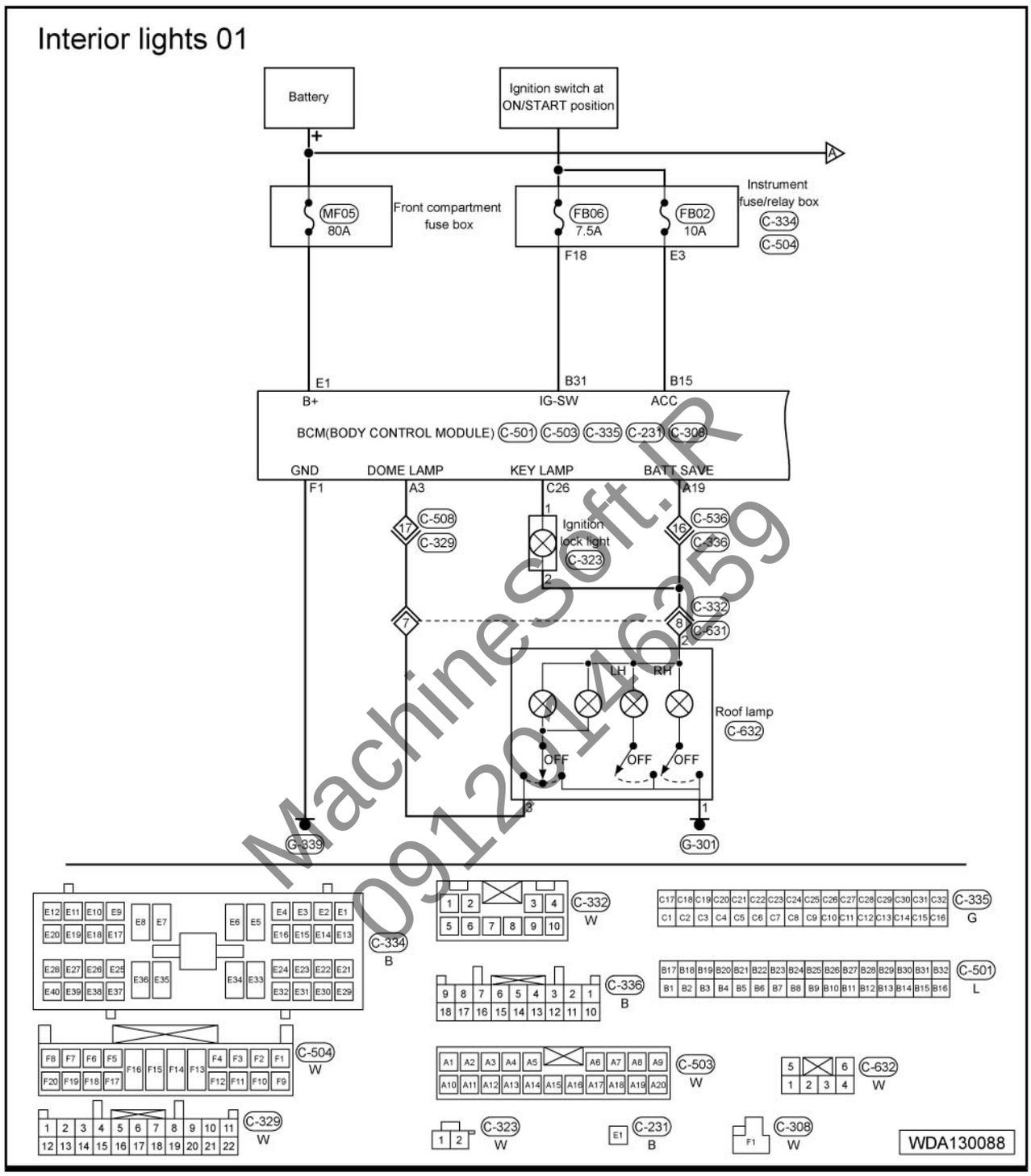
9.1.1 Description

Interior lights are controlled by the body control module (BCM) and consist of the following:

- Front roof lamp
- Backlight adjustment switch
- Instrument cluster
- Combination switch
- Hazard warning lamp switch lighting
- Cigarette lighter (lighting)
- Radio
- Door lock remote control switch lighting
- Power window main switch lighting
- Front power window switch lighting
- Rear power window switch lighting
- Trunk lamp

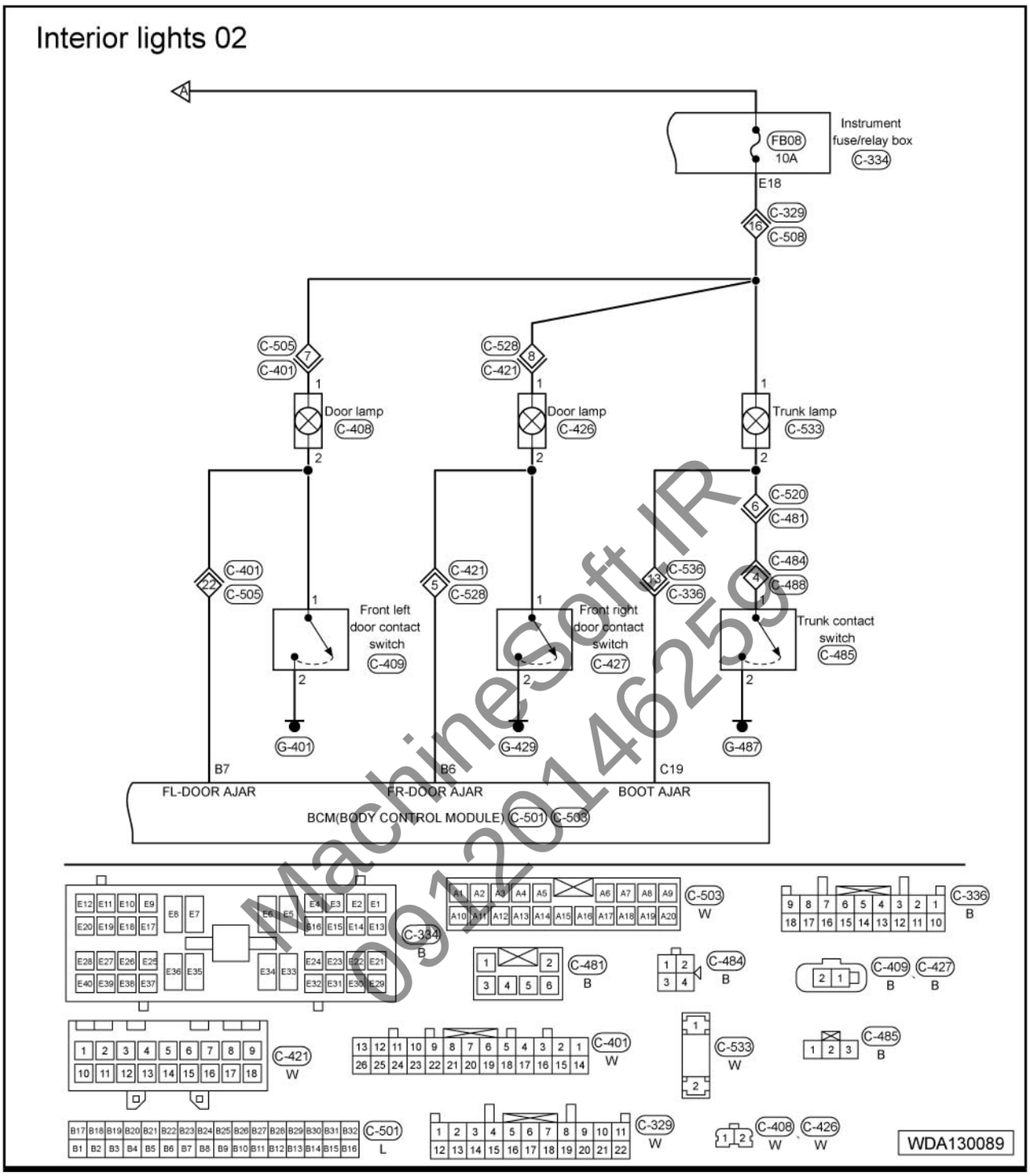
9.2 Circuit diagrams

Interior lights (page 1)



Interior lights (page 2)

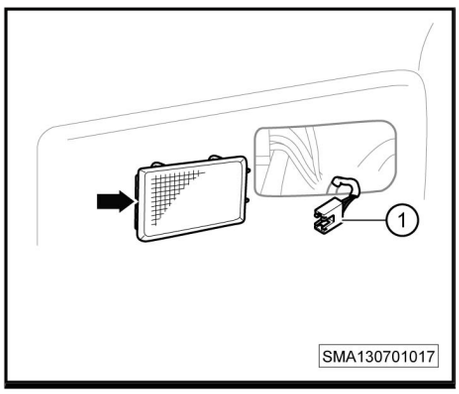
07



9.3 Removing and installing the trunk lamp

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Lever out the trunk lamp from the luggage compartment side trim (-arrow-) with the tools.
3. Disconnect the trunk lamp connector (-1-) and replace the trunk lamp.



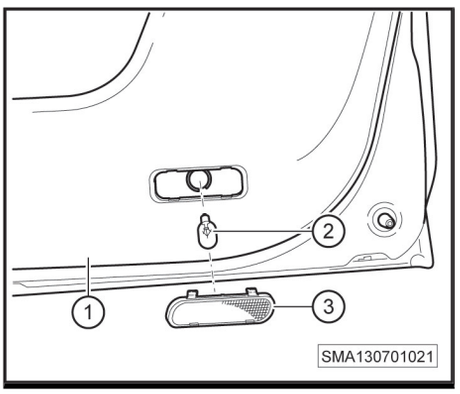
Installation

Installation shall follow the reverse sequence of the removal procedure.

9.4 Removing and installing the courtesy light bulbs

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Lever out the courtesy light cover (-3-) from the door trim (-1-).
3. Pull out the courtesy light bulbs (-2-) from the light holder and replace them.



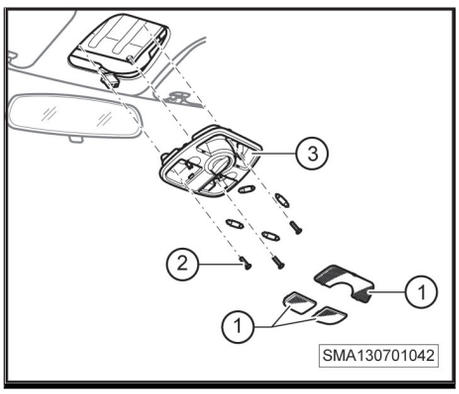
Installation

Installation shall follow the reverse sequence of the removal procedure.

9.5 Removing and installing the front roof lamp

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Lever out the front roof lamp cover (-1-) carefully and remove the 4 bulbs.
3. Unscrew the 3 fixing screws (-2-) inside the front roof lamp, lever out the front roof lamp assembly (-3-) from the roof, and disconnect the front roof lamp connector.



Installation

Installation shall follow the reverse sequence of the removal procedure.

10 Exterior Lights

10.1 General information

10.1.1 Description

Exterior lights consist of the following:

- Headlamp
- Turn signal
- Fog lamp
- Brake lamp
- Reversing light
- Number plate lamp

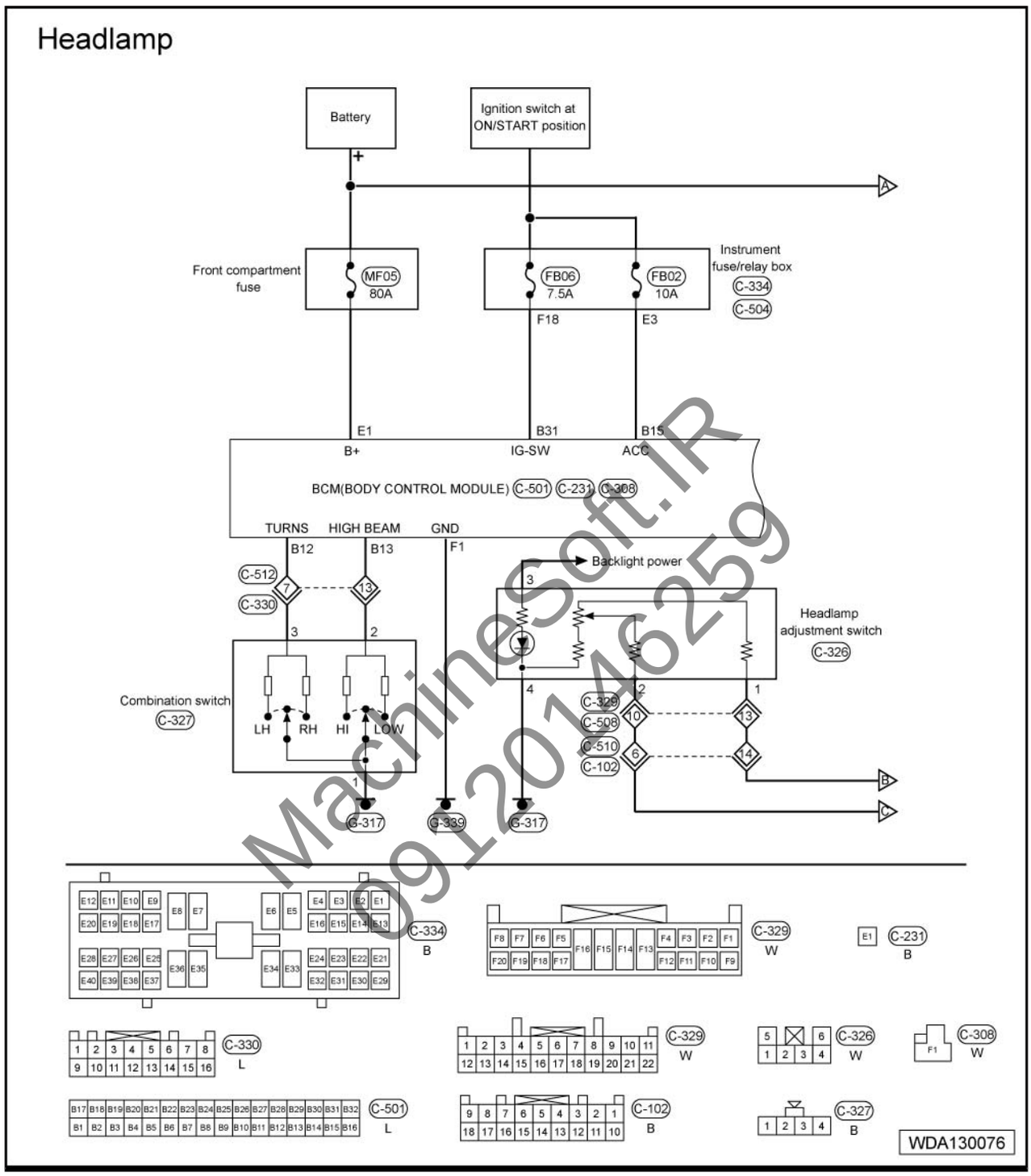
The power is supplied as follows:

- Headlamp: When the headlamp switch is turned on and the high beam or low beam relay works, the power supply is supplied to the fuse beneath the dashboard via the relay before supplying the headlamp through the fuse.
- Turn signal switch: When the ignition switch is in the ON position and the turn signal switch is pulled up or down, the power supply transmits power to the left or right turn signal.
- Hazard warning lamp switch: When the switch is in the ON position, the power supply transmits power to all turn signals.
- Fog lamp: When the front/rear fog lamp switch is in the ON position, the power supply transmits power to the fog lamps.
- Brake lamp: When the brake pedal is depressed, the power supply transmits power to the brake lamp through the brake switch.
- Reversing light: When the shift lever is in the R position and the reversing switch is turned on, the power supply transmits power to the reversing light.

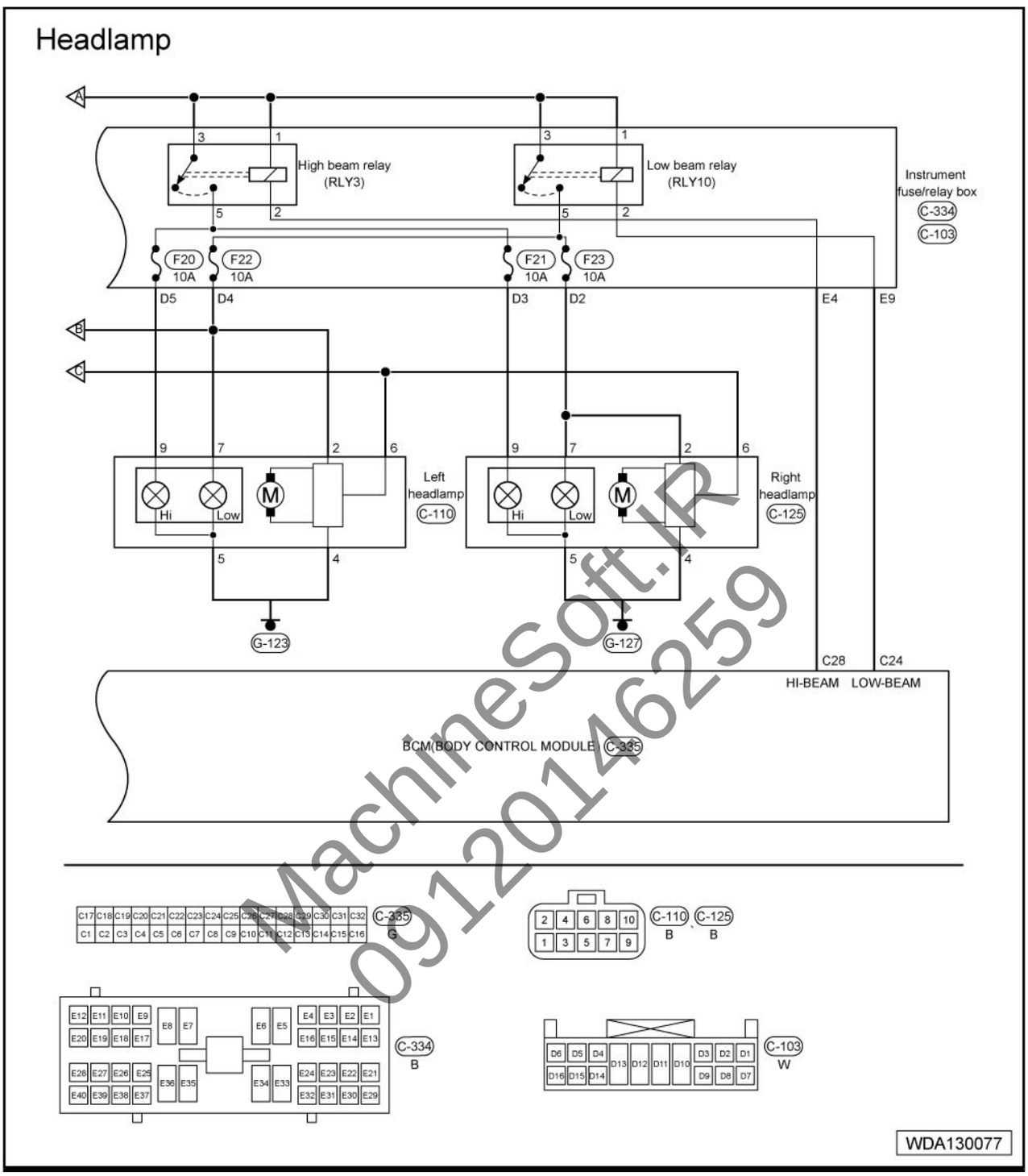
10.2 Circuit diagrams

Headlamp (page 1)

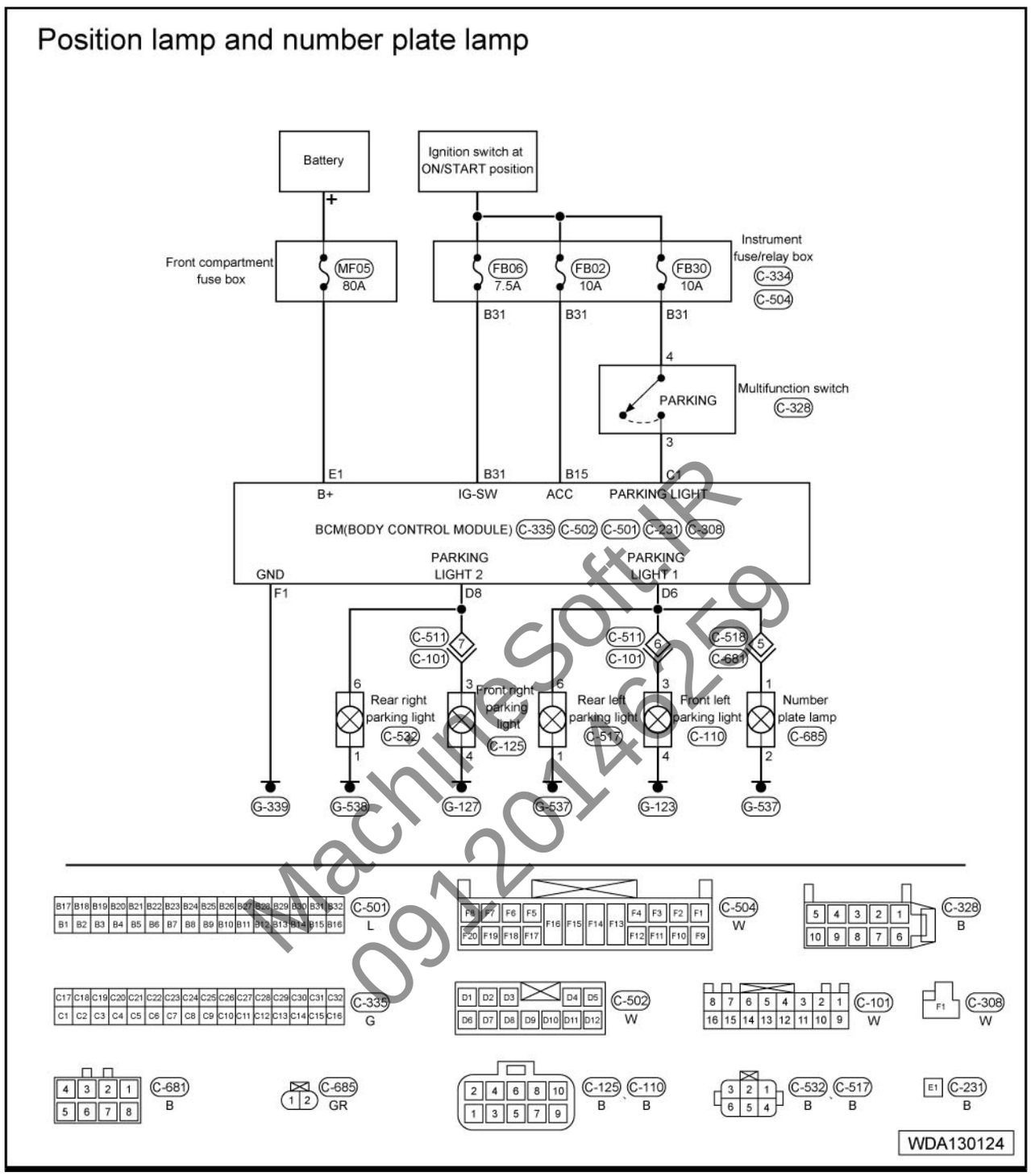
07



Headlamp (page 2)

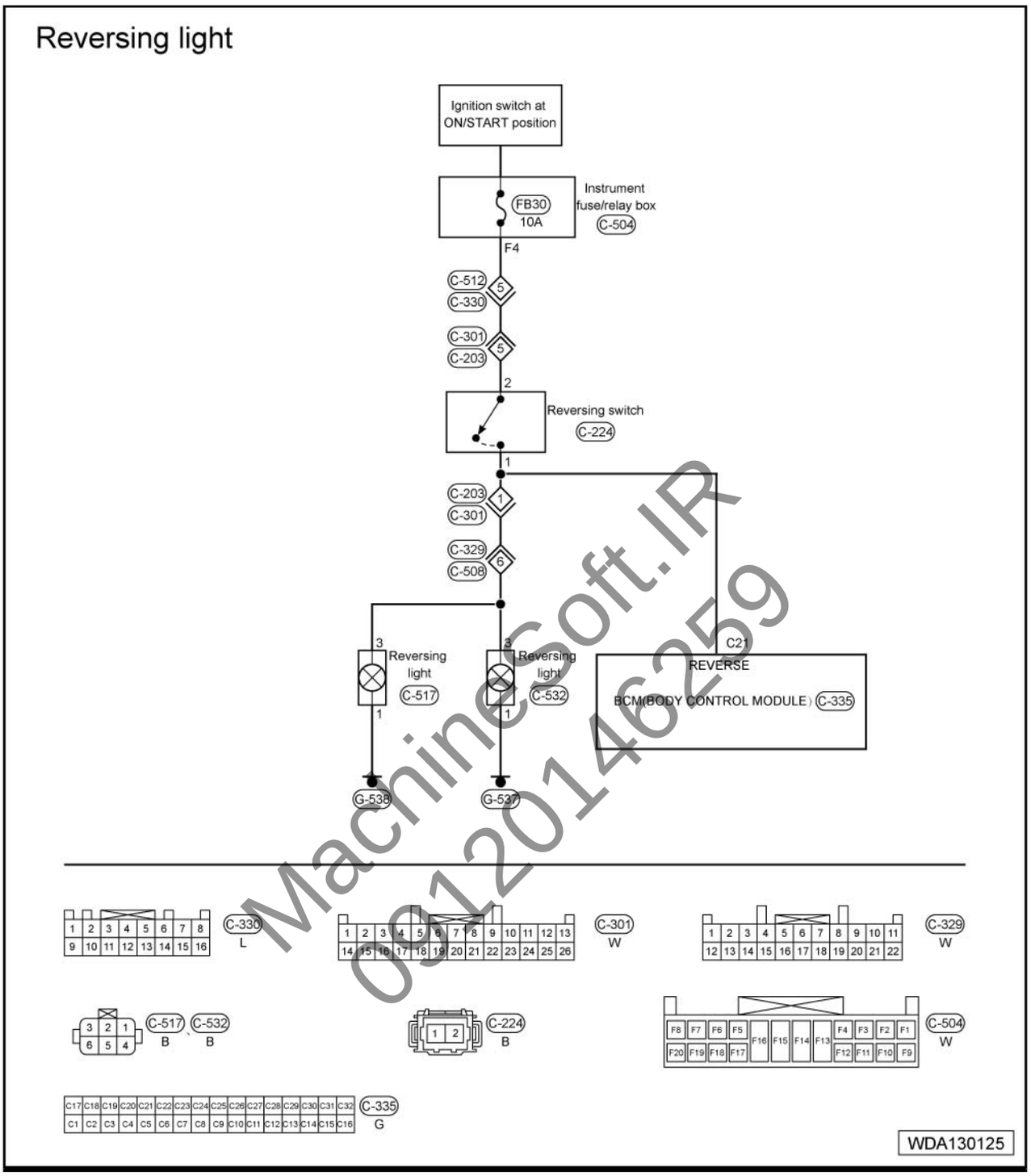


Position lamp and number plate lamp (page 1)

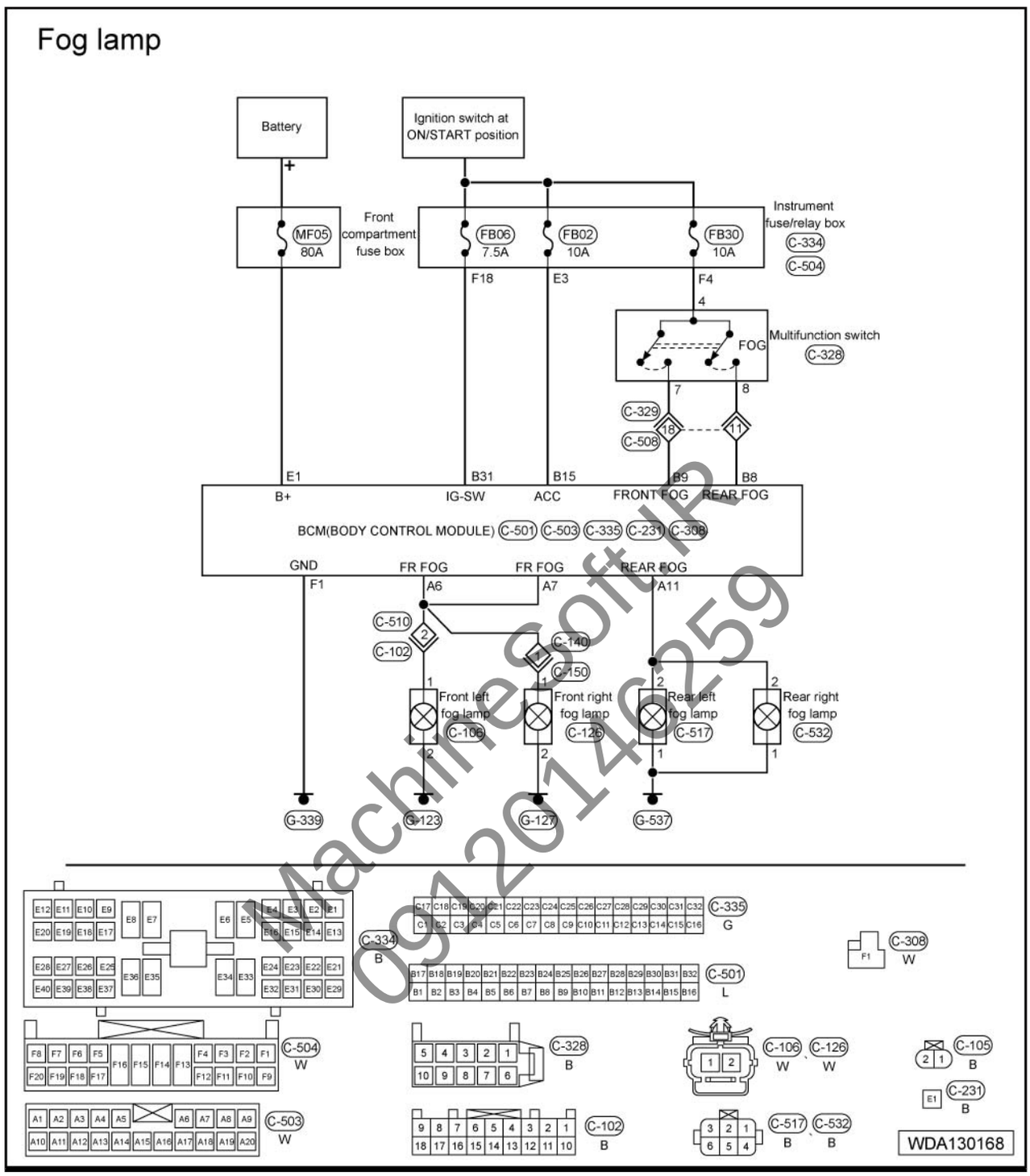


Reversing light (page 1)

07

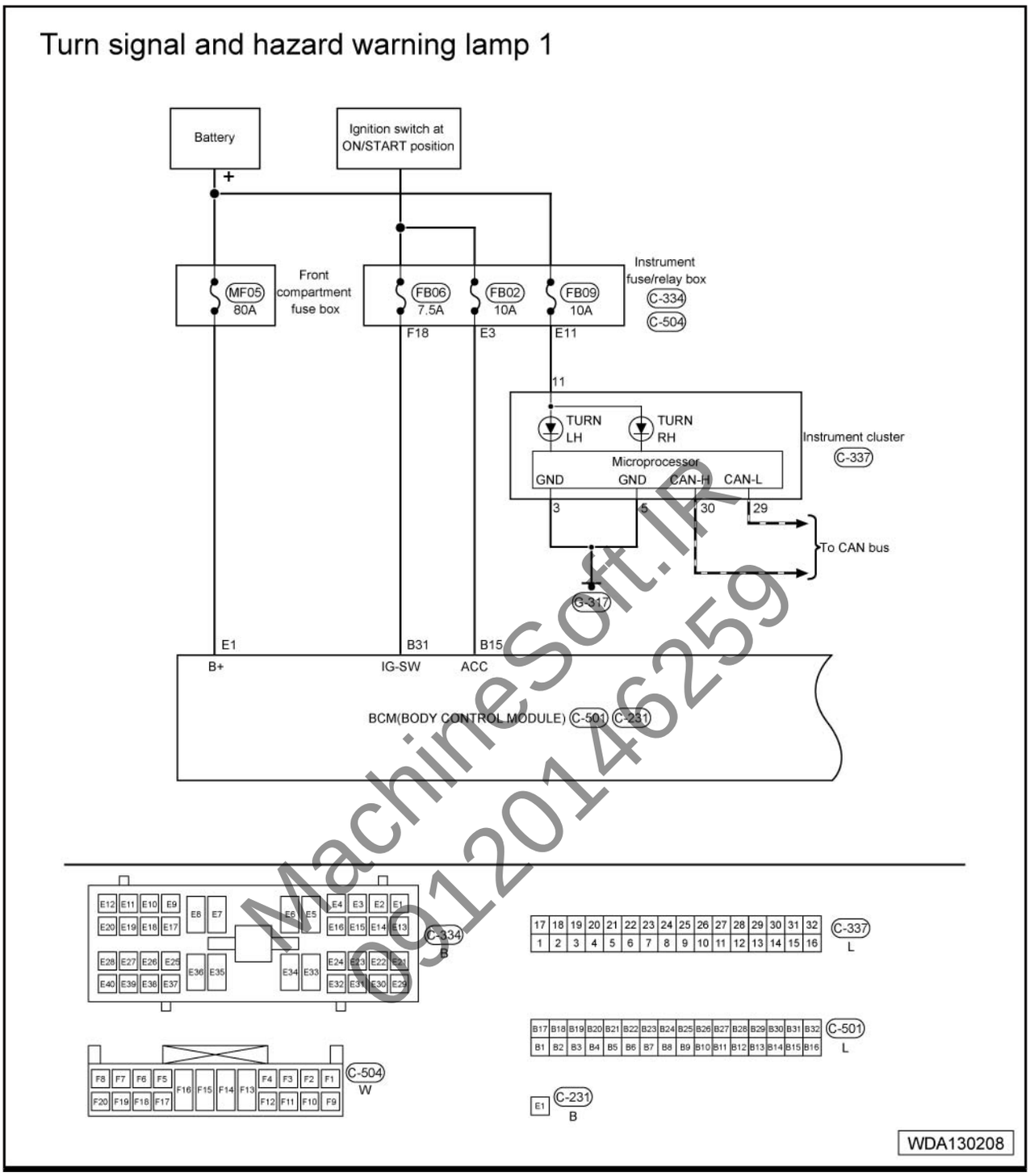


Fog lamp (page 1)

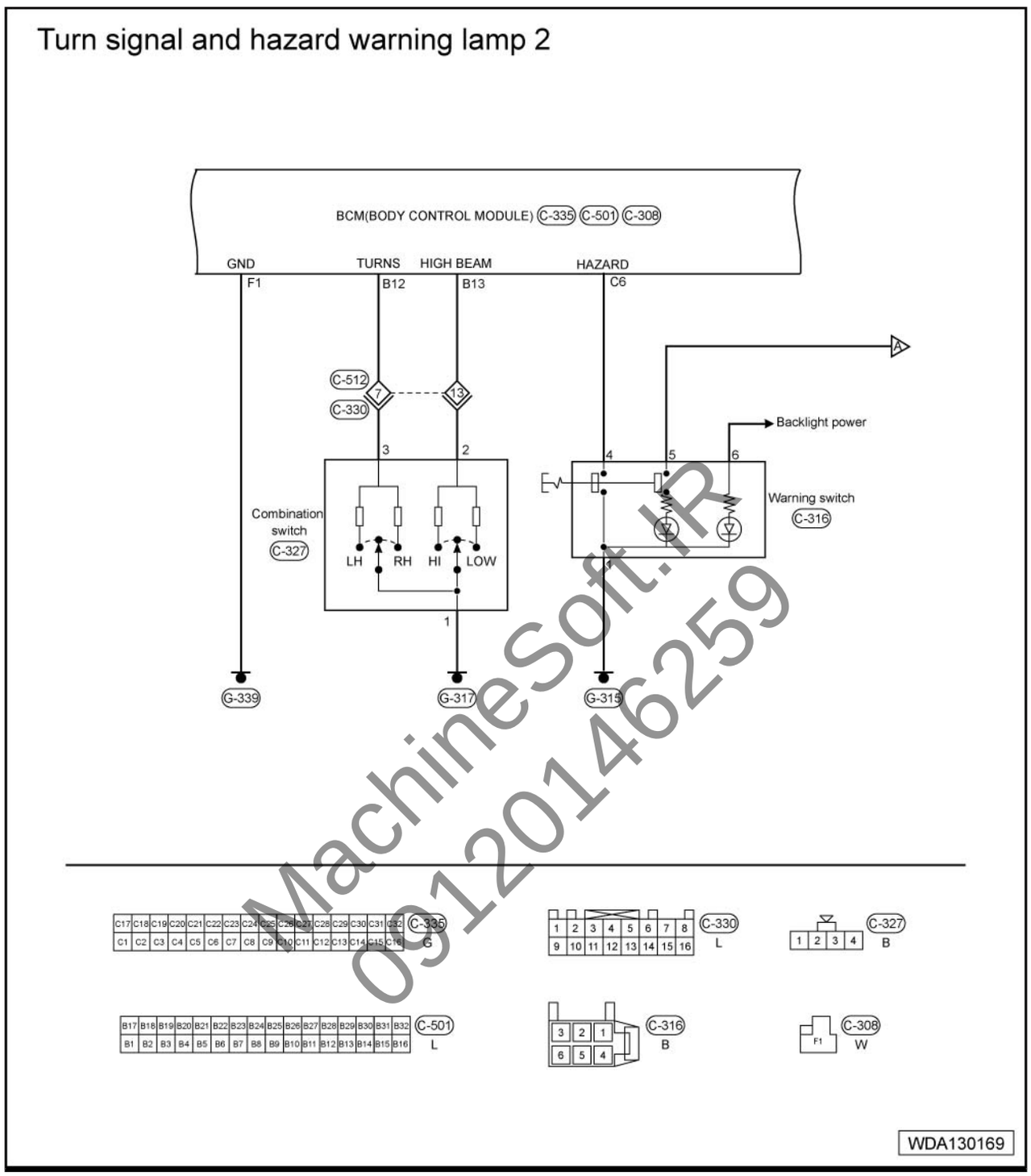


Turn signal and hazard warning lamp (page 1)

07

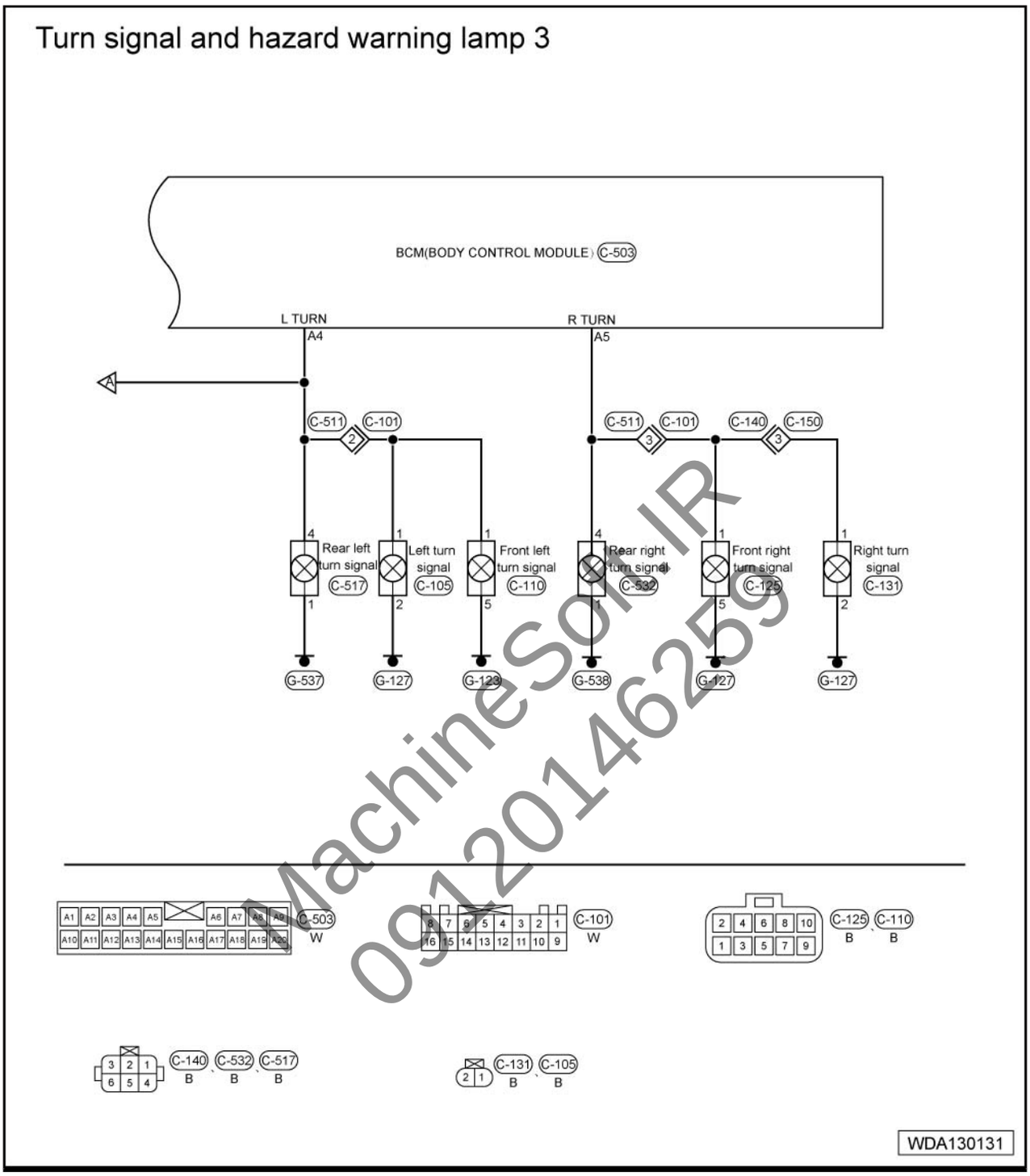


Turn signal and hazard warning lamp (page 2)



Turn signal and hazard warning lamp (page 3)

07

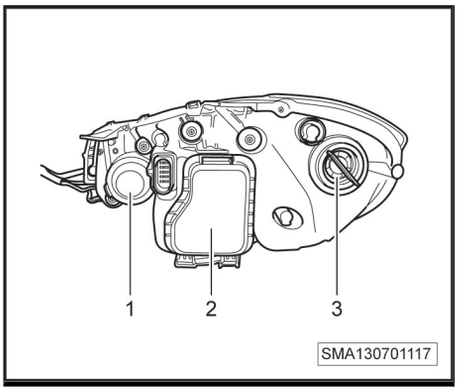


10.3 Headlamp

10.3.1 Removing and installing the headlamp

The right figure shows the lamps at the rear of the headlamp:

1. High beam headlamp/parking light/position lamp
2. Low beam headlamp
3. Turn signal



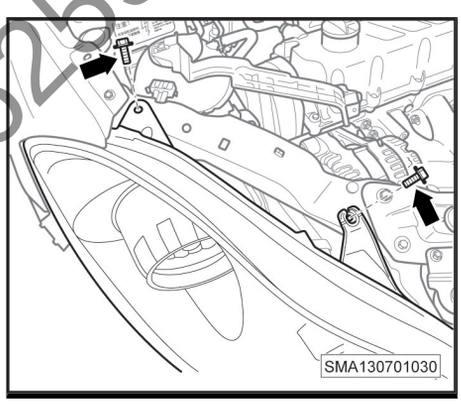
Note

- The removal and installation procedures of the left headlamp are the same as that of the right one. The method of removing and installing the right headlamp is taken as an example here.

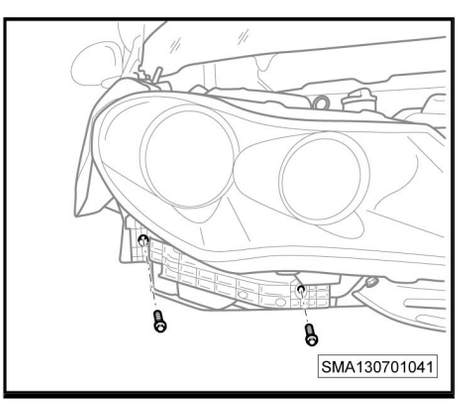
Two-box model

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Remove the front bumper .=> refer to page 838
3. Unscrew the headlamp assembly fixing bolt (-arrow-).



4. Unscrew the headlamp lower fixing bolts.
5. Remove the headlamp assembly and disconnect the headlamp connector.



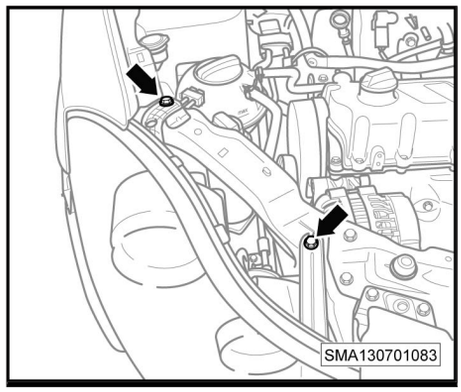
Installation

Installation shall follow the reverse sequence of the removal procedure.

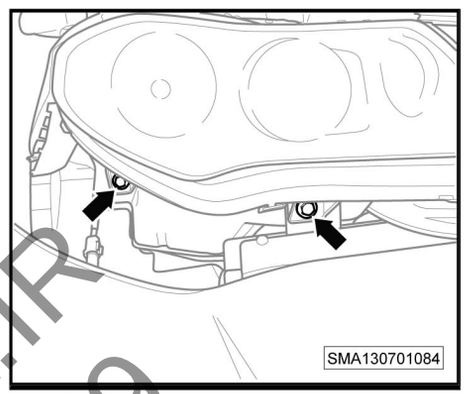
Three-box model

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Remove the front bumper .=> refer to page 838
3. Unscrew the headlamp fixing bolts (-arrow-).



4. Unscrew the headlamp lower fixing bolts (-arrow-).
5. Remove the headlamp assembly and disconnect the headlamp connector.



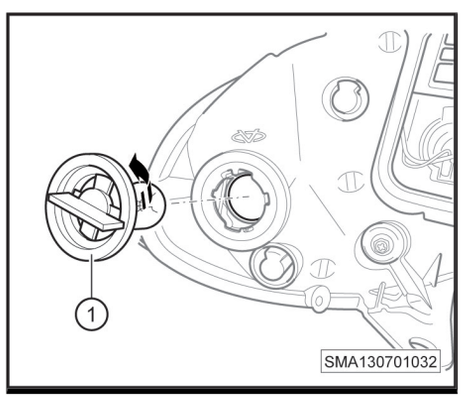
Installation

Installation shall follow the reverse sequence of the removal procedure.

10.3.2 Removing and installing the turn signal bulbs

Removal

1. Remove the headlamp .
2. Unscrew the holder of turn signal (- 1 -) in the (-arrow-) direction.
3. Unscrew the bulb anticlockwise and replace it.



Installation

Installation shall follow the reverse sequence of the removal procedure.

Turn signal bulb specification: 21 W

10.3.3 Removing and installing the low beam bulbs

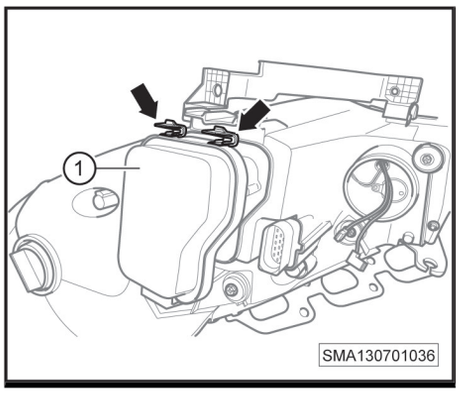
Note

- The removal and installation procedures of the low beam bulbs are the same as that of the high beam ones. The method of removing the low beam bulbs is taken as an example here.

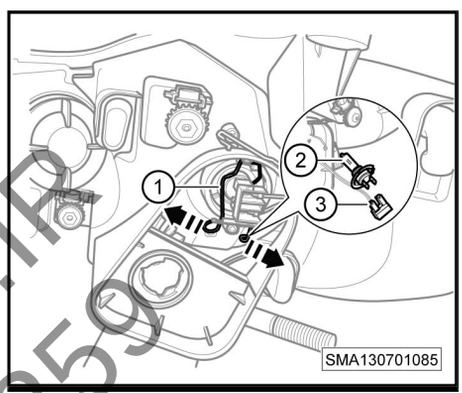
Two-box model

Removal

1. Press the fixing clip of the low beam waterproof cover (-arrow-) at the rear of the headlamp and remove the waterproof cover (-1-).



2. Loosen the fixing clamp spring (-1-) at the rear of the headlamp in the (-arrow-) direction and remove the lamp holder.
3. Disconnect the bulb connector (-3-) and replace the low beam bulb (-2-).



Installation

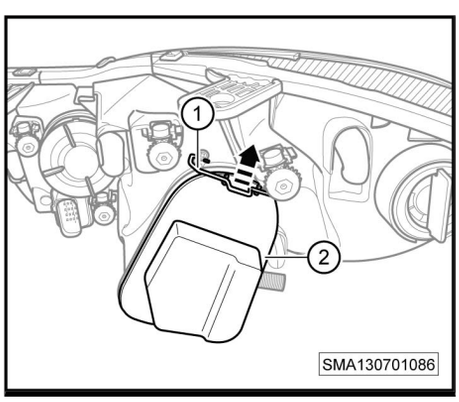
Installation shall follow the reverse sequence of the removal procedure.

High beam/low beam bulb specification: 55 W

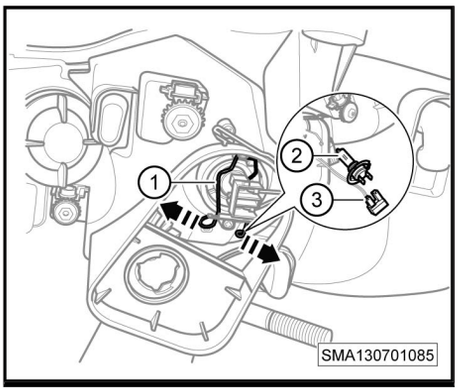
Three-box model

Removal

1. Loosen the fixing clamp spring (-1-) of the low beam waterproof cover at the rear of the headlamp in the (-arrow-) direction and remove the waterproof cover (-2-).



2. Loosen the fixing clamp spring (-1-) in the (-arrow-) direction and remove the lamp holder.
3. Disconnect the bulb connector (-3-) and replace the bulb (-2-).



Installation

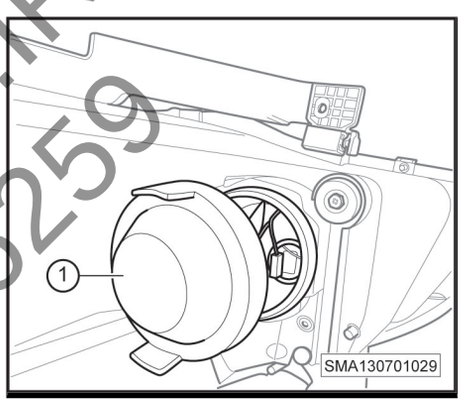
Installation shall follow the reverse sequence of the removal procedure.

High beam/low beam bulb specification: 55 W

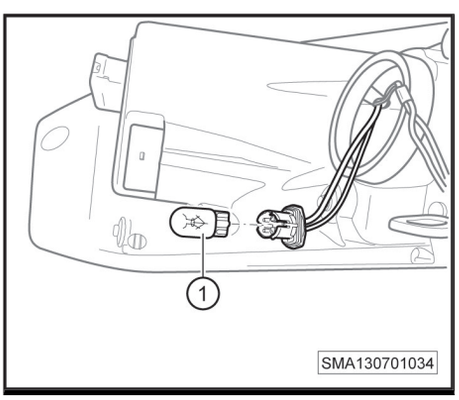
10.3.4 Removing and installing the parking light/position lamp bulbs

Removal

1. Remove the high beam waterproof cover (-1-) at the rear of the headlamp.



2. Unscrew the parking light/position lamp holder from the headlamp anticlockwise and take it out.
3. Pull out the bulb (-1-) from the lamp holder and replace it.



Installation

Installation shall follow the reverse sequence of the removal procedure.

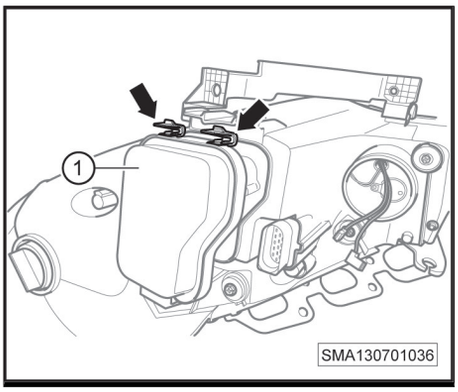
Parking light/position lamp bulb specification: 5 W

10.3.5 Removing and installing the low beam electric adjustment motor

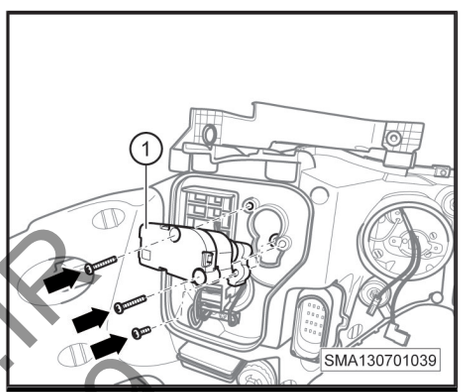
Two-box model

Removal

1. Remove the headlamp assembly .=> refer to page 1135
2. Loosen the fixing clip of the low beam waterproof cover (-arrow-) and remove the waterproof cover (-1-).



3. Unscrew the fixing screws of the low beam electric adjustment motor (-arrow-) and remove the adjustment motor (-1-).
4. Disconnect the adjustment motor connector.



Installation

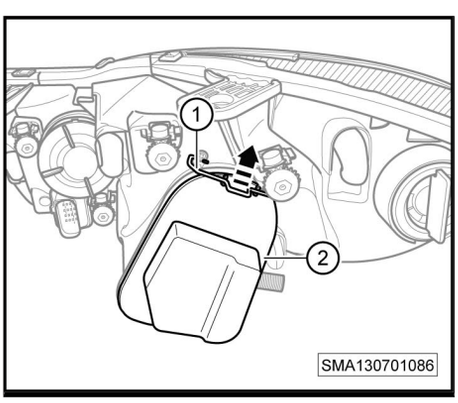
Installation shall follow the reverse sequence of the removal procedure.

Low beam electric adjustment motor specification: 5 W

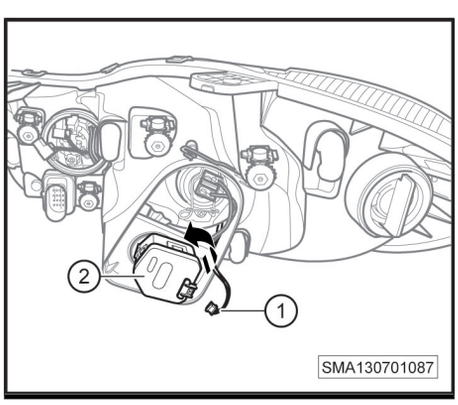
Three-box model

Removal

1. Remove the headlamp assembly.=> refer to page 1135
2. Loosen the fixing clamp spring of the low beam waterproof cover (-1-) in the (-arrow-) direction and remove the waterproof cover (-2-).



3. Disconnect the wiring harness connector of the low beam electric adjustment motor (-1-).
4. Unscrew and pull out the adjustment motor (-2-) in the (-arrow-) direction.



Installation

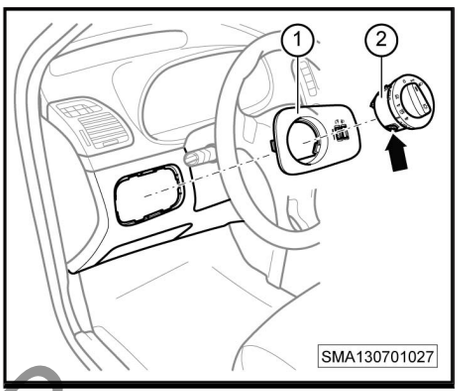
Installation shall follow the reverse sequence of the removal procedure.

Low beam electric adjustment motor specification: 5 W

10.3.6 Removing and installing the combination switch

Removal

1. Lever out the combination switch base (-1-) from the dashboard carefully with the tools and disconnect the switch wiring harness connector.
2. Press the fixing clip of the combination switch and push out the combination switch (-2-).



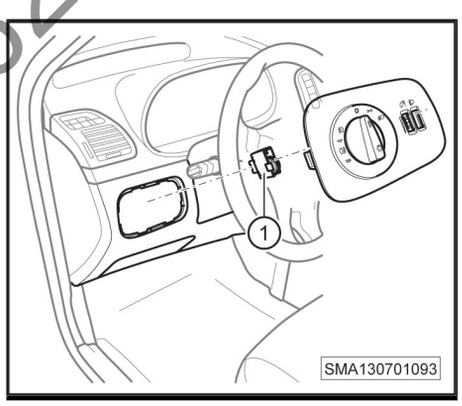
Installation

Installation shall follow the reverse sequence of the removal procedure.

10.3.7 Removing and installing the low beam height adjustment switch

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Lever out the combination switch panel assembly from the dashboard with tools.
3. Disconnect the low beam height adjustment switch connector.
4. Remove the adjustment switch (-1-) from the combination switch panel assembly.



Installation

Installation shall follow the reverse sequence of the removal procedure.

10.4 Tail lights

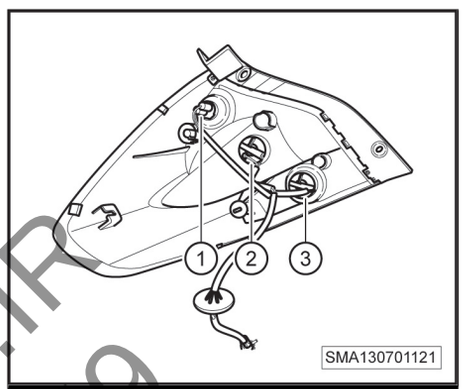
10.4.1 Removing and installing the tail lights

Note

- The lamps of the left tail light are in the same position as that of the right one. The left tail light is taken as an example here.

Two-box model

The right figure shows the lamps at the rear of the tail light:



1. Position lamp

- Bulb specification: 5 W

2. Turn signal

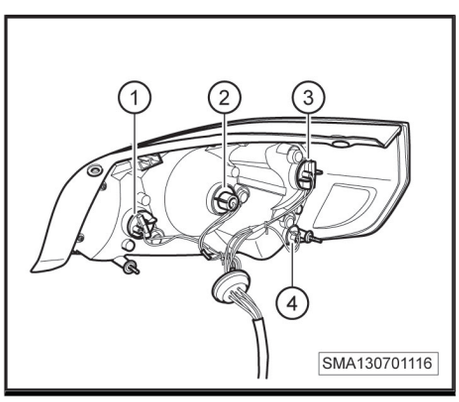
- Bulb specification: 21 W

3. Brake lamp

- Bulb specification: 21 W

Three-box model

The right figure shows the lamps at the rear of the tail light:



1. Rear fog lamp

- Bulb specification: 21 W

2. Turn signal

- Bulb specification: 21 W

3. Brake/position lamp

- Bulb specification: 5 W

4. Reversing light

- Bulb specification: 21 W

Note

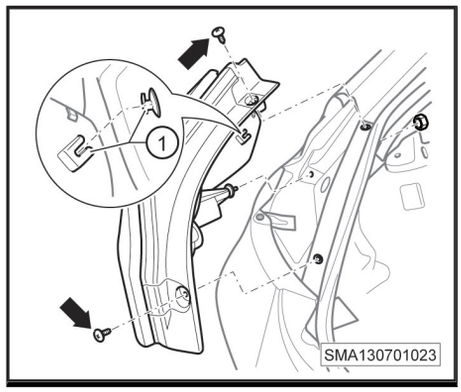
- The removal procedures of the left tail light are the same as that of the right one. The method of removing the left tail light is taken as an example here.

Two-box model

07

Removal

1. Remove the luggage compartment side trim and disconnect the tail light connector.
2. Unscrew the fixing screws of the tail light assembly (-arrow-) and the fixing nuts.
3. Remove the tail light assembly. Pay attention to the fixing clip of the tail light assembly and the body (-1-).



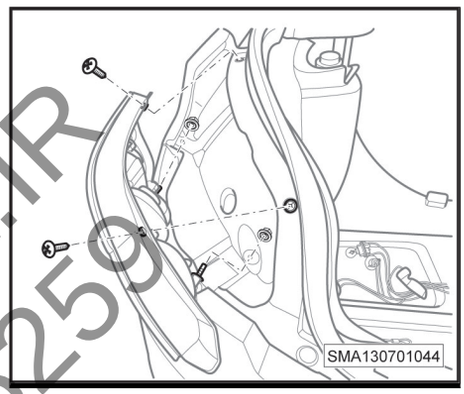
Installation

Installation shall follow the reverse sequence of the removal procedure.

Three-box model

Removal

1. Remove the luggage compartment side trim and disconnect the tail light connector.
2. Unscrew the fixing screws of the tail light assembly (-arrow-) and the fixing nuts.
3. Remove the tail light assembly.



Installation

Installation shall follow the reverse sequence of the removal procedure.

10.4.2 Removing and installing the reversing light, rear fog lamp, brake lamp and turn signal

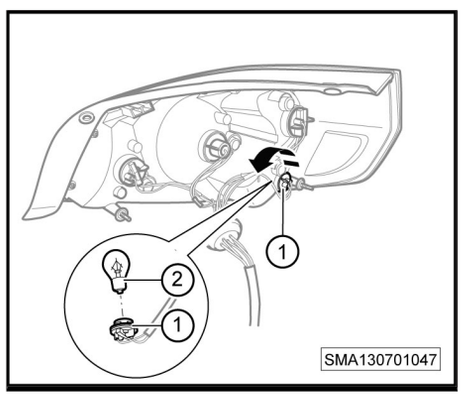
Three-box model

Note

- The removal procedures of the brake lamp, turn signal, rear fog lamp and reversing light of the three-box model are the same. The method of removing the reversing light is taken as an example here.

Removal

1. Remove the tail light assembly .
2. Unscrew the reversing light holder (-1-) in the (-arrow-) direction.
3. Remove the bulb (-2-) from the lamp holder (-1-).



Installation

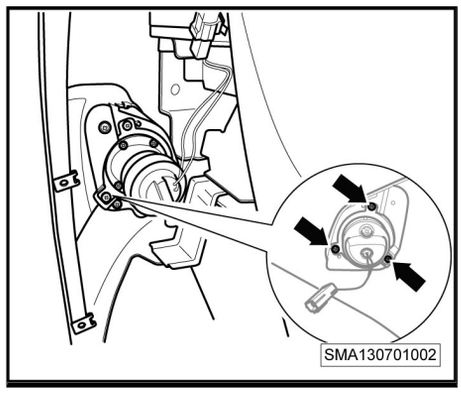
Installation shall follow the reverse sequence of the removal procedure.

10.5 Front fog lamp

10.5.1 Removing and installing the front fog lamp

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Remove the front wheel trim .
3. Disconnect the front fog lamp wiring harness connector.
4. Unscrew the fixing screws of the front fog lamp assembly (-arrow-) and remove the front fog lamp.



Installation

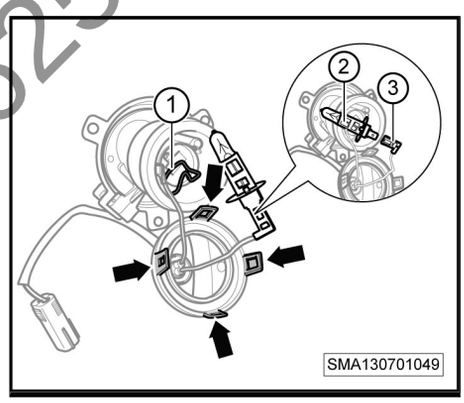
Installation shall follow the reverse sequence of the removal procedure.

10.5.2 Removing and installing the front fog lamp bulbs

Two-box model

Removal

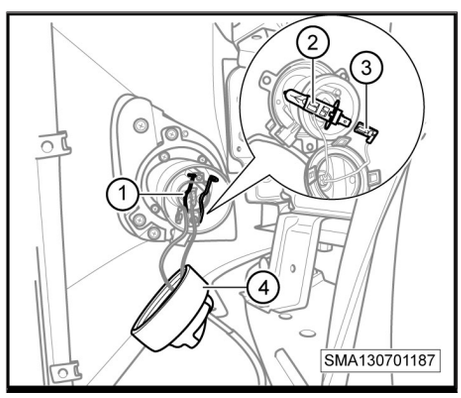
1. Remove the front fog lamp assembly .=> refer to page 998
2. Loosen the clip of the fog lamp waterproof cover (-arrow-) and remove the waterproof cover.
3. Loosen the fixing clamp spring of the front fog lamp holder (-1-).
4. Take the fog lamp out of the front fog lamp assembly.
5. Disconnect the fog lamp connector (-3-) and replace the fog lamp (-2-).



Three-box model

Removal

1. Remove the front wheel trim.
2. Remove the waterproof cover of the fog lamp (-4-).
3. Loosen the fixing clamp spring of the front fog lamp holder (-1-).
4. Take the fog lamp out of the front fog lamp assembly.
5. Disconnect the fog lamp connector (-3-) and replace the fog lamp (-2-).



Installation

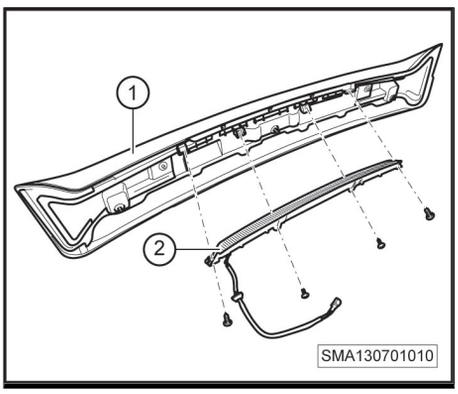
Installation shall follow the reverse sequence of the removal procedure.

10.6 Removing and installing the high-level brake lamp

Two-box model

Removal

1. Remove the rear fender assembly (-1-).=> refer to page 857
2. Unscrew the fixing screws of the high-level brake lamp and remove the high-level brake lamp assembly (-2-) from the rear fender assembly.



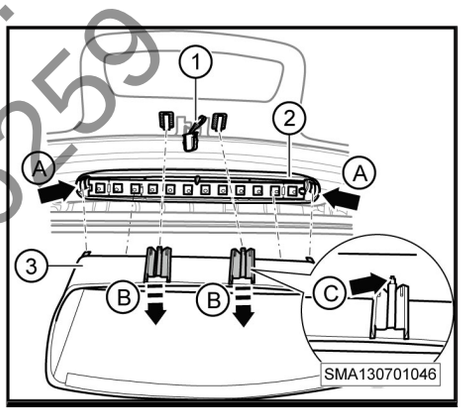
Installation

Installation shall follow the reverse sequence of the removal procedure.

Three-box model

Removal

1. Press the fixing clip (-arrow A-), and remove the high-level brake lamp (-2-) from the brake lamp cover (-3-).
2. Disconnect the high-level brake lamp connector (-1-).
3. Press the fixing clip of the lamp cover (-arrow C-) and remove the cover (-3-) from the rear windshield in the (-arrow B-) direction.



Installation

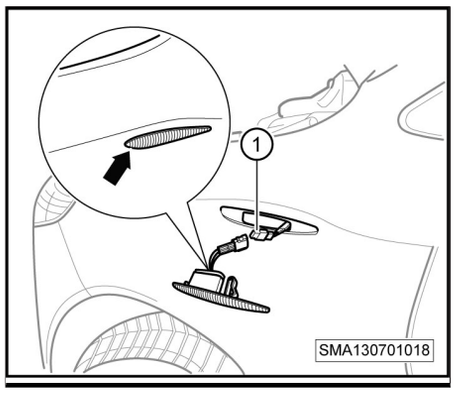
Installation shall follow the reverse sequence of the removal procedure.

10.7 Turn signal and hazard warning lamp

10.7.1 Removing and installing the side turn signal

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Lever out the side turn signal (-arrow) from the fender with the tools.
3. Disconnect the side turn signal connector (-1-) and remove the side turn signal.



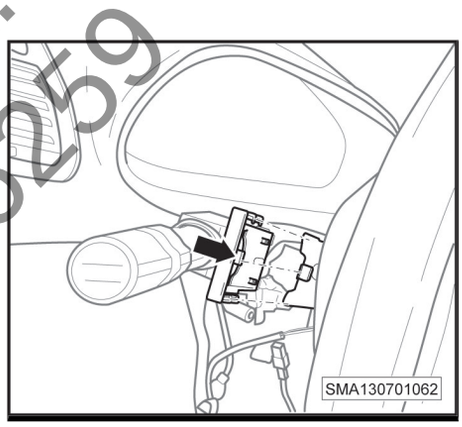
Installation

Installation shall follow the reverse sequence of the removal procedure.

10.7.2 Removing and installing the turn signal switch

Removal

1. Remove the steering column upper and lower covers .
2. Disconnect the turn signal switch connector.
3. Press the fixing clip of the turn signal switch (-arrow-) and remove the switch from the steering column.



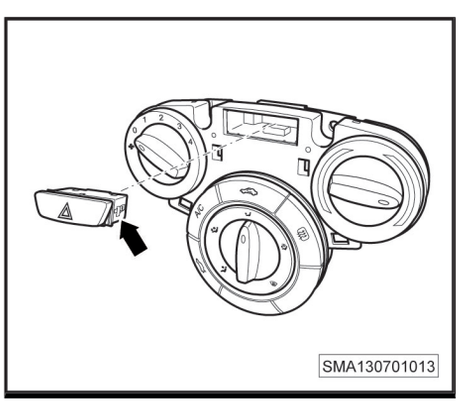
Installation

Installation shall follow the reverse sequence of the removal procedure.

10.7.3 Removing and installing the hazard warning lamp switch

Removal

1. Lever out the hazard warning lamp switch (-arrow-) from the A/C control panel with tools.
2. Disconnect the hazard warning lamp switch connector.



Installation

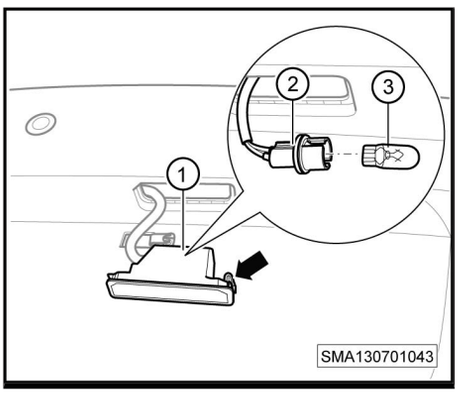
Installation shall follow the reverse sequence of the removal procedure.

07

10.8 Removing and installing the number plate lamp

Removal

1. Press the fixing clip of the number plate lamp (-arrow-) with the tools and lever out the number plate lamp assembly (-1-).
2. Unscrew the lamp holder (-2-) from the number plate lamp assembly.
3. Pull out the bulb (-3-) and replace it.



Installation

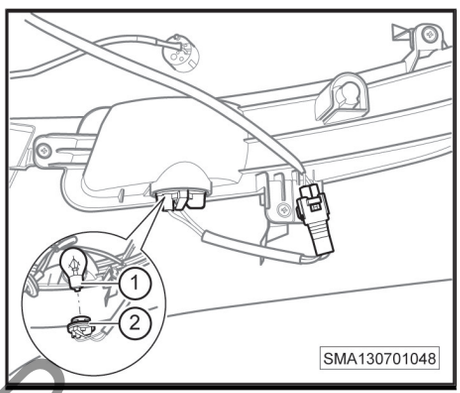
Installation shall follow the reverse sequence of the removal procedure.

10.9 Removing and installing the reversing light bulbs

Note

- The reversing lights of the two-box model are located at the right side of the rear bumper and the rear fog lamps are located at the left side of the rear bumper.

Removal



1. Remove the rear right wheel trim.
2. Unscrew the reversing light holder (-2-) from the reversing light assembly anticlockwise.
3. Unscrew the bulb (-1-) from the lamp holder (-2-).

Installation

Installation shall follow the reverse sequence of the removal procedure.

11 Power Windows

11.1 General information

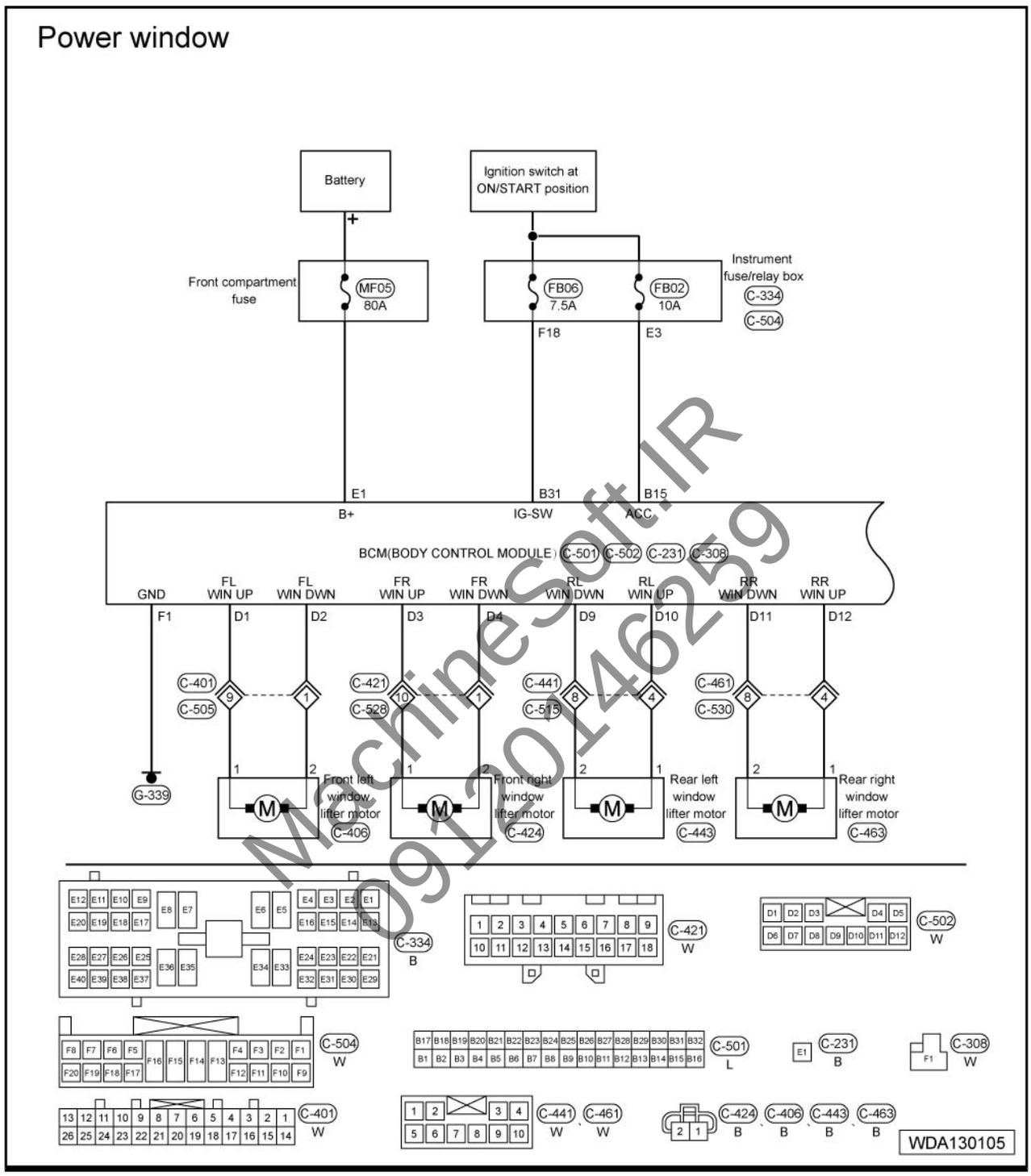
11.1.1 Description

- Window lifter switch controls the current flow of the window lifter motor via the BCM so as to control the up or down movement of the power window.
- Each door has a window lifter switch. The driver's side door can be used to control the up or down movement and the lock of all power windows (when the power window safety switch on the driver's side door is pressed, all other doors' window lifter switches will be disabled).
- The window lifter motor is a permanent-magnet motor, which can modify the rotation direction of motor by changing the current direction.

07

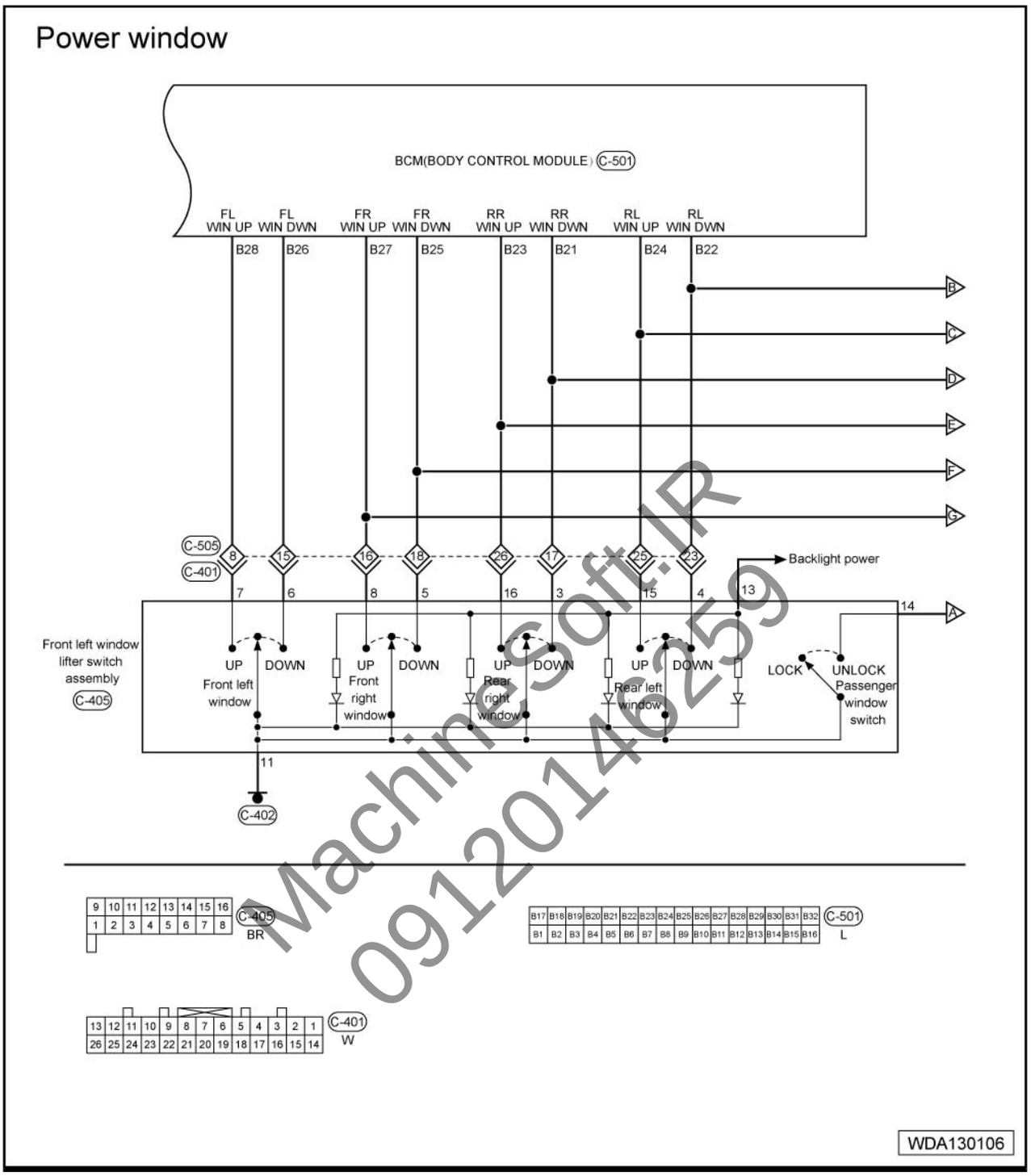
11.2 Circuit diagrams

Power windows (page 1)

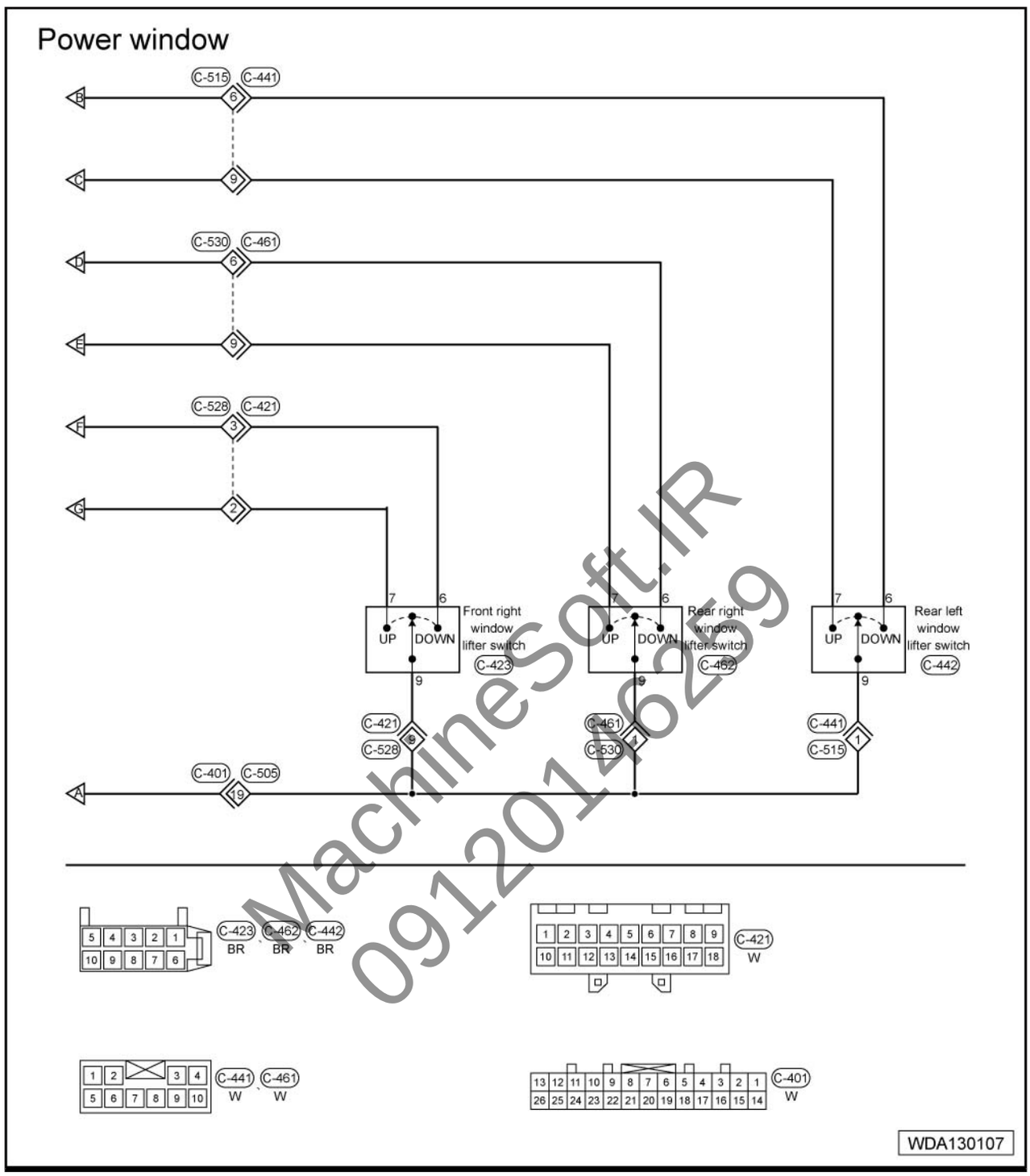


Power windows (page 2)

07



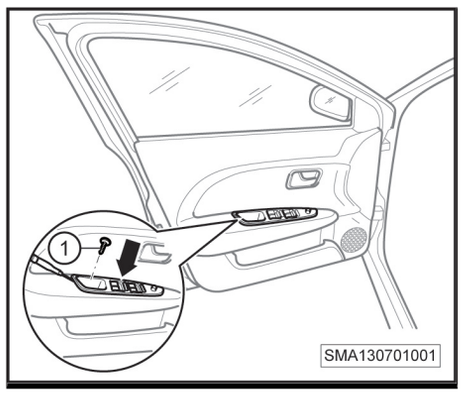
Power windows (page 3)



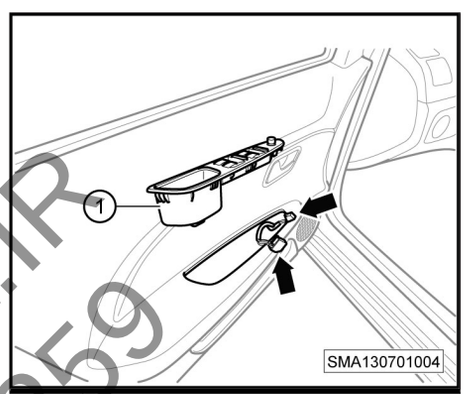
11.3 Removing and installing the power window main switch

Removal

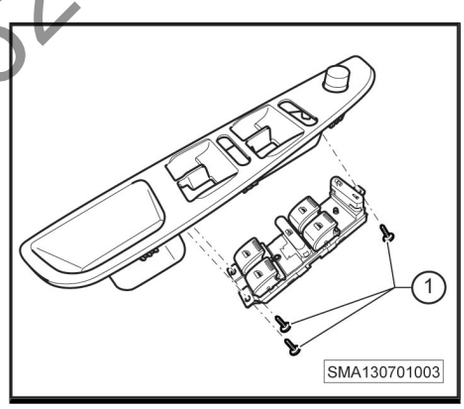
1. Lever out the decorative cover for the main switch screws carefully and unscrew the fixing screws of the main switch (-1-).
2. Lever out the main switch assembly (-arrow-) from the door trim with the tool.



3. Disconnect the main switch connector (-arrow-).
4. Remove the main switch assembly (-1-).



5. Unscrew the fixing screws of the main switch button (-1-).
6. Remove the main switch button.



Installation

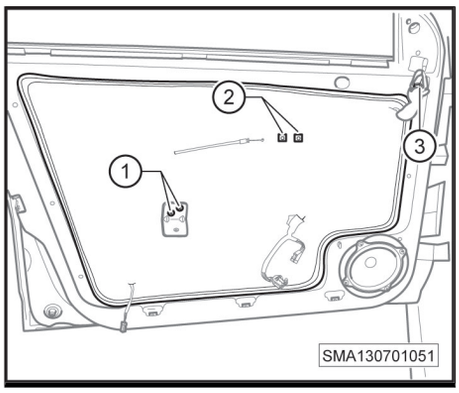
Installation shall follow the reverse sequence of the removal procedure.

11.4 Power window lifter motor

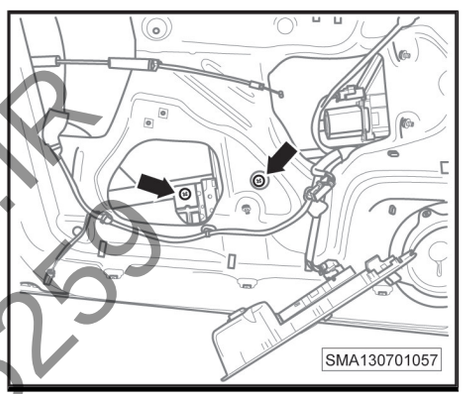
11.4.1 Removing and installing the front power window lifter motor

Removal

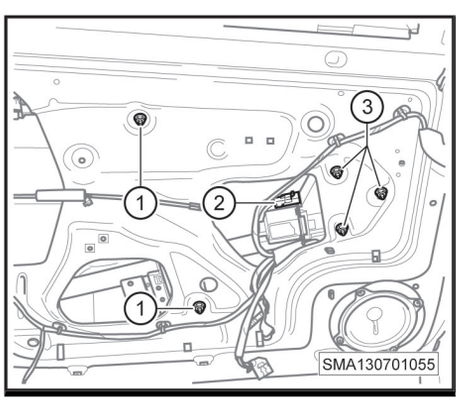
1. Turn off the ignition switch.
2. Remove the door interior trim .=> refer to page 764
3. Remove the front door triangular interior trim.
4. Unscrew the screws (-1-) and remove the main switch fixing parts.
5. Lever out the mounting tab for the inner pull handle fixing screws (-2-).
6. Disconnect the exterior mirror connector (-3-).
7. Remove the door dust cover.



8. Lower the window lifter.
9. Unscrew the fixing bolts of the windshield (-arrow-).
10. Remove the windshield.



11. Disconnect the window lifter motor connector (-2-).
12. Unscrew the fixing nuts of the window lifter rail (-1-).
13. Unscrew the fixing nuts of the window lifter motor (-3-).
14. Take out the window lifter rail along with the motor.



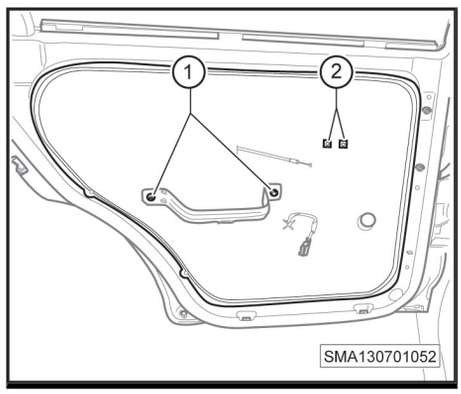
Installation

Installation shall follow the reverse sequence of the removal procedure.

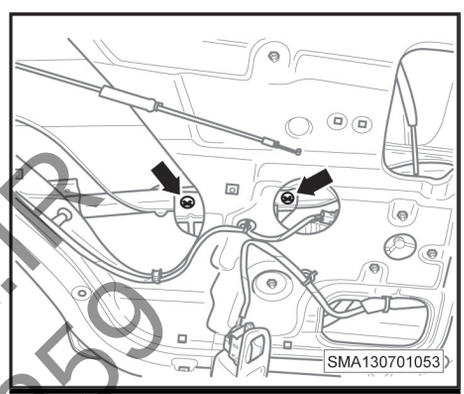
11.4.2 Removing and installing the rear power window lifter motor

Removal

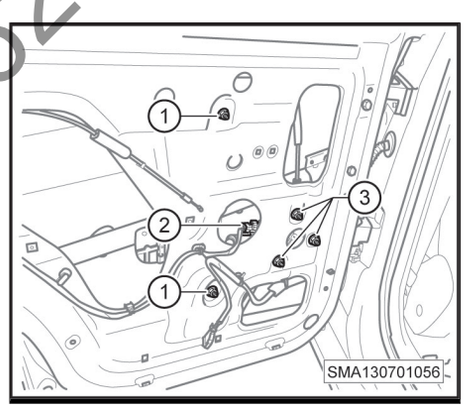
1. Turn off the ignition switch.
2. Remove the door interior trim .=> refer to page 768
3. Unscrew the screws (-1-) and remove the fixing parts.
4. Lever out the mounting tab for the inner pull handle fixing screws (-2-).
5. Remove the door dust cover.



6. Lower the window lifter.
7. Unscrew the fixing bolts of the windshield (-arrow-).
8. Remove the windshield.



9. Disconnect the window lifter motor connector (-2-).
10. Unscrew the fixing nuts of the window lifter rail (-1-).
11. Unscrew the fixing nuts of the window lifter motor (-3-).
12. Take out the window lifter rail along with the motor.

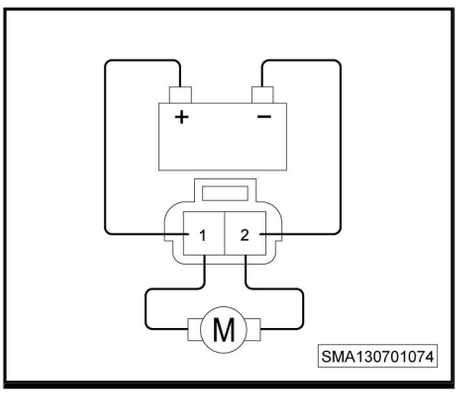


Installation

Installation shall follow the reverse sequence of the removal procedure.

11.4.3 Testing the power window lifter motor

Testing the motor down operation



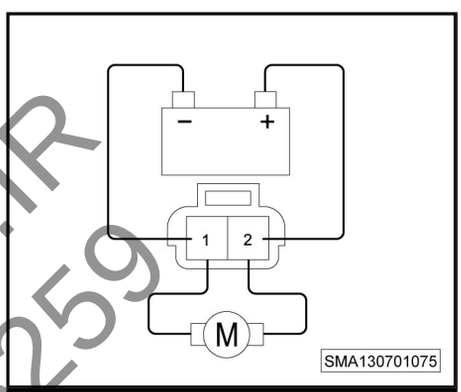
Connect the battery to the motor as shown in the figure.

Connect the positive pole of the battery to No.1 terminal of the motor

Connect the negative pole of the battery to No.2 terminal of the motor

The motor rotates anticlockwise, otherwise the motor assembly should be replaced.

Testing the motor up operation



Connect the battery to the motor as shown in the figure.

Connect the positive pole of the battery to No.2 terminal of the motor

Connect the negative pole of the battery to No.1 terminal of the motor

The motor rotates clockwise, otherwise the motor assembly should be replaced.

12 Exterior Mirror

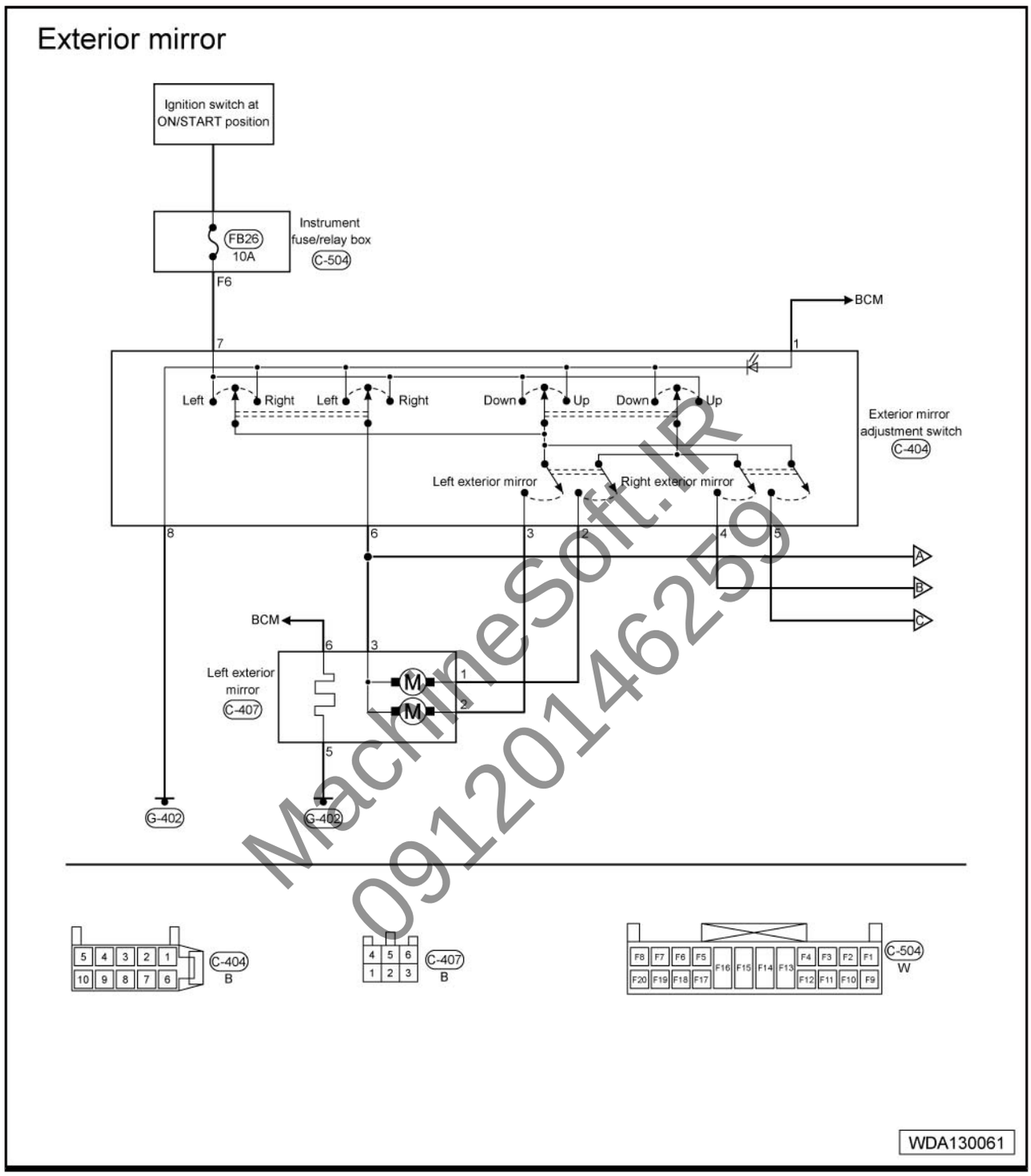
12.1 General information

12.1.1 Description

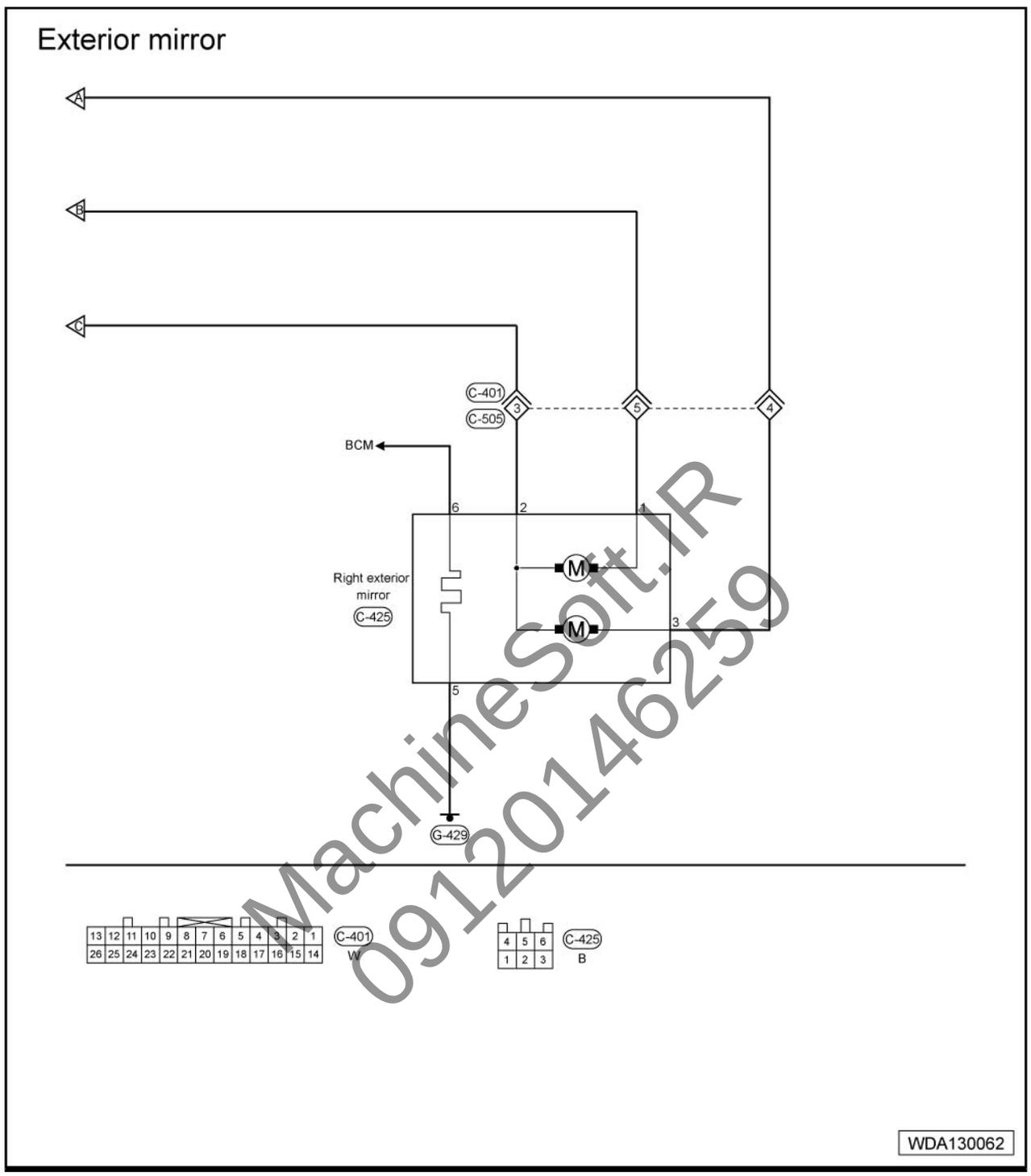
- The exterior mirror adjustment switch is installed on the power window main switch at the driver's side door trim. When the ignition switch is switched on, turn the exterior mirror adjustment switch to left or right to adjust the left or right exterior mirror. Select the exterior mirror to be adjusted and you can adjust the exterior mirror lens up and down by turning the rocker forward and backward; and left and right by turning the rocker left and right.
- When water vapor is found in the exterior mirror lens, turn on the window defroster switch and the lens will be heated by the heating wires installed on the lens to eliminate the vapor.

12.2 Circuit diagrams

Exterior mirror (page 1)

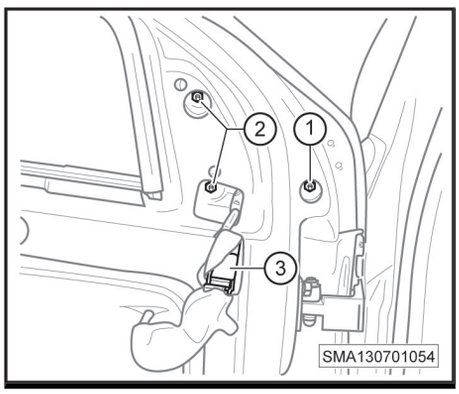


Exterior mirror (page 2)



12.3 Removing and installing the exterior mirror

Removal



1. Remove the front door interior trim. => refer to page 766
2. Remove the front door triangular trim.
3. Remove the protective cover for the exterior mirror fixing nuts (-1-) and unscrew the nuts.
4. Unscrew the fixing nuts of the exterior mirror (-2-) .
5. Disconnect the wiring harness connector (-3-).
6. Remove the exterior mirror.

Installation

Installation shall follow the reverse sequence of the removal procedure.

13 Horn

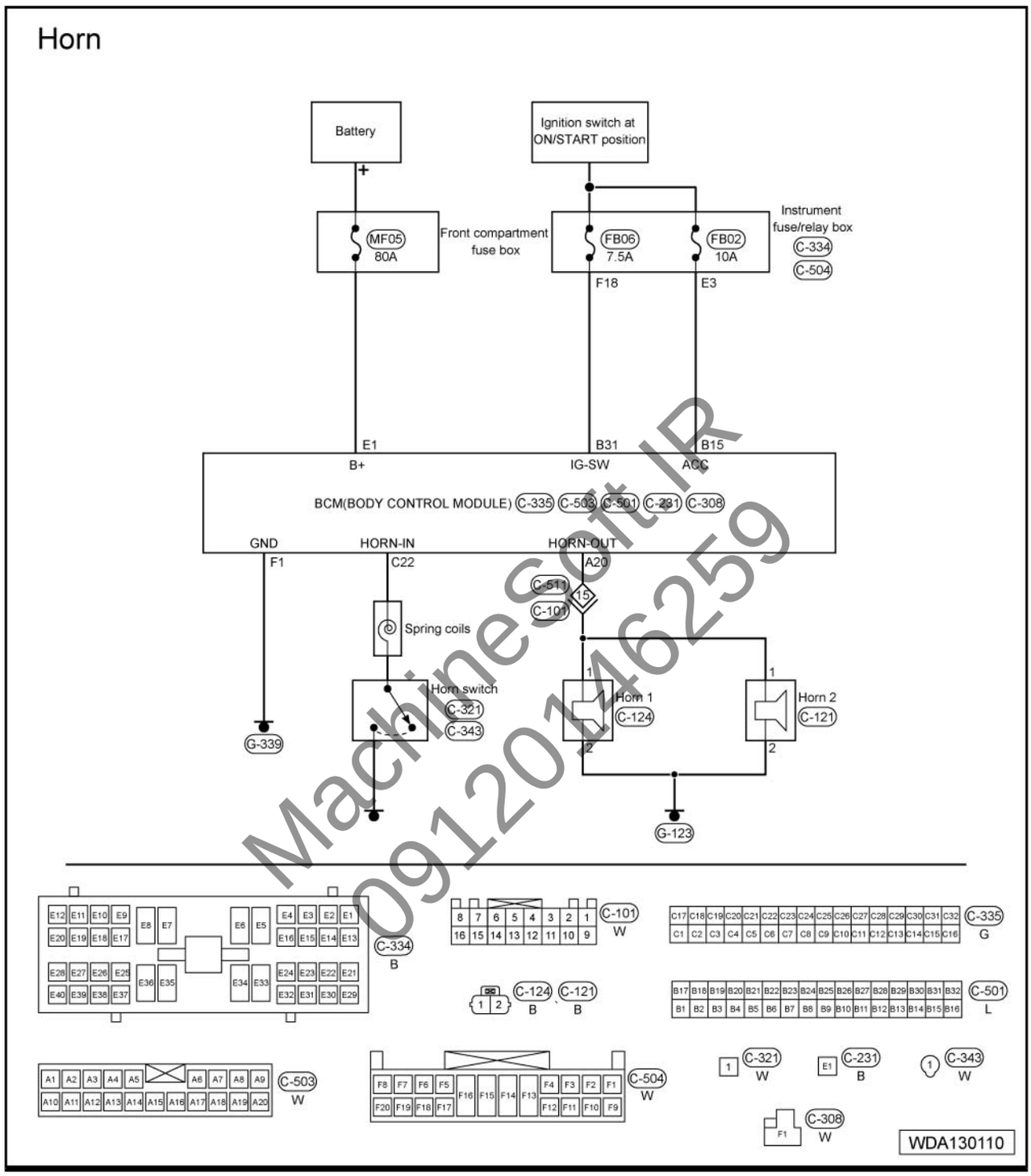
13.1 General information

13.1.1 Description

- Horn is a device that can produce sound by vibrating the metal diaphragm with the inside electromagnetic coil energized and deenergized constantly.
- This model comes with two horns.
- The horns are installed on the cross member behind the front intake grid.
- The horn switch is installed on the steering wheel.

13.2 Circuit diagram

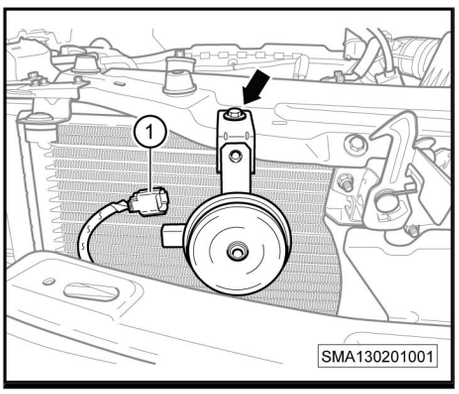
Horn (page 1)



13.3 Removing and installing the horn

Removal

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Remove the front intake grid .
3. Disconnect the horn wiring harness connector (-1-).
4. Unscrew the fixing bolts (-arrow-) and remove the horn.



Installation

Installation shall follow the reverse sequence of the removal procedure.

14 Wiper and Washer System

14.1 General Information

14.1.1 Description

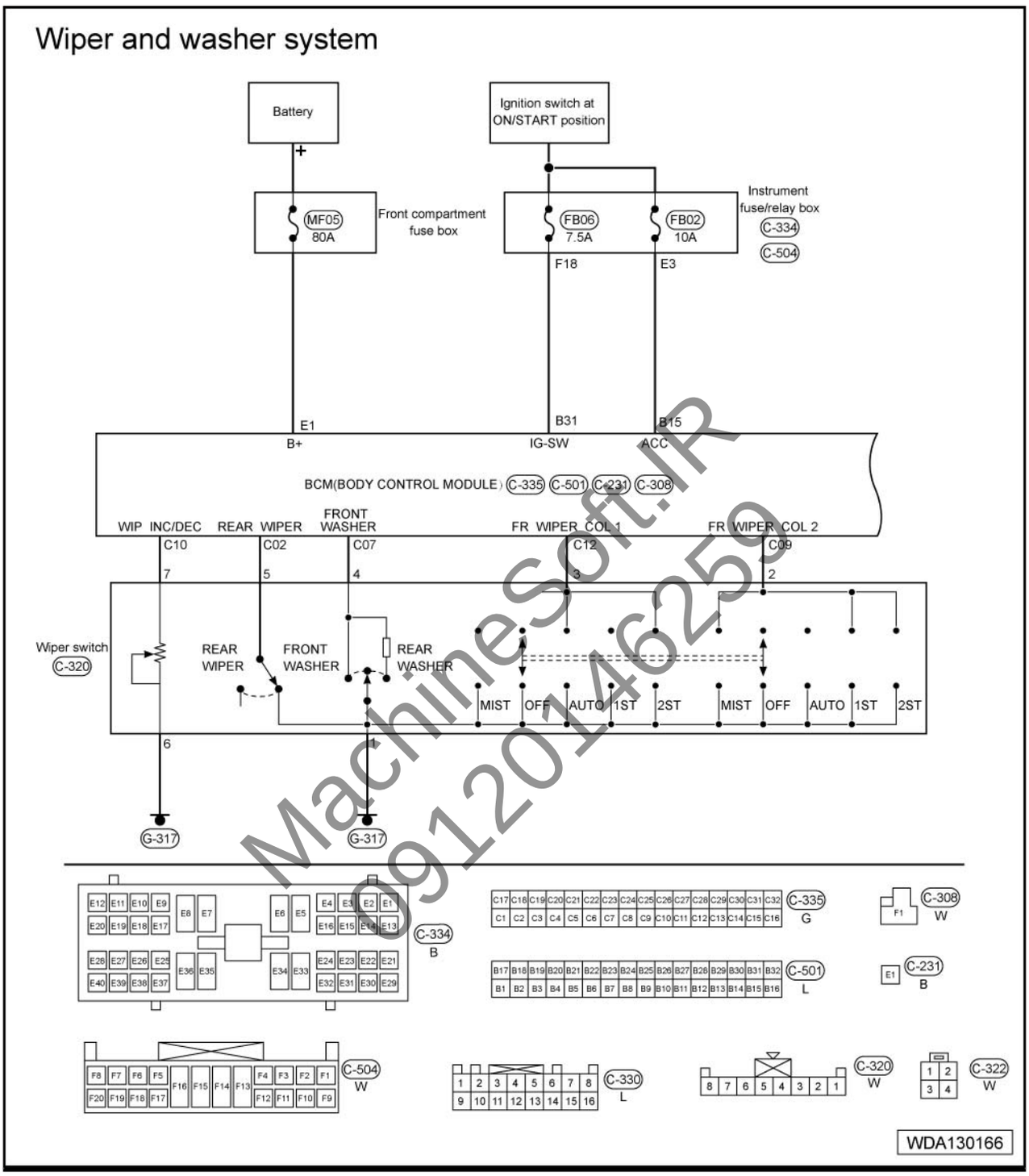
The wiper and washer system serves to keep a clear vision by wiping off the raindrops on the windshield and rear window when it is raining. The system can remove the dirt on the windshield with the spray washer. This is an indispensable system for safe driving. It consists of the following components:

- Wiper motor
- Wiper arm
- Front wiper motor linkage
- Washer reservoir, washer pump
- Wiper switch

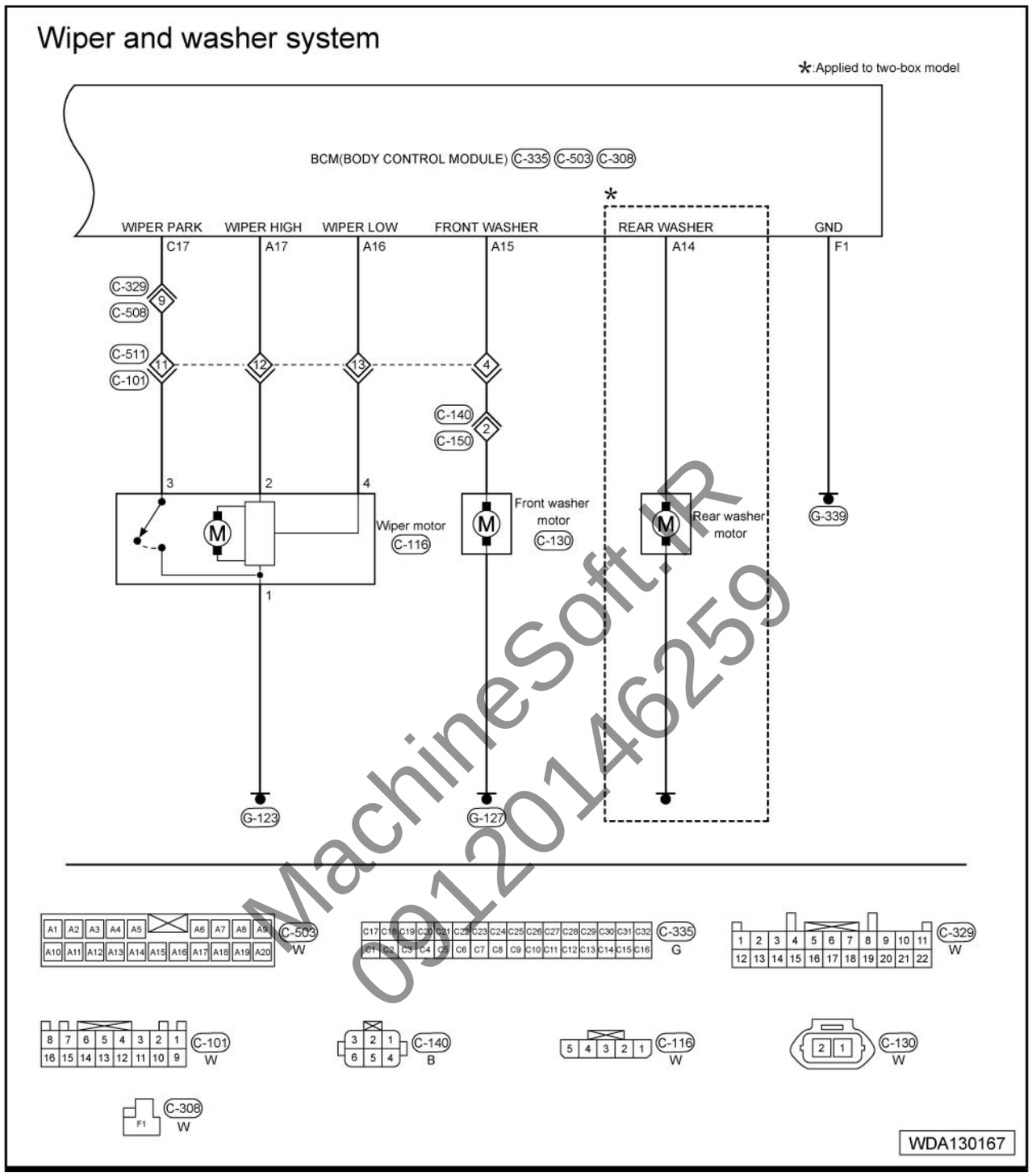
14.2 Circuit diagrams

07

Wiper and washer system (page 1)



Wiper and washer system (page 2)

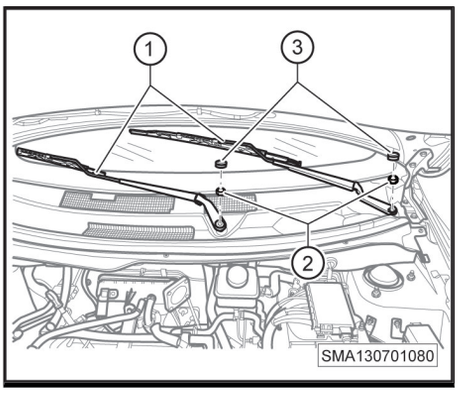


14.3 Front wiper

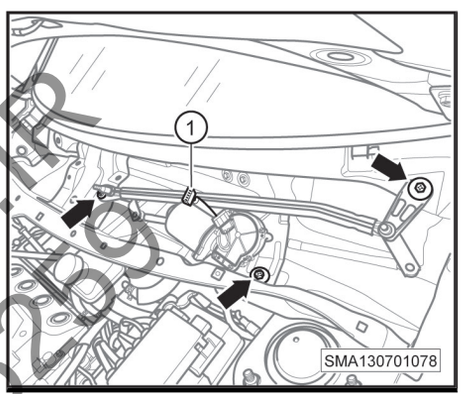
14.3.1 Removing and installing the front wiper motor

Removal

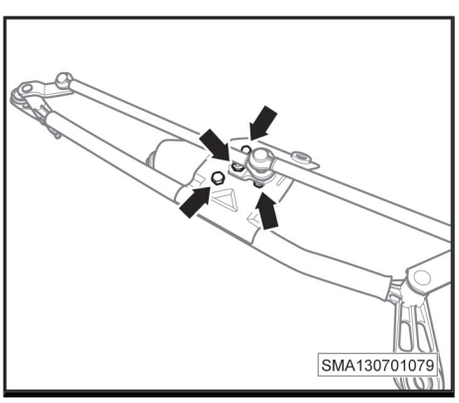
1. Lever out the decorative cover for front wiper arm nut (-3-) carefully.
2. Unscrew the fixing nuts of the wiper arm (-2-).
3. Remove the wiper blade and wiper arm (-1-) from the linkage.



4. Remove the water drain cover from the engine compartment .
5. Disconnect the wiring harness connector of the front wiper motor (-1-).
6. Unscrew the fixing bolts of the front wiper linkage (-arrow-).
7. Remove the linkage and wiper motor.



8. Unscrew the fixing bolts and nuts of the wiper motor (-arrow-).
9. Remove the front wiper motor.



Installation

Installation shall follow the reverse sequence of the removal procedure.

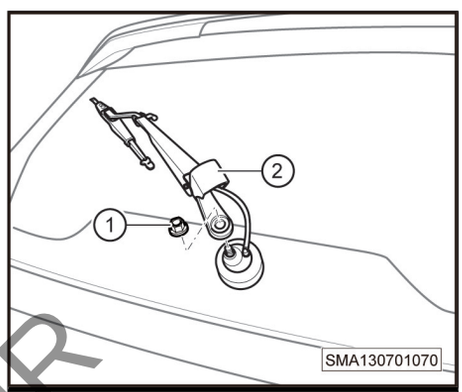
14.4 Rear wiper

14.4.1 Removing and installing the rear wiper motor

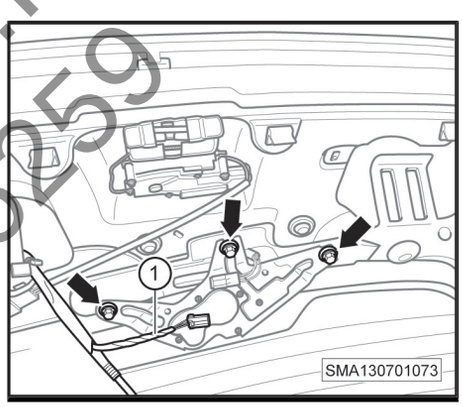
Note

- Chery A13A model is equipped with the rear wiper and washer system.

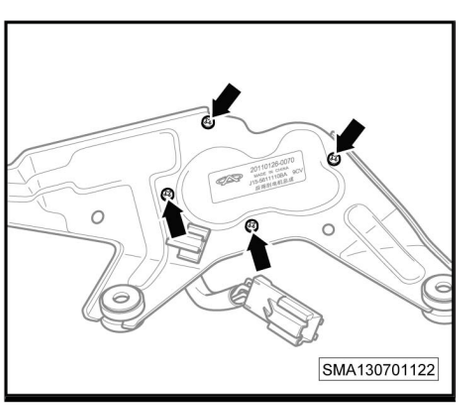
Removal



1. Lever out the cover for rear wiper arm nuts (-2-).
2. Unscrew the fixing nuts of the wiper arm (-1-).
3. Disconnect the washer fluid pipe.
4. Remove the wiper arm from the wiper motor.



5. Remove the trunk lid guard assembly .
6. Disconnect the wiring harness connector of the rear wiper motor (-1-).
7. Unscrew the fixing parts bolts of the rear wiper motor (-arrow-).
8. Remove the fixing parts and rear wiper motor assembly.



9. Unscrew the fixing bolts of the rear wiper motor (-arrow-).
10. Remove the rear wiper motor.

Installation

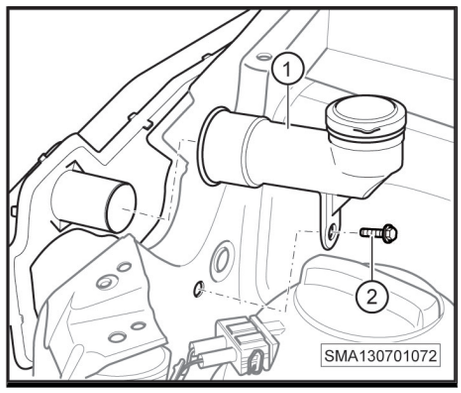
Installation shall follow the reverse sequence of the removal procedure.

14.5 Washer reservoir

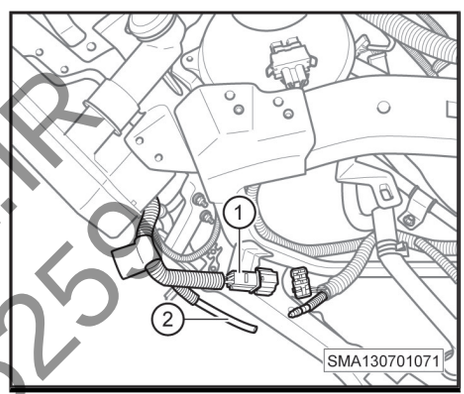
14.5.1 Removing and installing the washer reservoir

Removal

1. Remove the right headlamp.
2. Unscrew the fixing bolts (-2-) of the washer fluid filler (-1-).
3. Detach the washer fluid filler (-1-) from the washer reservoir.



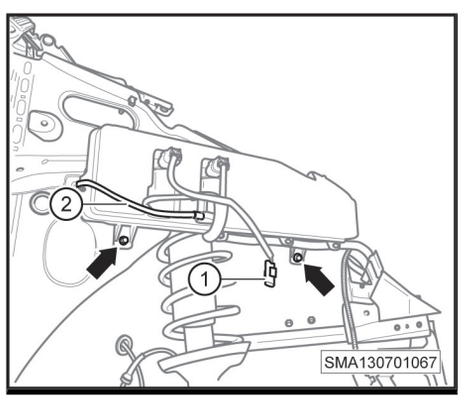
4. Disconnect the connector of the washer pump wiring harness and the front compartment wiring harness (-1-).
5. Disconnect the washer reservoir pipe (-2-).



Note

- For better display of the washer reservoir, the figure shows the status when the rear right fender is removed.

6. Remove the front right wheel trim.
7. Unscrew the washer reservoir lower fixing bolts (-arrow-).
8. Pull out the right turn signal connector (-1-).
9. Pull out the water outlet pipe of rear window washer motor (-2-) and remove the washer reservoir.



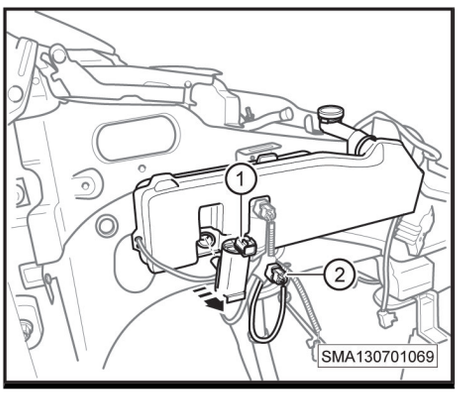
Installation

Installation shall follow the reverse sequence of the removal procedure.

14.5.2 Removing and installing the washer pump

Removal

1. Remove the front right fender.=> refer to page 842
2. Disconnect the washer pump wiring harness connector (-2-).
3. Pull out the washer pump guide.
4. Pull out the washer pump (-1-) from the washer reservoir in the (-arrow-) direction.



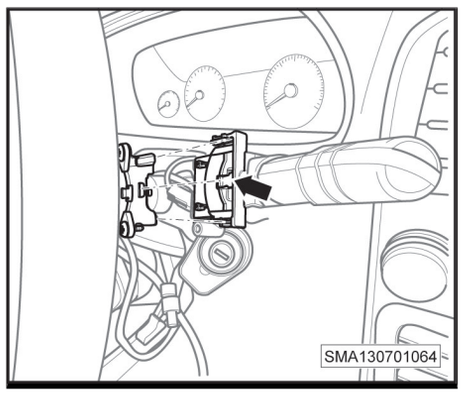
Installation

Installation shall follow the reverse sequence of the removal procedure.

14.6 Removing and installing the wiper switch

Removal

1. Remove the steering column upper and lower covers.
2. Disconnect the wiring harness connector of the wiper switch.
3. Press the fixing clip of the wiper switch (-arrow-) and remove the switch from the steering column.



Installation

Installation shall follow the reverse sequence of the removal procedure.

15 Rear Window Defroster

15.1 General information

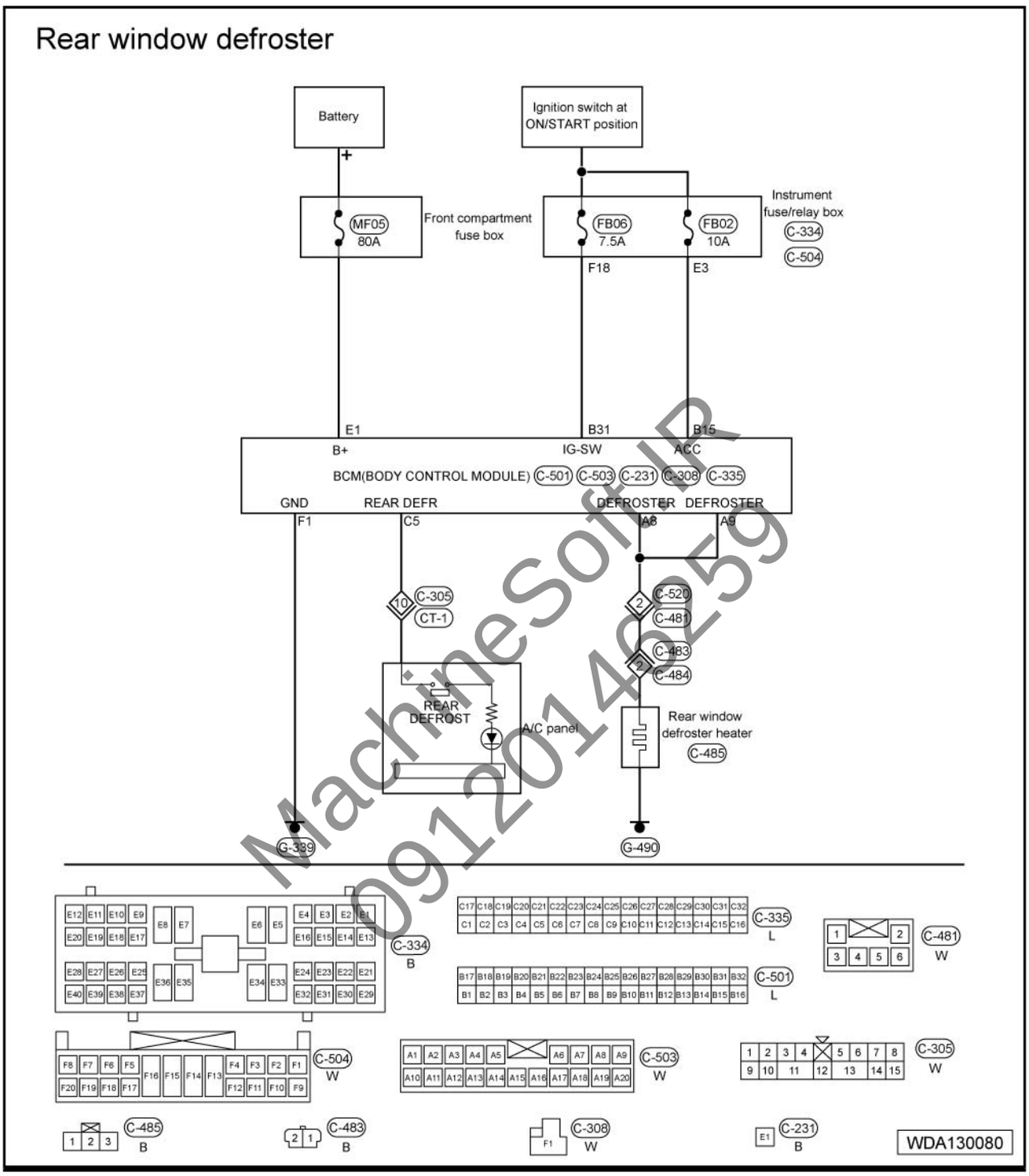
15.1.1 Description

- This function is used to remove frost, fog or water vapor on the rear windshield by heating the windshield with electric wires at the bottom of the rear windshield, thus to get a clearer vision.
- The rear window defroster function is controlled by the BCM. When the ignition switch is in the ACC position, turn on the defroster switch and the BCM will supply power to the rear window heating wires.

15.2 Circuit diagram

07

Rear window defroster system (page 1)



16 Anti-theft System

16.1 General information

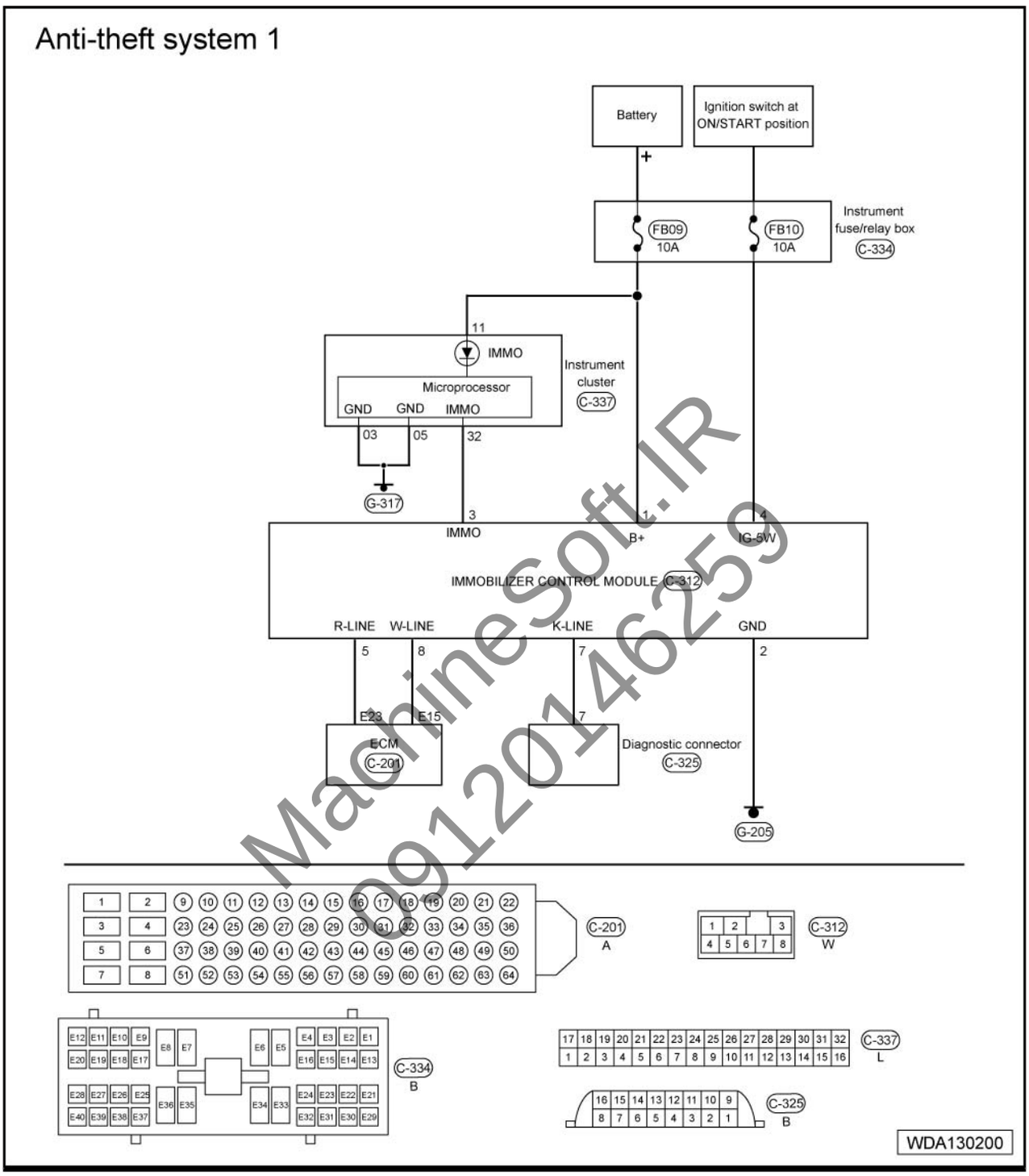
16.1.1 Description

- The vehicle anti-theft system is controlled by the anti-theft control module and identifies through the anti-theft induction coil to prevent any improper ignition key from starting the engine.
- If the improper ignition key is inserted into the ignition switch, the anti-theft coil will sense the incorrect password and send signals to the anti-theft control module and the engine control module (ECM) to forbid the start of the engine for the anti-theft purpose.

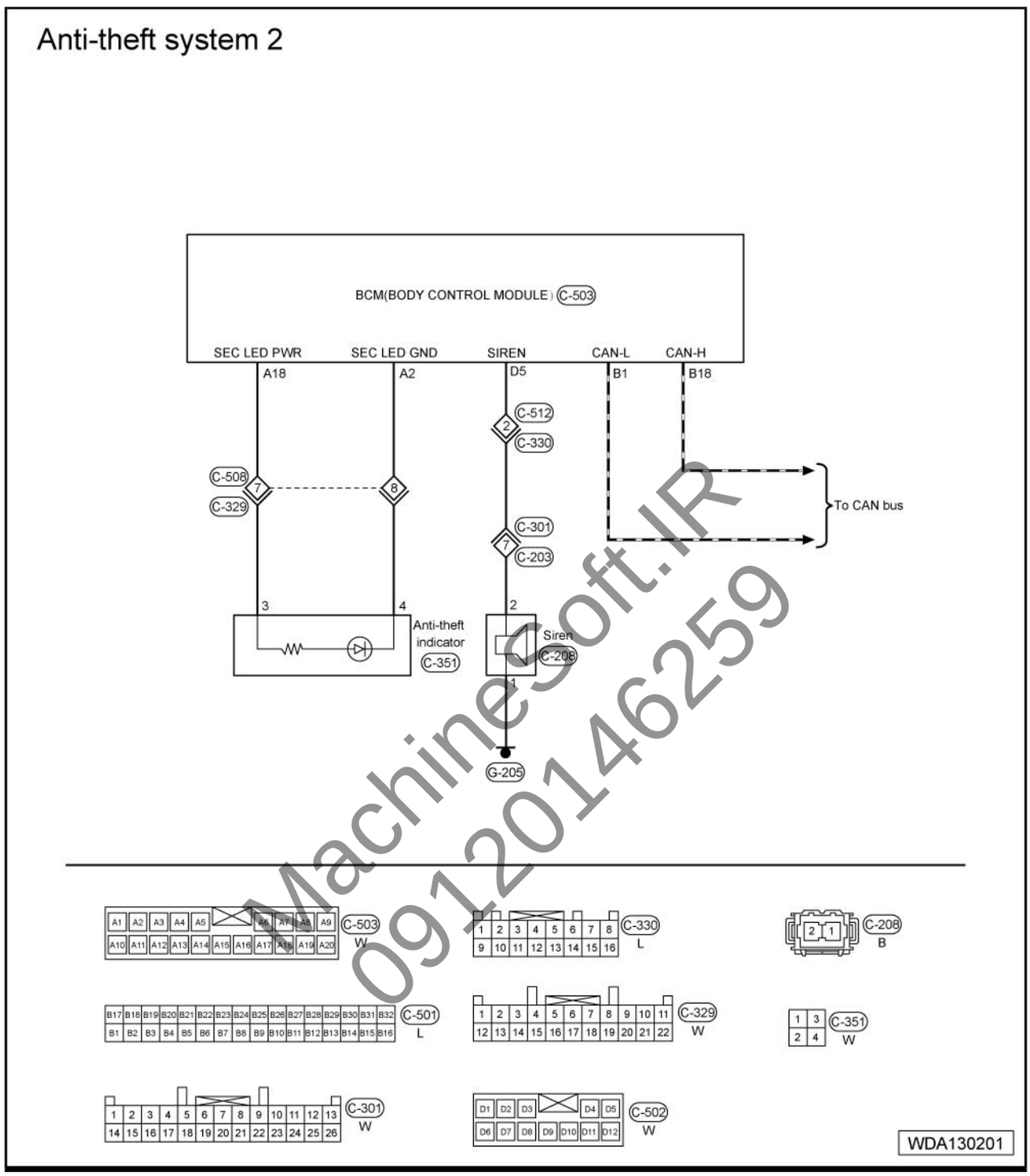
16.2 Circuit diagrams

07

Anti-theft system (447F+UAES) (page 1)

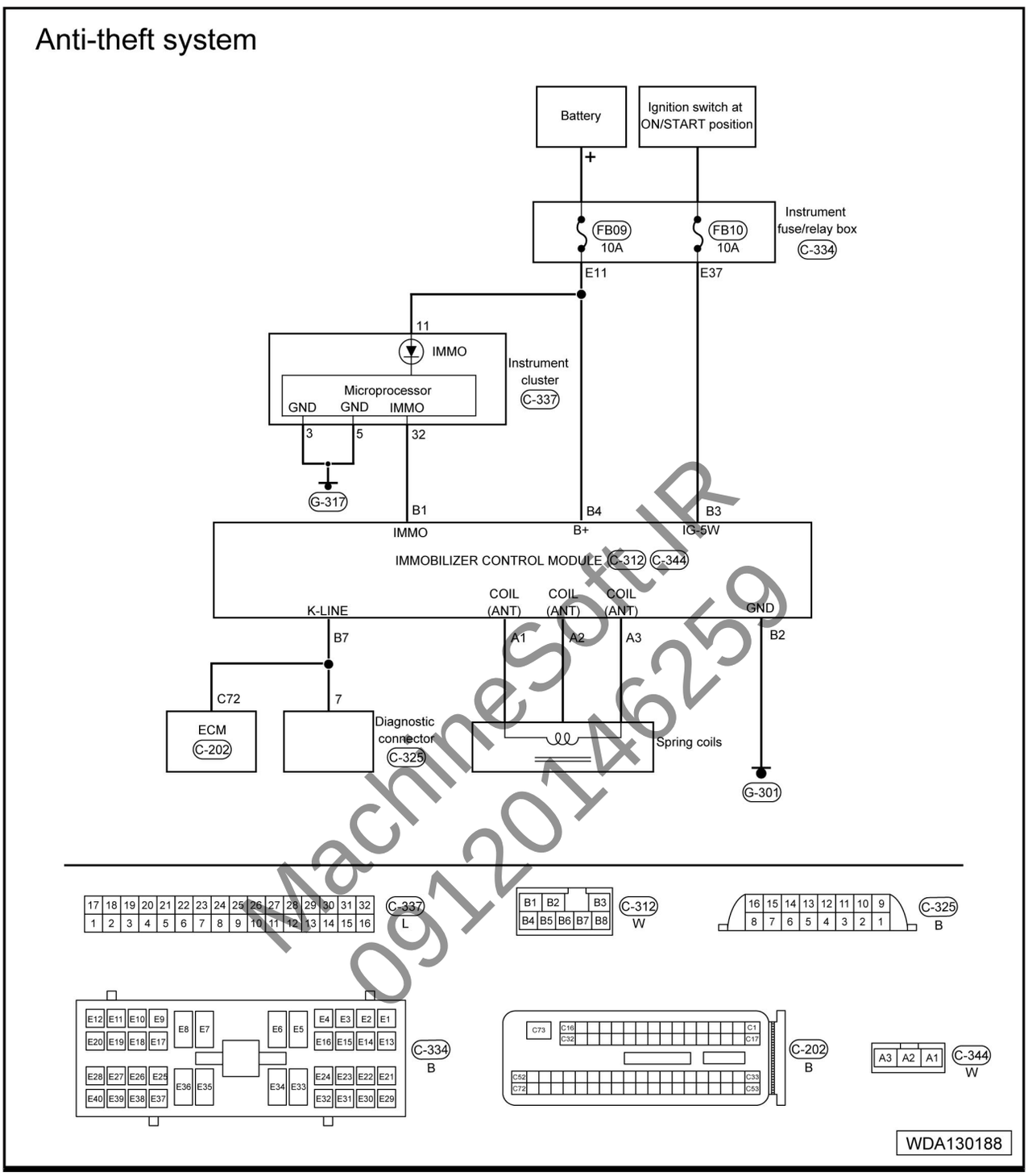


Anti-theft system (447F+UAES) (page 2)

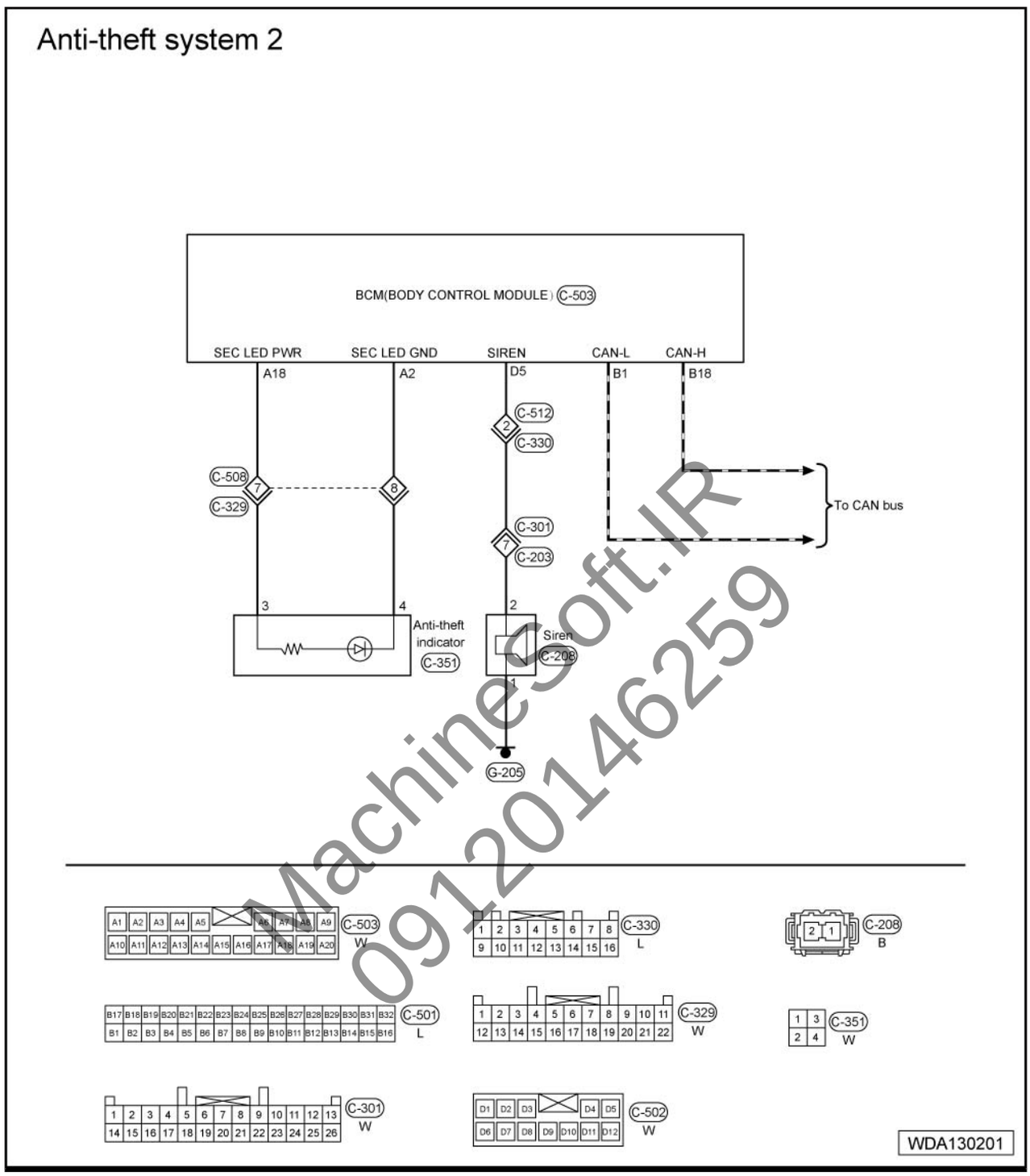


Anti-theft system (447F+DELPHI) (page 1)

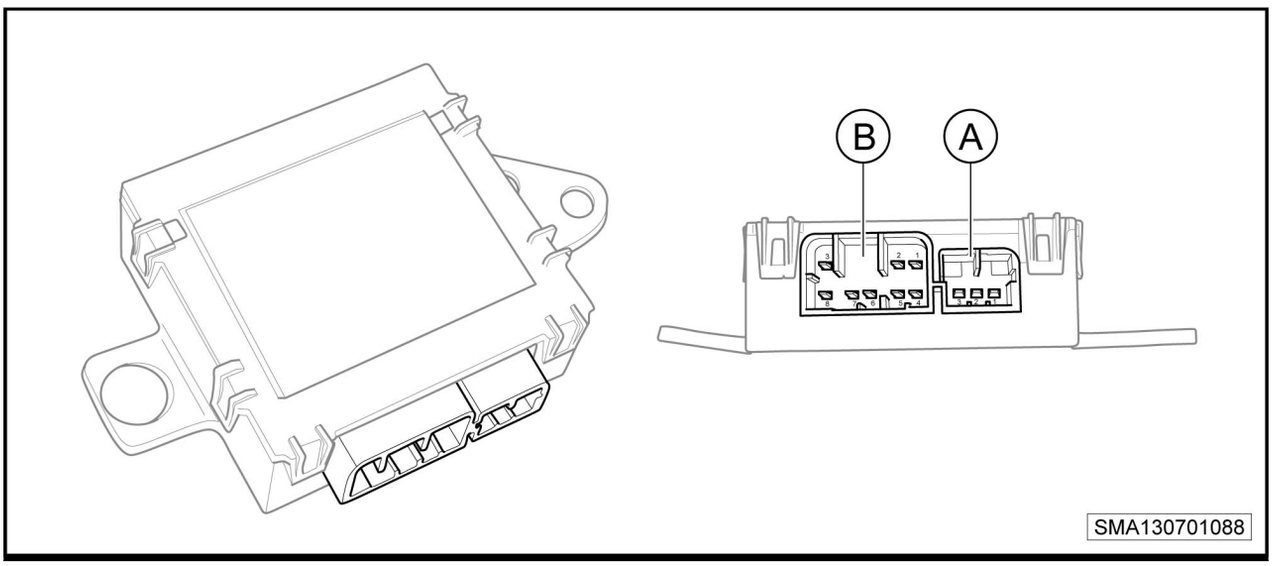
07



Anti-theft system (447F+DELPHI) (page 2)



16.3 Definition of the anti-theft control module pin



B: 8-pin connector of the anti-theft control module (447F+UAES control system)

Pin No.	Function	Pin No.	Function
1	KL30	5	EMS wake-up line
2	Ground	6	—
3	Anti-theft indicator	7	Diagnostic line
4	KL15	8	EMS communication port

A: 3-pin connector of the anti-theft control module (447F+DELPHI control system)

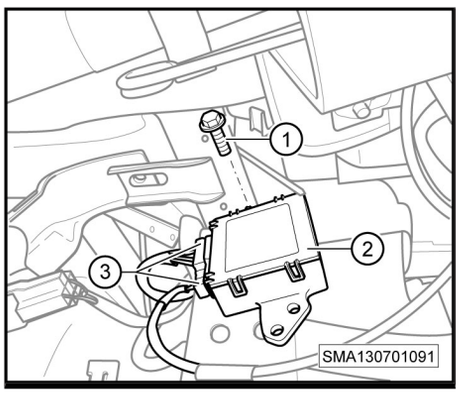
Pin No.	Function	Pin No.	Function
1	Anti-theft identification coil (positive)	3	Anti-theft identification coil (negative)
2	—		

B: 8-pin connector of the anti-theft control module (447F+UAES control system)

Pin No.	Function	Pin No.	Function
1	Warning lamp	5	—
2	Ground	6	—
3	KL15	7	Communication diagnostic connector
4	KL30	8	—

16.4 Removing and installing the anti-theft control module

Removal



1. Switch off all electrical equipment and disconnect the battery negative cable.
2. Remove the base guard of the driver's side dashboard => refer to page 832.
3. Pull out the anti-theft control module connector (-3-).
4. Unscrew the fixing bolts of the anti-theft control module (-1-).
5. Remove the anti-theft control module (-2-).

Installation

Installation shall follow the reverse sequence of the removal procedure.

16.5 Anti-theft system adaption

16.5.1 Key adaption

Caution

- Security code (PIN code) is only entered through a special diagnostic device of Chery. When entering, please note that the letters are case sensitive and the ECM will be locked permanently after the erroneous codes are entered consecutively for more than a certain number of times.

Key adaption procedures:

1. Connect the diagnostic connector of the diagnostic device to the diagnostic connector inside the cockpit.
2. Insert the key to be adapted into the ignition switch and turn it to the ON position.
3. Access the diagnostic device option menu and select "Anti-theft control" → "Adaption" → "Authorization code setting" → "Enter the security code" and then return to "Adaption" → "Enter the user authorization code".
4. Return to "Adaption" and select the menu "Clear the key list" to clear the previously lost key information.
5. Return to the "Adaption" and select the menu "Adapt the key" and perform the adaption operation according to the steps shown on the diagnostic device.
6. After adaption, turn off the ignition switch and turn it on again and start the engine to verify if the adaption is successful.

Remote control adaption procedures:

Note

- This function can be used to adapt 2 remote controls.

1. Connect the diagnostic connector of the diagnostic device to the diagnostic connector inside the cockpit.
2. Insert the key to be adapted into the ignition switch and turn it to the ON position.
3. Access the diagnostic device option menu and select "Body control module" → "Select the functions" → "Write the data flow" → "Erase all the remote control keys". Clear the previously lost key information.
4. Return to the "Select the functions" and select the menu "Key learning" and perform the adaption operation according to the steps shown on the diagnostic device.
5. After adaption, verify if the adaption is successful.

16.5.2 Anti-theft control adaption

Caution

- Security code (PIN code) is only entered through a special diagnostic device of Chery. When entering, please note that the letters are case sensitive and the ECM will be locked permanently after the erroneous codes are entered consecutively for more than a certain number of times.

Anti-theft control adaption procedures:

1. Turn off the ignition switch and replace the anti-theft control with a new one.
2. Insert the key into the ignition switch and turn it to the ON position.
3. Access the diagnostic device option menu and select "Anti-theft control" → "Adaption" → "Authorization code setting" → "Enter the security code" and then return to "Adaption" → "Enter the user authorization code".
4. Return to the "Adaption" and select the menu" Replace the anti-theft control" and perform the adaption operation according to the steps shown on the diagnostic device.

5. After the completion of the anti-theft control adaption, adapt the original keys one by one.

17 Diagnosis and Inspection of the Anti-theft System

17.1 Diagnosis and inspection of sporadic DTC faults

If the sporadic DTC faults occur, please check the following items:

- Check if the connector of the DTC-related actuator or sensor is properly installed.
- Check the connector pins of the actuator or sensor for leakage and corrosion.
- Check the leads for bending or squeezing.
- Check the sensor for dirt or damage.
- Check if the routing of wiring harness is correct and proper.

17.2 Checking earth connection

A good earth connection is prerequisite for ensuring the normal operation of the circuit. If the earth terminal of the circuit is always exposed to the wet and dusty environment, the metal of the earth terminal will corrode and affect the circuit smoothness, thus causing various electrical system malfunctions. As the control circuit is very sensitive, the loosened or corroded wires may significantly affect the transmission of various signals in the electronic control circuit. Therefore, please note the followings when inspecting:

- Replace the earth bolts or nuts.
- Check the earth terminal and coil for corrosion.
- Clean and polish the earth terminal and coil when necessary to ensure good contact.
- Check if there is any accessory interfering with the earth circuit.

07

17.3 Special tools

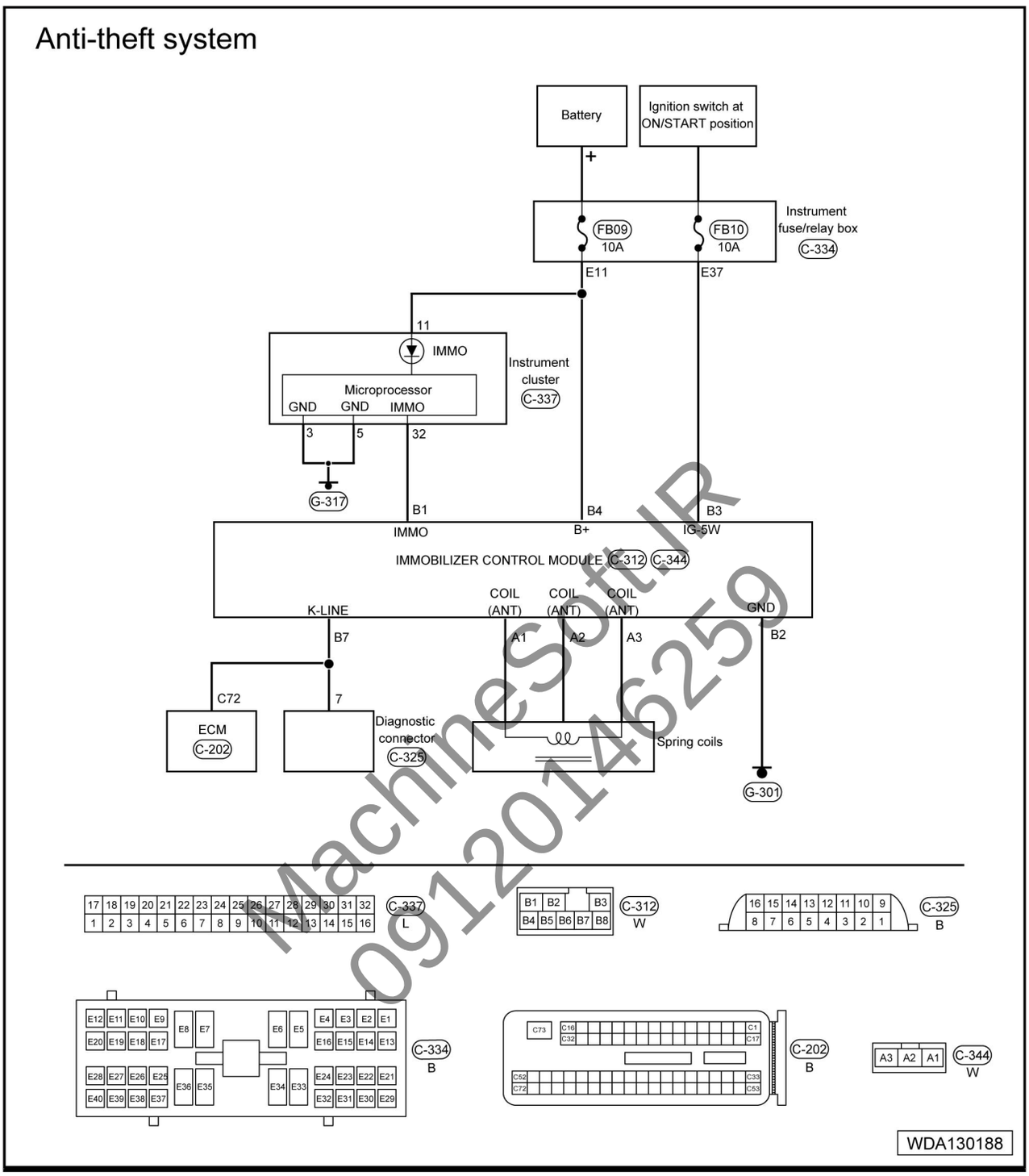
- X-431 diagnostic device
- Digital multimeter
- Adapter cable

17.4 Fault diagnosis (DTC)

17.4.1 Anti-theft system diagnosis (DTC) list

DTC	Definition
B1001	Failure of the anti-theft control
B1005	K line short to ground
B1017	Failure of warning lamp output

17.4.2 B1001 Failure of the anti-theft control



Checking the voltage between the anti-theft control module and the grounding

Pin No.	Function	Condition	Value (DC voltage range)
B3	The anti-theft control energized	The ignition switch in the LOCK position	Battery voltage
B4	The anti-theft control energized	The ignition switch in the ON/START position	Battery voltage

Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1001	Failure of the anti-theft control	The ignition switch in the ON position or the START position	The anti-theft control module short or open circuit detected by the system	• Failure of the wiring harnesses or connector • Failure of the anti-theft control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

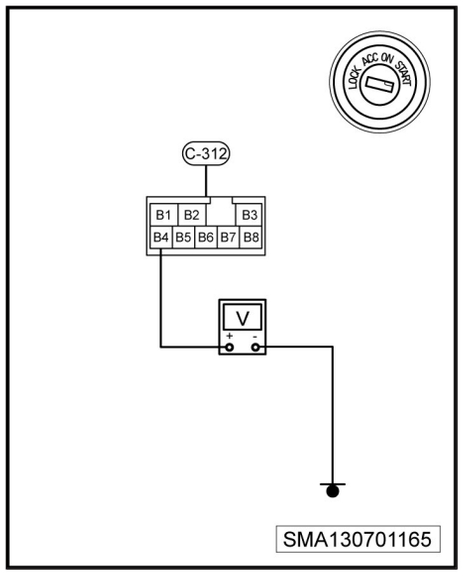
Diagnosis procedures:

Note

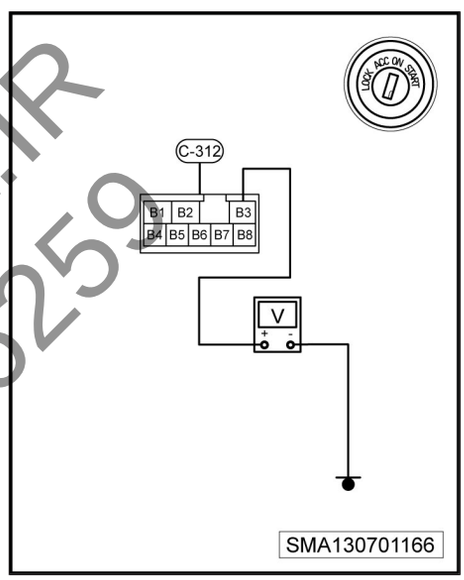
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Check if the power supply fuse FB09/FB10 in the anti-theft control module has a fault.
   - If yes, replace the corresponding fuses. ■
   - If not, go to step 2.

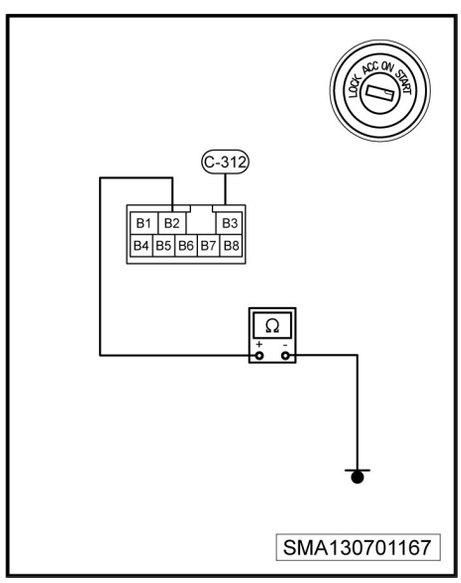
2. Check if the voltage between the pin B4 of the anti-theft control module connector C-312 and the ground is the battery voltage from the anti-theft control module connector side.
   - If yes, go to step 3.
   - If not, check if the power supply line of the pin B4 of the anti-theft control module connector C-312 has the following faults such as short circuit, open circuit, excessive resistance and virtual connection. ■



3. Turn the ignition switch to the ON/START position, and check if the voltage between the pin B3 of the anti-theft control module connector C-312 and the ground is the battery voltage from the anti-theft control module connector side.
   - If yes, go to step 4.
   - If not, check if the power supply line of the pin B3 of the anti-theft control module connector C-312 has the following faults such as short circuit, open circuit, excessive resistance and virtual connection. ■



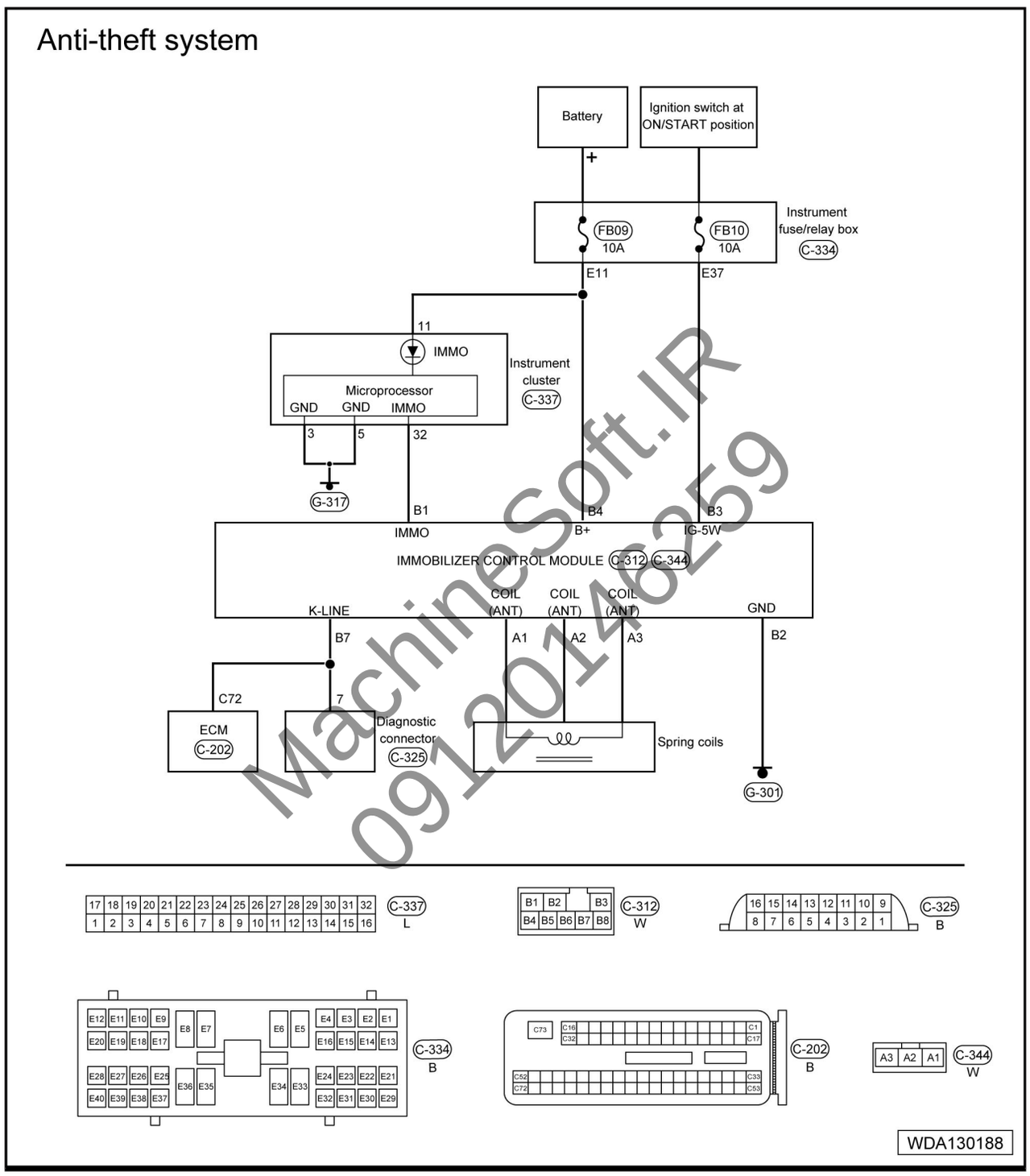
4. Check if the ground line of the pin B2 of the anti-theft control module connector C-312 is normal.
   - If yes, go to step 5.
   - If not, repair the faulty line. ■



5. Replace the anti-theft control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.
- If not, the fault has been rectified. ■

17.4.3 B1005 K line open circuit to ground



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1005	K line open circuit to ground	The ignition switch in the ON/START position	The K line of anti-theft control module short or open	• Failure of the wiring harnesses or connector

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
			circuit detected by the engine control module	• Failure of the anti-theft control module

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

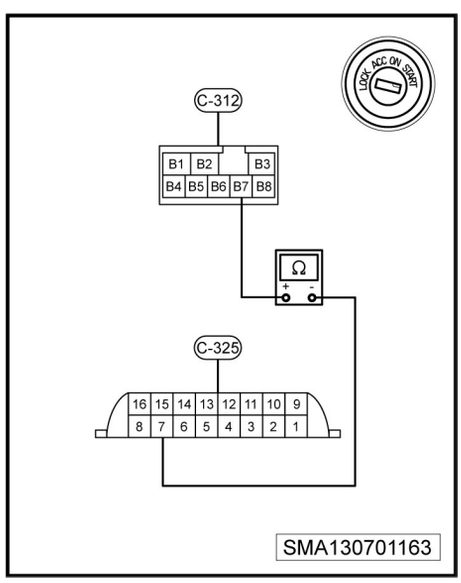
Diagnosis procedures:

Note

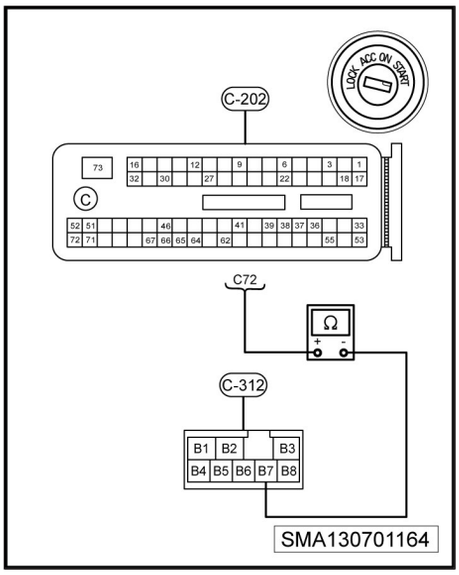
- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the LOCK position, and check if the lead between the pin B7 of the anti-theft control module connector C-312 and the pin 7 of the diagnostic connector C-325 is conducted.

- If yes, go to step 2.
- If not, check if the lead between the pin B7 of the anti-theft control module connector C-312 and the pin 7 of the diagnostic connector C-325 has open circuit and repair or replace the defective lead. ■



2. Turn the ignition switch to the LOCK position, and check if the lead between the pin B7 of the anti-theft control module connector C-312 and the pin C72 of the engine control module connector C-202 is conducted.
   - If yes, go to step 3.
   - If not, check if the lead between the pin B7 of the anti-theft control module connector C-312 and the pin C72 of the engine control module connector C-202 has open circuit and repair or replace the defective lead. ■



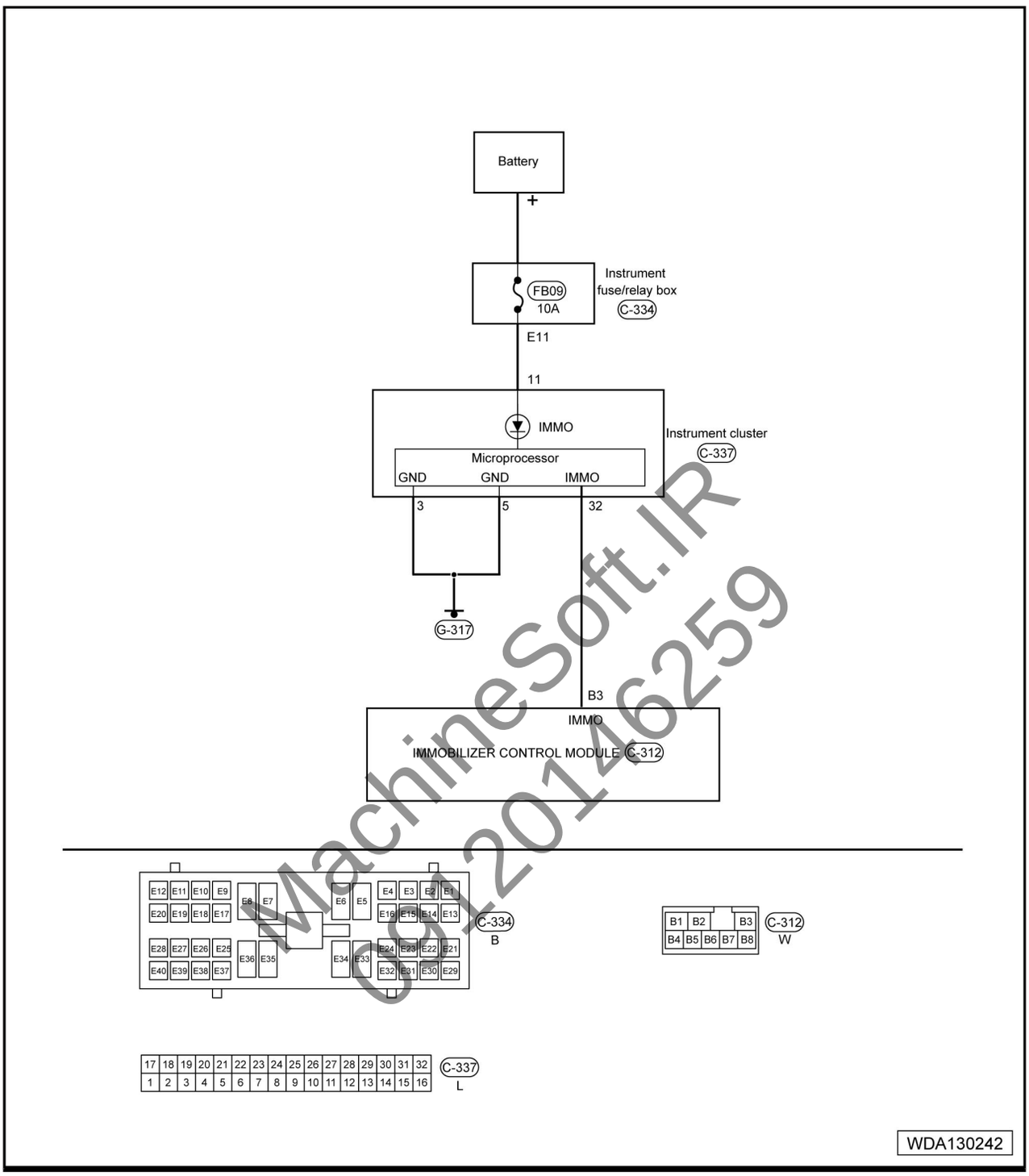
3. Check if the power supply line and the ground line of the anti-theft control module are normal.
   - If yes, go to step 4.
   - If not, repair the faulty line. ■

4. Replace the anti-theft control module, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, go to step 5.
   - If not, the fault has been rectified. ■

5. Check if the power supply line and ground line of the engine control module are normal.
   - If yes, go to step 6.
   - If not, repair the faulty line. ■

6. Replace the engine control module, carry out the function test again, and read the fault code to verify if it exists or not.
   - If yes, find the fault cause from other symptoms.
   - If not, the fault has been rectified. ■

17.4.4 B1017 Failure of warning lamp output



Fault code definition and fault causes

DTC	DTC definition	DTC test condition	DTC triggering condition	Possible causes
B1017	Failure of warning lamp output	The ignition switch in the ON/START position	The anti-theft indicator circuit short or open circuit detected by the instrument cluster	• Failure of the wiring harnesses or connector • Failure of the anti-theft control module • Failure of the instrument cluster

DTC test procedures:

Please confirm that the battery voltage is normal before performing the following procedures.

- Turn off the ignition switch.
- Connect the X-431 diagnostic device to the DLC and perform the test with the updated software.
- Turn on the ignition switch.
- Measure and clear the DTC with the diagnostic device.
- Turn off the ignition switch and turn it on again after 3 to 5 seconds.
- Measure the DTC with the diagnostic device.
- If a DTC is detected, it indicates that the vehicle is faulty, please perform corresponding diagnostic procedures.

  If no DTC is detected, it indicates that the previously detected faults are sporadic. (Please refer to the chapters on the sporadic DTC and check faults)

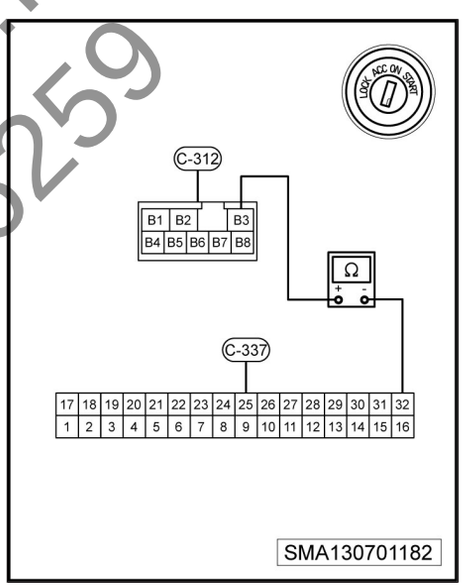
Diagnosis procedures:

Note

- Please verify again if the DTC and its symptoms are present after fault is rectified.

1. Turn the ignition switch to the LOCK position, and check if the lead between the pin B3 of the anti-theft control module connector C-312 and the pin 32 of the instrument cluster connector C-337 is conducted.

- If yes, go to step 2.
- If not, check if the lead between the pin B3 of the anti-theft control module connector C-312 and the pin 32 of the instrument cluster connector C-337 has open or short circuit and repair or replace the defective lead. ■



2. Check if the power supply line and the ground line of the anti-theft control module are normal.

- If yes, go to step 3.
- If not, repair the faulty line. ■

3. Check if the power supply line and the ground line of the instrument cluster are normal.

- If yes, go to step 4.
- If not, repair the faulty line. ■

4. Replace the anti-theft control module, carry out the function test again, and read the fault code to verify if it exists or not.

- If yes, find the fault cause from other symptoms.

- If not, the fault has been rectified. ■

18 Reversing Radar System

18.1 General information

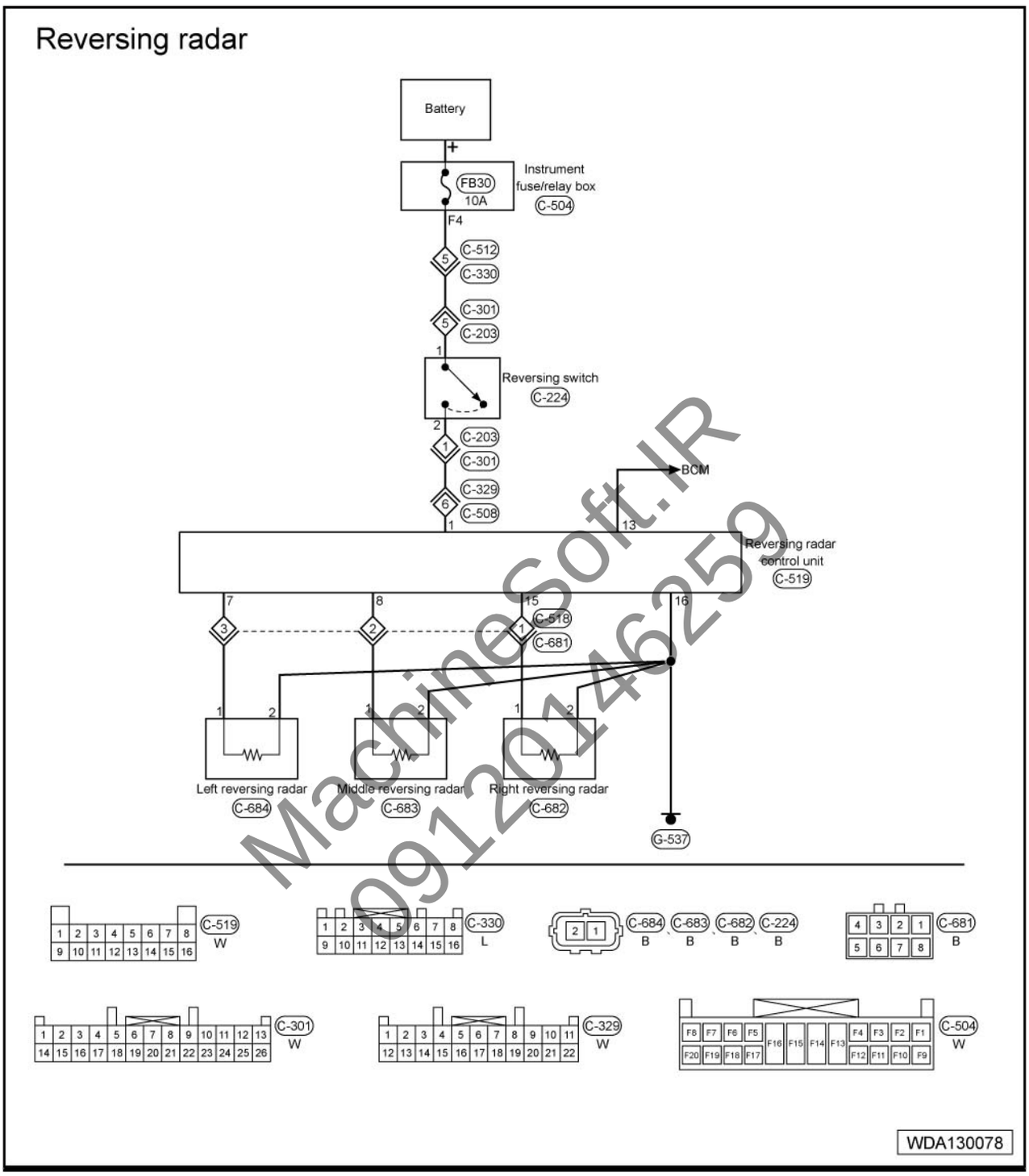
18.1.1 Description

- When the shift lever is in the R position, the reversing radar sensor will send the ultrasonic waves to detect objects near the vehicle and send out a warning tone. As the vehicle approaches the objects closer and closer, the warning tone frequency will be increased.
- Power supply transmits power to the reversing radar system via the reversing switch. When the shift lever is in the R position, turn on the reversing switch to activate the reversing radar control module. During this time, the reversing radar sensor will sense the obstacles while sending the signals to the reversing radar control module and it will send the distance message to the BCM through the LIN bus. Then the BCM will transmit it to the instrument cluster via the CAN bus. The instrument cluster controls the frequency of buzzer beeping to give a sound alert.

18.2 Circuit diagram

07

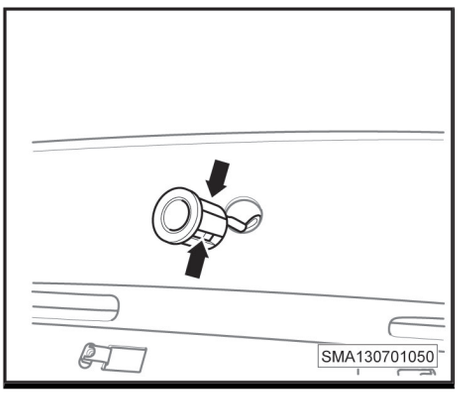
Reversing radar system (page 1)



18.3 Removing and installing the reversing radar sensor

Removal

1. Remove the rear bumper assembly => refer to page 848.
2. Pull out the reversing radar sensor connector.
3. Press the fixing clip of the reversing radar sensor (-arrow-) and push the sensor out of the bumper.



Installation

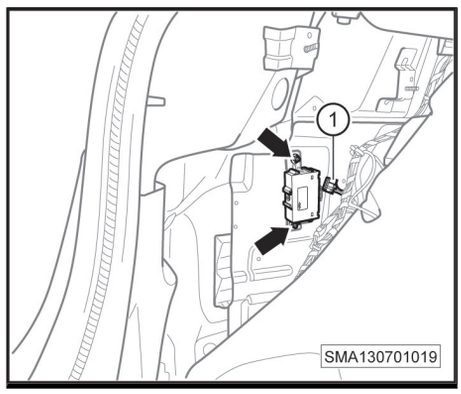
Installation shall follow the reverse sequence of the removal procedure.

18.4 Removing and installing the reversing radar control module

Two-box model

Removal

1. Remove the left luggage compartment trim => refer to page 783.
2. Disconnect the radar control module connector (-1-).
3. Unscrew the fixing bolts of the control module (-arrow-) and remove the control module.



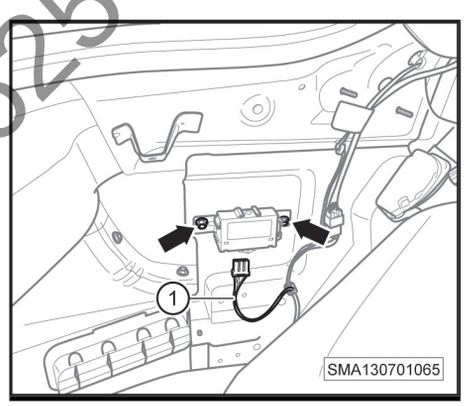
Installation

Installation shall follow the reverse sequence of the removal procedure.

Three-box model

Removal

1. Remove the left luggage compartment trim => refer to page 783.
2. Disconnect the radar control module connector (-1-).
3. Unscrew the fixing bolts of the control module (-arrow-) and remove the control module.



Installation

Installation shall follow the reverse sequence of the removal procedure.

19 Audio System

19.1 General information

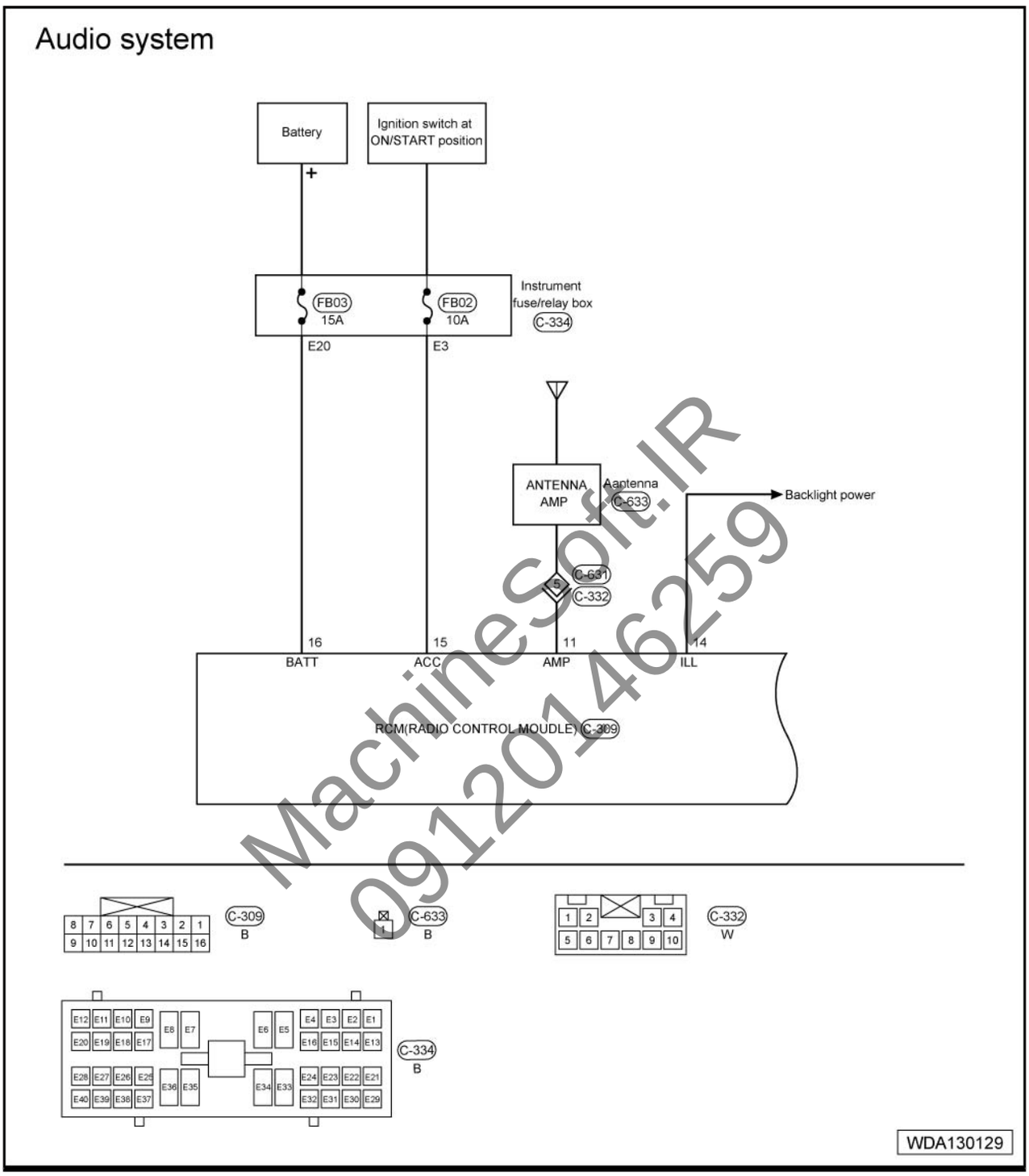
19.1.1 Description

Audio system is powered by the battery via the ignition switch. When the ignition switch is in the ACC position, the audio system can be switched on. The radio antenna receives the electrical wave signals of audio and transmits them to the audio system for processing. Then the sound will be produced by the speaker. The audio system consists of the following components:

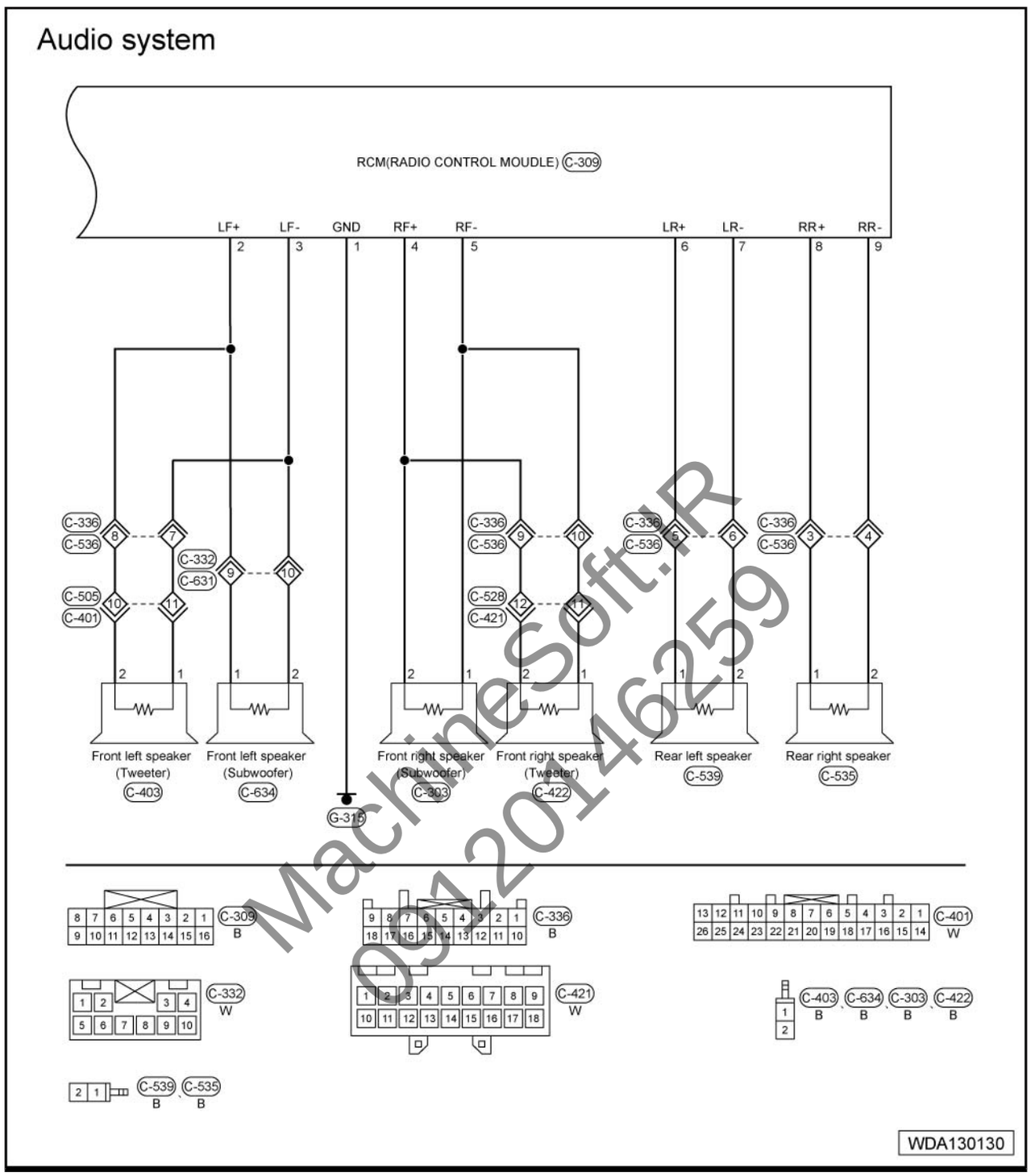
- Audio device
- Two front speakers
- Two A pillar tweeters
- Two rear speakers
- Radio antenna assembly

19.2 Circuit diagrams

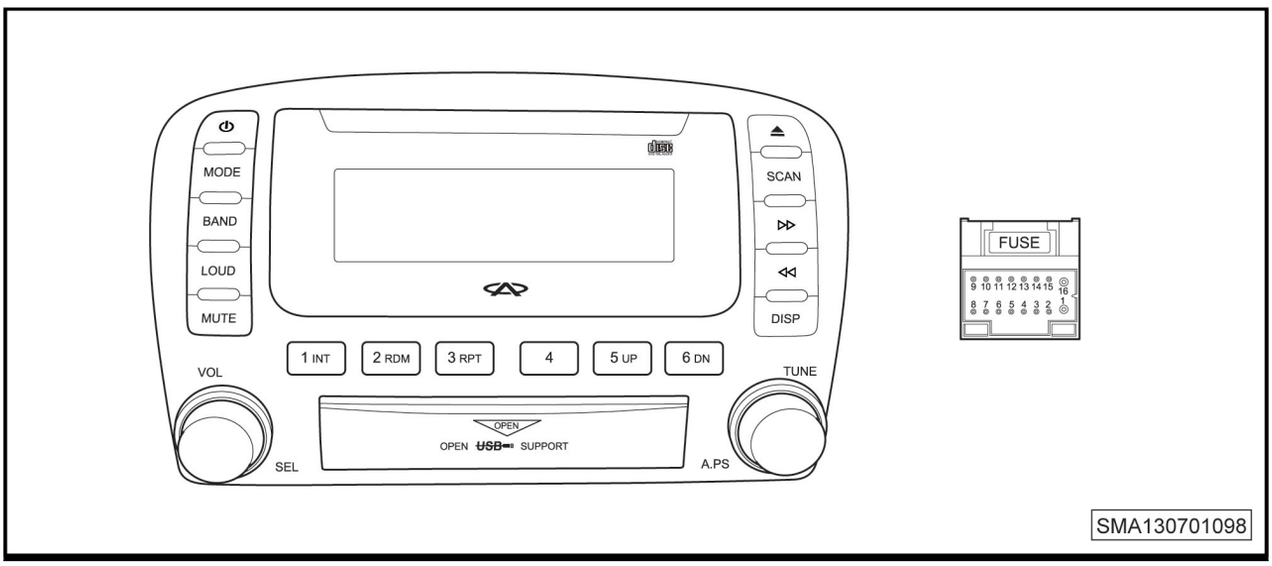
Audio system (page 1)



Audio system (page 2)



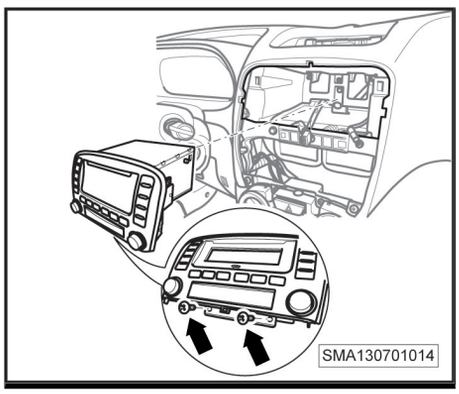
19.3 Definition of audio system module pin



Pin No.	Function	Pin No.	Function
1	Power supply	9	Rear right speaker (negative)
2	Front left speaker (positive)	10	Not used
3	Front left speaker (negative)	11	Automatic antenna
4	Front right speaker (negative)	12	Not used
5	Front right speaker (positive)	13	Steering wheel button signal
6	Rear left speaker (positive)	14	Backlight power
7	Rear left speaker (negative)	15	Power supply
8	Rear right speaker (positive)	16	Power supply

19.4 Removing and installing the radio

Removal



1. Remove the central control panel air outlet assembly .
2. Unscrew the lower fixing screws of the radio (-arrow-).
3. Remove the radio assembly and disconnect the radio connector.

Installation

Installation shall follow the reverse sequence of the removal procedure.

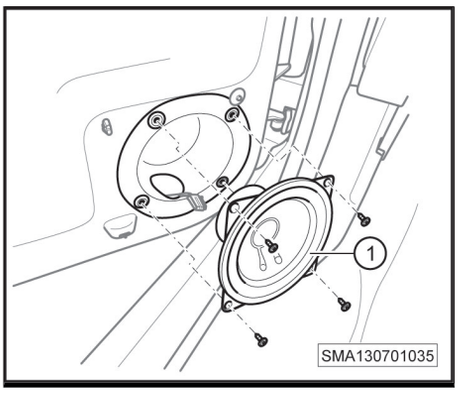
07

19.5 Speaker

19.5.1 Removing and installing the front speaker

Removal

1. Remove the front door interior trim assembly => refer to page 764.
2. Unscrew the fixing screws of the speaker (-1-).
3. Disconnect the speaker wiring harness connector and take out the speaker (-1-).



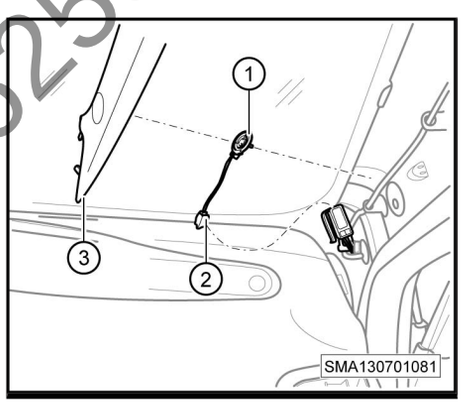
Installation

Installation shall follow the reverse sequence of the removal procedure.

19.5.2 Removing and installing the A pillar tweeter

Removal

1. Remove the A pillar upper trim .=> refer to page 771
2. Pull out the tweeter connector (-2-).
3. Carefully lever out the tweeter (-1-) from the A pillar upper trim (-3-).



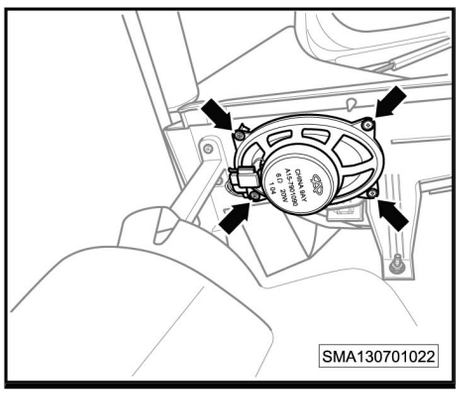
Installation

Installation shall follow the reverse sequence of the removal procedure.

19.5.3 Removing and installing the rear speaker

Removal

1. Disconnect the rear speaker connector.
2. Unscrew the screws of the speaker (-arrow-) and take out the rear speaker.



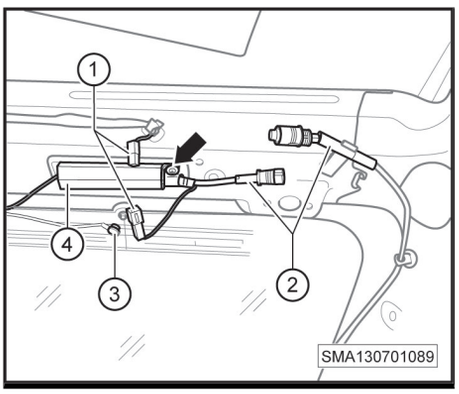
Installation

Installation shall follow the reverse sequence of the removal procedure.

07

19.6 Removing and installing the antenna amplifier

1. Remove the roof .
2. Disconnect the connector (-2-) between the amplifier and antenna.
3. Disconnect the antenna amplifier connector (-1-).
4. Disconnect the window antenna connector (-3-).
5. Unscrew the fixing screws of the amplifier (-arrow-) and remove the antenna amplifier.



Installation

Installation shall follow the reverse sequence of the removal procedure.

19.7 General fault diagnosis of the audio system

Caution

- The audio system is powered by a DC 12V power.
- Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable during the removal and installation of the components.
- During the use and maintenance of the audio system, pay attention to protecting the display.
- When inspecting the general faults of audio system, you shall carry out inspection in a nearby open area without obstacles.

How to carry out the fault diagnosis when no radio signal is received or the radio signal is very weak.

1. Check if the radio can receive the radio signals properly?

- If yes, the audio system works properly.
- If not, go to step 2.

2. Check if the antenna connector is inserted into the radio correctly?

- If not, go to step 3.
- If not, reinsert the antenna connector into the radio correctly.

3. Check if the antenna is conducted?

- If yes, go to step 4.
- If not, replace the antenna lead.

4. Check if the circuit between the central signal wire peripheral terminal and the audio device housing is conducted?

- If yes, replace the antenna amplifier.
- If not, replace the audio device.

How to carry out the fault diagnosis when there is noise in the radio.

1. Check the noise level of the audio system and verify if it can receive any radio signal properly?

- If yes, go to step 2.
- If not, the audio system works properly.

2. Check if the noise of radio is caused by the electrical wave interference?

- If yes, the audio system works properly.
- If not, replace the audio device.

If the CD eject button is pressed and the CD cannot removed from the driver, please carry out the fault diagnosis for this.

1. Press the CD eject button and check if the CD can be ejected properly?

- If yes, it works properly.
- If not, go to step 2.

2. Check if it can be fully ejected from the audio device and not jammed?

- If yes, go to step 3.
- If not, replace the audio device.

3. Check if the antenna is conducted?

- If yes, replace the audio device.
- If not, replace the CD.

How to carry out the fault diagnosis when the CD cannot be inserted normally.

1. Insert CD into the audio device and check if the same symptom occurs again?

- If yes, it works properly.
- If not, go to step 2.

2. Insert another CD and check if it can be inserted normally?

- If yes, replace the CD.
- If not, replace the audio device.

How to carry out the fault diagnosis when the CD play is interrupted.

1. Insert a CD and check if the same symptom occurs again?

- If yes, go to step 2.
- If yes, it works properly.

2. Check if the CD has any corrupted point?

- If yes, insert a normal CD and check it again.
- If not, go to step 3.

3. Check if the same symptom occurs again.

- If yes, replace the audio device.
- If yes, it works properly.

How to carry out the fault diagnosis when you cannot hear any sound.

1. Check if only one speaker cannot function normally?

- If yes, go to step 2.
- If not, go to step 5.

2. Check if the dead speaker is damaged?

- If yes, replace the speaker and check it again.
- If not, go to step 3.

3. Check if the speaker connector is connected with the speaker firmly?

- If yes, go to step 4.
- If not, check it again and this may be a temporary fault.

4. Remove the audio device connector and speaker connector, and check if they are conducted?

- If yes, go to step 5.

- If not, repair the lead.

5. Check if the audio device connector is connected with the audio device firmly?

- If yes, replace the audio device.
- If not, reconnect the audio device connector and check it again.

How to carry out the fault diagnosis if the sound is low or distorted.

1. Check if all CDs have the symptom?

- If yes, go to step 2.
- If not, replace the CDs.

2. Check if the speakers are damaged?

- If yes, replace the speakers.
- If not, replace the audio device.

20 Cigarette Lighter

20.1 General information

20.1.1 Description

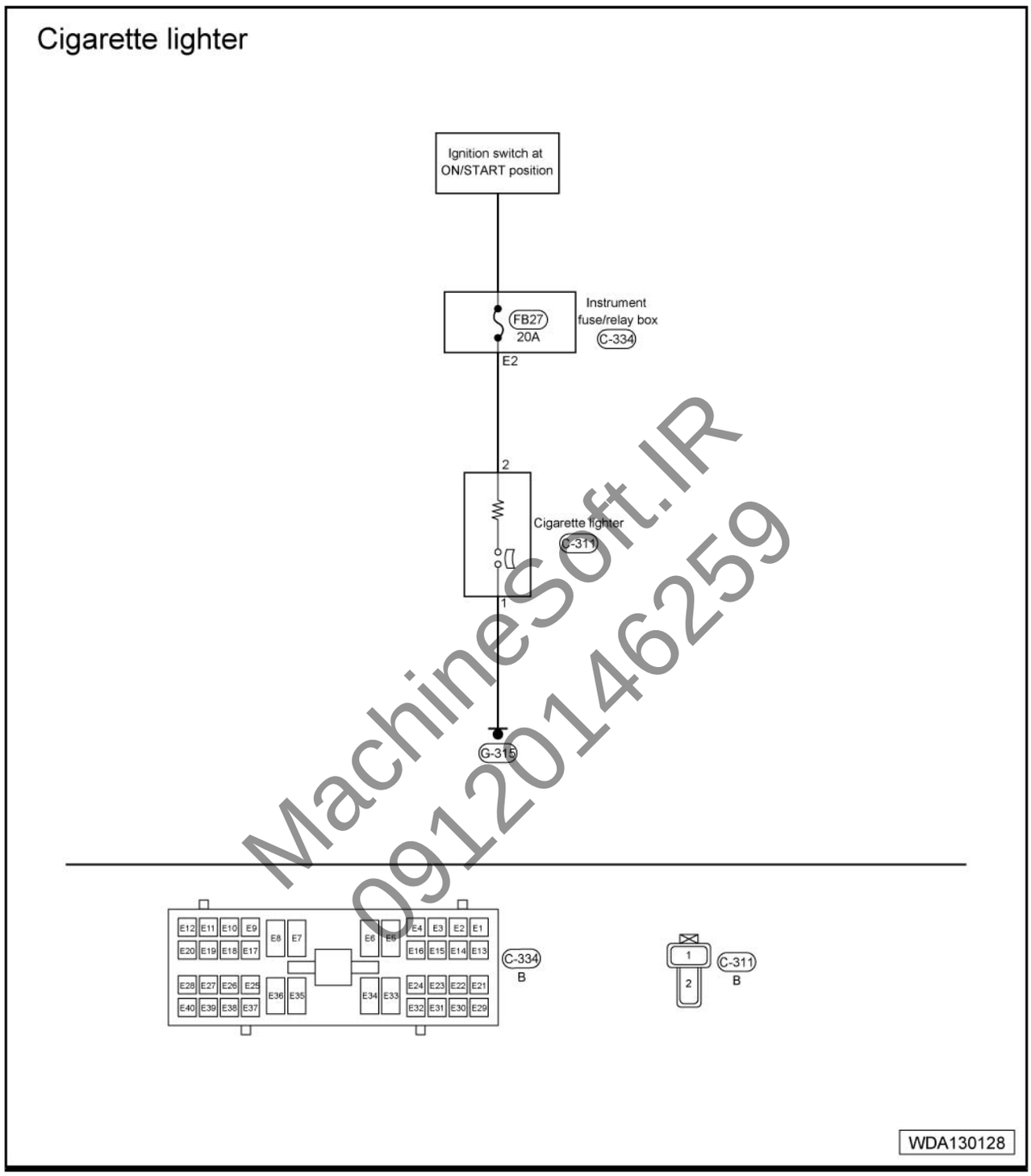
- The cigarette lighter is located under the console, next to the ashtray, which can be used as a 12V onboard socket.
- Turn the ignition switch to the ON position when using cigarette lighter socket.

Caution

- The rated voltage of the cigarette lighter socket is 12V DC. Do not use any electrical equipment whose voltage is beyond the rated voltage.

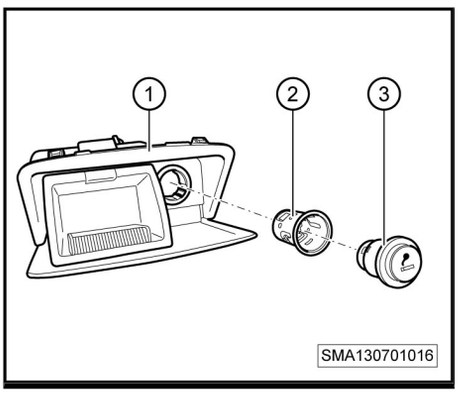
20.2 Circuit diagram

Cigarette lighter (page 1)



20.3 Removing and installing the cigarette lighter

Removal



1. Remove the ashtray assembly (-1-) from the front section of shift lever and disconnect the cigarette lighter connector.
2. Remove the cigarette lighter (-3-), press the fixing clip of the ashtray and lever out the cigarette lighter socket (-2-).

Installation

Installation shall follow the reverse sequence of the removal procedure.

21 CAN Bus

21.1 General information

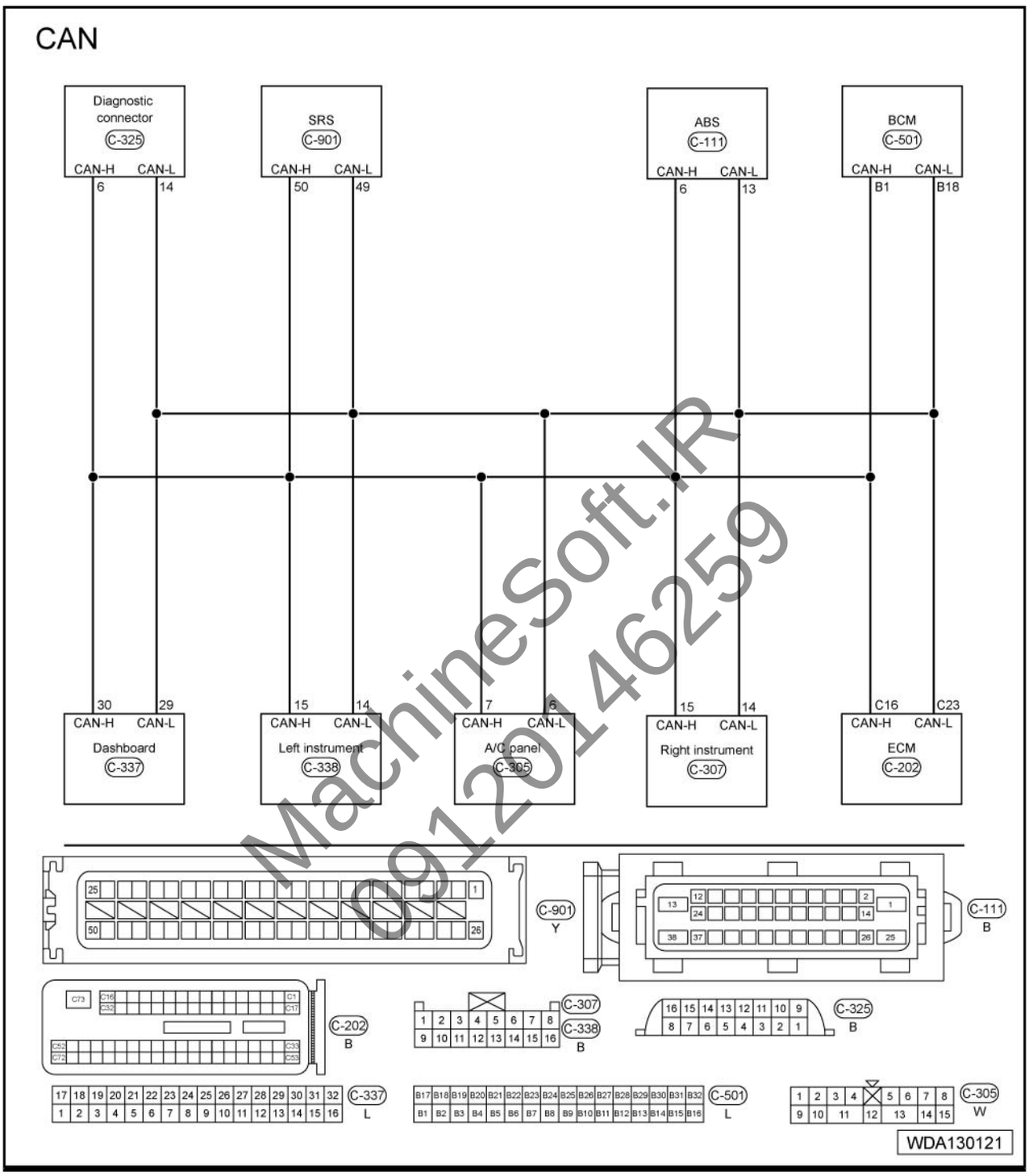
21.1.1 Description

- CAN bus is the abbreviation of controller area network (CAN) and it is a multi-channel communication system divided into the CAN-H and CAN-L (high speed data cables and low speed data cables). The system is connected to different control modules inside the vehicle and simultaneously send and receive information data at a high speed, thus achieving mutual communication of each control module and sharing the overall vehicle information data timely and reliably.
- The data transmission of the controller area network (CAN) employs the international standardized serial communication protocol. Its data signals use variable pulse width modulation signals, the change of the signal voltage differences between the high and low speed CAN buses can generate data signals with different lengths and these signals are transmitted to each control module for processing.

21.2 Circuit diagram

07

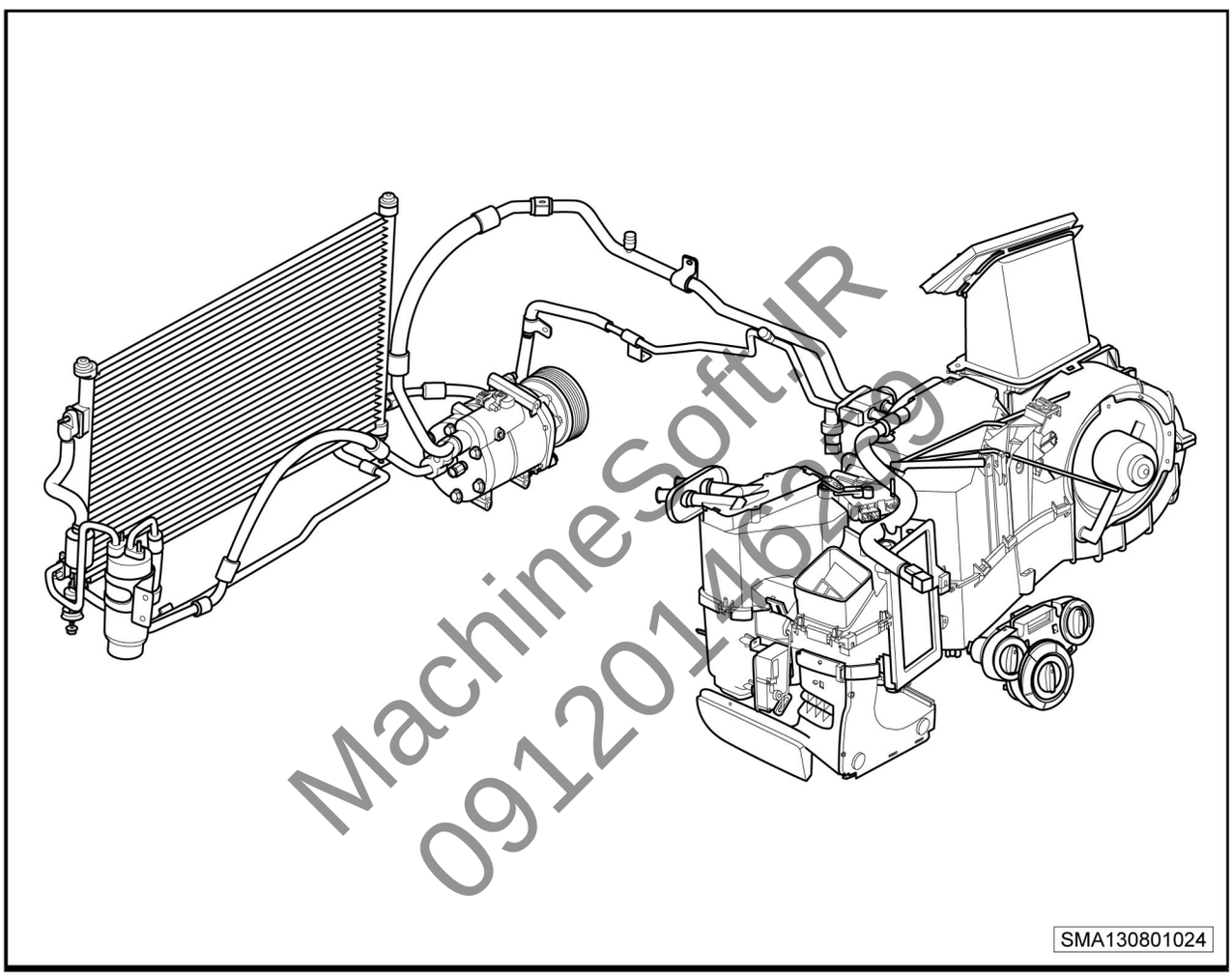
CAN bus (page 1)



0801 Manual Control A/C

1 General Information

1.1 Overview



- The HVAC system is used for heating, ventilating and air conditioning within the vehicle, which provides comfort and safety to occupants, lightens the fatigue of the driver and thus improves the driving safety.
- The HVAC system consists of the following components:

  a. Condenser
  b. A/C compressor
  c. Reservoir dryer
  d. Air filter assembly
  e. HVAC assembly
  f. A/C control panel assembly
  g. Sensor
  h. A/C pipe
  i. Servo motor

1.2 Important notes

- The working environment and tools must be kept clean and tidy when repairing the A/C system.
- The battery negative cable must be disconnected before repairing the heating system.
- Protective measures must be taken to avoid any contact or inhaling when operating the refrigerant.
- Good ventilation must be kept in A/C pipe repairing, in which the welding of A/C pipe containing refrigerant is not allowed.
- Seal plug must be applied while disconnecting the A/C system pipe to prevent water infiltration from the air.
- It is prohibited to discharge the refrigerant directly into the atmosphere. And special equipment must be used to reclaim and dispose the waste refrigerant as stipulated.
- Containers with refrigerant must be kept in cool place to avoid sunlight, high temperature or even bursting expansion.
- The compressed air and refrigerant can be mixed to form flammable gas mixture.
- R-134a refrigerant and PAG56 refrigerant oil are applied in the A/C system.
- Special equipment for R-134a refrigerant should be applied in repair work.
- The system must be vacuumized for about 15 to 30 minutes before adding refrigerant.
- The refrigerant and refrigerant oil must be kept as required to prevent water in the air and other impurities infiltrating. Any unsealed refrigerant oil and expired refrigerant are not allowed to use.
- Only use the A/C system pipe seals approved by Chery Automobile Co., Ltd..

1.3 Product specifications

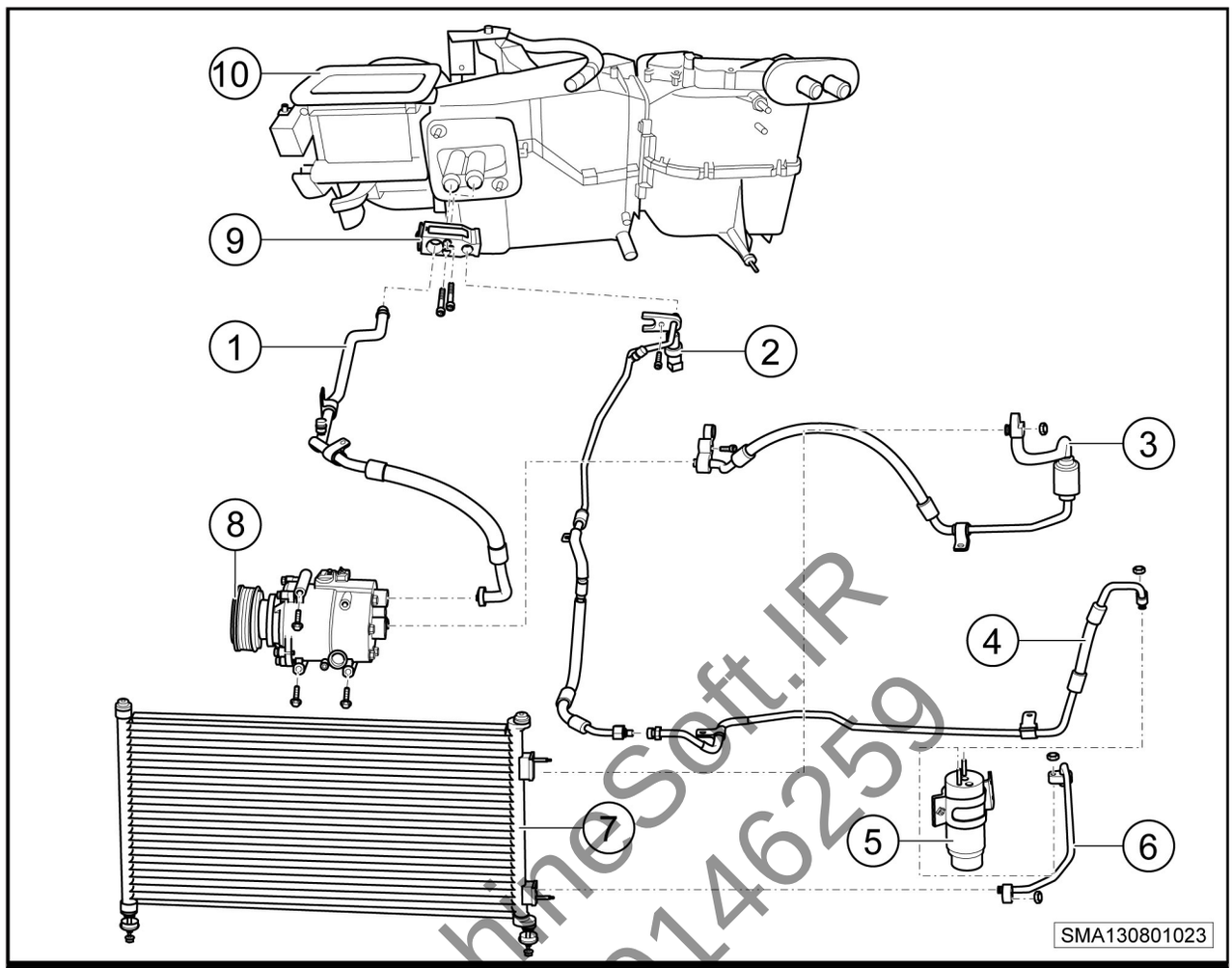
Torque specifications

Component	Torque (N·m)
Fixing bolt of the compressor	25±3
Coupling bolt of the pipe clip and the compressor	32±3
Coupling bolt between the reservoir dryer and the compressor-dryer pipe	8±1
Coupling bolt between the reservoir dryer and the dryer-condenser pipe	8±1
Assembling nut of the condenser pipe assembly	9±1
Coupling bolt of the pipe clip and the expansion valve	7.5±1
Coupling nut of the A/C pipe	12±1
Fixing bolt of the expansion valve	13±1
Fixing nut of the HVAC assembly and vehicle body	9±1
Coupling bolt of the vent and the cross car beam	6±1
Fastening bolt of the reservoir dryer	6±0.5

Basic information

Component	Refrigerant	Refrigerant oil
Type	R134a	PAG56
Filling capacity	625±10 g	150 ml

1.4 The A/C system assembly drawing

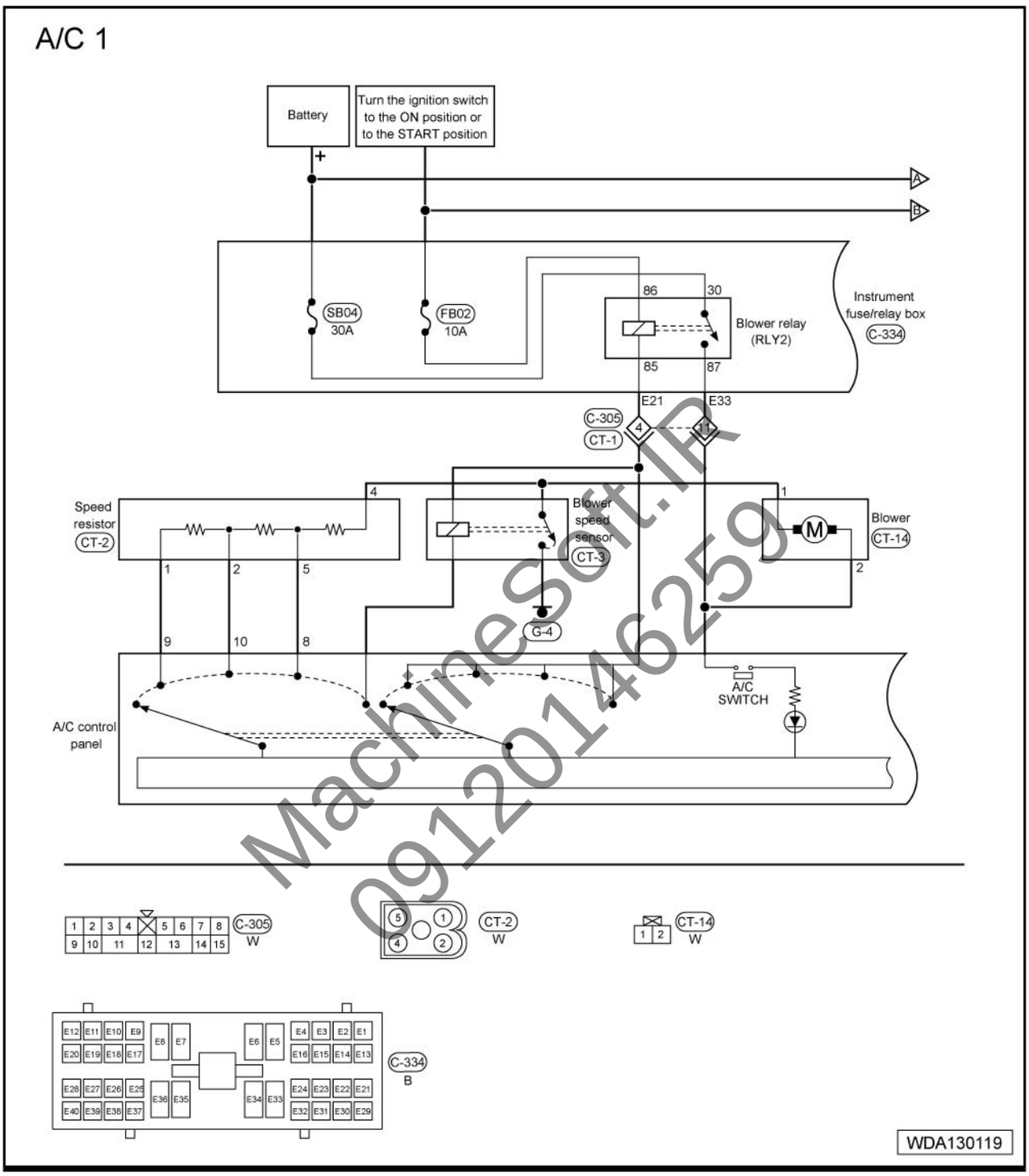


1. Connection pipe from the expansion valve to the compressor	2. Connection pipe from the expansion valve to the reservoir dryer
3. Connection pipe from the compressor to the condenser	4. Connection pipe from the expansion valve to the reservoir dryer
5. Reservoir dryer	6. Connection pipe from the reservoir dryer to the condenser
7. Condenser	8. A/C compressor
9. Expansion valve	10. HVAC assembly

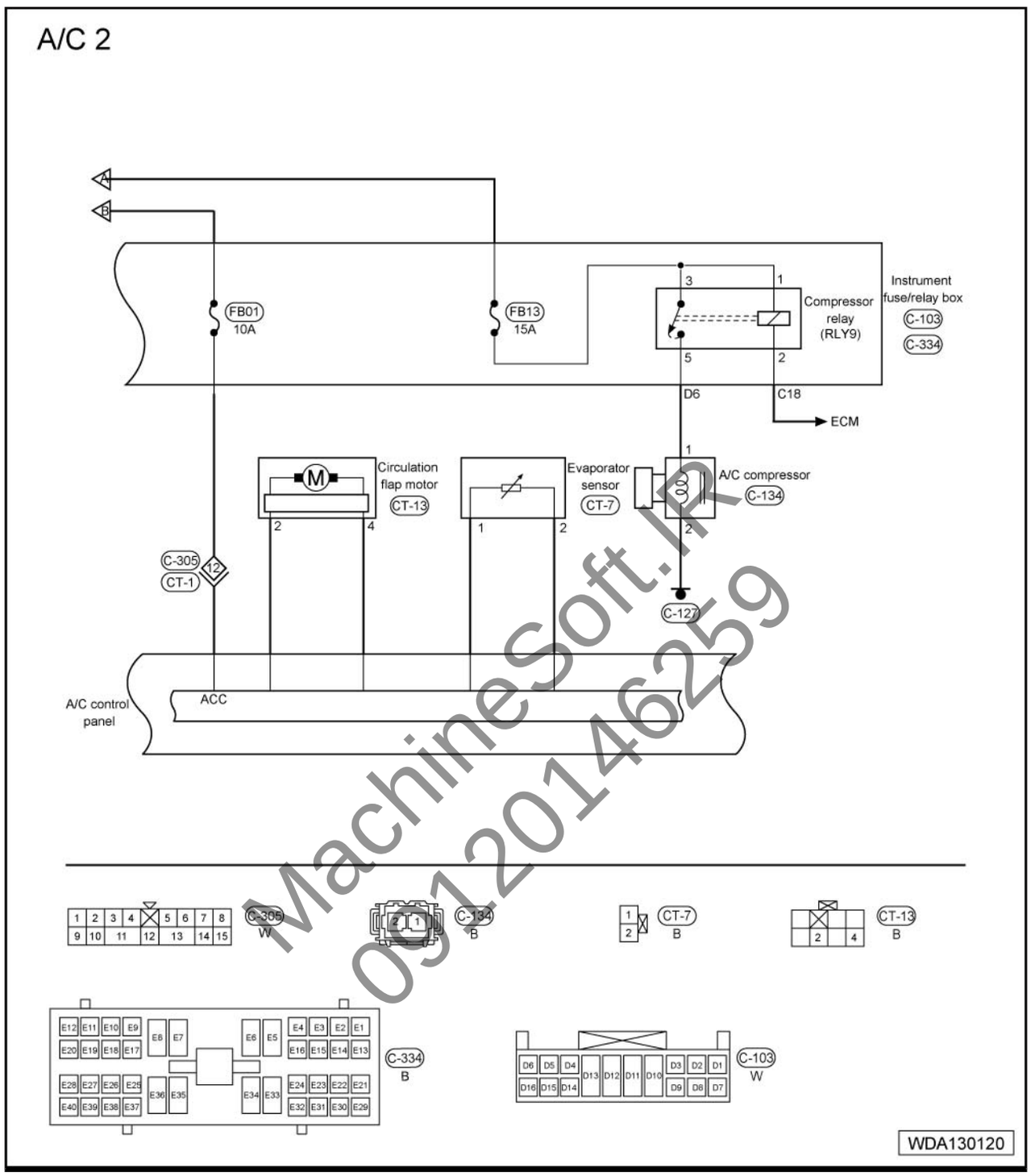
1.5 A/C circuit diagram

A/C (Page 1)

08

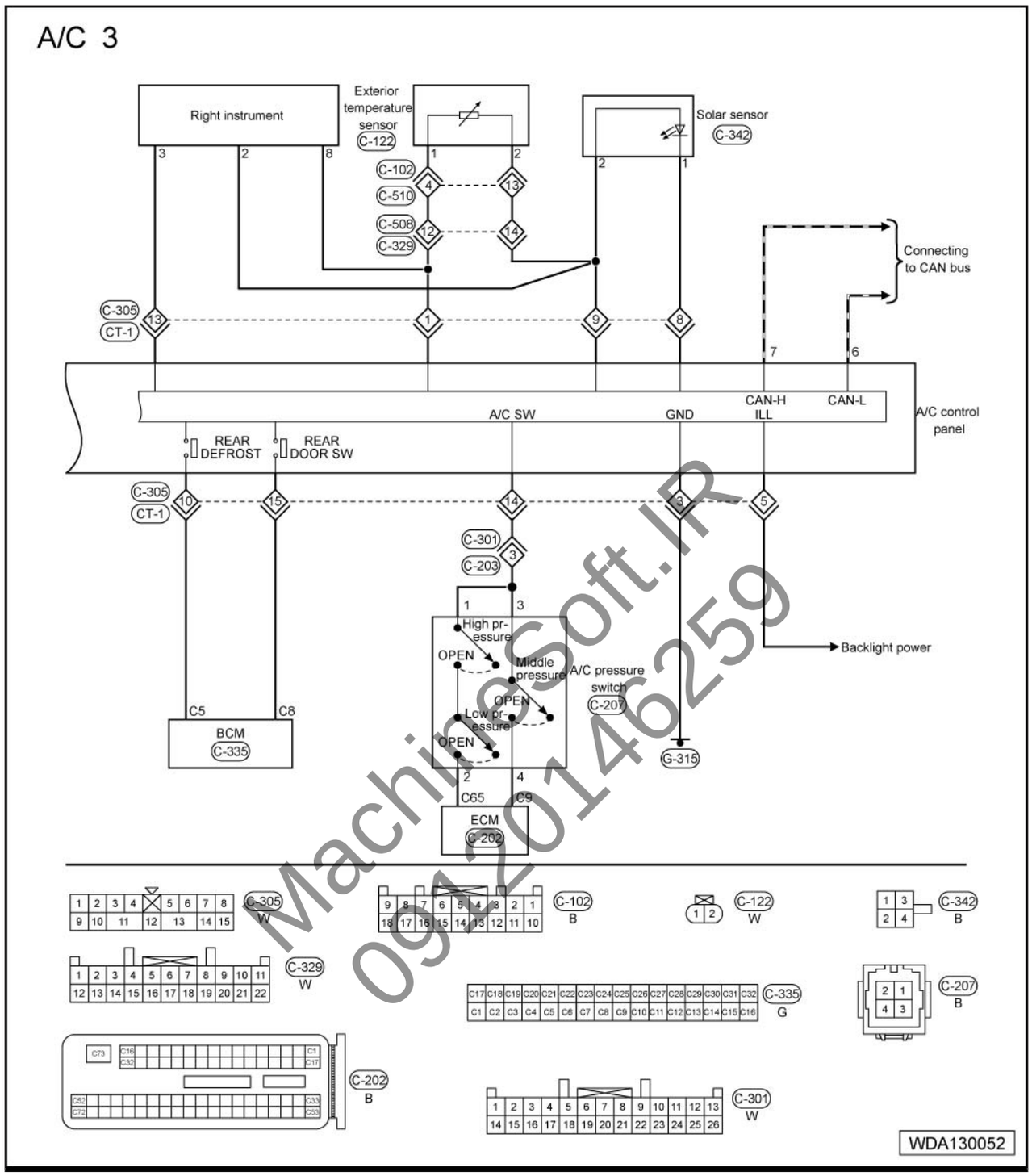


A/C (Page 2)



08

A/C (Page 3)



2 Diagnosis and Inspection

2.1 Manual control A/C fault diagnosis list

Item	Possible causes	Troubleshooting
Discontinuous cool air	Water exists in the refrigerant circulation loop	Vacuumize the A/C system and replace the reservoir dryer
	Damage to the evaporator temperature sensor	Check the evaporator temperature sensor and replace it if necessary
	Signal error of the pressure sensor	Replace the pressure sensor
	Failure of the A/C compressor	Replace the A/C compressor
Excessive pressure of the A/C system	Blockage of the condenser radiating fins	Clean or replace the condenser
	Failure of the electric fan	Inspect the electric fan and replace the electric fan assembly if necessary
	Excessive refrigerant	Adjust the refrigerant volume to the standard value
	Blockage or failure of the expansion valve	Replace the expansion valve
	Failure of the compressor	Replace the A/C compressor
Low pressure of the A/C system	Leakage in the A/C pipe	Replace the A/C pipe
	Refrigerant shortage	Adjust the refrigerant volume to the standard value
	Failure of the expansion valve	Replace the expansion valve
	Failure of the A/C compressor	Replace the A/C compressor
Failure of the air-conditioner	Failure of the relay	Replace the relay
	Fuse melted	Replace the fuse
	Failure of the sensor	Replace the faulty temperature sensor
	Inadequate pressure in the cooling system	Check the pipe for leakage and add refrigerant if necessary
	Refrigerant shortage or excess	Adjust the refrigerant volume to the standard value
	Failure of the A/C compressor	Replace the A/C compressor
	Failure of the expansion valve	Replace the expansion valve
	Failure of the A/C control panel assembly	Replace the A/C control panel assembly
Abnormal noise of the compressor	Slipping of the A/C poly V-belt	Adjust the poly V-belt
	Aging of the A/C poly V-belt	Replace the poly V-belt
	Looseness of the compressor parts	Tighten the parts
	Damage to the compressor bearing	Replace the compressor
No warm air in the A/C system	Failure of the relay	Replace the relay

Item	Possible causes	Troubleshooting
	Fuse melted	Replace the fuse
	Failure of the blower	Inspect or replace the blower
	Blockage or leakage of the heater core	Clean or replace the heater core
	Failure of the A/C control panel assembly	Replace the A/C control panel assembly
	Failure of the mixing flap servo motor	Replace the mixing flap servo motor

3 Temperature Control

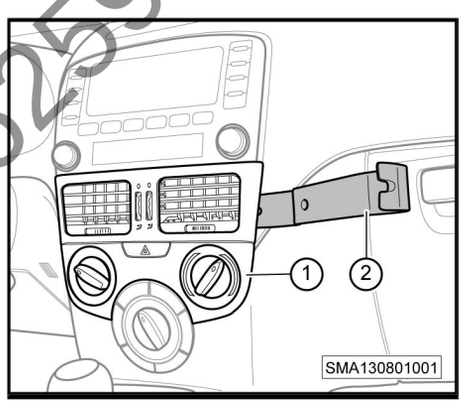
3.1 Removing and installing the A/C control panel assembly

Caution

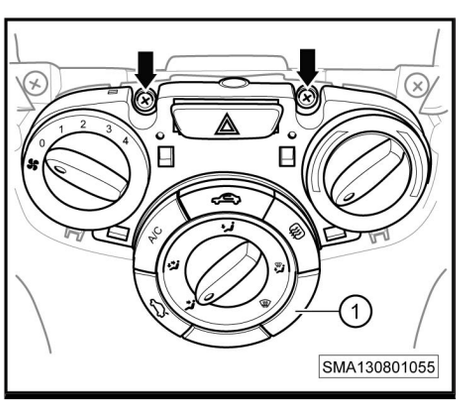
- Interior trim remover or similar tools shall be applied in removing the A/C control panel assembly.
- Be careful not to scratch the dashboard.

Removal

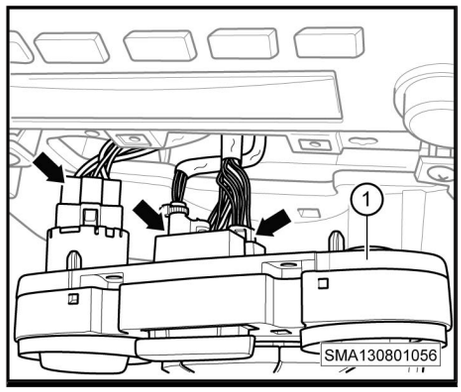
1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Lever out the central air outlet panel (-1-) with the remover (-2-).



4. Unscrew the fixing screws of the A/C control panel assembly (-arrow-).
5. Take out the A/C control panel assembly (-1-).



6. Disconnect the A/C control panel assembly connectors (-arrow-).
7. Remove the A/C control panel assembly (-1-).



Installation

- Installation shall follow the reverse sequence of the removal procedure.

3.2 Removing and installing the blower motor resistor

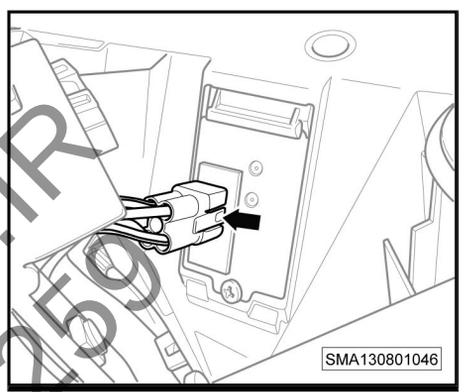
Note

- The blower motor resistor must be cooled down before being removed since it may produce high temperature in operation.

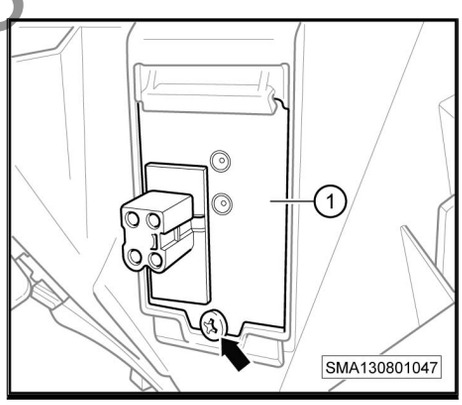
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the dashboard=> refer to page 828.

4. Disconnect the blower motor resistor connector (-arrow-).



5. Unscrew the fixing screw of the blower motor resistor (-arrow-).
6. Remove the blower motor resistor (-1-).



Installation

- Installation shall follow the reverse sequence of the removal procedure.

3.3 Removing and installing the solar sensor

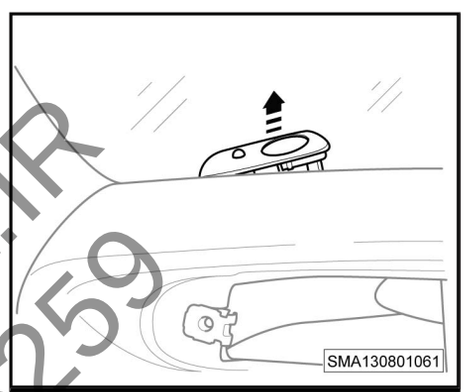
Note

- Interior trim remover or similar tools shall be applied in removing the solar sensor.
- Be careful not to scratch the dashboard.

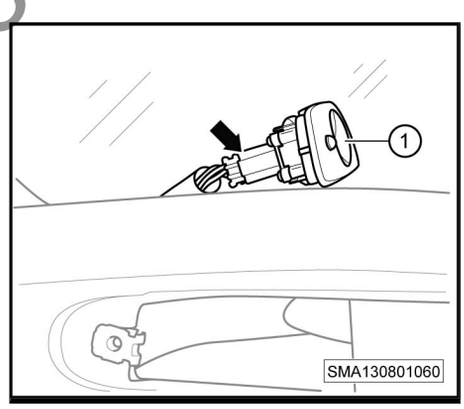
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the left instrument=> refer to page 996.

4. Lever out the solar sensor in the (-arrow-) direction.



5. Disconnect the solar sensor connector (-arrow-).
6. Remove the solar sensor (-1-).



Installation

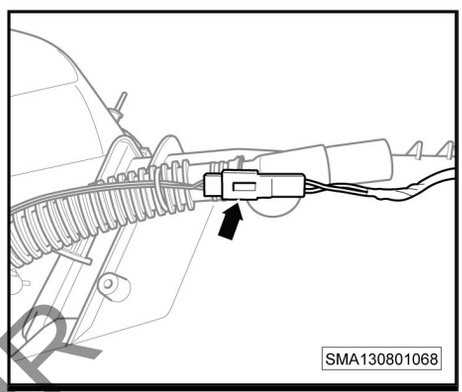
- Installation shall follow the reverse sequence of the removal procedure.

3.4 Removing and installing the interior temperature sensor

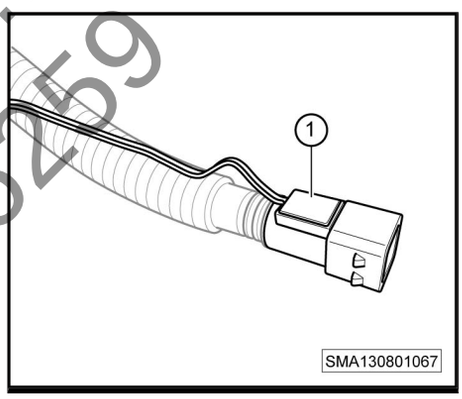
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the dashboard => refer to page 828.

4. Disconnect the interior temperature sensor connector (-arrow-).



5. Remove the interior temperature sensor (-1-).



Installation

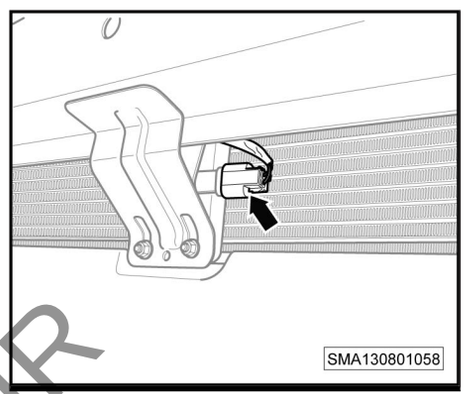
- Installation shall follow the reverse sequence of the removal procedure.

3.5 Removing and installing the exterior temperature sensor

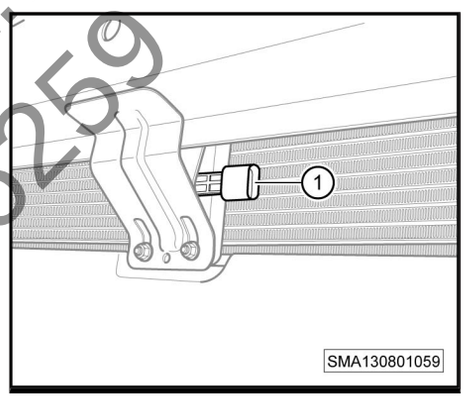
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Remove the front bumper=> refer to page 838.

4. Disconnect the exterior temperature sensor connector (-arrow-).



5. Remove the exterior temperature sensor (-1-).



Installation

- Installation shall follow the reverse sequence of the removal procedure.

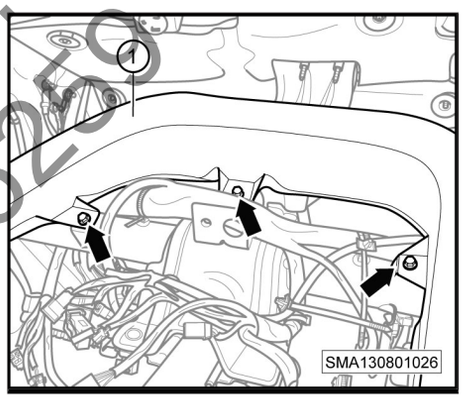
4 System Control

4.1 Removing and installing the HVAC assembly

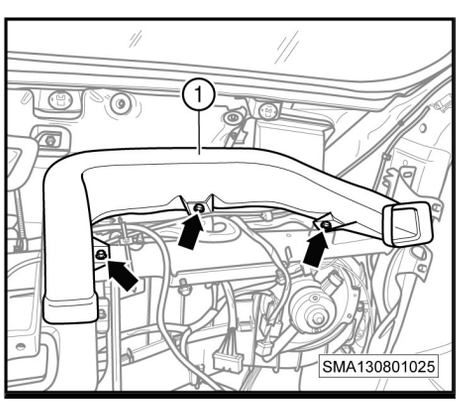
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1249.
4. Remove the expansion valve=> refer to page 1262.
5. Remove the dashboard=> refer to page 828.
6. Remove the cross car beam=> refer to page 829.

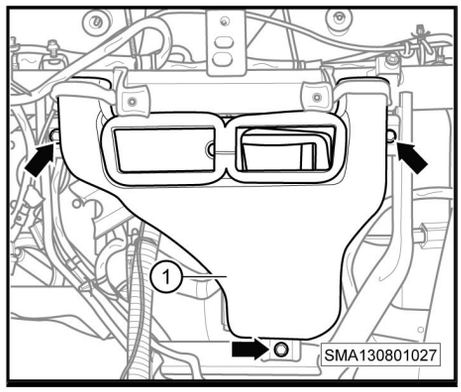
7. Unscrew the fixing bolts of the left air outlet pipe (-arrow-) and remove the left air outlet pipe (-1-).



8. Unscrew the fixing bolts of the right air outlet pipe (-arrow-) and remove the right air outlet pipe (-1-).

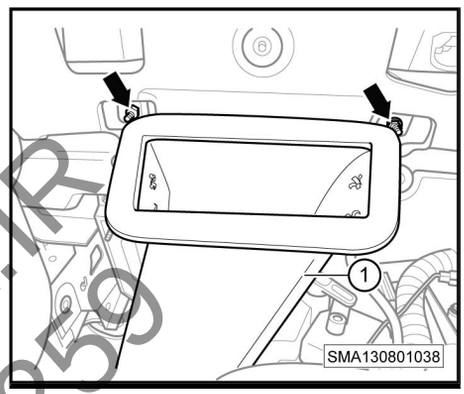


9. Unscrew the fixing bolts of the middle air outlet pipe (-arrow-) and remove the middle air outlet pipe (-1-).

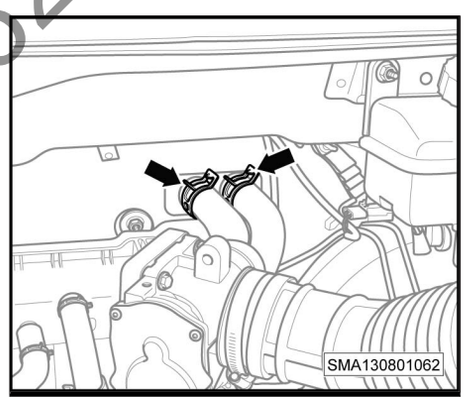


10. Remove the cross car beam=> refer to page 829.

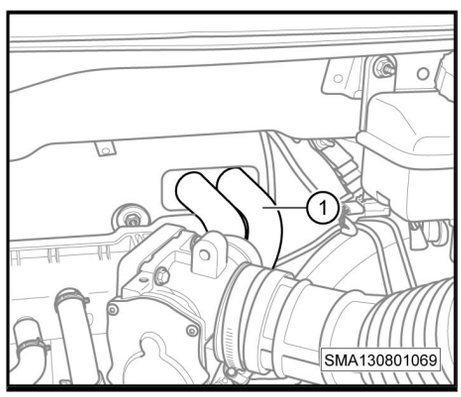
11. Unscrew the fixing nuts of the defroster air outlet pipe (-arrow-) and remove the defroster air outlet pipe (-1-).



12. Loosen the fixing clamps of the heater inlet and outlet pipe (-arrow-).

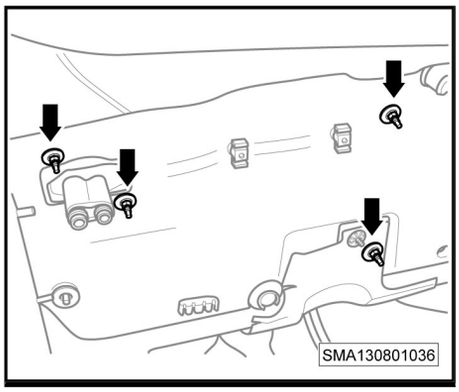


13. Remove the heater inlet and outlet pipe (-1-).

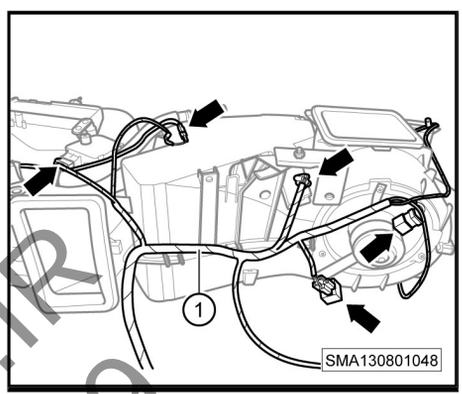


14. Unscrew the fixing nuts of the HVAC assembly in the engine compartment (-arrow-).

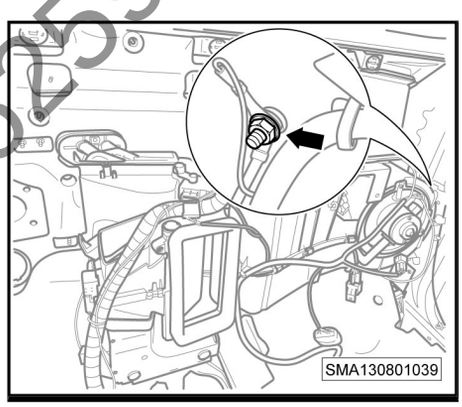
- Tightening torque of the nut: 9±1 N•m



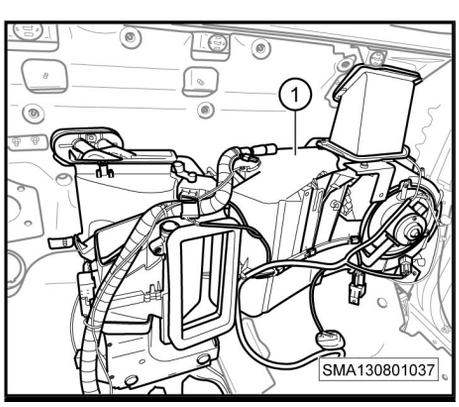
15. Disconnect the HVAC assembly wiring harness connectors (-arrow-).



16. Unscrew the earth fixing nut of the HVAC assembly wiring harness (-arrow-).



17. Remove the HVAC assembly (-1-).

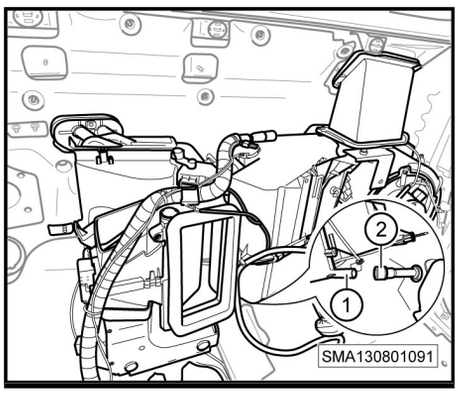


Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant .

- Only use brand new O-rings and apply compressor lubricant before installation.
- The HVAC assembly drain outlet (-1-) should be aligned with the drain pipe assembly (-2-) in installation.

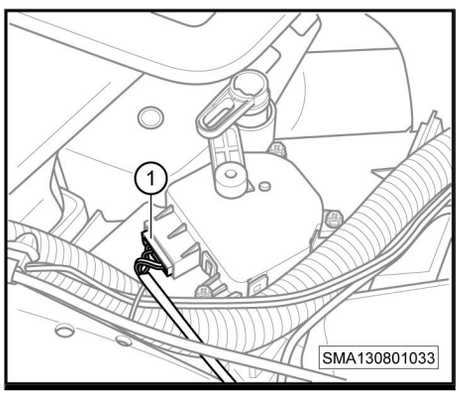


4.2 Removing and installing the mixing flap servo motor

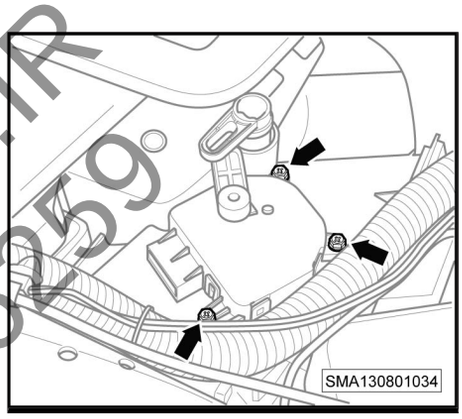
Removal

1. Remove the dashboard=> refer to page 828.

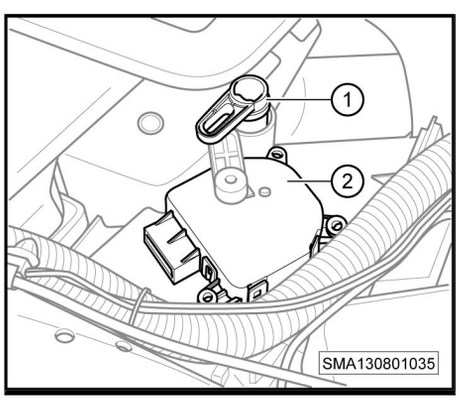
2. Disconnect the mixing flap servo motor connector (-1-).



3. Unscrew the fixing bolts of the mixing flap servo motor (-arrow-).



4. Remove the mixing flap connecting rod (-1-).
5. Remove the mixing flap servo motor (-2-).



Installation

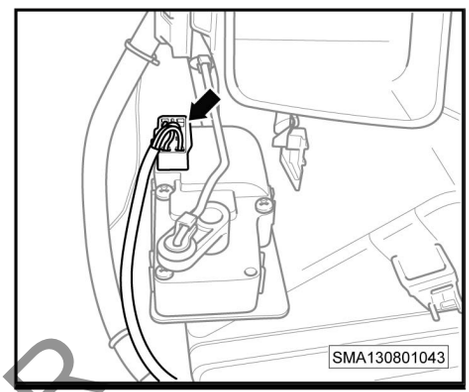
- Installation shall follow the reverse sequence of the removal procedure.

4.3 Removing and installing the defroster flap servo motor

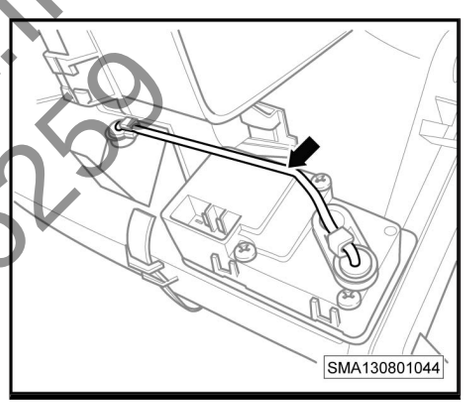
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.

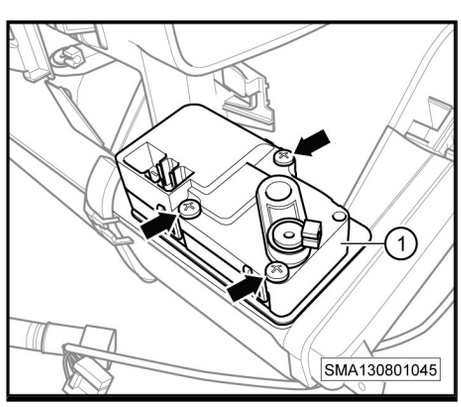
3. Disconnect the defroster flap servo motor connector (-arrow-).



4. Remove the defroster flap servo motor connecting rod (-arrow-).



5. Unscrew the fixing bolts of the defroster flap servo motor (-arrow-).
6. Remove the defroster flap servo motor (-1-).



Installation

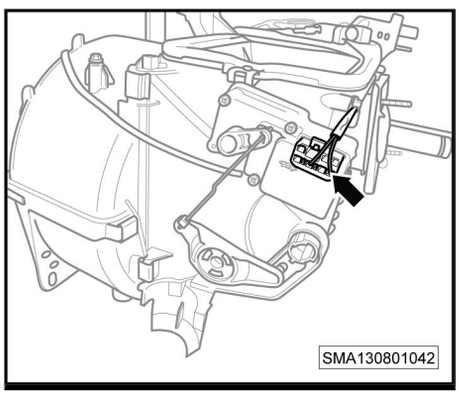
- Installation shall follow the reverse sequence of the removal procedure.

4.4 Removing and installing the inner-outer circulation servo motor

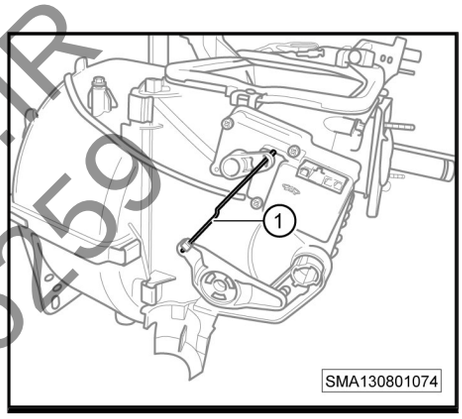
Removal

1. Remove the HVAC assembly => refer to page 1233.

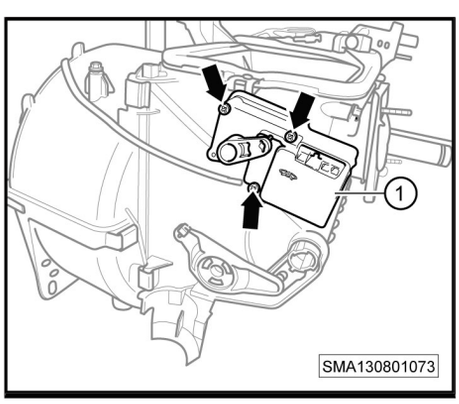
2. Disconnect the inner-outer circulation servo motor connector (-arrow-).



3. Remove the inner-outer circulation servo motor connecting rod (-1-).



4. Unscrew the fixing bolts of the inner-outer circulation servo motor (-arrow-).
5. Remove the inner-outer circulation servo motor (-1-).



Installation

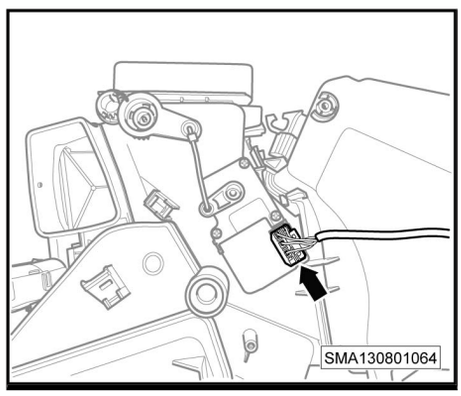
- Installation shall follow the reverse sequence of the removal procedure.

4.5 Removing and installing the central flap servo motor

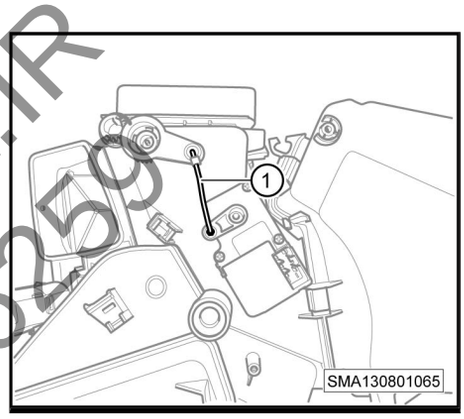
Removal

1. Remove the HVAC assembly=> refer to page 1233.

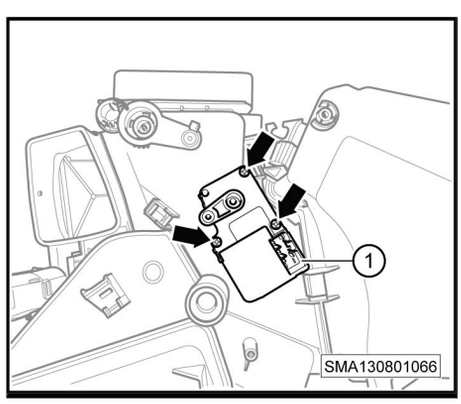
2. Disconnect the central flap servo motor connector (-arrow-).



3. Remove the central flap servo motor connecting rod (-1-).



4. Unscrew the fixing bolts of the central flap servo motor (-arrow-).
5. Remove the central flap servo motor (-1-).



Installation

- Installation shall follow the reverse sequence of the removal procedure.

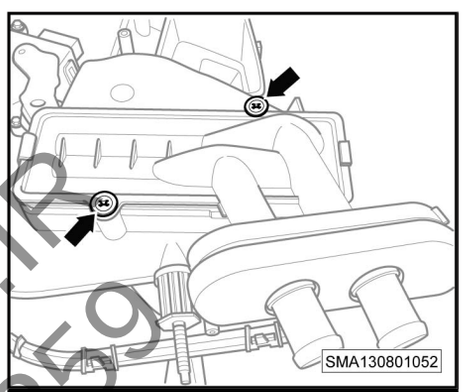
5 Ventilation

5.1 Removing and installing the heater core

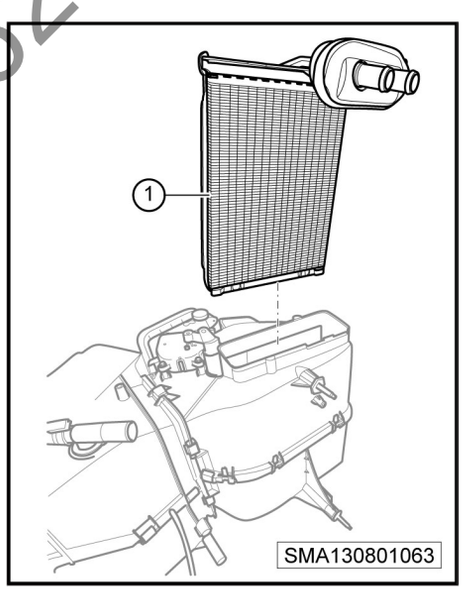
Removal

1. Remove the HVAC assembly => refer to page 1233.

2. Unscrew the fixing screws of the heater core (-arrow-).



3. Remove the heater core (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- The heater core pipes cannot be exchanged. Please pay attention to the installation position.
- Check the seals for damage.
- Install the heater core correctly.

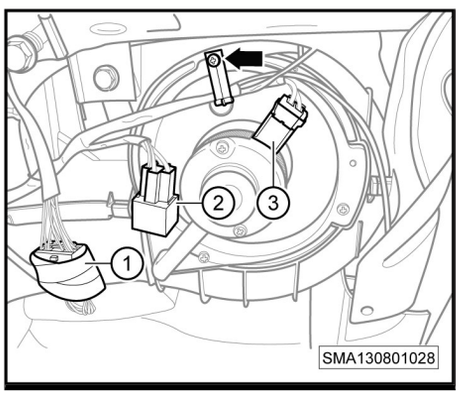
- Replace the engine coolant.

5.2 Removing and installing the blower motor

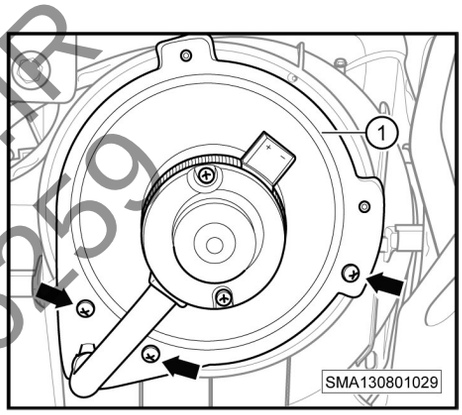
Removal

1. Remove the dashboard => refer to page 828.

2. Disconnect the connectors (-1-), (-2-) and (-3-).
3. Unscrew the fixing bolt of the wiring harness hook (-arrow-).



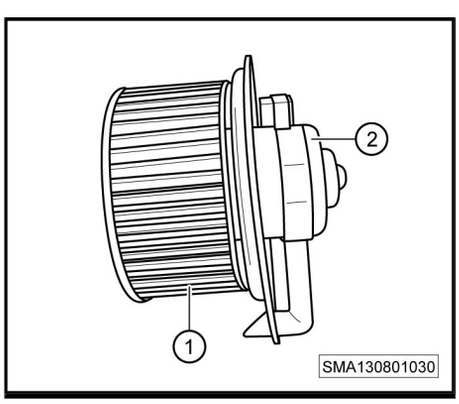
4. Unscrew the fixing bolts of the blower (-arrow-).
5. Remove the blower (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Check the blower impellers (-1-) for damage or distortion.
- Check the blower motor (-2-) for rotation smoothness.

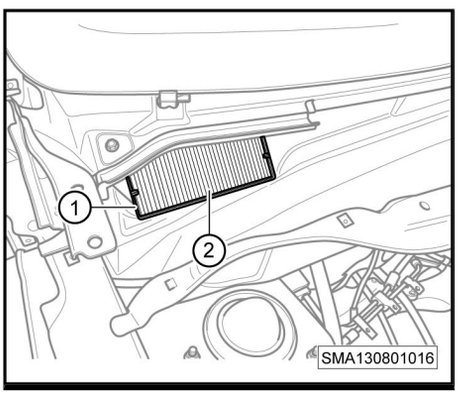


5.3 Removing and installing the air filter

Removal

1. Remove the wiper cover=> refer to page 846.

2. Remove the air filter (-2-) from the fixing housing (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- The air filter and inlet must be kept clean and away from foreign matters.

6 A/C System

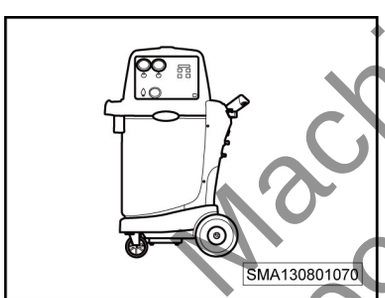
6.1 Vacuumizing the A/C system, adding and reclaiming the refrigerant

6.1.1 Vacuumizing the A/C system

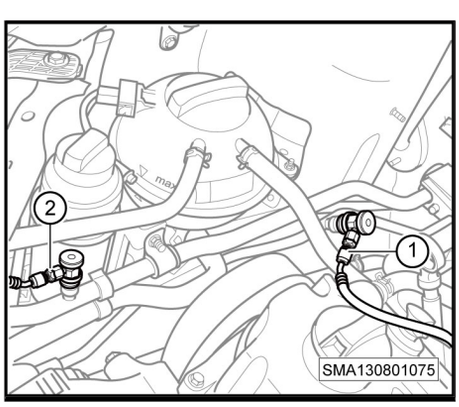
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- It is not allowed to get close to flames.

Maintenance tools and common equipment

	
A/C refrigerant reclaiming and filling machine	

1. Connect the pipe connectors (-1-) and (-2-) of the A/C refrigerant reclaiming and filling machine to the A/C system high and low pressure pipes respectively.
2. Open the high pressure valve (-1-) and low pressure valve (-2-) of the A/C refrigerant reclaiming and filling machine pipe connector, and select the "Vacuumization" option to set the time as 15 minutes.
3. Start the "Vacuumization" function of the machine. When the time reaches the set value, it will stop working automatically.
4. Close the high pressure valve (-1-) and low pressure valve (-2-) of the A/C refrigerant reclaiming and filling machine pipe connector, and record the pressure value displayed on the pressure gauge.



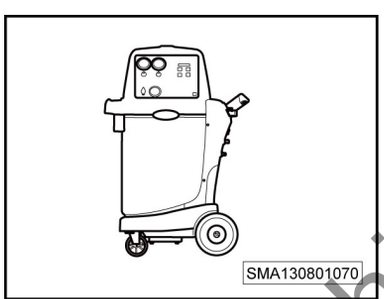
5. If the pressure value does not change in 15 minutes, it indicates that there is no leakage in the A/C pipe and that the refrigerant and refrigerant oil can be added. If the pressure value rises, please check the A/C system for leakage.
6. Disconnect the connection between the A/C refrigerant reclaiming and filling machine pipes and the A/C system high/low pressure pipes.

6.1.2 Adding the refrigerant

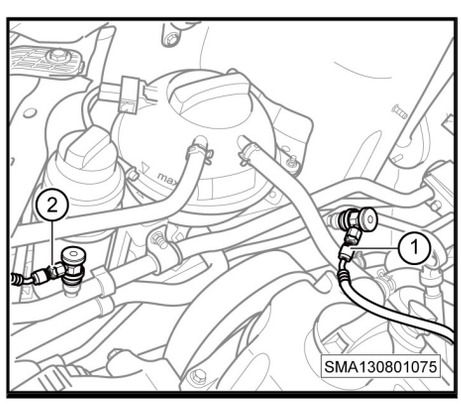
Note

- The refrigerant must be added after the refrigerant oil.
- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- It is not allowed to get close to flames.

Maintenance tools and common equipment

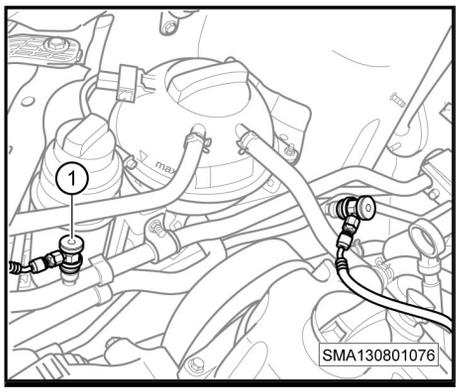
	
A/C refrigerant reclaiming and filling machine	

1. Connect the pipe connectors (-1-) and (-2-) of the A/C refrigerant reclaiming and filling machine to the A/C system high and low pressure pipes respectively.



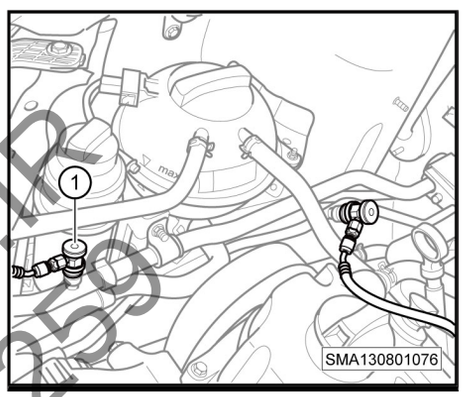
2. Vacuumize the A/C system => refer to page 1245.
3. Add the refrigerant oil => refer to page 1249.
4. Select the "Adding refrigerant" option on the A/C refrigerant reclaiming and filling machine and adjust the filling capacity.
   - The filling capacity of the A/C refrigerant: 625±10g

5. Switch on the low pressure valve of the A/C refrigerant reclaiming and filling machine pipe connector (-1-) and start the machine to add refrigerant.



6. Observe the display of the machine. When the filling capacity reaches the set value, it will display FINISH.

7. Switch off the low pressure valve of the A/C refrigerant reclaiming and filling machine pipe connector (-1-).



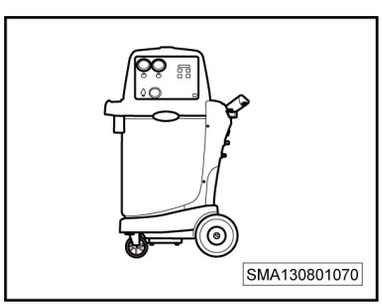
8. Disconnect the connection between the A/C refrigerant reclaiming and filling machine pipes and the A/C system high/low pressure pipes.
9. Make sure there is no leakage in the A/C system.
10. Refrigerant Filling is finished.

6.1.3 Reclaiming the refrigerant

Note

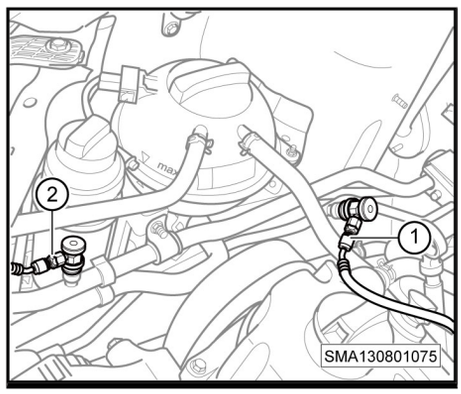
- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- It is not allowed to get close to flames.
- Dispose the reclaimed refrigerant as stipulated.

Maintenance tools and common equipment

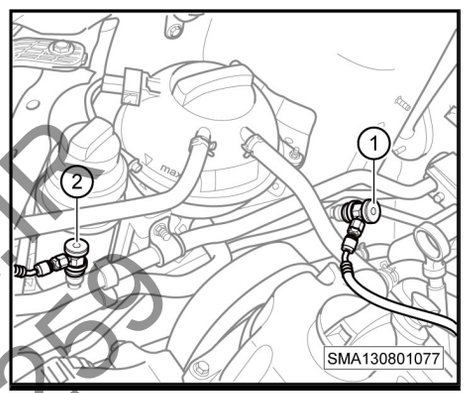
	

A/C refrigerant reclaiming and filling machine	

1. Connect the pipe connectors (-1-) and (-2-) of the A/C refrigerant reclaiming and filling machine to the A/C system high and low pressure pipes respectively.



2. Switch on the high pressure valve (-1-) and low pressure valve (-2-) of the A/C refrigerant reclaiming and filling machine pipe connectors.



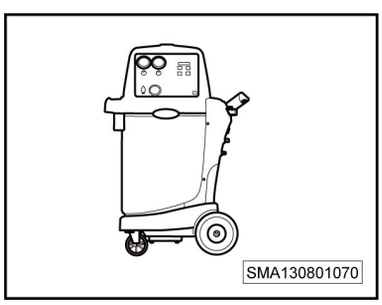
3. Select the "Reclaiming" option on the machine and start it to work.
4. Check the low pressure value displayed on the pressure gauge of the machine to make sure the reclaiming is completed. Then switch off the machine.
5. Disconnect the connection between the A/C refrigerant reclaiming and filling machine pipes and the A/C system high/low pressure pipes.

6.2 Reclaiming and adding the refrigerant oil

Note

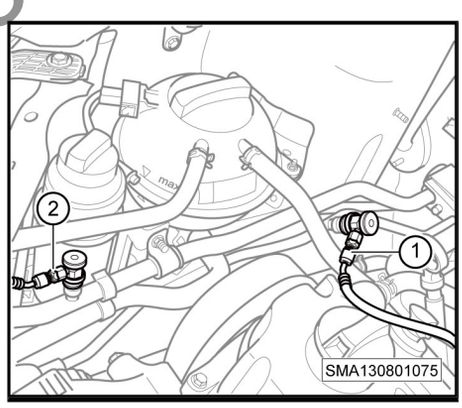
- The refrigerant must be added after the refrigerant oil.
- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- Dispose the reclaimed refrigerant oil as stipulated.
- Refrigerant oil must be refilled after reclaiming the refrigerant or replacing the A/C parts.

Maintenance tools and common equipment

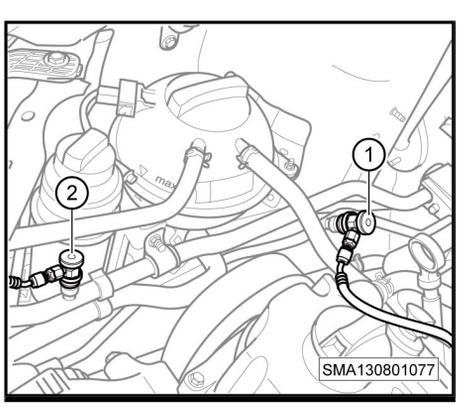
	
A/C refrigerant reclaiming and filling machine	

Reclaiming

1. Connect the pipe connectors (-1-) and (-2-) of the A/C refrigerant reclaiming and filling machine to the A/C system high and low pressure pipes respectively.



2. Switch on the high pressure valve (-1-) and low pressure valve (-2-) of the A/C refrigerant reclaiming and filling machine pipe connectors.



3. Reclaim the refrigerant oil according to the instructions of the A/C refrigerant reclaiming and filling machine.

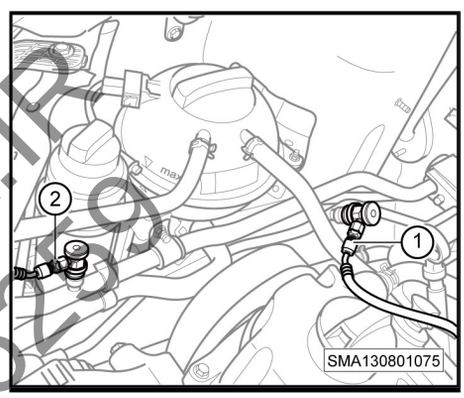
4. Record the volume of the reclaimed refrigerant oil.
5. Disconnect the connection between the A/C refrigerant reclaiming and filling machine pipes and the A/C system high/low pressure pipes.

Filling

The filling capacity of the refrigerant oil

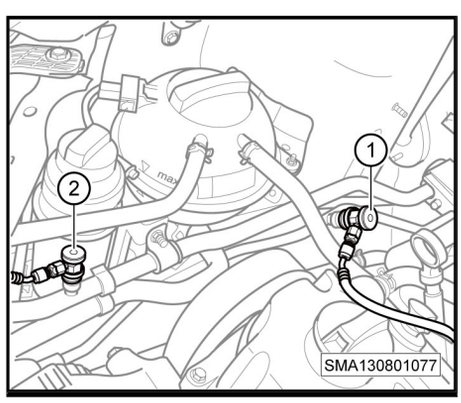
Item	Replacing the A/C compressor	Replacing the condenser	Replacing the evaporator	Replacing the reservoir dryer	Reclaiming the refrigerant
The filling capacity of the refrigerant oil	The oil of the new compressor and the old are the same in filling capacity	30 ml	30 ml	20 ml	Adding the oil with the same volume as reclaimed

1. Connect the pipe connectors (-1-) and (-2-) of the A/C refrigerant reclaiming and filling machine to the A/C system high and low pressure pipes respectively.



2. Vacuumize the A/C system=> refer to page 1245.

3. Switch on the high pressure valve (-1-) and low pressure valve (-2-) of the A/C refrigerant reclaiming and filling machine pipe connectors.



4. Add the refrigerant oil according to the instructions of the A/C refrigerant reclaiming and filling machine, and make sure to add the stipulated filling capacity.

6.3 Removing and installing the high pressure pipe

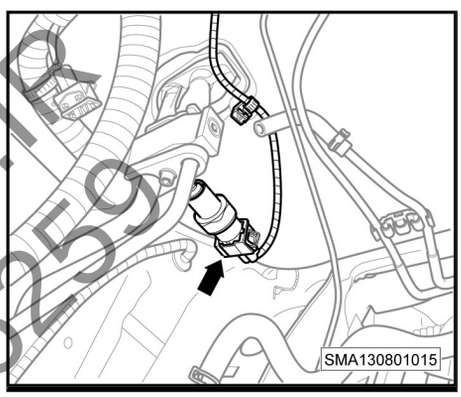
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

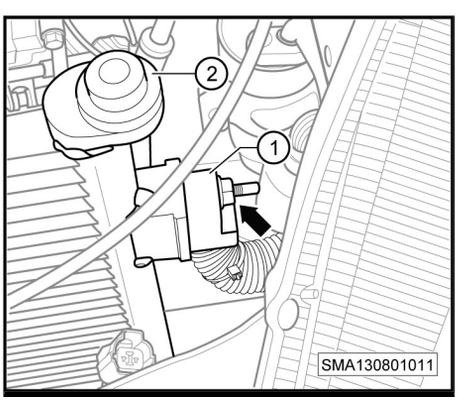
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1249.
4. Remove the radiator=> refer to page 188.

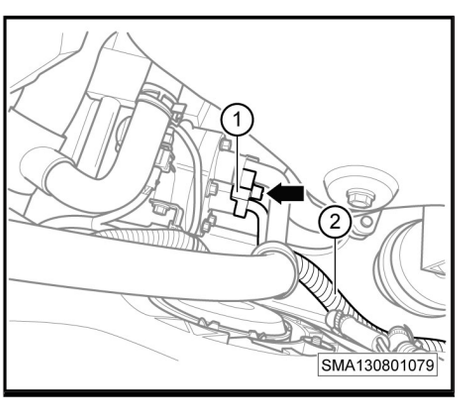
5. Disconnect the A/C pressure switch connector (-arrow-).



6. Unscrew the fixing nut (-arrow-) of the pipe (-1-) and condenser (-2-), and disconnect the connection between them.
   - Tightening torque of the nut: 9±1 N•m

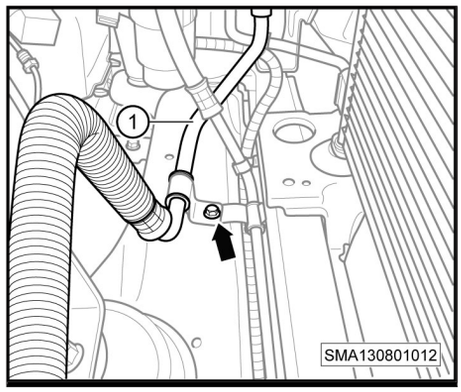


7. Unscrew the pipe clip bolt (-arrow-), loosen the pipe clip (-1-) and remove the pipe (-2-).
   - Tightening torque of the bolt: 32±3 N•m

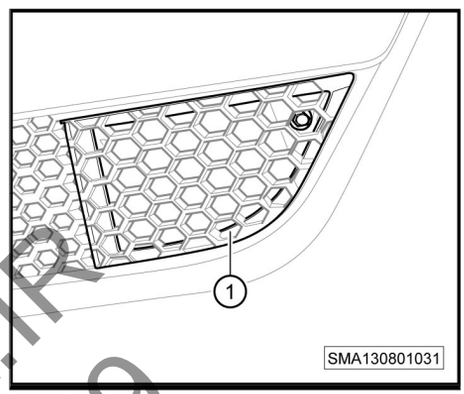


8. Unscrew the pipe clip fixing bolt (-arrow-) and remove the pipe (-1-).

- Tightening torque of the bolt: 9±1 N•m

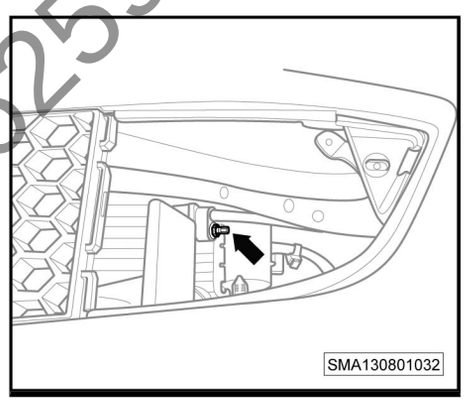


9. Remove the bumper grid (-1-).



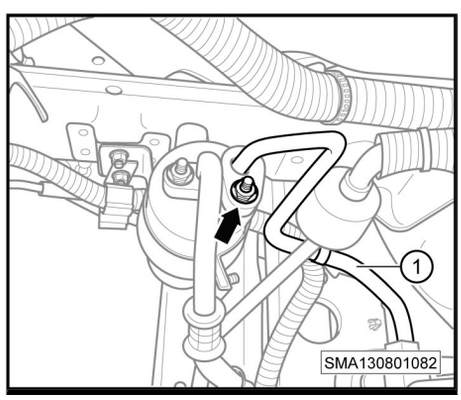
10. Unscrew the coupling nut between the reservoir dryer and the dryer-condenser pipe (-arrow-).

- Tightening torque of the nut: 9±1 N•m

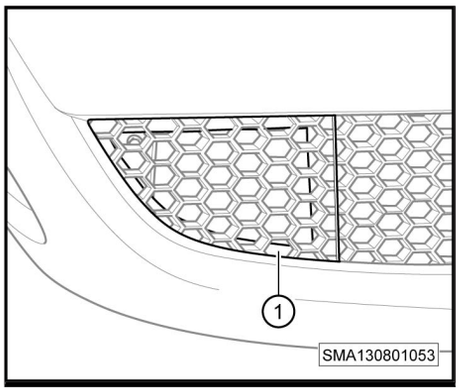


11. Unscrew the coupling nut (-arrow-) between the reservoir dryer and the dryer-condenser pipe (-1-), and take out the connection pipe from the reservoir dryer to the condenser.

- Tightening torque of the nut: 8±1 N•m

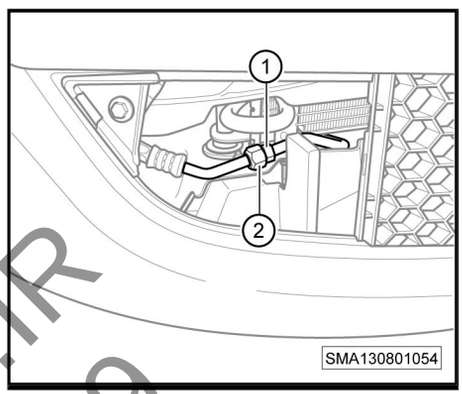


12. Remove the bumper grid (-1-).



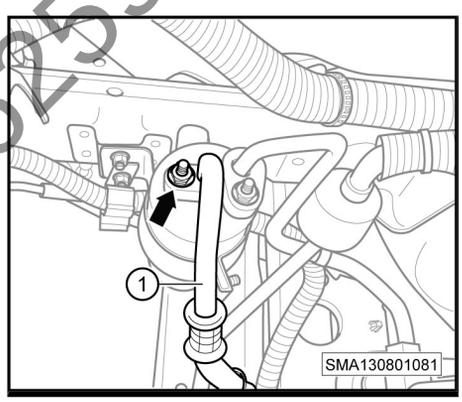
13. Disconnect the connection between the pipes (-1-) and (-2-).

- Tightening torque of the coupling nut: 12±1 N•m



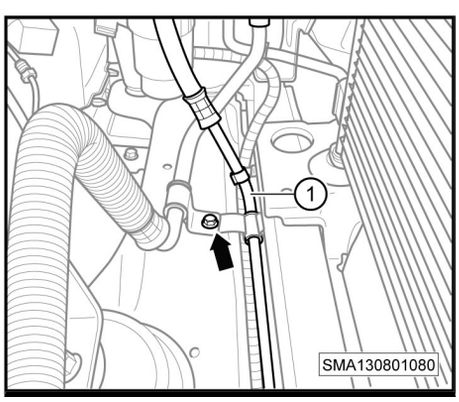
14. Unscrew the coupling nut (-arrow-) between the reservoir dryer and the expansion valve-dryer connection pipe (-1-).

- Tightening torque of the nut: 8±1 N•m



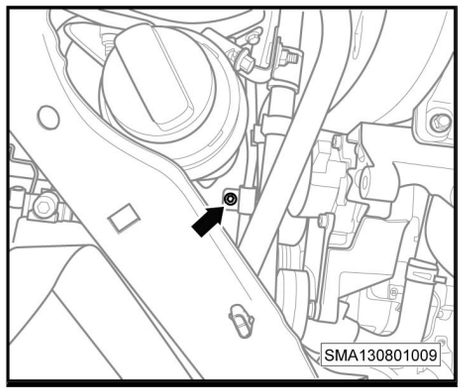
15. Unscrew the pipe clip fixing bolt (-arrow-) and remove the pipe (-1-).

- Tightening torque of the bolt: 9±1 N•m



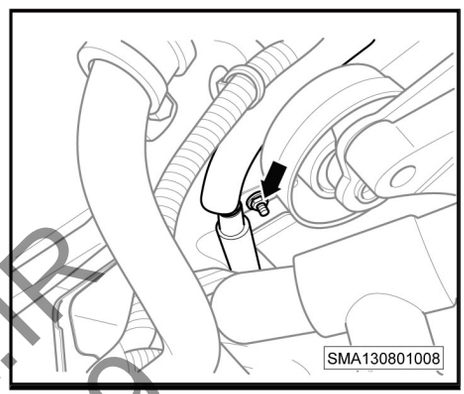
16. Unscrew the pipe clip fixing bolt (-arrow-).

- Tightening torque of the bolt: 9±1 N•m



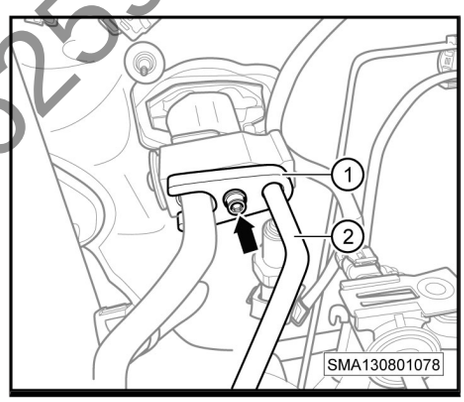
17. Unscrew the pipe clip fixing nut (-arrow-).

- Tightening torque of the nut: 9±1 N•m



18. Unscrew the pipe clip fixing bolt (-arrow-), loosen the pipe clip (-1-) and remove the pipe (-2-).

- Tightening torque of the bolt: 7.5±1 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant .
- Only use brand new O-rings and apply compressor lubricant before installation.

6.4 Removing and installing the low pressure pipe

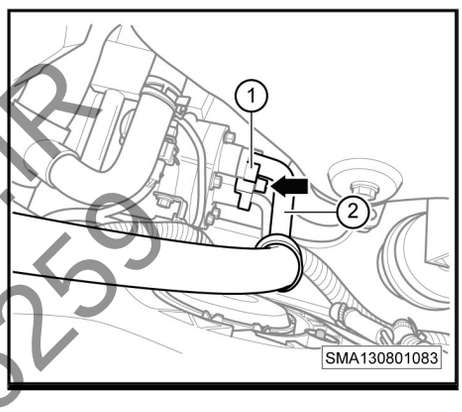
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

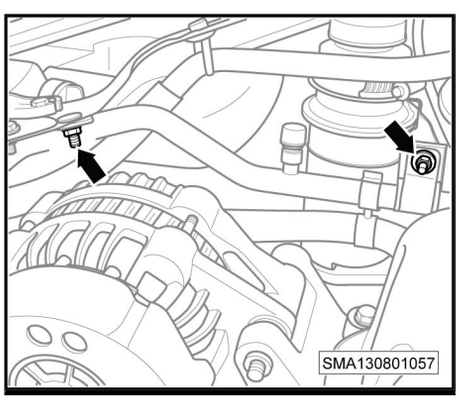
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1245.

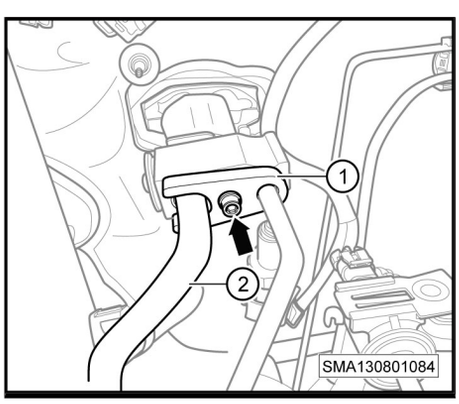
4. Unscrew the pipe clip fixing bolt (-arrow-), loosen the pipe clip (-1-) and remove the pipe (-2-).
   - Tightening torque of the bolt: 32±3 N•m



5. Unscrew the pipe clip fixing nuts (-arrow-).
   - Tightening torque of the nut: 9±1 N•m



6. Unscrew the pipe clip fixing bolt (-arrow-), loosen the pipe clip (-1-) and remove the low pressure pipe (-2-).
   - Tightening torque of the bolt: 7.5±1 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant .
- Only use brand new O-rings and apply compressor lubricant before installation.

6.5 Removing and installing the A/C compressor

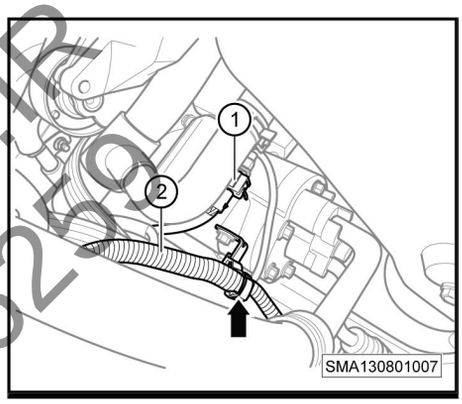
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

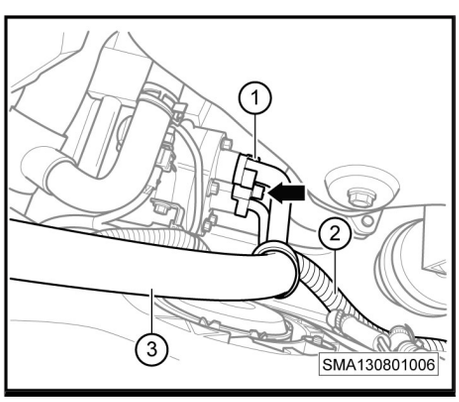
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1245.
4. Remove the three-way catalytic preconverter and the exhaust manifold .

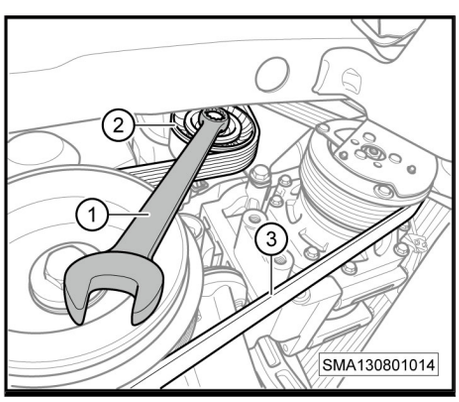
5. Disconnect the connector (-1-), loosen the generator wiring harness clip (-arrow-) and move the generator wiring harness (-2-).



6. Unscrew the pipe clip fixing bolt (-arrow-), loosen the pipe clip (-1-) and remove the pipes (-2-) and (-3-).
   - Tightening torque of the bolt: 32±3 N•m

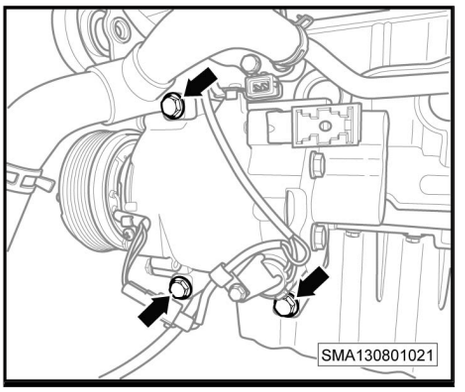


7. Wrench the poly V-belt tension pulley (-2-) with the wrench (-1-) and take out the poly V-belt (-3-).



8. Unscrew the fixing bolts of the compressor (-arrow-) and remove the compressor.

- Tightening torque of the bolt: 25±3 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant.
- Only use brand new O-rings and apply compressor lubricant before installation.

6.6 Removing and installing the evaporator

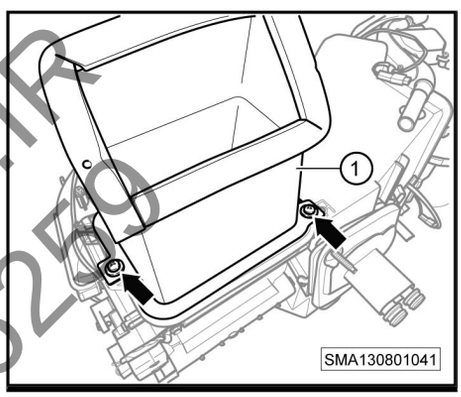
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

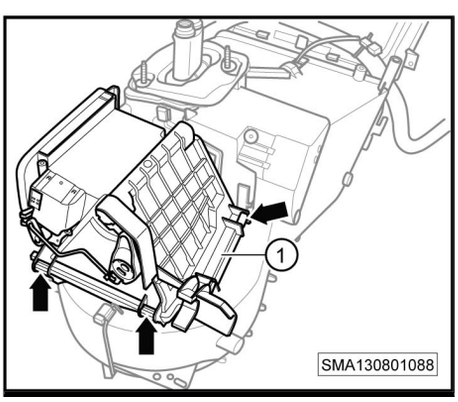
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1245.
4. Remove the HVAC assembly=> refer to page 1233.

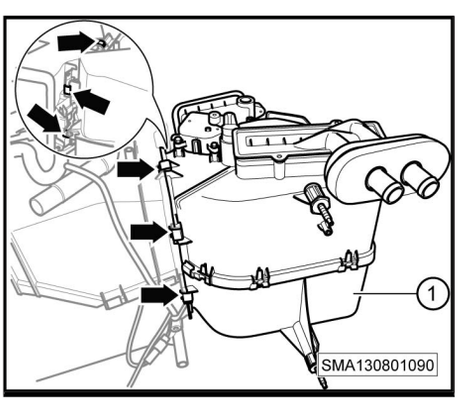
5. Unscrew the fixing bolts (-arrow-) and remove the air inlet housing (-1-).
   - Tightening torque of the bolt: 6±1 N•m



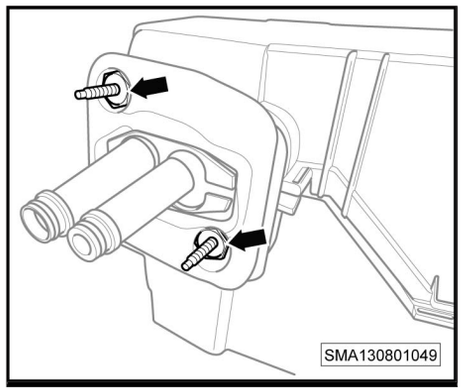
6. Loosen the clips (-arrow-) and remove the mixing flap housing (-1-).



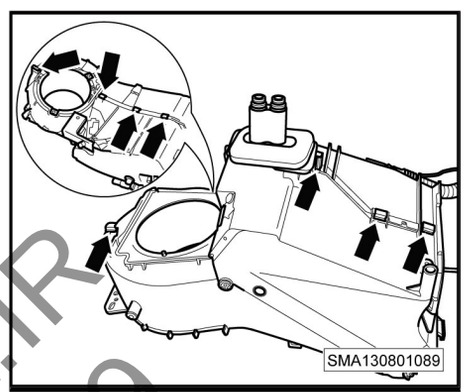
7. Loosen the clips (-arrow-) and remove the heater housing (-1-).



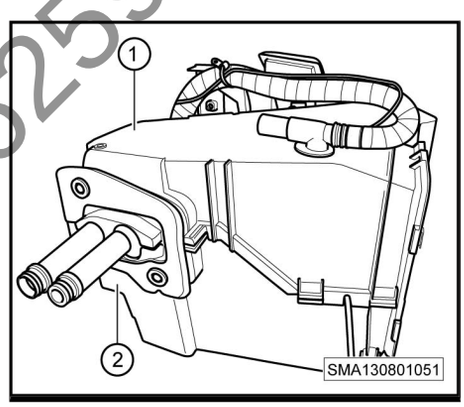
8. Unscrew the fixing bolts of the evaporator (-arrow-).



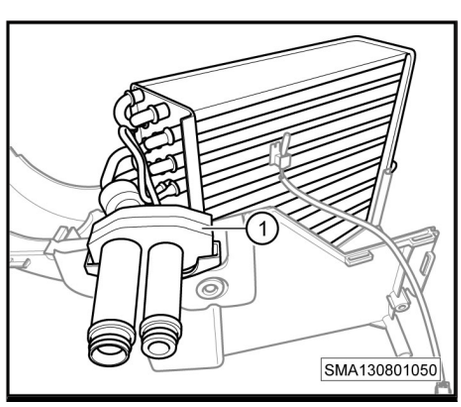
9. Loosen the clips (-arrow-).



10. Separate the evaporator housing into (-1-) and (-2-).



11. Take out the evaporator (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant .

- Only use brand new O-rings and apply compressor lubricant before installation.

6.7 Removing and installing the expansion valve

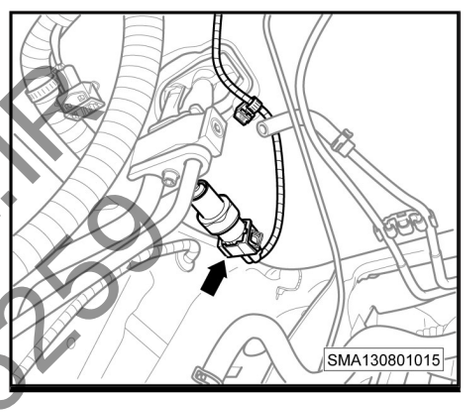
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

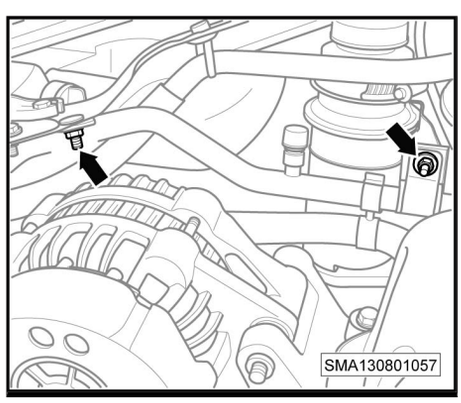
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1245.

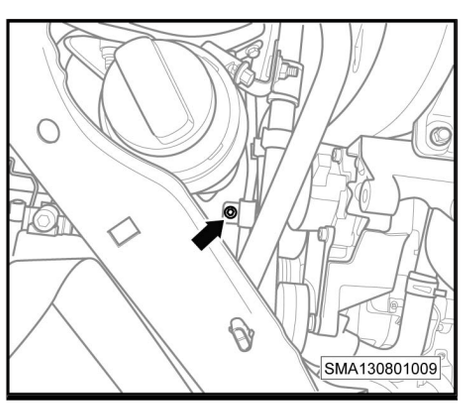
4. Disconnect the A/C pressure switch (-arrow-).



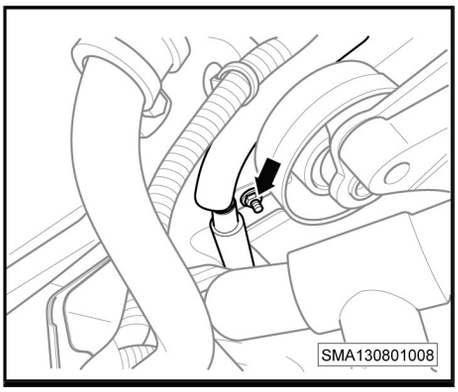
5. Unscrew the pipe clip fixing nuts (-arrow-).
   - Tightening torque of the nut: 9±1 N•m



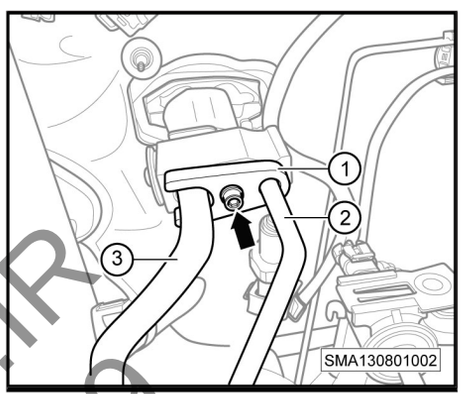
6. Unscrew the pipe clip fixing bolt (-arrow-).
   - Tightening torque of the bolt: 9±1 N•m



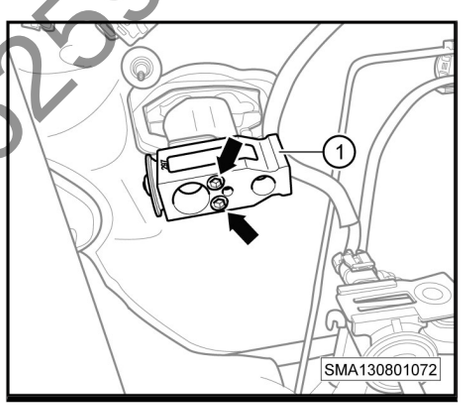
7. Unscrew the pipe clip fixing nut (-arrow-).
   - Tightening torque of the nut: 9±1 N•m



8. Unscrew the pipe clip fixing bolt (-arrow-), loosen the pipe clip (-1-) and remove the pipes (-2-) and (-3-).
   - Tightening torque of the bolt: 12±1 N•m



9. Unscrew the fixing bolts (-arrow-) of the expansion valve and remove the expansion valve (-1-).
   - Tightening torque of the bolt: 13±1 N•m



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant .
- Only use brand new O-rings and apply compressor lubricant before installation.

6.8 Removing and installing the heater core

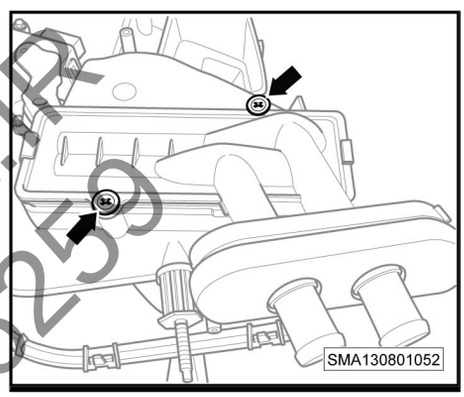
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

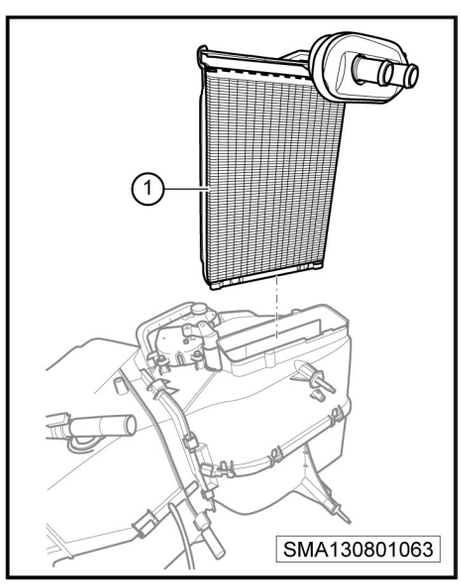
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1245.
4. Remove the HVAC assembly=> refer to page 1233.

5. Unscrew the fixing bolts of the heater core (-arrow-).



6. Take out the heater core (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant .

- Only use brand new O-rings and apply compressor lubricant before installation.

6.9 Removing and installing the condenser

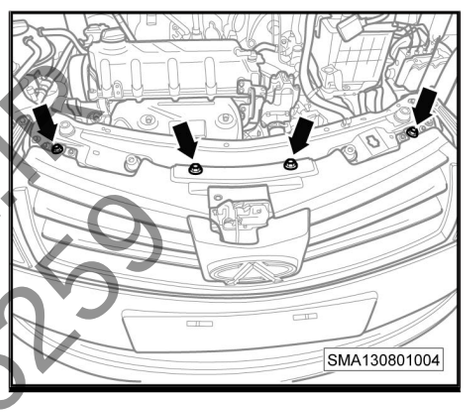
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

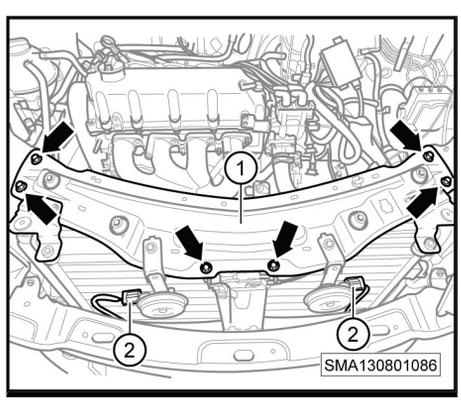
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant => refer to page 1245.

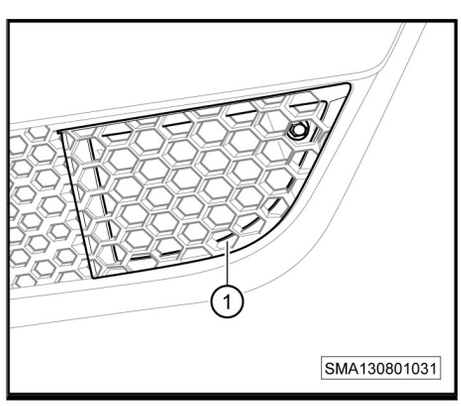
4. Unscrew the fixing bolts of the front air intake grid (-arrow-).



5. Unscrew the fixing bolts (-arrow-), pull out the horn connectors (-2-) and remove the front cross member (-1-).

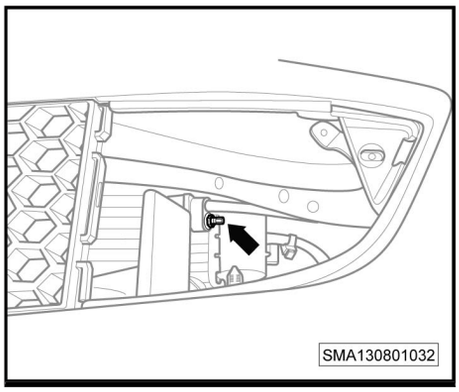


6. Remove the front bumper grid (-1-).



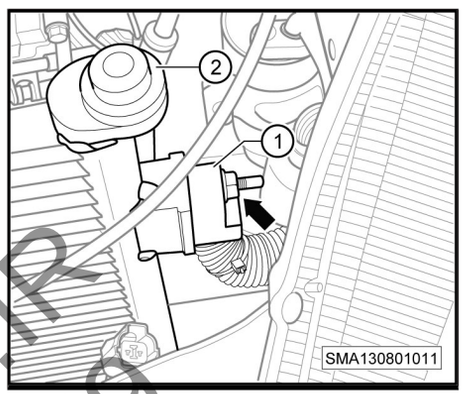
7. Unscrew the coupling nut between the reservoir dryer and the dryer-condenser pipe (-arrow-).

- Tightening torque of the nut: 8±1 N•m

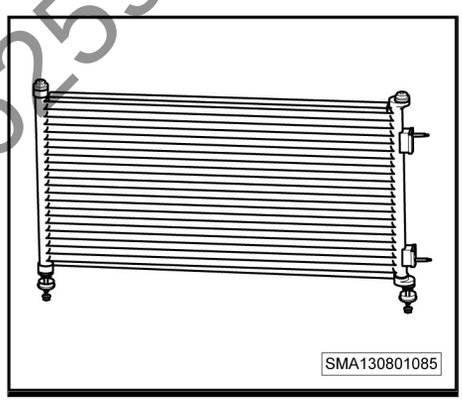


8. Unscrew the coupling nut (-arrow-) between the condenser (-2-) and the compressor-condenser pipe (-1-) and then disconnect the connection.

- Tightening torque of the nut: 8±1 N•m



9. Remove the condenser.



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant.
- Only use brand new O-rings and apply compressor lubricant before installation.

6.10 Removing and installing the reservoir dryer

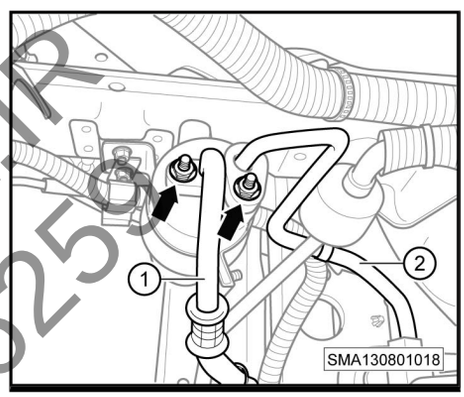
Note

- Special service equipment for R-134a refrigerant must be applied.
- Good ventilation must be kept in the working area since the A/C system is prone to leakage.
- The disconnected pipe should be sealed to prevent foreign matters from getting in.

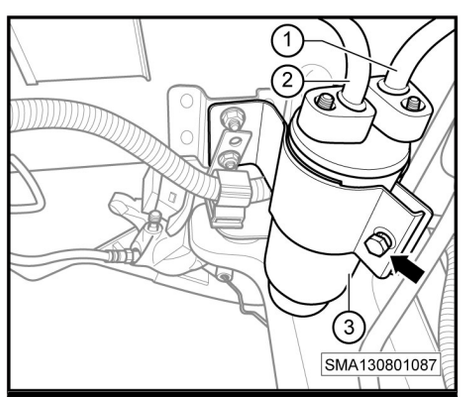
Removal

1. Switch off all electrical equipment and the ignition switch.
2. Disconnect the battery negative cable.
3. Reclaim the refrigerant=> refer to page 1245.
4. Remove the air intake assembly=> refer to page 238.

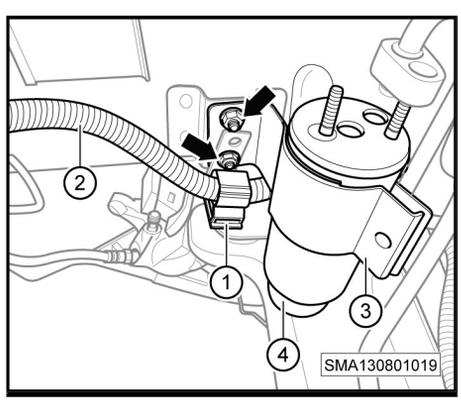
5. Unscrew the fixing nuts (-arrow-) between the reservoir dryer and the pipes (-1-) and (-2-).
   - Tightening torque of the nut: 8±1 N•m



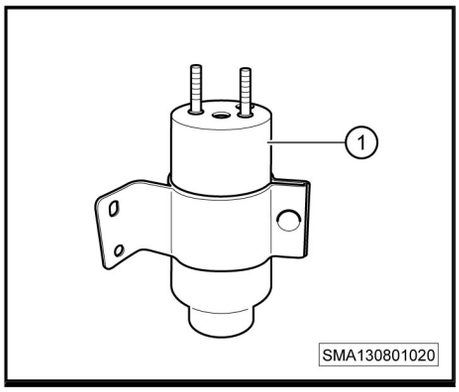
6. Unscrew the fixing bolt (-arrow-) of the reservoir dryer bracket, move the reservoir dryer (-3-) downward and release the A/C pipes (-1-) and (-2-).



7. Loosen the wiring harness clip (-1-) and move out the wiring harness clip (-2-). Then unscrew the fixing nuts of the reservoir dryer bracket (-arrow-), and remove the reservoir dryer bracket (-3-) together with the reservoir dryer (-4-).
   - Tightening torque of the nut: 6±0.5 N•m



8. Take out the reservoir dryer (-1-).



Installation

Installation shall follow the reverse sequence of the removal procedure. Please pay attention to the following notes:

- Tighten the fixing bolts with the specified torque.
- Refill the refrigerant.
- Only use brand new O-rings and apply compressor lubricant before installation.

0901 Wiring Harness

1 Circuit Information

1.1 General information

1.1.1 Introduction

The circuit information contains brief introductions of the circuit diagrams, the inspection methods of the leads and connectors, as well as the layout of connector pins and the wiring harness assemblies.

1.1.2 Circuit diagram information

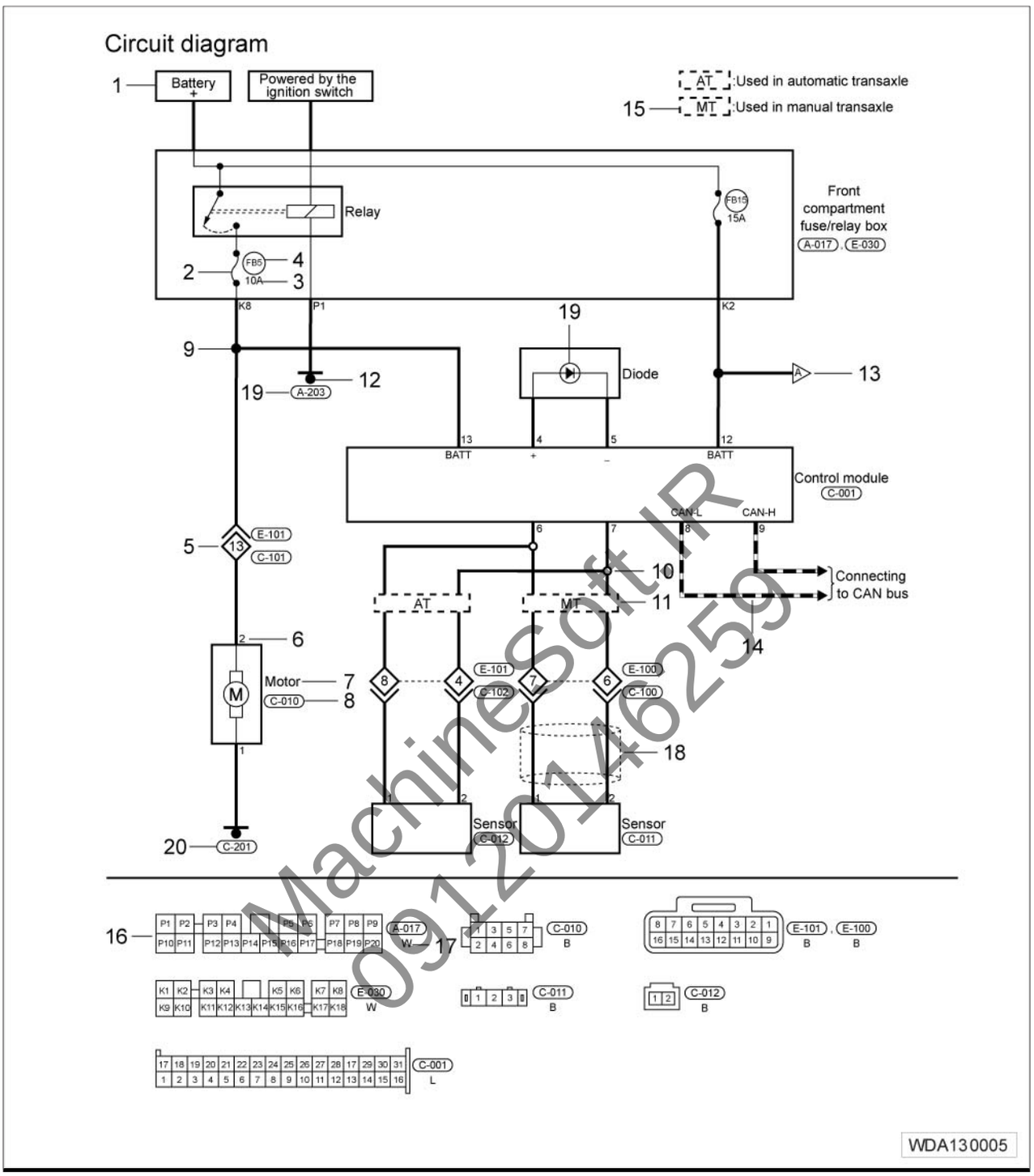
The circuit diagram is classified into the Electrical Equipment Service Manual. If some component appears in a specific system, its related information (like wires, connectors, pins etc.) will appear in the circuit diagram and be introduced emphatically. For example, the information of Body Control Module (BCM) is mainly introduced in Chapter 7. If the component wires involve other systems, the component information will also appear in the corresponding system.

Chery Automobile offers the related circuit diagram information of the vehicle's electrical equipment to help the technical staff to determine and inspect the vehicle failures effectively.

Functions and features of the circuit diagrams:

- The power circuit is on the top of the page, while the ground circuit is near the bottom.
- Components such as electrical switches and fuses are shown in the form of simple icons in the circuit diagram.

1.2 Instructions of the circuit diagram



No.	Component	Description
1	Power supply	Supply power to the electrical equipment
2	Fuse	The wave single line represents the fuse
3	Rated current	Refer to the rated current range of the fuse
4	Fuse No.	Distinguish the location and No. of the fuse in the front compartment

No.	Component	Description
		fuse/relay box or the instrument fuse/relay box
5	Connector	Indicate that E-101 is a female connector and C-101 is a male one
6	Connector pin code	Refer to the code No. of the connector pin
7	Name	Refer to the name of the component
8	Connector code	Refer to the code No. of the connector
9	Connection point	Solid circle indicates that the leads are interconnected
10	Optional connection point	Hollow circle indicates the circuit connection mode of the vehicle components which is optional
11	Abbreviation	The wires are selected with the actual model
12	Ground	Refer to the connection to ground
13	Connecting to ...	The wire connects to the circuit in the next page. The letter "A" corresponds to the "A"in the circuit diagram next page.
14	Data cable	Refer to the data transmission cable between the system and other system
15	Description of the option	Refer to the description of the abbreviation used in the circuit diagram
16	Connector pin drawing	Description of the connector code on the component
17	Connector color	Letters representing the connector colors are given as follows: B=Black W=White R=Red G=Green L=Blue Y=Yellow BR=Brown O=Orange GR=Gray
18	Shielding line	The dashed lines refer to the shielding lines

No.	Component	Description
19	LED (Light-emitting diode)	Serve as a lighting tool in the circuits or instruments

1.3 The electrical equipment fault diagnosis and troubleshooting

1.3.1 Basic methods of diagnosis and troubleshooting

The basic steps are as follows:

1. Checking for failures

   Energize all the components in the faulty circuit and determine if there is any failure existing according to the customer's description. Do not perform any removal or test before ascertaining the reason and location of the failure.

2. Analysing the circuit diagram

   Analyse the circuit diagram to determine the faulty circuit. Check all components from the power supply along the current path to the ground to idenfy its operating principles. If several failures appearing in circuits at the same time, it may be caused by the fuse or ground. Determine the causes based on the symptoms and the circuits' operating principles.

3. Determining the failure through a circuit test

   Determine the failure through a circuit test to check the diagnosis made in step 2. Logical and concise diagnostic steps are the key to eliminate the failures effectively. Firstly, test the most likely cause of the failure and then attempt to test for the accessible areas.

4. Eliminating the failures

   Make a service operation after determining the failure. Use the tools as required and perform safety operations according to correct procedures in repair.

5. Ensuring the circuit working properly after repair

   In all operating modes, connect all components in the circuit that has been repaired to ensure the failure has been already eliminated; if the failure is caused by a melted fuse, you must carry out a test for all power supply circuits in which the fuse is connected, and make sure the failure will no longer occur.

Testing the voltage

1. The negative pointer (black) of the voltmeter is grounded.
2. The positive pointer (red) of the voltmeter connects to the selected measuring points (switch on the ignition switch if necessary). Check the voltage value shown in the voltmeter.

Testing the circuit continuity

1. Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable.
2. Remove the circuit to be tested.
3. The two ohmmeter leads are connected to the two ends of the circuit to be tested respectively (low resistance means the circuit is in good condition).

Testing the short circuit

1. Measure and record the battery voltage.
2. Pull out the fuse of the wires to be tested or disconnect the power end of the test circuit.
3. One end of the voltmeter lead is connected to the positive terminal of the battery and the other to the power supply of the circuit.

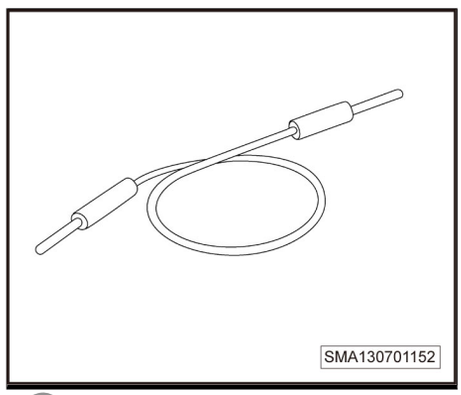
4. Check the voltage value shown in the voltmeter. If it shows any voltage value, it indicates that the test circuit is shorted to ground.

1.3.2 Diagnostic tools

Short jumper

09

Establish a connection circuit with a short jumper, then connect both ends of the jumper to the ends of the electrical equipment component respectively.

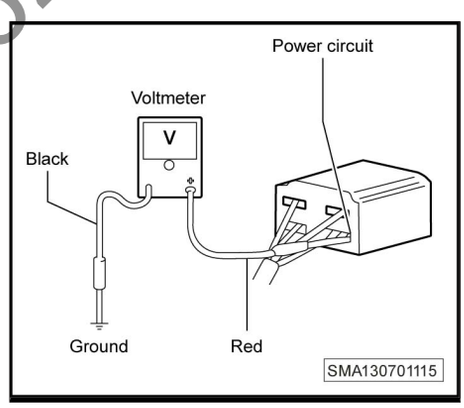


Caution

- Do not connect both ends of the short jumper to the power supply and the vehicle ground directly; otherwise it will damage the power supply and other components.

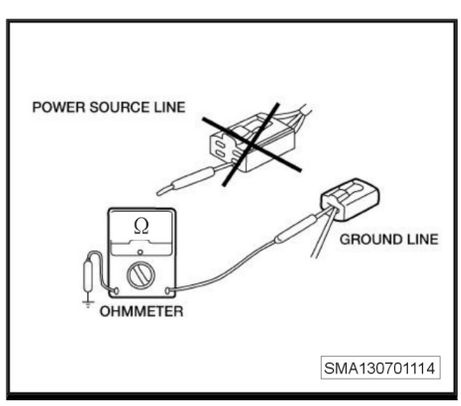
Voltmeter

The DC voltmeter is used to measure the voltage value in the circuit. Its measuring range should be set to be above 15V. Connect the red positive (+) pointer to the positive lead of the component to be tested and the black negative (-) pointer to the ground of the vehicle.



Ohmmeter

The ohmmeter is used to measure electrical resistance and test if there is a connection or short circuit between two points of the circuit.



Caution

- The ohmmeter can not be serially connected to the circuit, otherwise it will be damaged.

1.4 Electrical equipment maintenance

1.4.1 Repairing the leads

Caution

- Measure the length of the lead to be repaired and select a suitable replacement lead before repairing.
- If there are several leads to be repaired, please stagger the repairing areas.

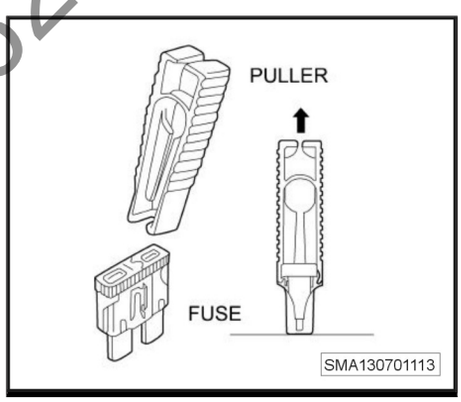
1. Peel off 0.5 inches insulating layer of the lead to be repaired and the replacement lead.
2. Connect the original lead to the replacement lead with the heat shrinkable tube and compress the metal core of the heat shrinkable tube with tools in order to make the original lead with the replacement lead fixed firmly.
3. Heat the heat shrinkable tube to shrink the outer rubber layer and ensure the sealing of repairing area.
4. Wind the repaired leads together with an electircal tape.

1.4.2 Replacing the fuse

Caution

- Electrical equipment should be energized after replacing the fuse. If the fuse is melted again, check the corresponding circuit for short circuit or if the owner installs any electrical equipment powered more than rated or additional consumers. Please replace them with the fuse of larger amperes in these cases.

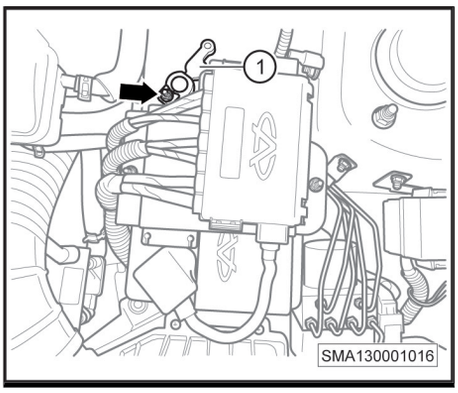
- Switch off all electrical equipment and the ignition switch, and disconnect the battery negative cable before repair.
- Remove the melted fuse with a fuse clip.
- Replace the melted fuse with new one which has the same specifications.



1.5 Notes on the electrical equipment maintenance

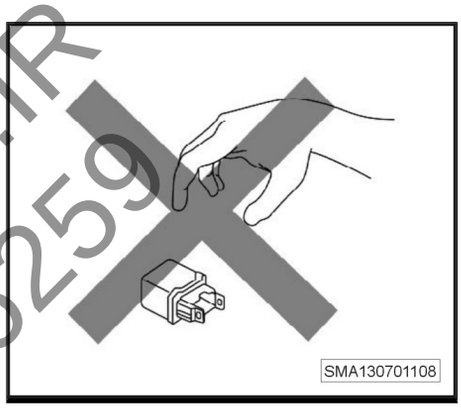
1.5.1 Battery cable

- Unscrew the nut (-arrow-) and disconnect the battery negative cable (-1-) before any repair.



1.5.2 Sensor, switch and relay

- Be careful not to make the sensor, switch or relay fall to the ground from high to avoid unnecessary damage in repair work.



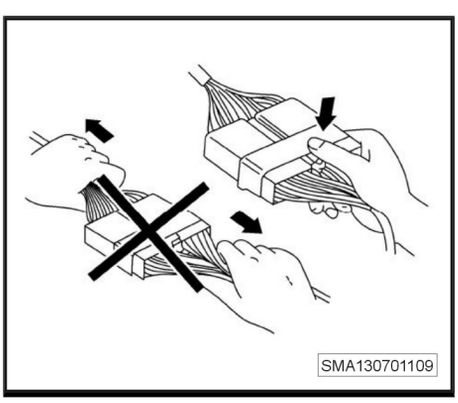
1.5.3 Connector

Diconnecting the connector

Caution

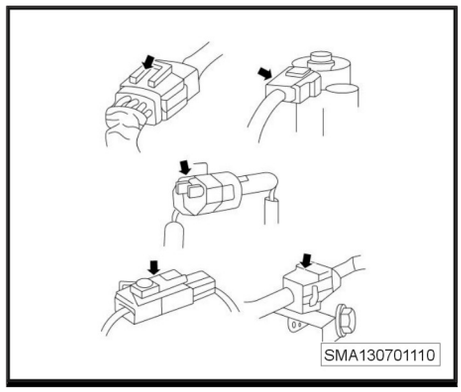
- Be careful not to pull the wiring harness with force to avoid damage when disconnecting the connector.

- Hold the connector with hand and press the connector clips to disconnect it.



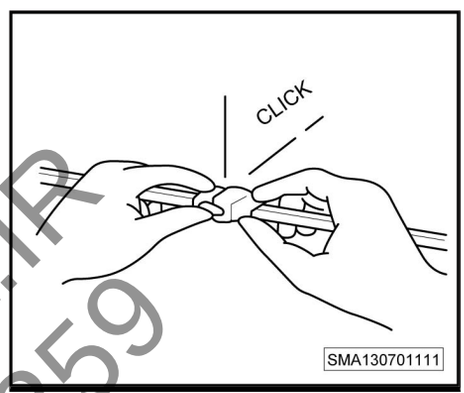
Common ways of disconnecting the connectors

- There are several ways of fixing the connector clips. And their removal procedures are shown in the figure.



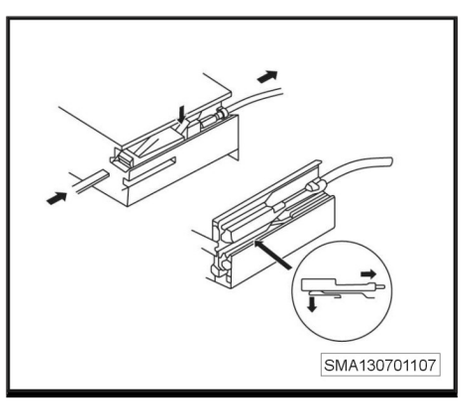
Installing the connector

- You cannot hear a "click" from the connector until it is installed in place.



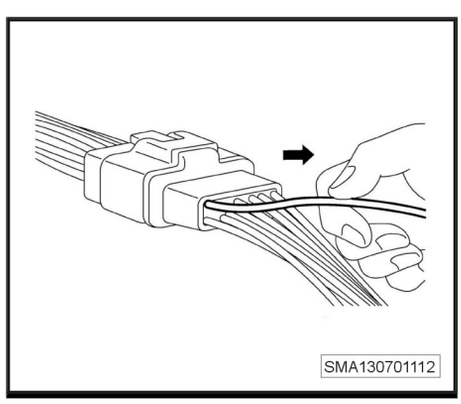
Replacing the connector terminal

- As shown in the figure, insert a suitable tool into the terminal to press down the fixing clips. Then pull out the terminal from behind.
- Push the terminal from the back of the connector to ensure that the fixing clips are installed in the stop position.



Checking the connector terminal

- Pull the individual wiring harness terminal gently to check if it is installed in the stop position.



2 Power Supply System

2.1 General information

2.1.1 Introduction

The power supply system provides security for safe, reliable and efficient running of the vehicle electircal system.

The power supply sytem consists of the following components:

- Battery
- Body fuse/relay box
- Front compartment fuse/relay box
- Ignition switch
- Fuse
- Relay

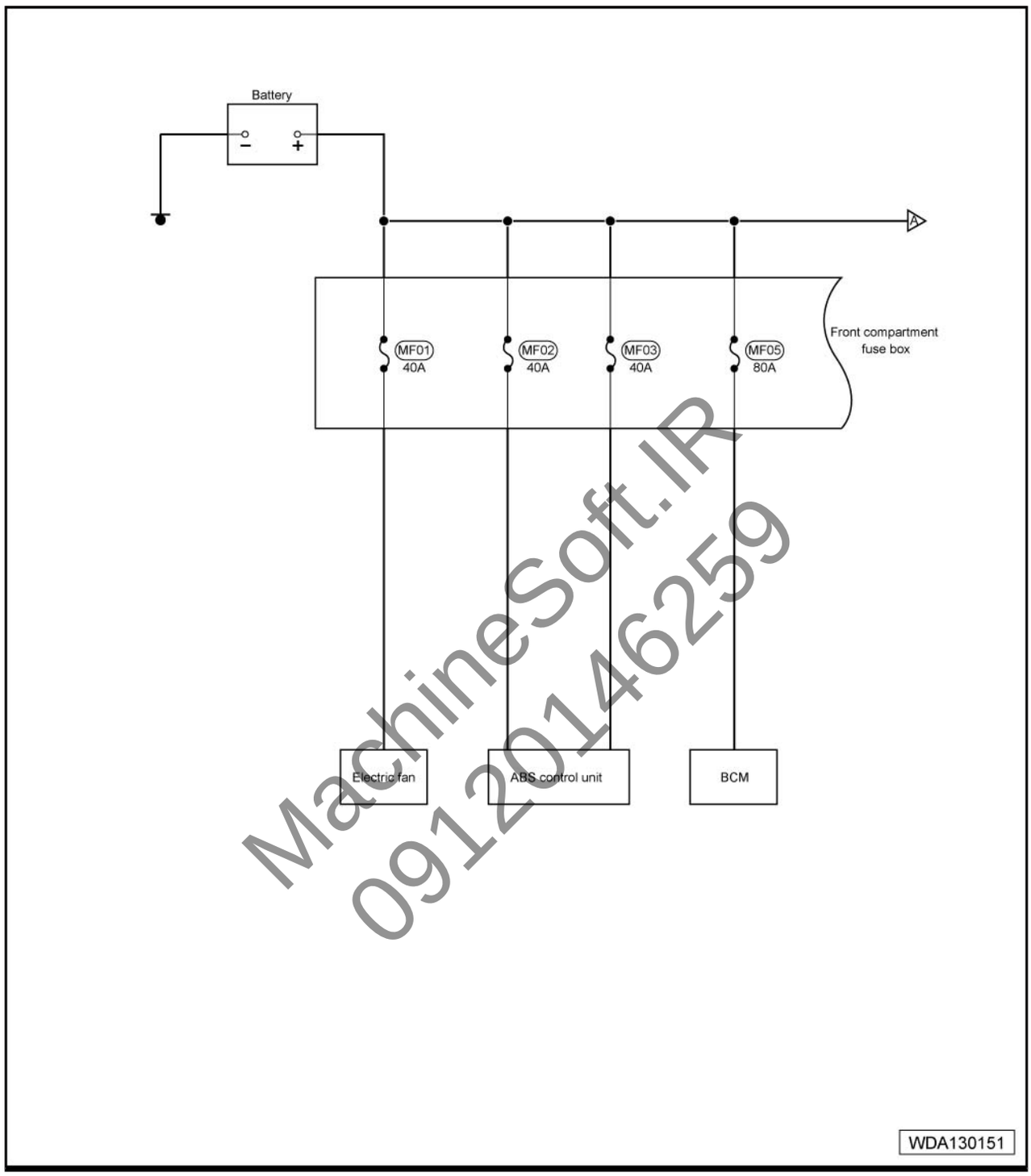
2.2 Power supply

2.2.1 Introduction

The power distribution circuit diagram includes all of the vechicle electrical components and leads information, which shows the information of the connector, the pin code and the wiring harness connection of an individual component to help determine the common electrical equipment failures.

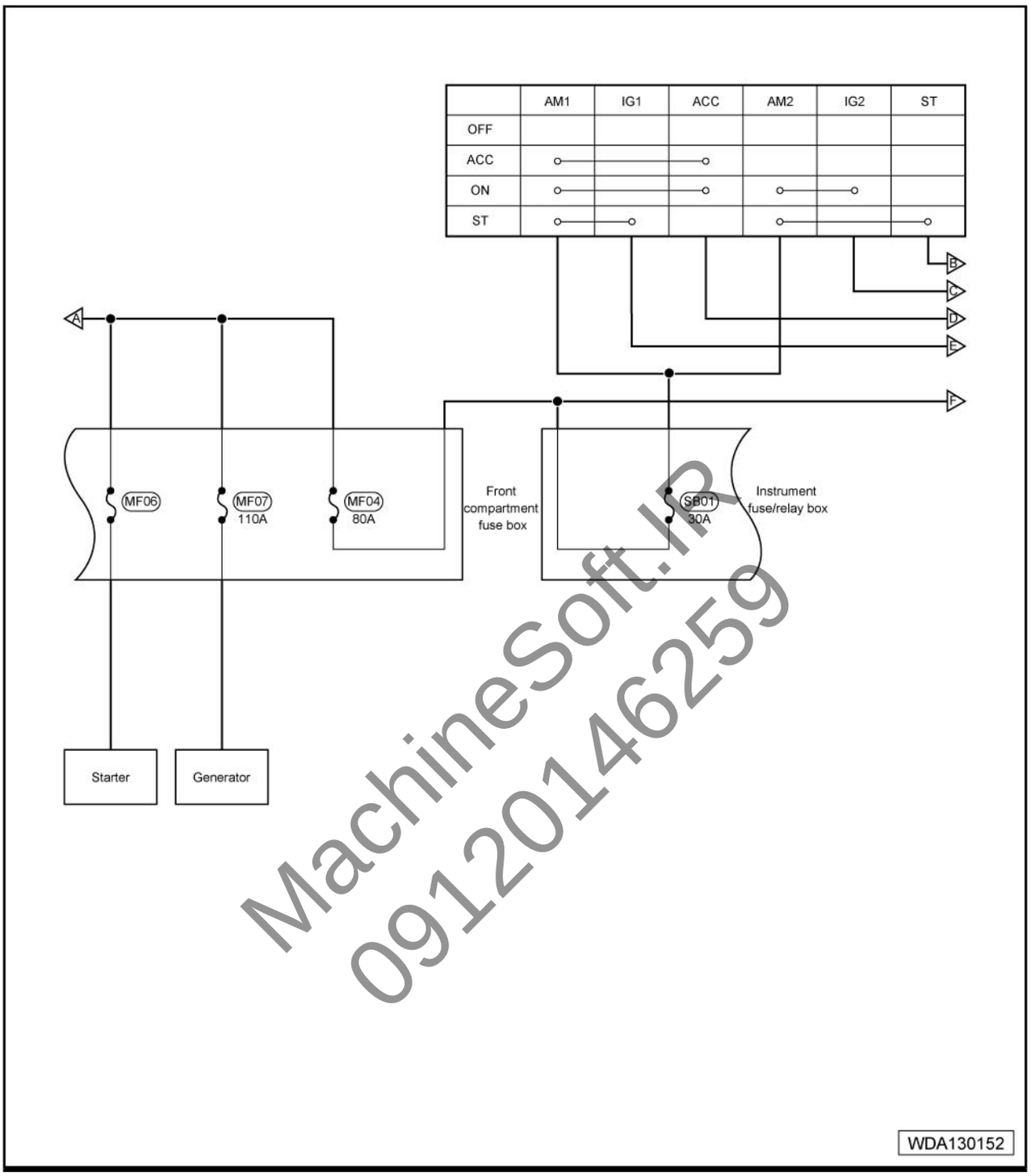
2.2.2 Circuit diagram

Power supply circuit diagram (Page 1)

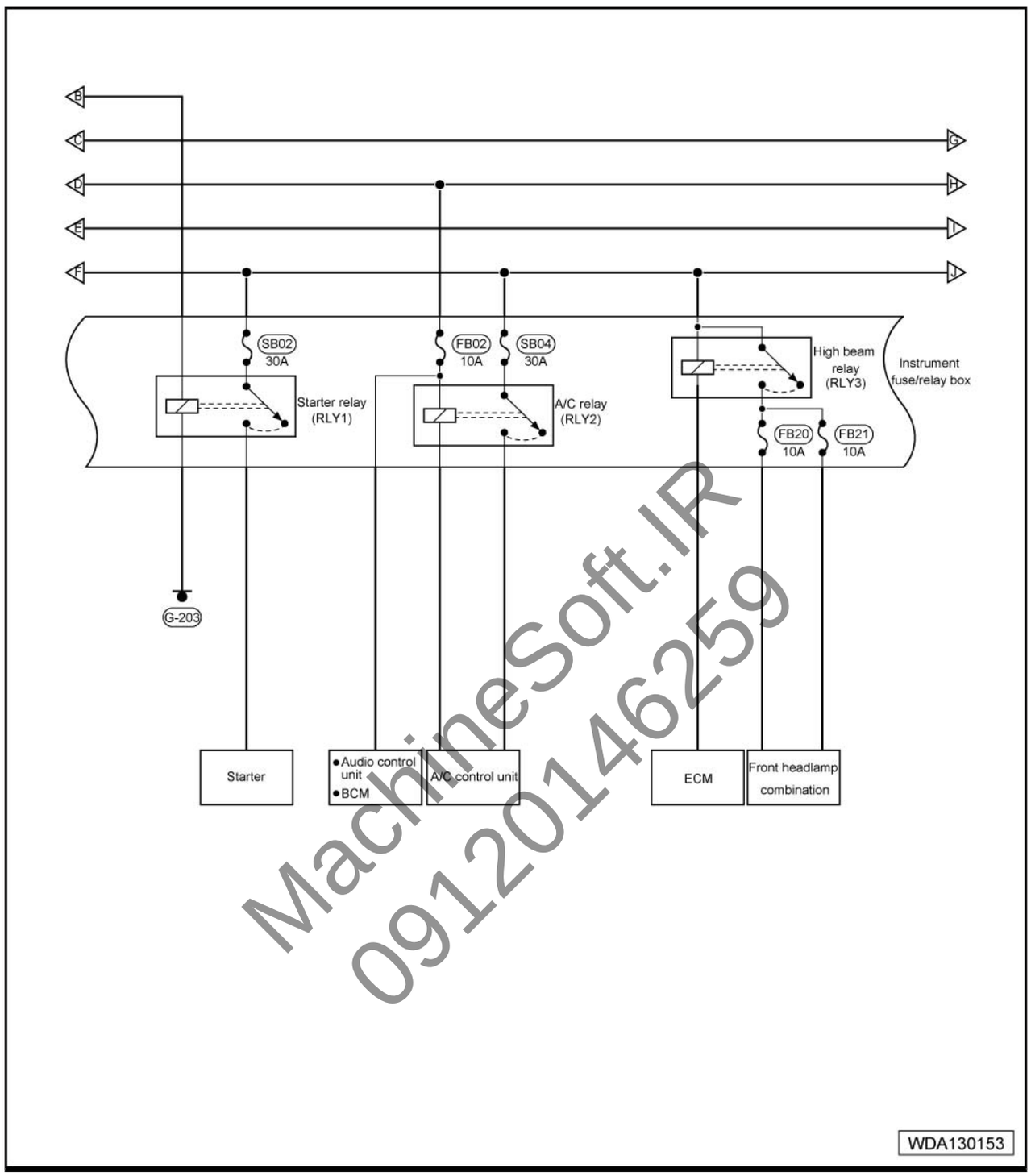


09

Power supply circuit diagram (Page 2)

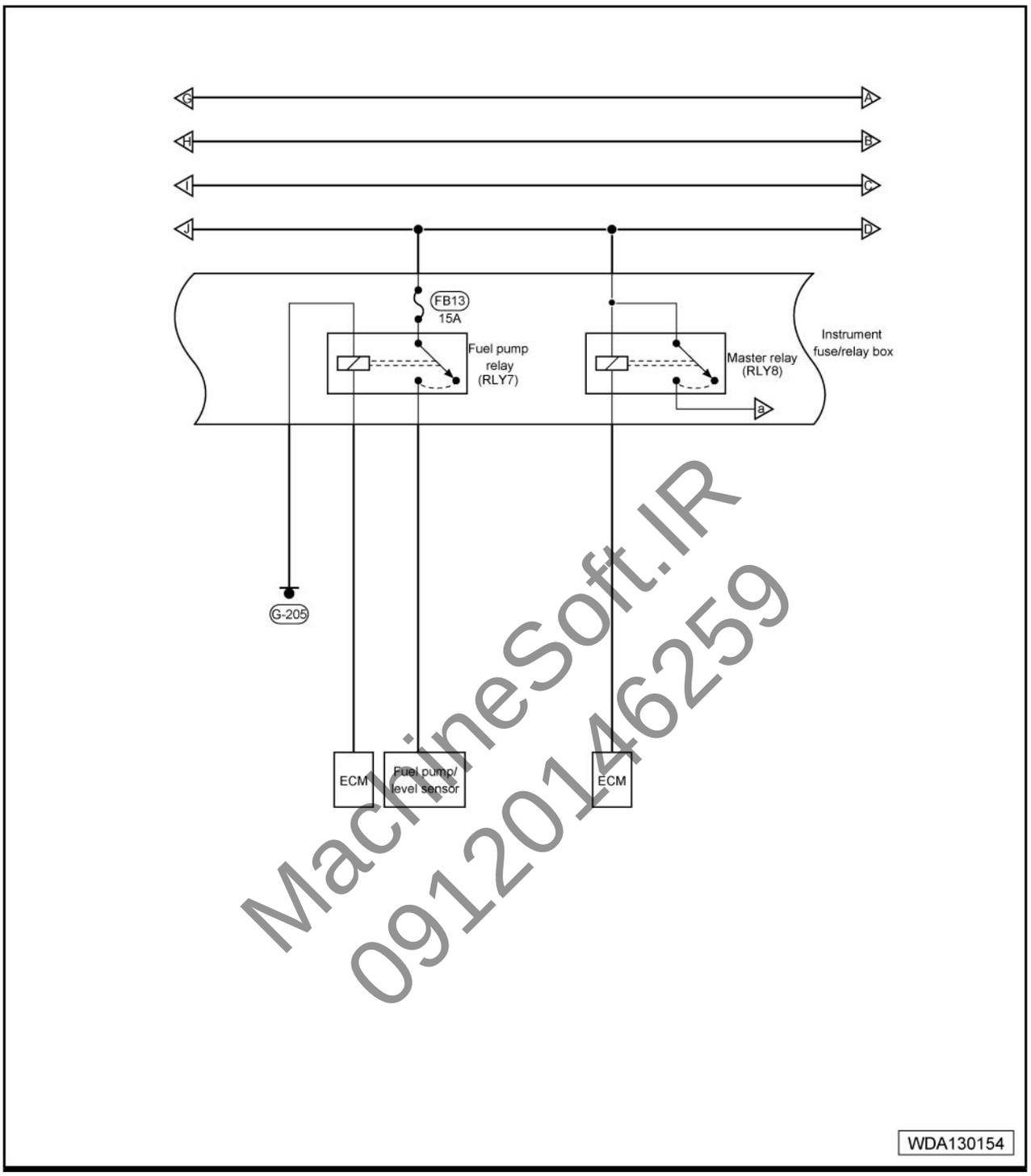


Power supply circuit diagram (Page 3)

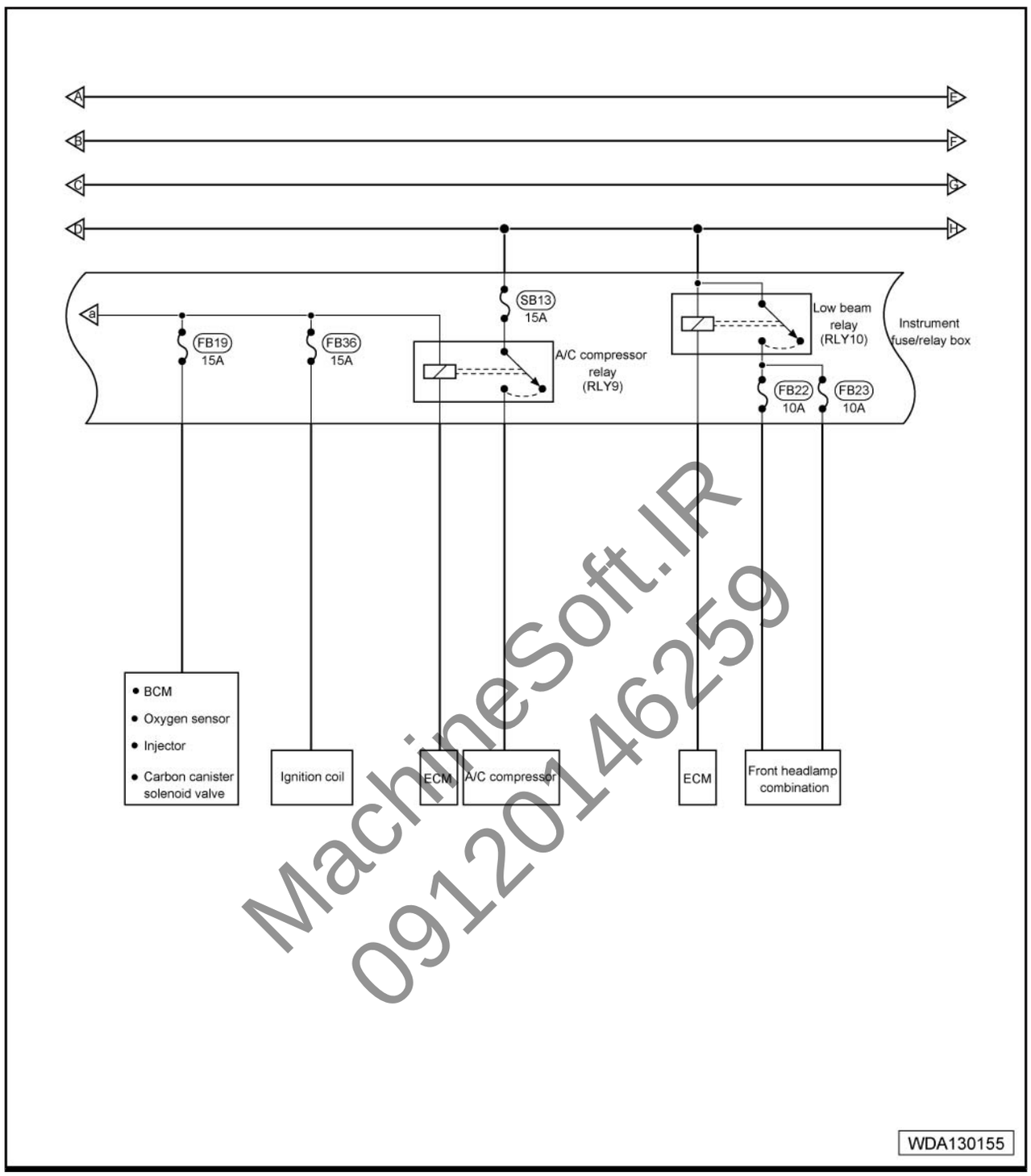


09

Power supply circuit diagram (Page 4)

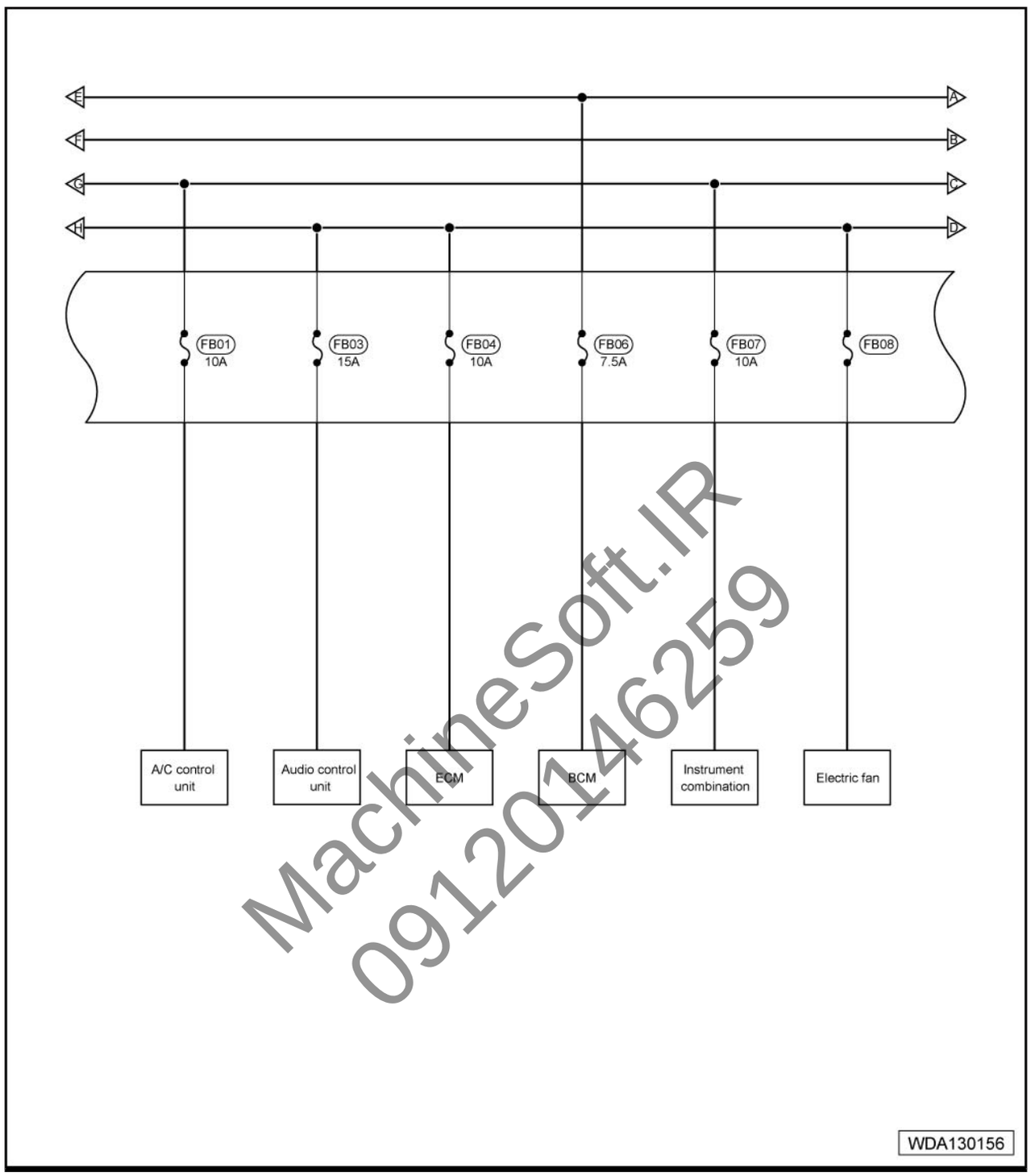


Power supply circuit diagram (Page 5)

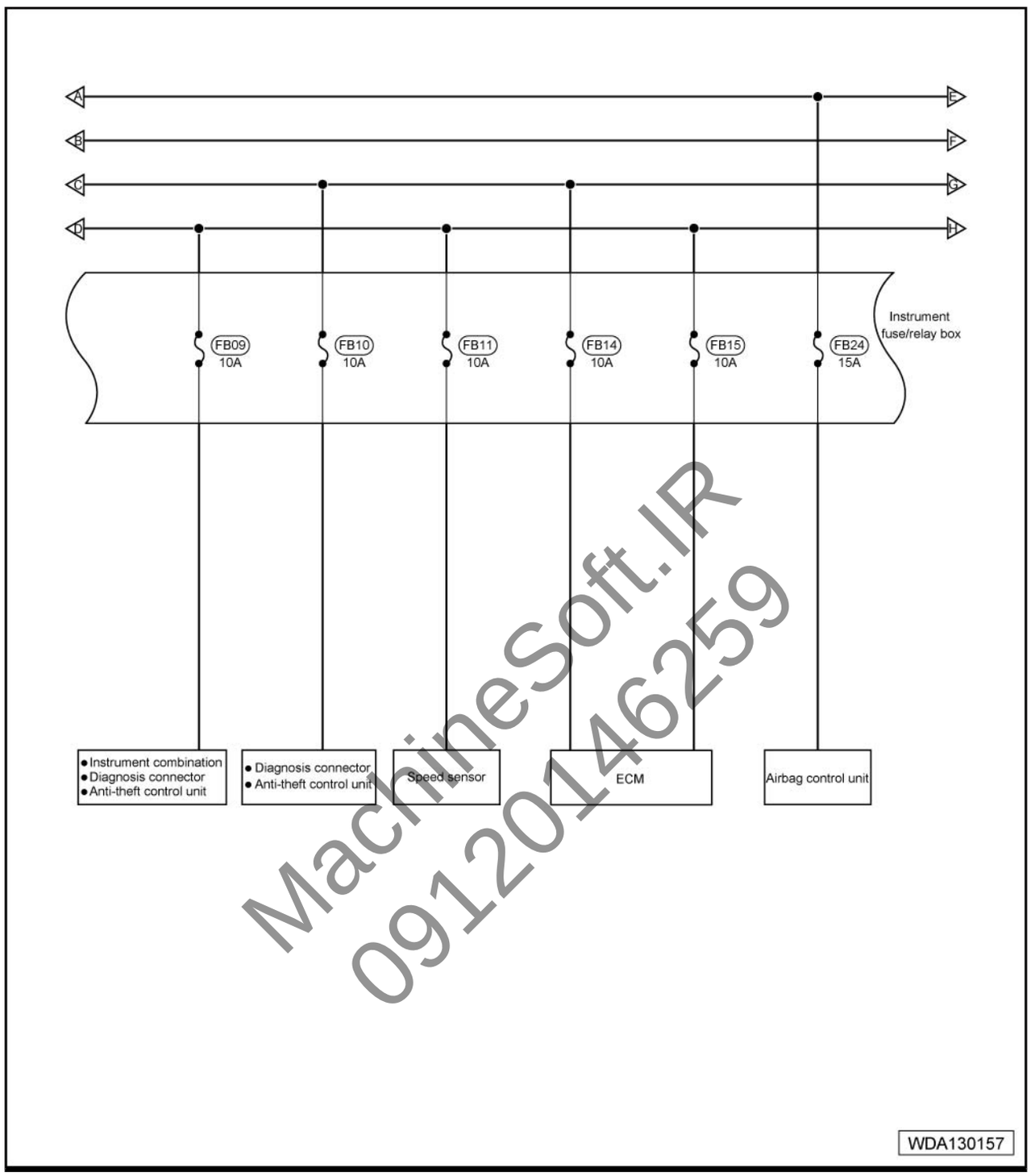


09

Power supply circuit diagram (Page 6)

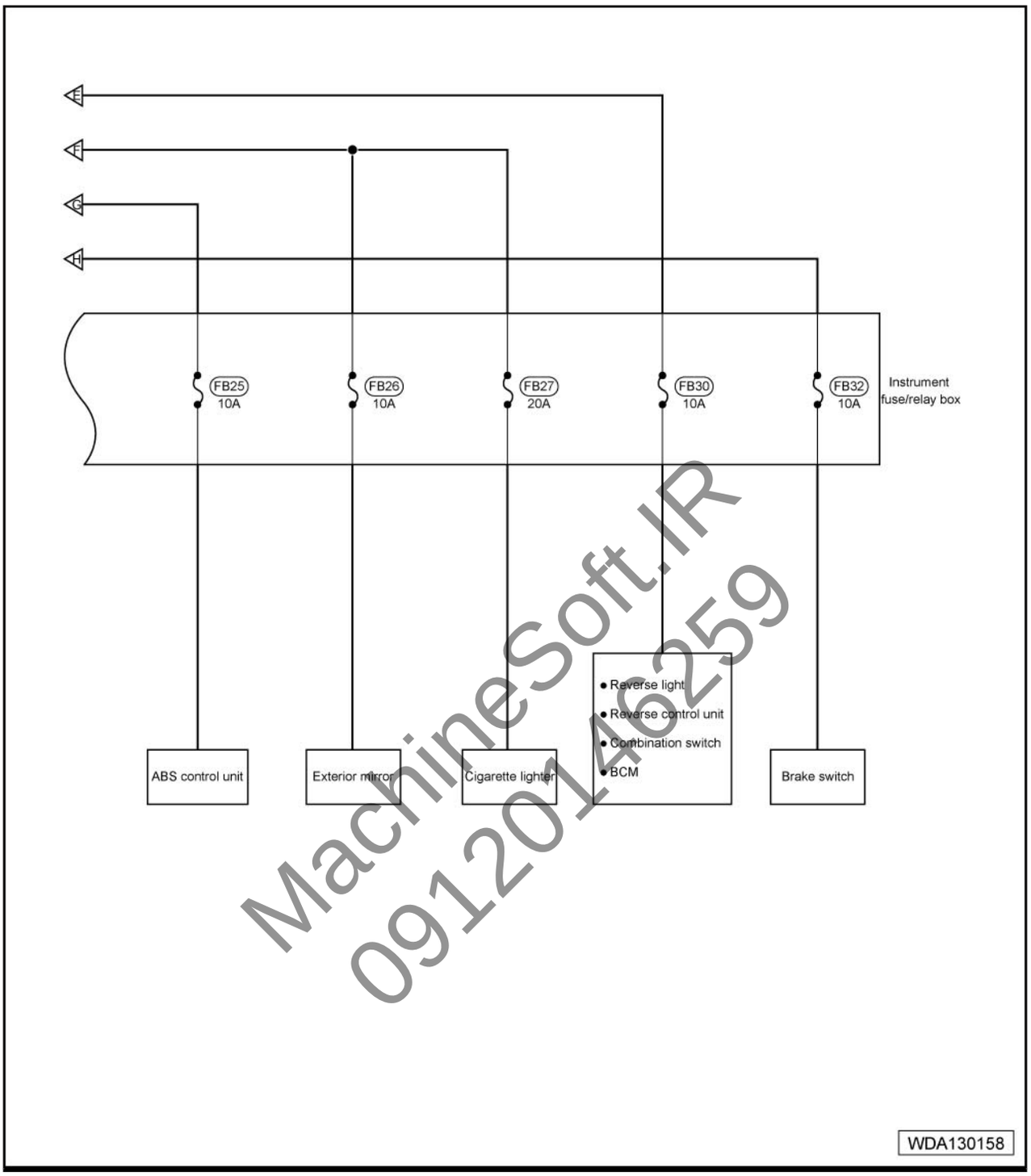


Power supply circuit diagram (Page 7)



09

Power supply circuit diagram (Page 8)



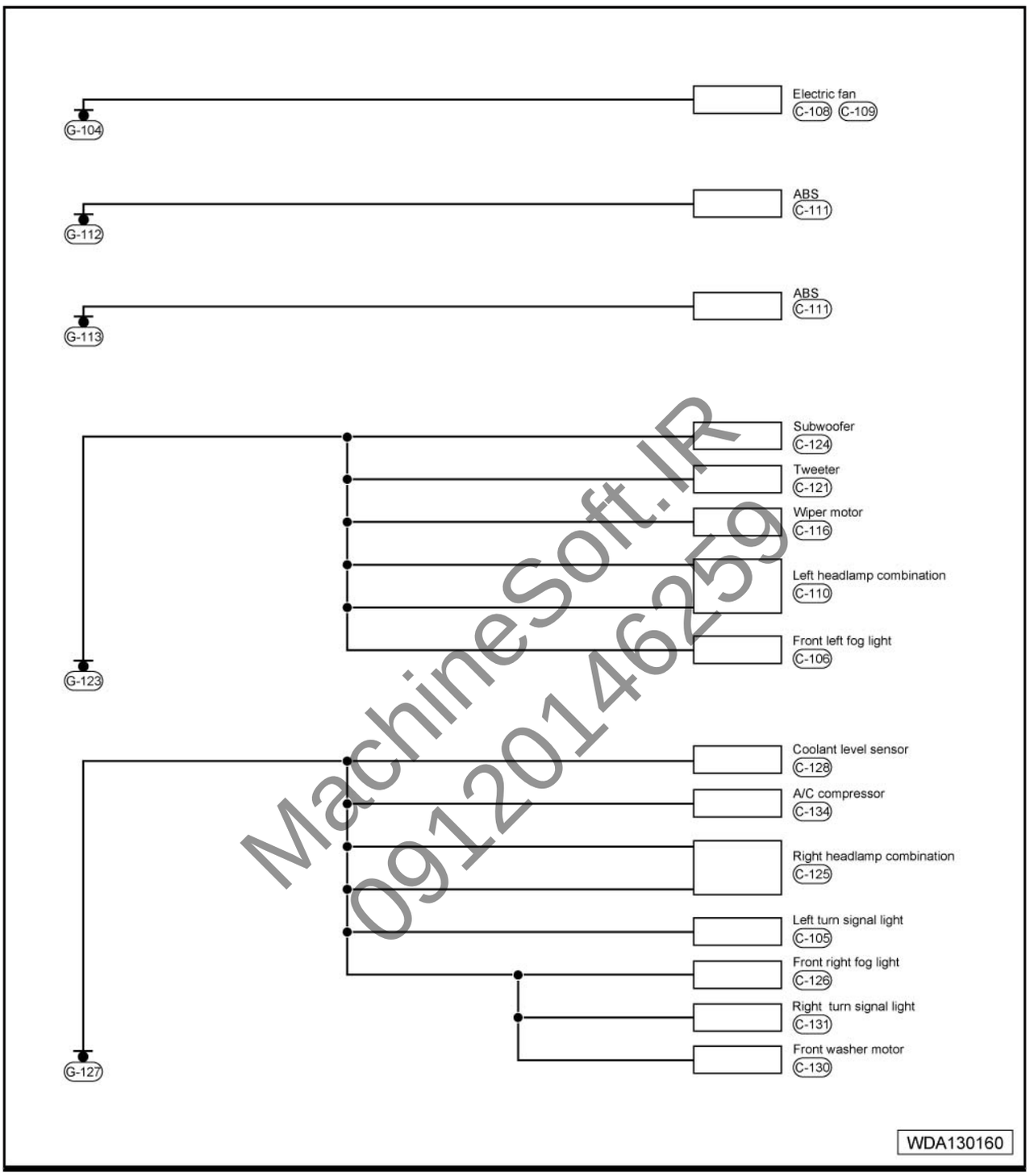
2.3 Ground

2.3.1 Introduction

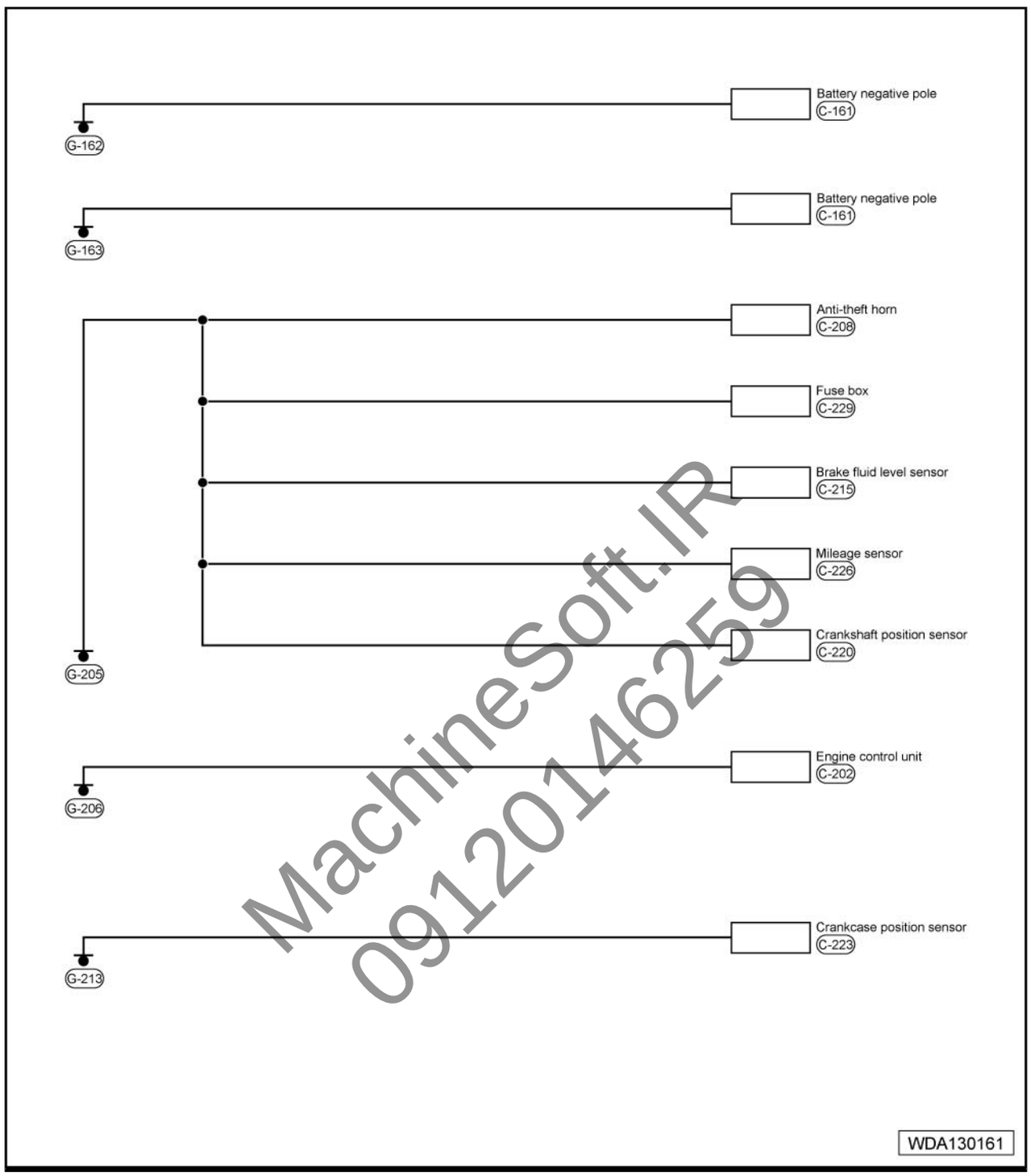
The gound distribution diagram includes the information of all ground points in the circuit diagram to help determine the ground circuit failures of an individual component.

2.3.2 Circuit diagram

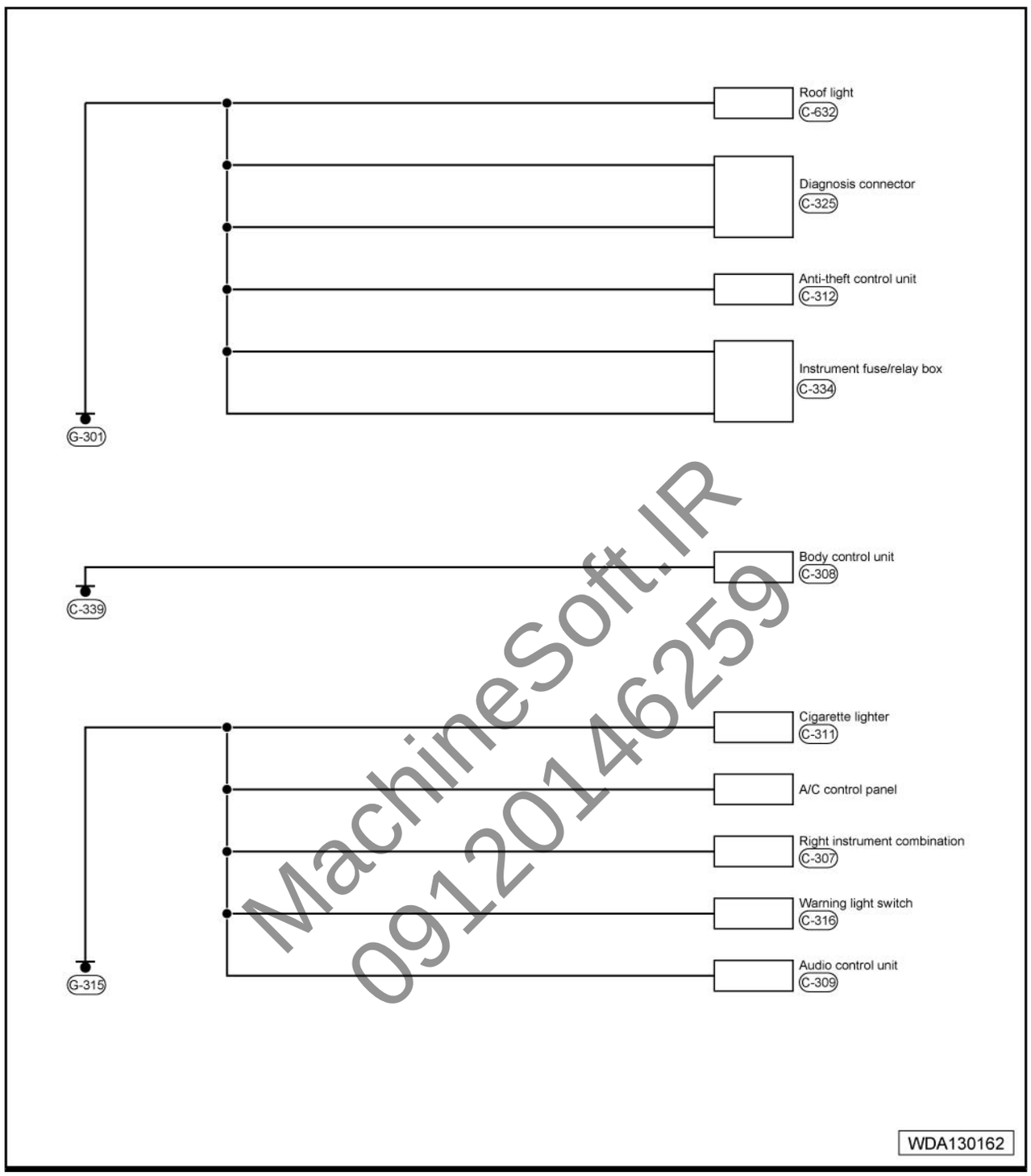
Gound circuit diagram (Page 1)



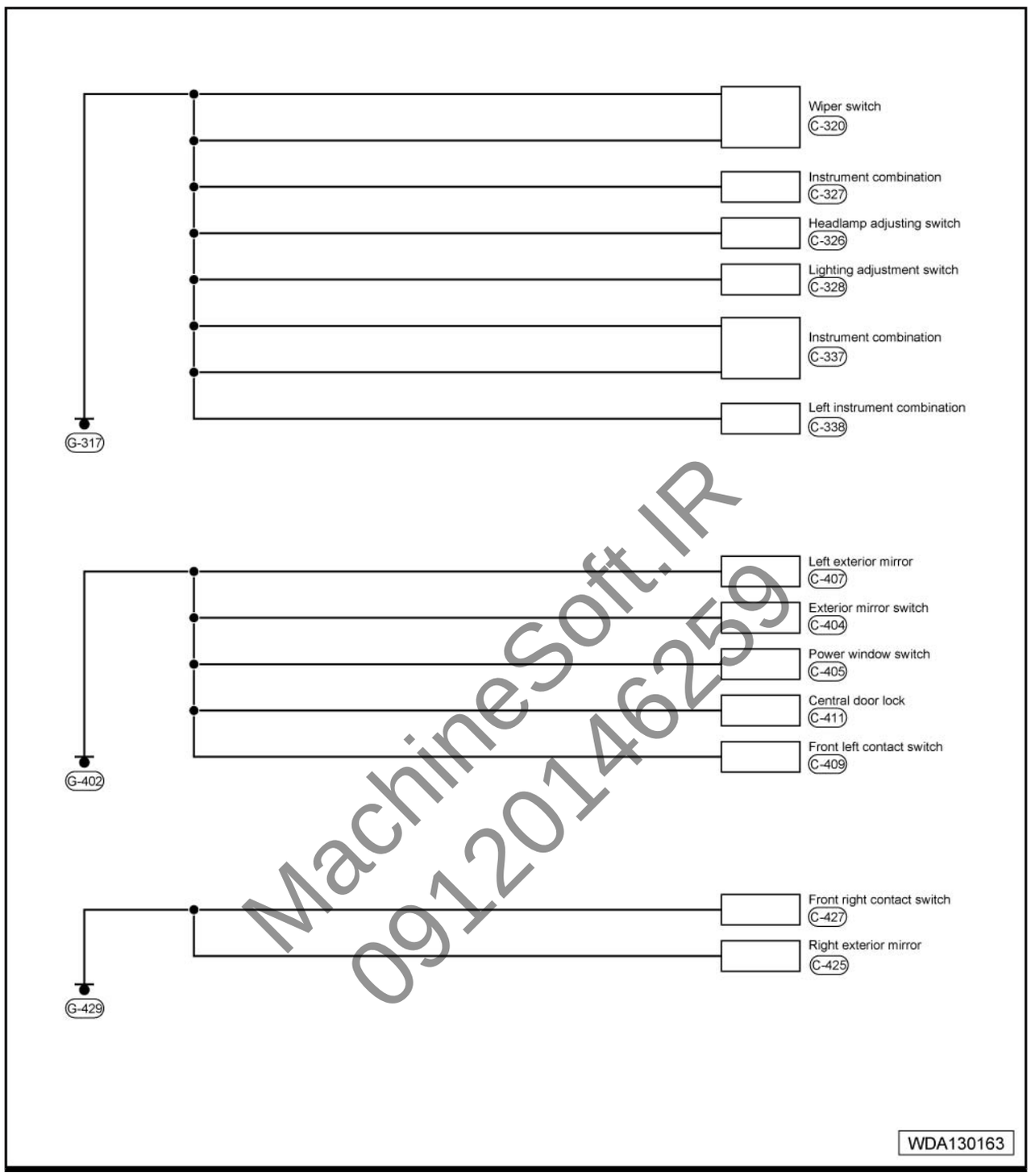
Gound circuit diagram (Page 2)



Gound circuit diagram (Page 3)

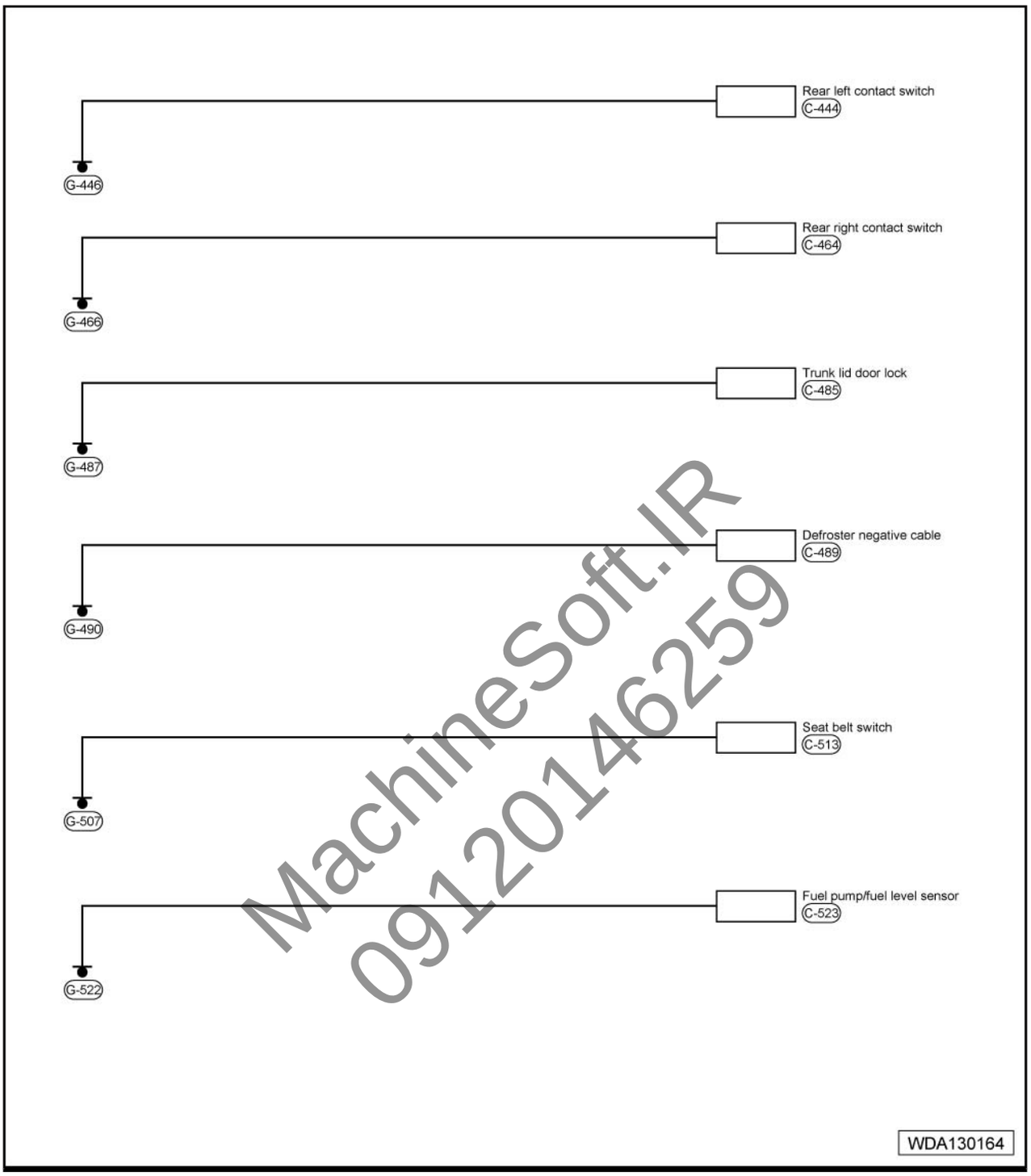


Gound circuit diagram (Page 4)

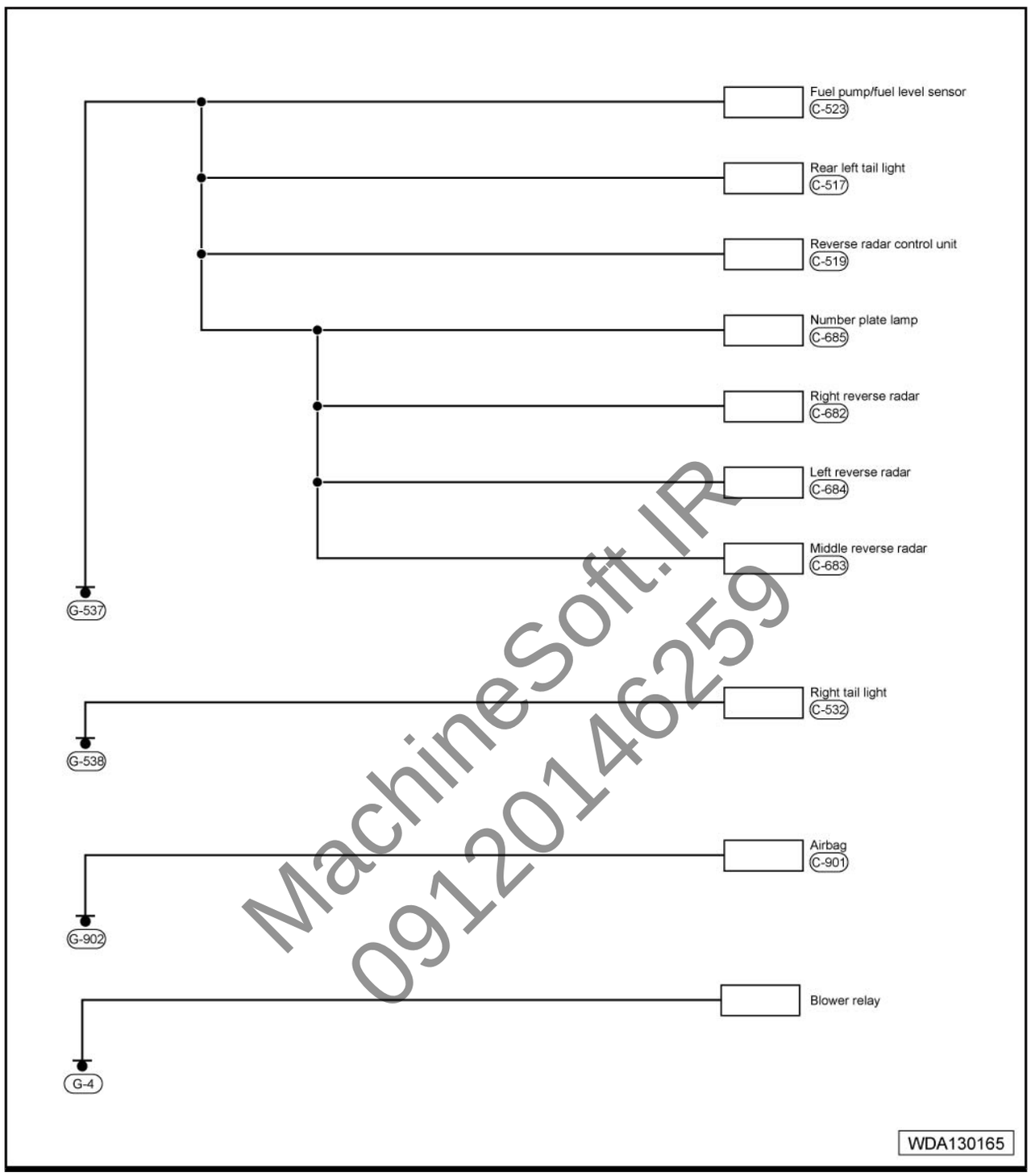


09

Gound circuit diagram (Page 5)



Gound circuit diagram (Page 6)



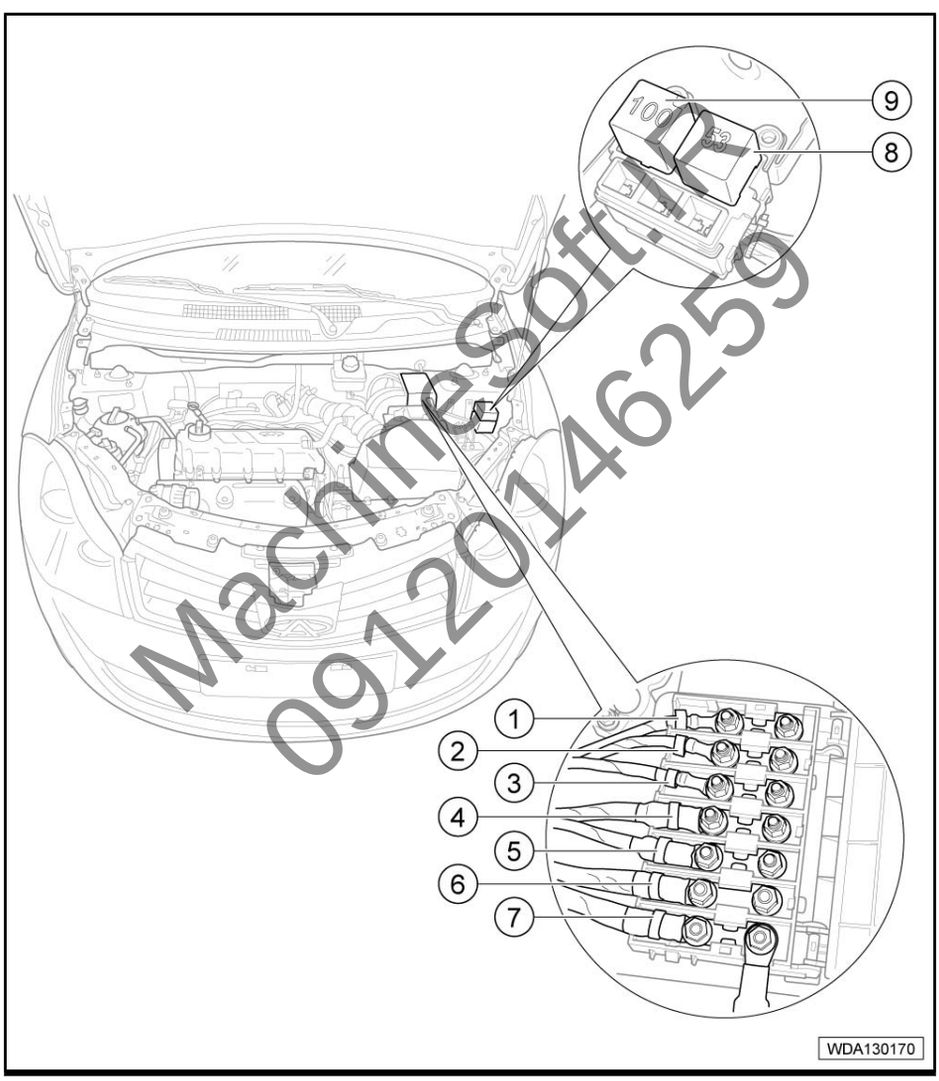
2.4 Fuse and relay

2.4.1 Introduction

Each system should be equipped with fuse and relay to ensure normal operation of the vehicle electrical system. The fuse and relay are integerated in the fuse/relay box which are installed in the following positions in the vehicle:

- Front compartment fuse box: installed on the battery cover.
- Front compartment relay box: installed next to the battery.
- Dashboard fuse/relay box: installed beneath the dashboard on the left.

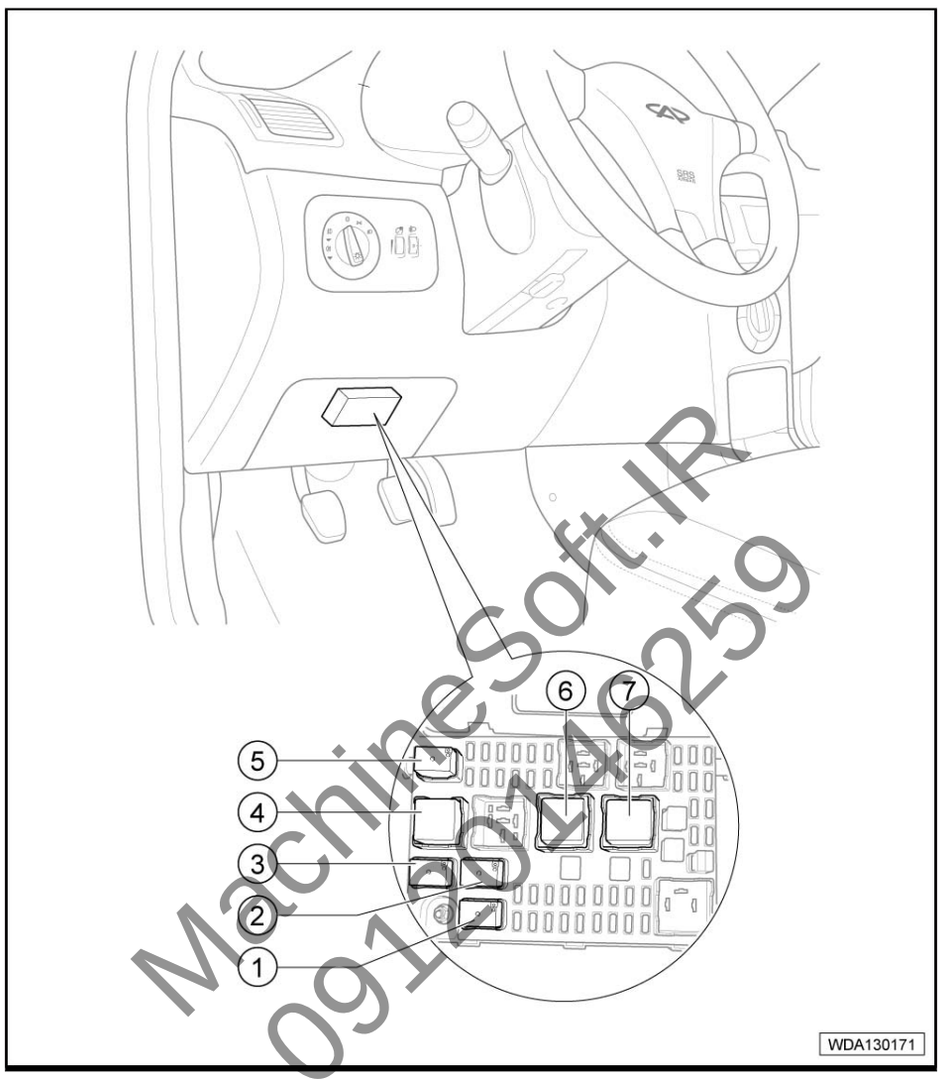
2.4.2 Front compartment fuse/relay box



No.	Connection piece	No.	Connection piece
1	Fan power supply	6	Starter
2	ABS controller 1	7	Generator
3	ABS controller 2	8	Fan low speed relay
4	Instrument fuse/relay box	9	Fan high speed relay

No.	Connection piece	No.	Connection piece
5	BCM (Body Control Module)		

2.4.3 Instrument fuse/relay box



No.	Connection piece	No.	Connection piece
1	Oil pump relay	5	High beam relay
2	A/C relay	6	Starter relay
3	Low beam relay	7	Blower relay
4	Electric injection control module relay		

3 Wiring Harness Layout

3.1 General information

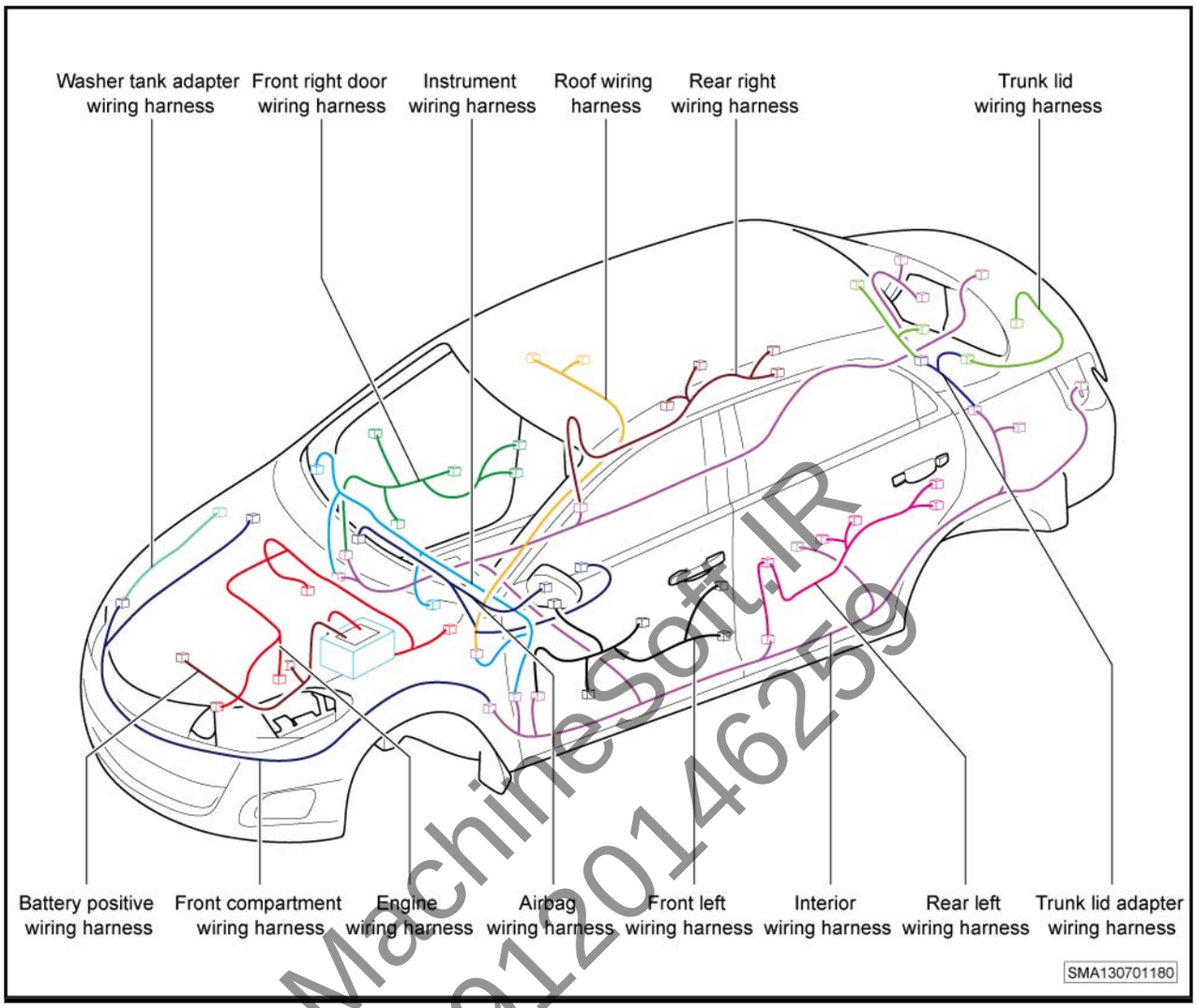
3.1.1 Introduction

The wiring harness layout introduces the location information of the wiring harness and electrical compoments in the vehichle to users in the form of figures. The whole vehicle wiring harness is divided into the following individual harnesses.

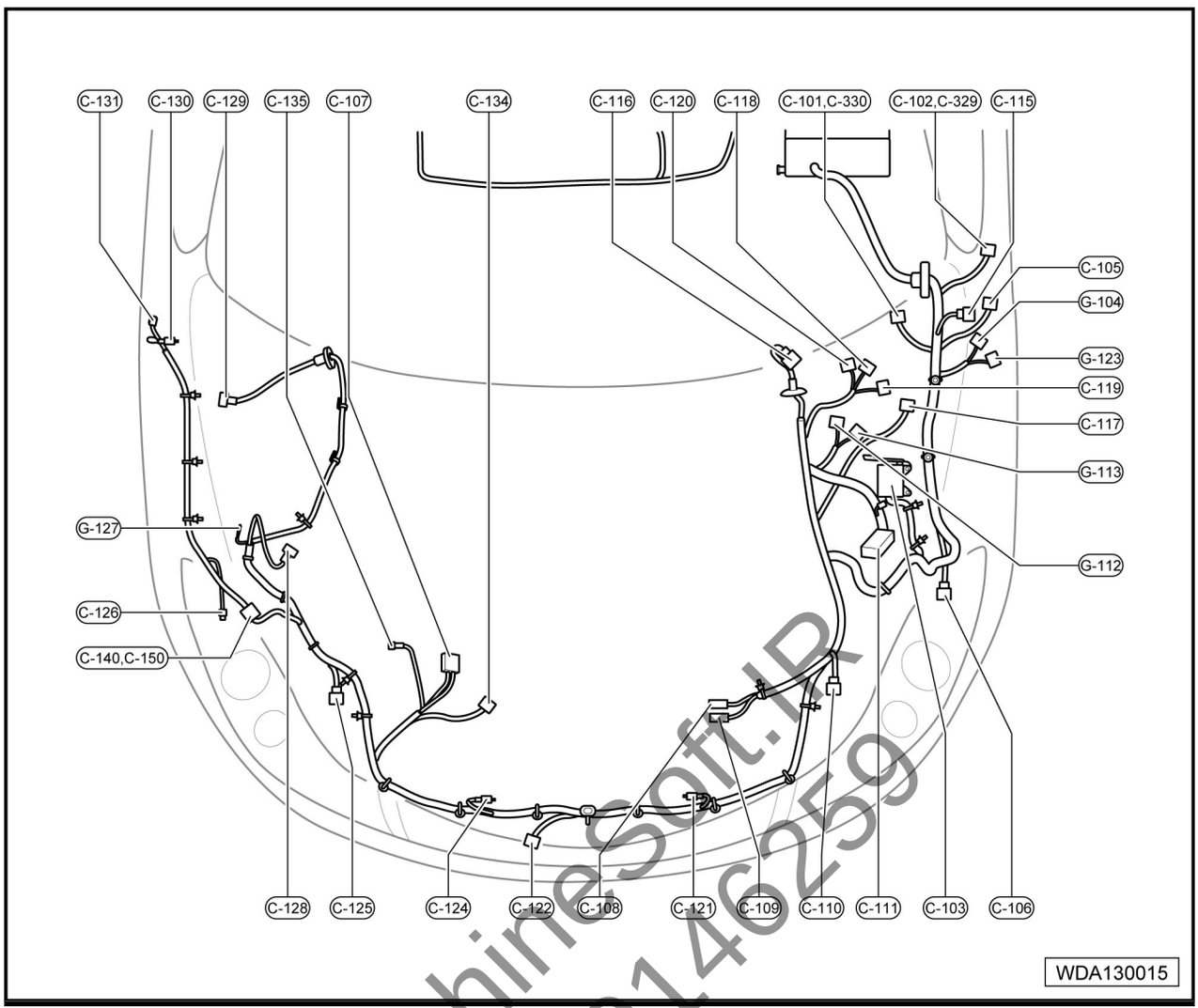
- Front compartment wiring harness
- Engine wiring harness
- Dashboard wiring harness
- Interior floor wiring harness
- Roof wiring harness
- Door wiring harness
- Trunk lid wiring harness
- Airbag wiring harness

3.2 Wiring harness layout and connector information

3.2.1 Overall vehicle wiring harness layout



3.2.2 Front compartment wiring harness layout

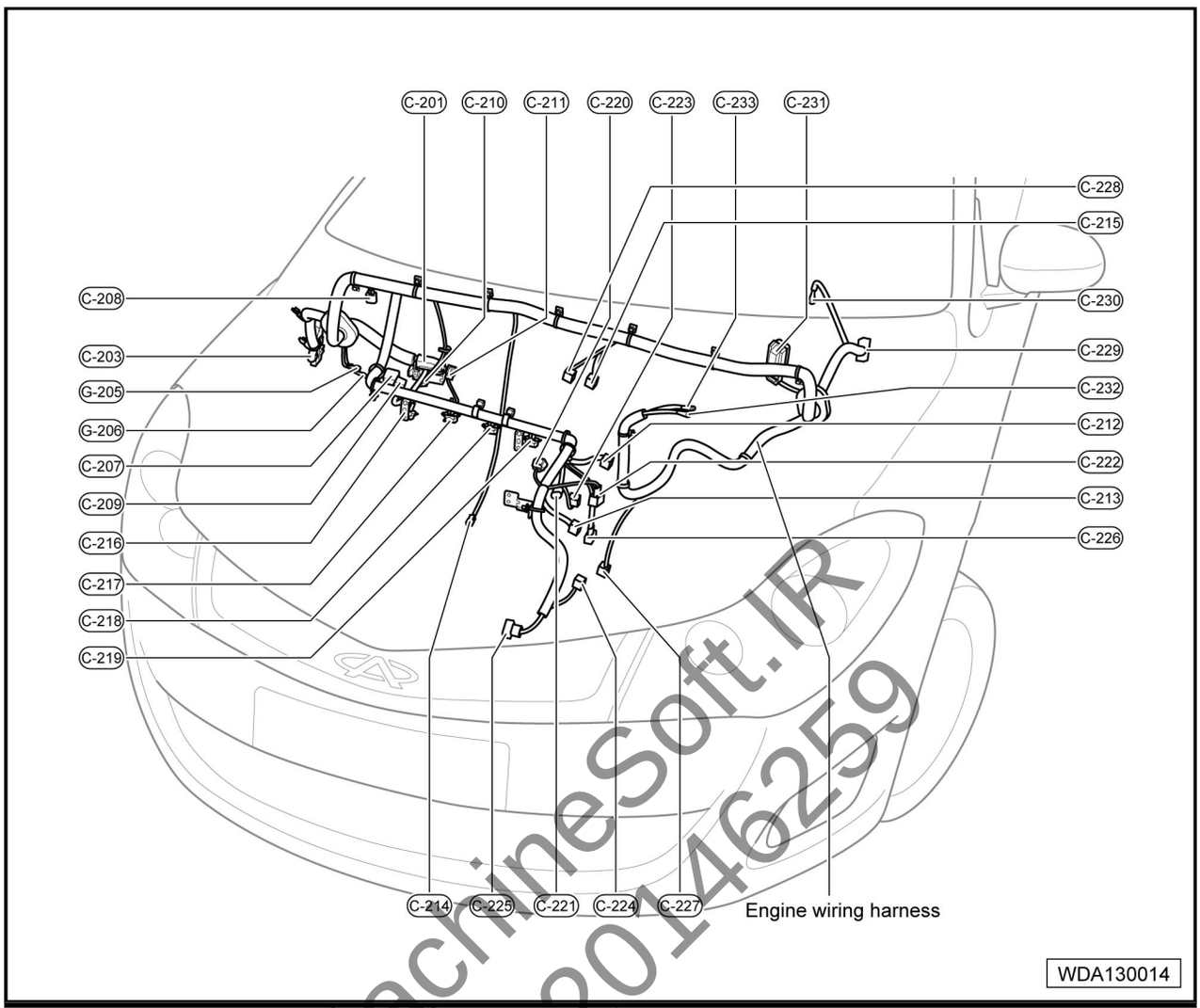


Connector code	Connector color/pin No.	Connector name
C-101	W/16-pin	Interior wiring harness connector
C-102	B/18-pin	Interior wiring harness connector
C-103	W/16-pin	Fuse box D connector
C-105	B/2-pin	Left turning signal light
C-106	W/2-pin	Front left fog lamp
C-107	B/1-pin	Power steering
C-108	B/3-pin	Fan motor connector A
C-109	B/3-pin	Fan motor connector B
C-110	B/10-pin	Left headlamp combination
C-111	B/38-pin	ABS controller connector
C-115	B/8-pin	Fan relay box
C-116	W/5-pin	Wiper motor connector
C-117	B/2-pin	Front left ABS wheel speed sensor
C-118	B/1-pin	Fan power
C-119	B/1-pin	ABS power supply A
C-120	B/1-pin	ABS power supply B
C-121	B/2-pin	Tweeter

Connector code	Connector color/pin No.	Connector name
C-122	W/2-pin	Exterior temperature sensor
C-124	B/2-pin	Subwoofer
C-125	B/10-pin	Right headlamp combination
C-126	W/2-pin	Front right fog lamp
C-128	B/2-pin	Coolant level sensor
C-129	B/2-pin	Front right ABS wheel speed sensor
C-130	W/2-pin	Front washer pump motor
C-131	B/2-pin	Right turning signal light
C-134	B/2-pin	A/C clutch connector
C-135	B/1-pin	Generator signal
C-140, C-150	B/6-pin	Front compartment wiring harness and washer tank wiring harness connector
C-182	B/1-pin	Starter
C-183	B/1-pin	Generator
G-104		Ground
G-112		Ground
G-113		Ground
G-123		Ground
G-127		Ground

09

3.2.3 Engine wiring harness layout

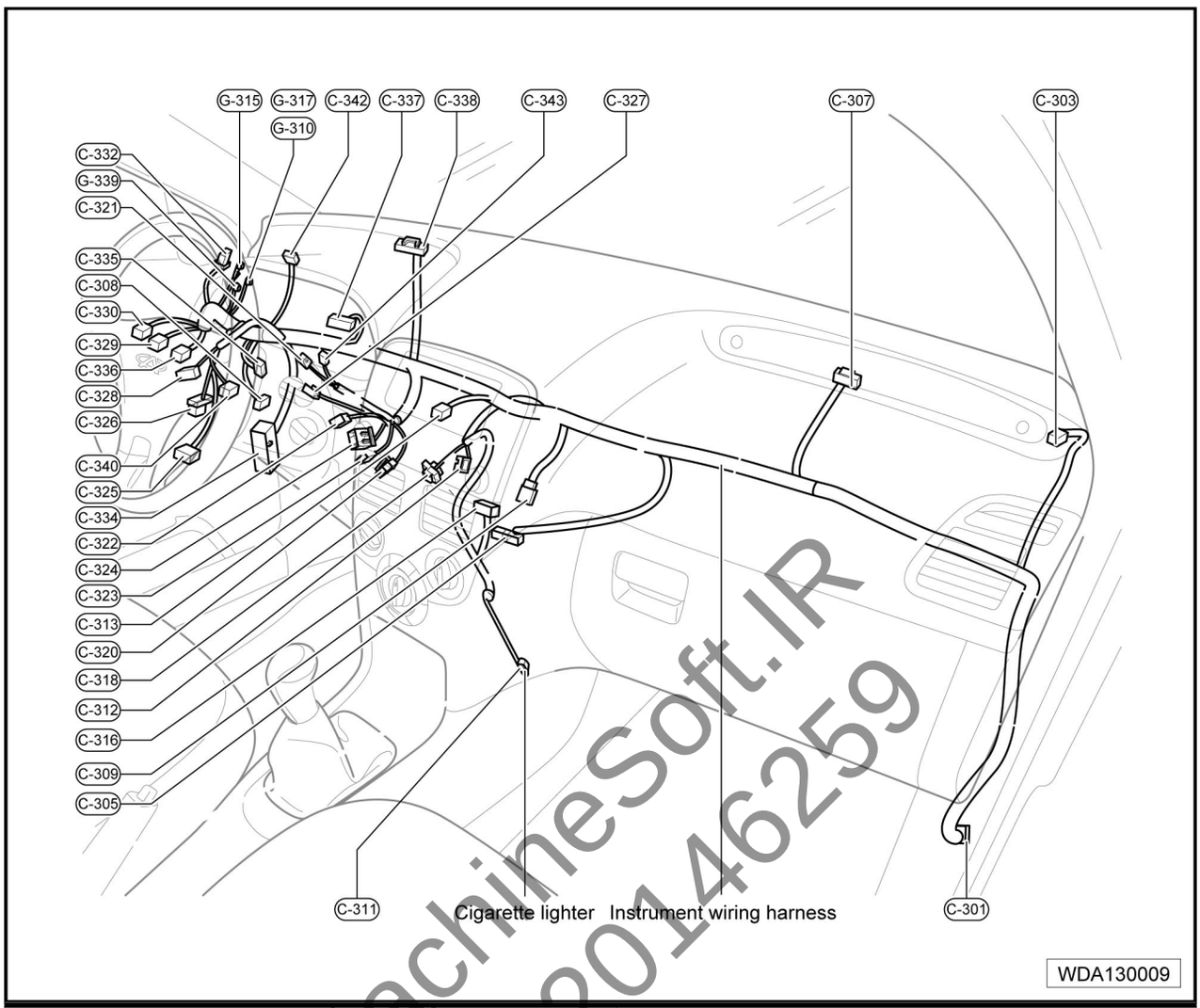


Connector code	Connector color/pin No.	Connector name
C-201	W/72-pin	ECM controller
C-202	B/73-pin	ECM controller
C-203	W/22-pin	Instrument wiring harness connector
C-207	B/4-pin	A/C pressure switch
C-208	B/2-pin	Anti-theft horn connector
C-209	B/2-pin	Carbon canister solenoid valve
C-210	B/3-pin	Knock sensor
C-211	B/4-pin	Intake temperature/pressure sensor
C-212	B/3-pin	Throttle position sensor
C-214	B/1-pin	Oil pressure
C-215	B/2-pin	Brake fluid level sensor
C-216	B/2-pin	Injection nozzle 1
C-217	B/2-pin	Injection nozzle 2
C-218	B/2-pin	Injection nozzle 3
C-219	B/2-pin	Injection nozzle 4

Connector code	Connector color/pin No.	Connector name
C-220	B/3-pin	Camshaft position sensor
C-221	B/2-pin	Water temperature sensor
C-222	B/4-pin	Ignition coil
C-223	B/3-pin	Engine speed sensor
C-224	B/2-pin	Reverse light switch
C-225	B/4-pin	Front oxygen sensor
C-226	B/3-pin	Mileage sensor
C-227	B/1-pin	Starter control cable
C-228	B/4-pin	Rear oxygen sensor
C-229	W/18-pin	Electrical box connector C-
C-230	B/1-pin	Fuse box power terminal
C-231	B/1-pin	Body controller power supply
C-232	B/1-pin	Fuse box 5
C-233	B/1-pin	Fuse box 4
C-234	B/4-pin	Stepper motor
G-205		Ground

09

3.2.4 Dashboard wiring harness layout

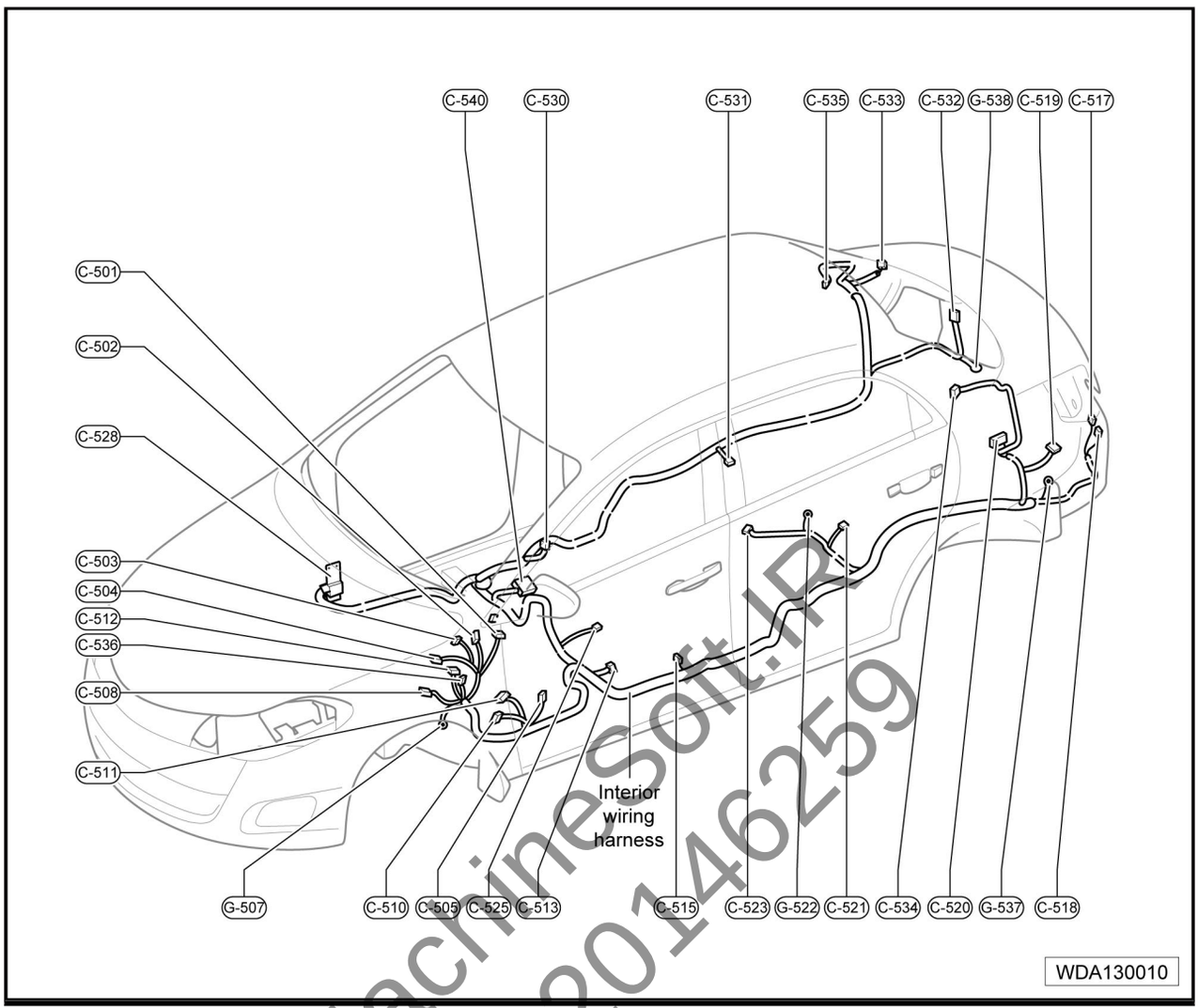


Connector code	Connector color/pin No.	Connector name
C-301	W/22-pin	Engine wiring harness connector
C-303	B/2-pin	Front right speaker connector
C-305	W/15-pin	A/C control panel connector
C-307	B/16-pin	Right instrument cluster
C-308	W/4-pin	Anti-theft indicator
C-309	B/6-pin	Radio connector
C-311	B/2-pin	Cigarette lighter connector
C-312	W/8-pin	Anti-theft module connector
C-313	B/6-pin	Accelerator pedal position sensor connector
C-316	B/6-pin	Warning light switch connector
C-318	B/4-pin	Brake switch connector
C-320	W/8-pin	Wiper switch connector
C-321	W/1-pin	Horn switch connector
C-322	W/4-pin	Key switch connector

Connector code	Connector color/pin No.	Connector name
C-323	W/2-pin	Ignition lock lighting connector
C-324	W/6-pin	Ignition switch connector
C-325	W/16-pin	Diagnostic module connector
C-326	W/6-pin	Headlamp adjusting switch connector
C-327	B/4-pin	Combination switch connector
C-328	B/10-pin	Headlamp combination switch connector
C-329	W/22-pin	Interior wiring harness connector
C-330	L/16-pin	Interior wiring harness connector
C-332	W/10-pin	Roof wiring harness connector
C-334	B/40-pin	Fuse box E connector
C-335	W/32-pin	Body controller connector
C-336	B/18-pin	Interior wiring harness connector
C-337	L/32-pin	Instrument cluster connector
C-338	B/16-pin	Left instrument cluster
C-340	W/3-pin	Lighting adjustment switch
C-342	W/4-pin	Connector
C-343	W/1-pin	Horn switch connector
G-310		Ground
G-315		Ground
G-317		Ground
G-339		Ground

09

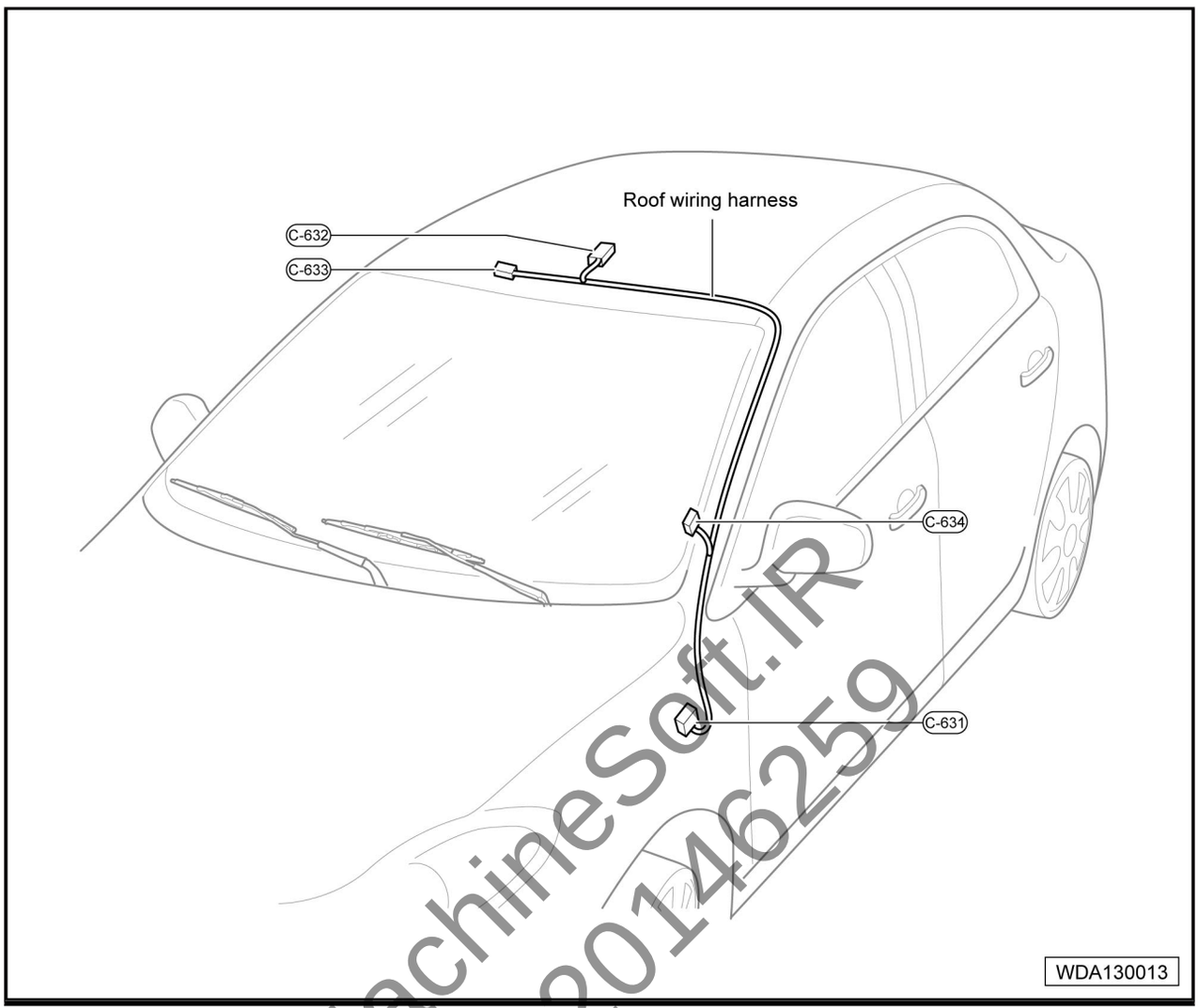
3.2.5 Interior wiring harness layout



Connector code	Connector color/pin No.	Connector name
C-501	L/32-pin	Body controller connector
C-502	W/12-pin	Body controller connector
C-503	W/20-pin	Body controller connector
C-504	W/20-pin	Fuse box F connector
C-505	W/26-pin	Front left door wiring harness connector
C-508	W/22-pin	Instrument wiring harness connector
C-510	B/18-pin	Front compartment wiring harness connector
C-511	W/16-pin	Front compartment wiring harness connector
C-512	L/16-pin	Instrument wiring harness connector
C-513	B/4-pin	Fuel pump/fuel level sensor
C-515	W/10-pin	Rear left door wiring harness connector
C-517	B/6-pin	Left tail light connector

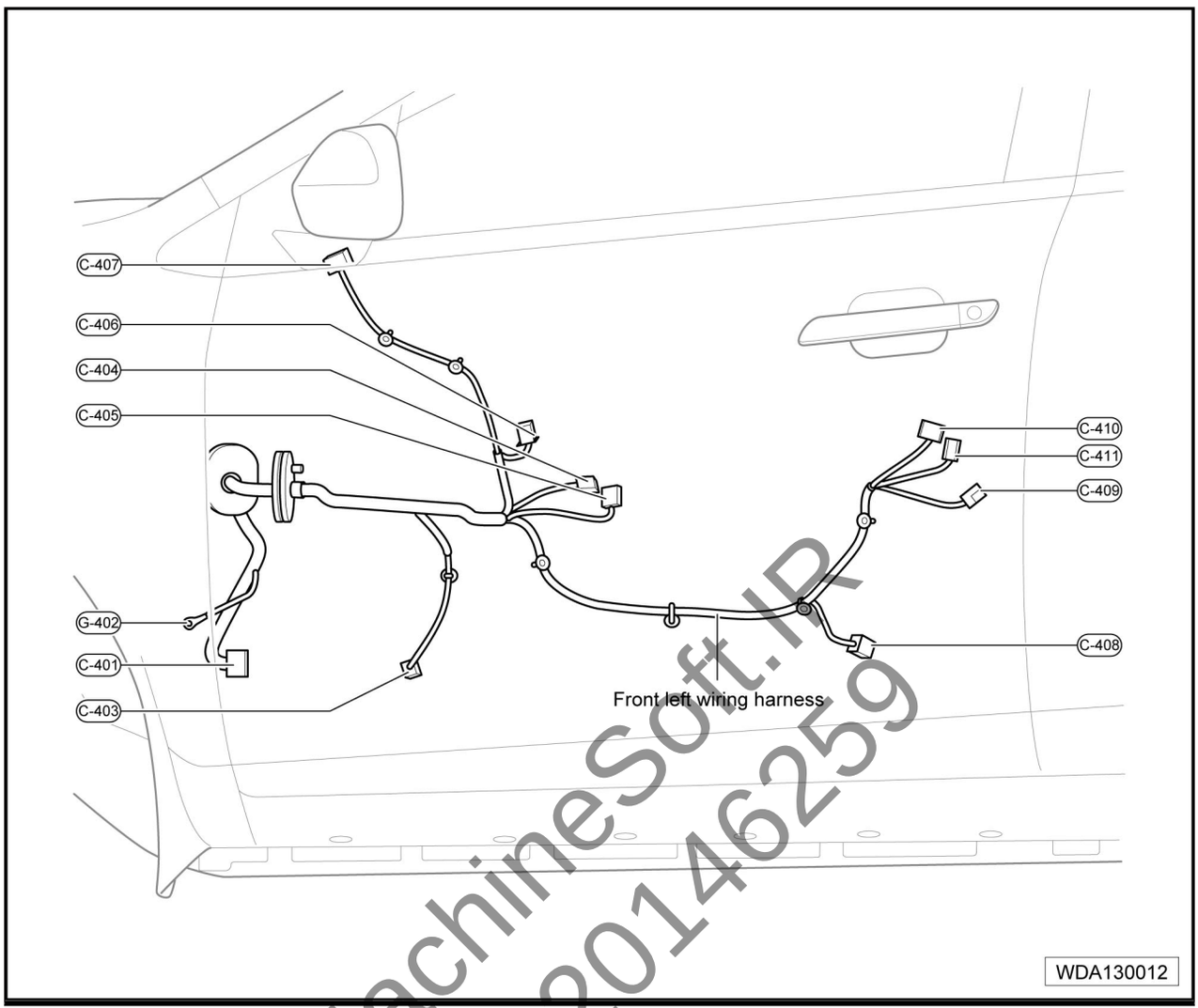
Connector code	Connector color/pin No.	Connector name
C-518	B/8-pin	Rear bumper wiring harness connector
C-519	W/16-pin	Radar module
C-520	B/6-pin	Trunk lid wiring harness connector
C-521	B/2-pin	Rear left ABS wheel speed sensor
C-523	B/4-pin	Fuel pump/fuel level sensor connector
C-525	B/1-pin	Parking brake switch
C-528	W/18-pin	Front passenger door wiring harness connector
C-530	W/10-pin	Rear right door wiring harness connector
C-531	W/2-pin	Rear right ABS wheel speed sensor
C-532	B/6-pin	Right tail light
C-533	B/2-pin	Luggage compartment light
C-535	B/2-pin	Rear right speaker connector
C-536	B/18-pin	Instrument wiring harness connector
C-539	B/2-pin	Rear left speaker connector
C-540	B/2-pin	Seat belt switch
G-507		Ground
G-522		Ground
G-537		Ground
G-538		Ground

3.2.6 Roof wiring harness layout



Connector code	Connector color/pin No.	Connector name
C-631	W/10-pin	Instrument wiring harness connector
C-632	W/6-pin	Roof light
C-633	W/1-pin	Antenna amplifier
C-634	B/2-pin	Front left speaker

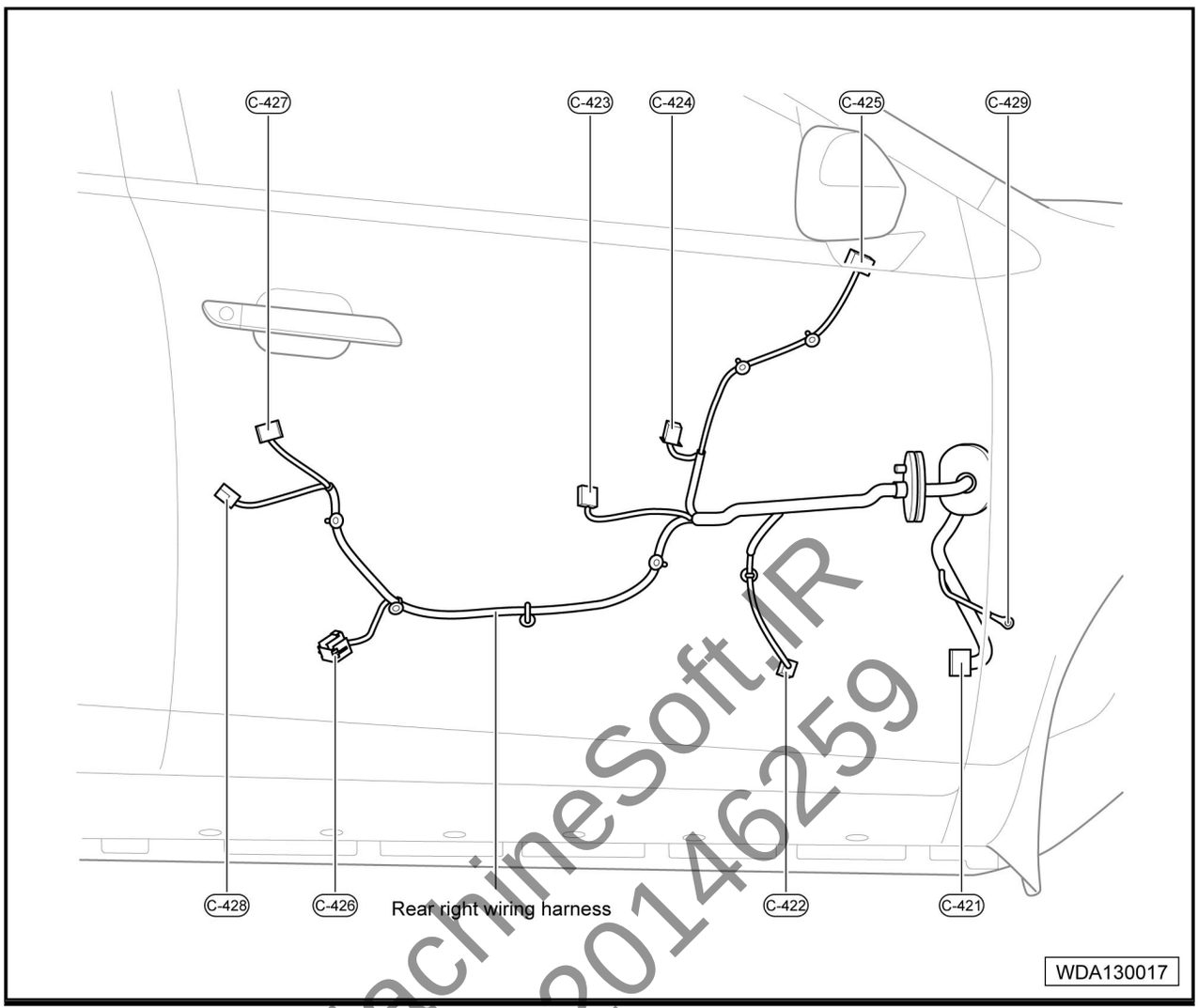
3.2.7 Front left door wiring harness layout



Connector code	Connector color/pin No.	Connector name
C-401	W/26-Pin	Interior wiring harness connector
C-403	B/2-Pin	Front left speaker
C-404	B/10-Pin	Rearview mirror switch
C-405	BR/16-Pin	Power window switch
C-406	B/2-Pin	Left power window motor
C-407	B/6-Pin	Left rearview mirror
C-408	B/2-Pin	Courtesy light on the driver's side
C-409	B/2-Pin	Front left door contact switch connector
C-410	B/3-Pin	Door-lock motor on the driver's side
C-411	B/3-Pin	Central door lock
G-402		Ground

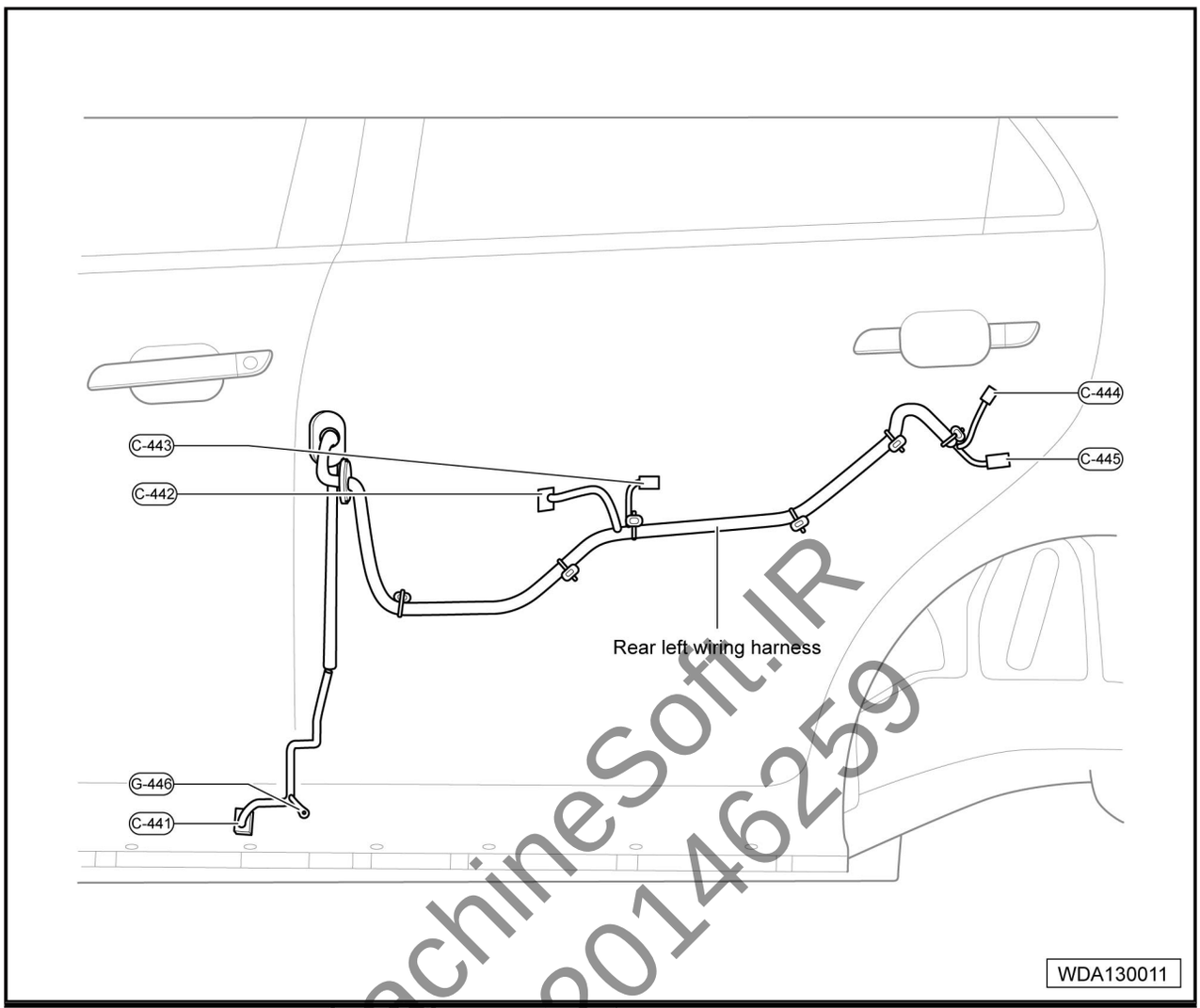
09

3.2.8 Front right door wiring harness layout



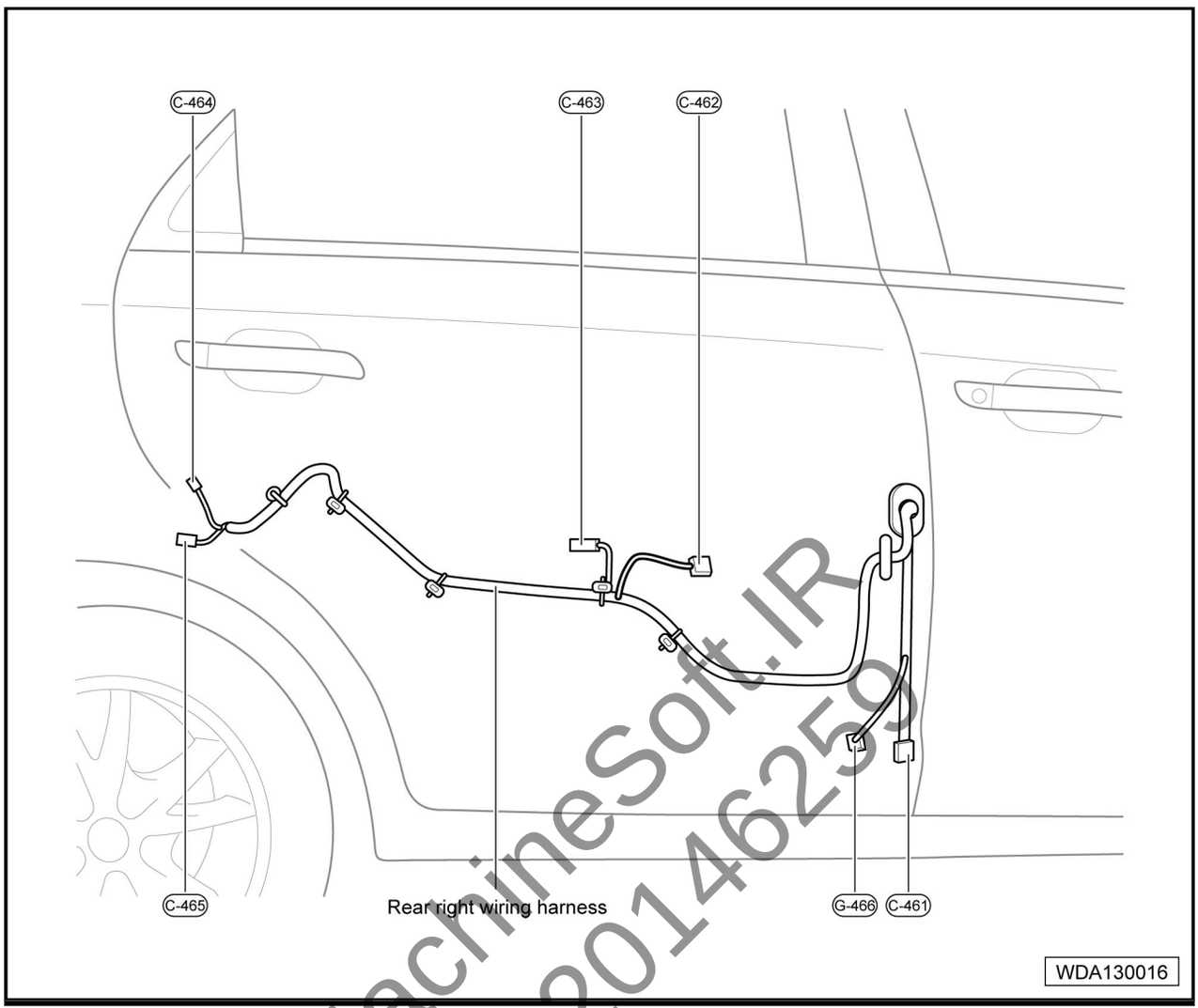
Connector code	Connector color/pin No.	Connector name
C-421	W/18-Pin	Interior wiring harness connector
C-422	B/2-Pin	Front right speaker
C-423	BR/10-Pin	Power window switch connector
C-424	B/2-Pin	Right power window motor
C-425	B/6-Pin	Right rearview mirror
C-426	B/2-Pin	Courtesy light on the front passenger's side
C-427	B/2-Pin	Contact switch on the front passenger's side
C-428	B/3-Pin	Door-lock motor on the front passenger's side
G-429		Ground

3.2.9 Rear left door wiring harness layout



Connector code	Connector color/pin No.	Connector name
C-441	W/10-Pin	Interior wiring harness connector
C-442	BR/10-Pin	Rear left power window switch
C-443	B/2-Pin	Left power window motor
C-444	B/2-Pin	Rear left contact switch
C-445	B/3-Pin	Rear left door-lock motor
G-446		Ground

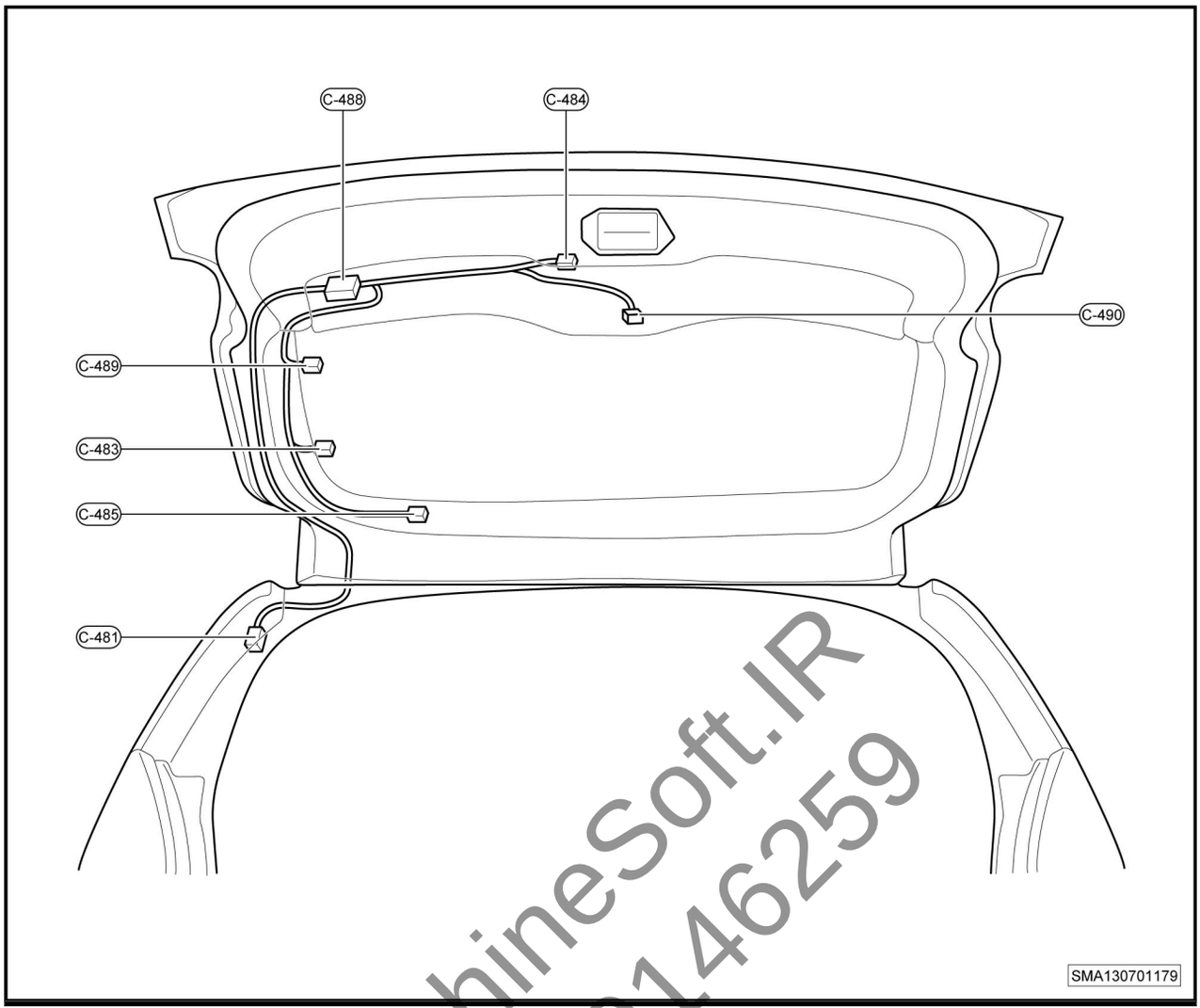
3.2.10 Rear right door wiring harness layout



Connector code	Connector color/pin No.	Connector name
C-461	W/10-Pin	Interior wiring harness connector
C-462	BR/10-Pin	Rear right power window switch
C-463	B/2-Pin	Right power window motor
C-464	B/2-Pin	Rear right contact switch
C-465	B/3-Pin	Rear right door-lock motor
G-466		Ground

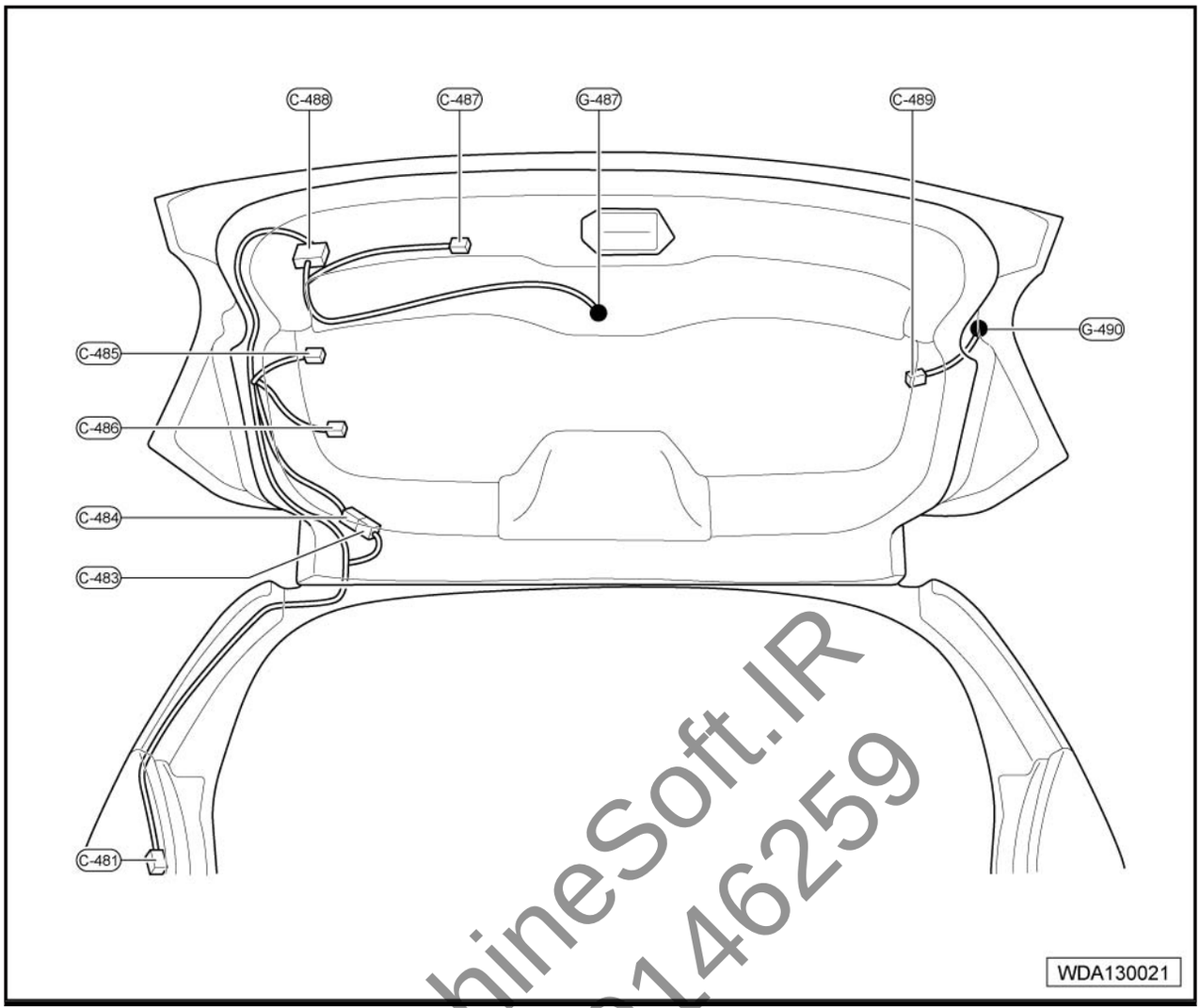
3.2.11 Trunk lid wiring harness layout

Two-box model



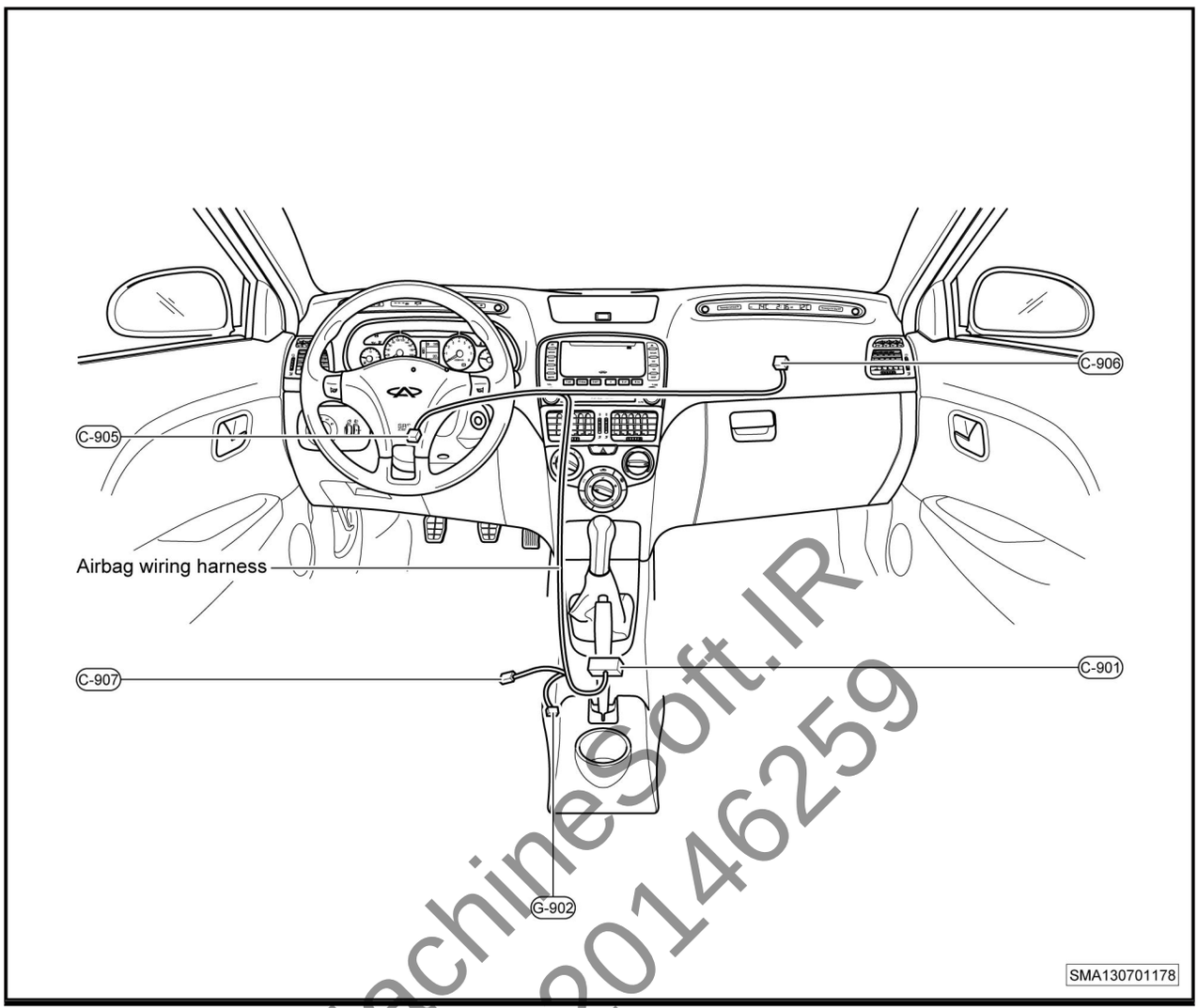
Connector code	Connector color/pin No.	Connector name
C481	W/6-Pin	Interior wiring harness connector
C483	B/2-Pin	Defroster positive pole (+)
C484	B/2-Pin	Adapter
C485	B/3-Pin	Trunk lid door-lock connector
C486	B/1-Pin	High-level brake lamp
C488	B/4-Pin	Adapter
C489	B/1-Pin	Defroster negative pole (-)

Three-box model



Connector code	Connector color/pin No.	Connector name
C-481	W/6-Pin	Interior wiring harness connector
C-483	W/2-Pin	Adapter
C-484	W/2-Pin	Adapter
C-485	B/1-Pin	Defroster positive pole (+)
C-486	B/1-Pin	High-level brake lamp
C-487	W/3-Pin	Trunk lid door lock
C-488	W/4-Pin	Adapter
C-489	B/1-Pin	Defroster negative pole (-)
G-487		Ground
G-490		Ground

3.2.12 Airbag wiring harness layout



Connector code	Connector color/pin No.	Connector name
C-901	Y/50-pin	Airbag control module
C-905	Y/2-pin	Driver airbag
C-906	Y/2-pin	Front passenger airbag
C-907	Y/6-pin	Interior floor wiring harness
G-902		Ground