

0208 Air Intake System

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02

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

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1 General Information

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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

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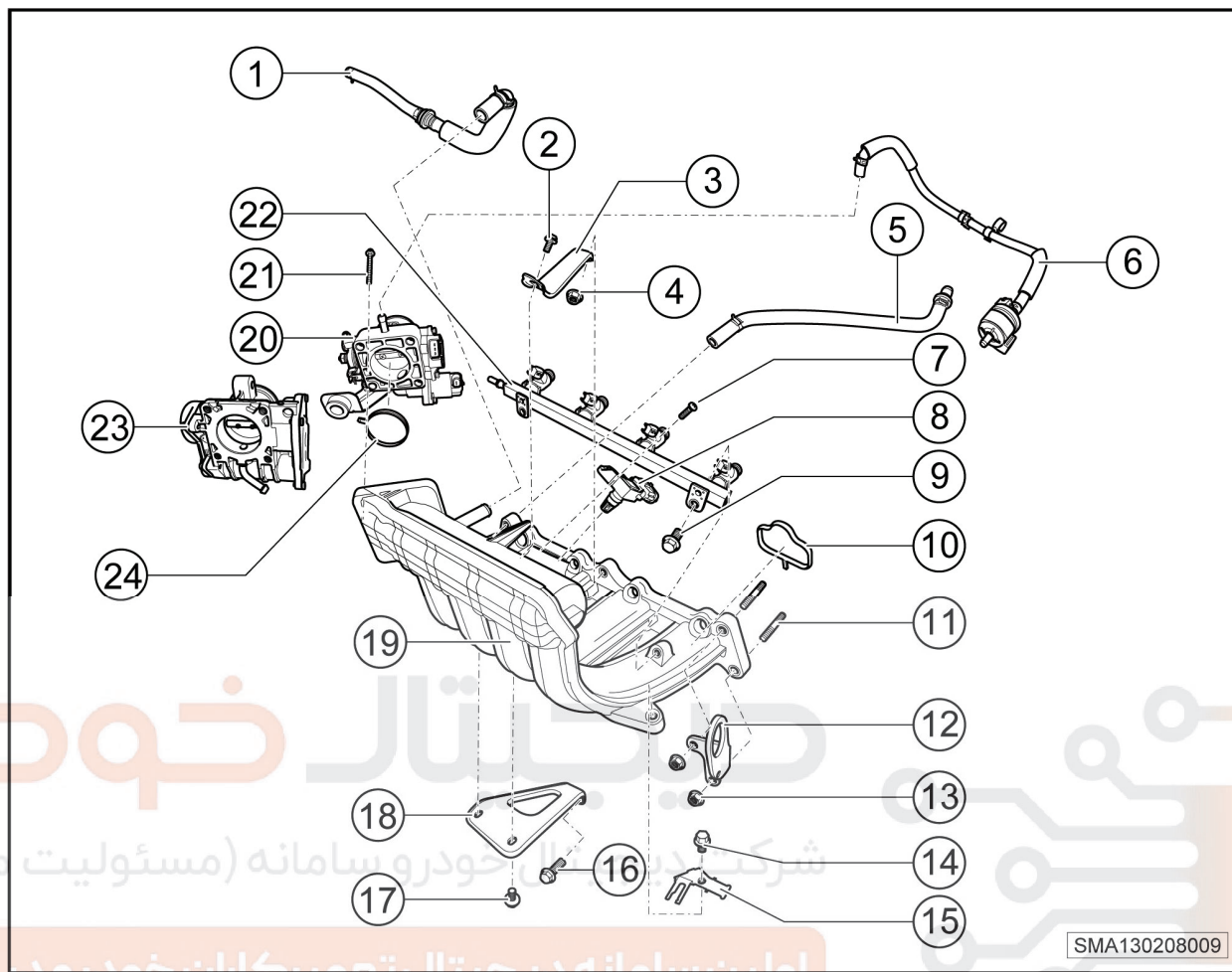
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1.3 The air intake system assembly drawing

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.....237

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

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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

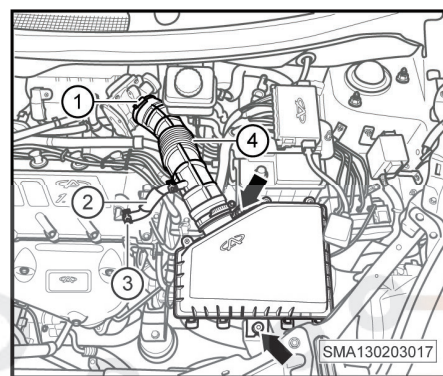
3 Air Filter

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3.2 Replacing the air filter element.....	239

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: $10 \pm 1 \text{ N} \cdot \text{m}$



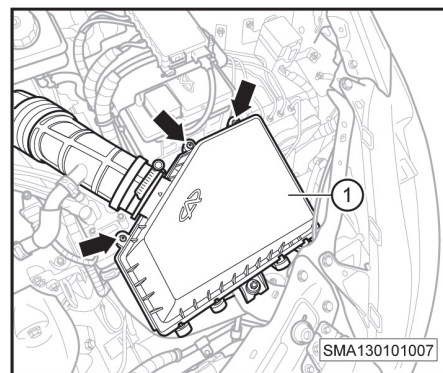
Installation

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.

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4 Throttle Body

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4.4 Removing and installing the accelerator pedal position sensor.....	245

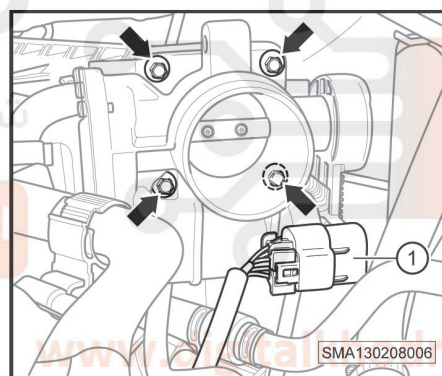
⚠ Warning

- 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.

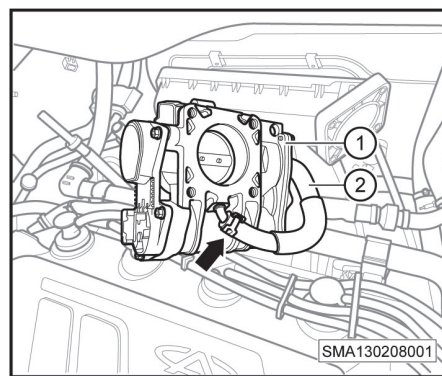
4.1 Removing and installing the electronic throttle body

Removal

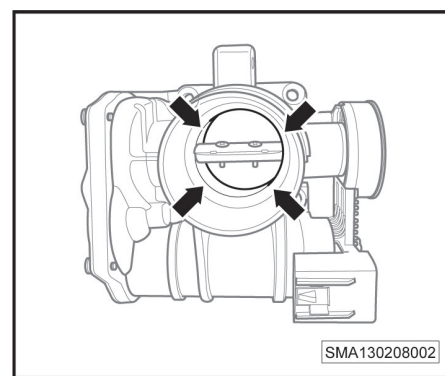
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the air filter assembly. => refer to page 239
4. Disconnect the electronic throttle connector (-1-), and unscrew the fixing bolts (-arrow-).



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.

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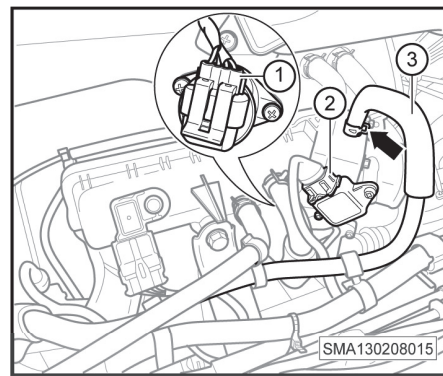


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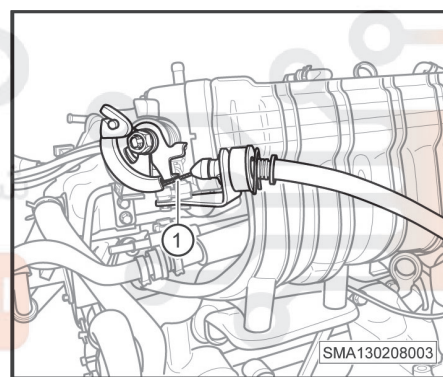
4.2 Removing and installing the mechanical throttle body

Removal

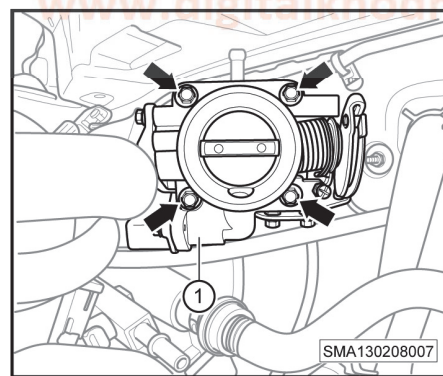
1. Switch off all electrical equipment and the ignition switch, and pull out the key.
2. Disconnect the battery negative terminal.
3. Remove the air filter assembly . => refer to page 239
4. Disconnect the idling stepper motor connector (-1-) and the throttle position sensor connector (-2-), loosen the clamp (-arrow-) and remove the hose (-3-).



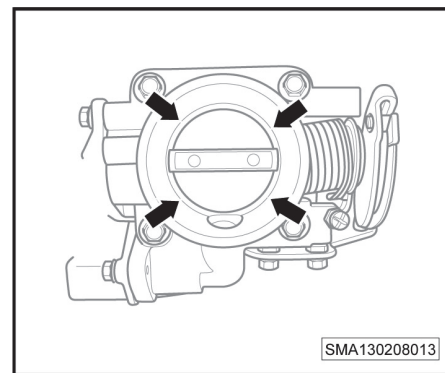
5. Loosen the mechanical throttle cable (-1-) and disconnect the cable from the bracket.



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.



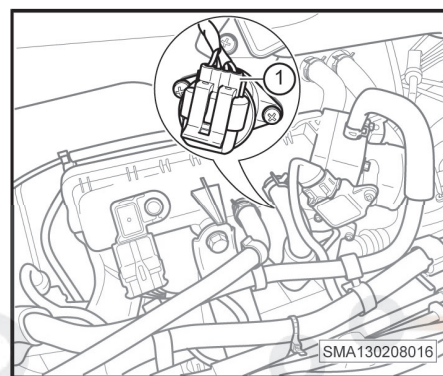
4.3 Removing and installing the idling stepper motor

Caution

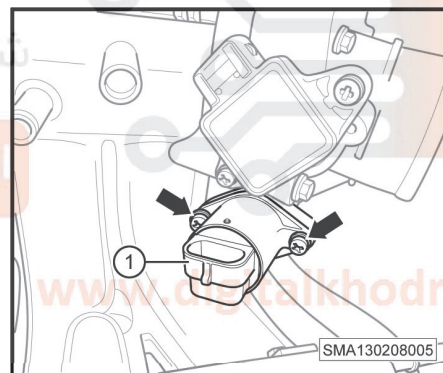
- Do not push and pull the idling stepper motor valve when cleaning the idling stepper motor.

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.

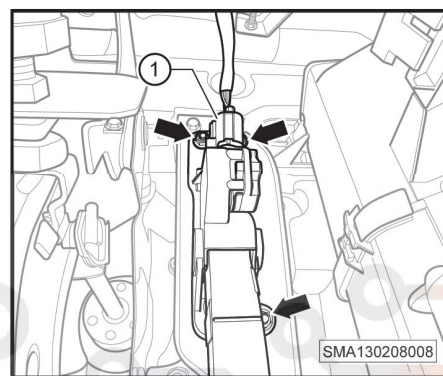
4.4 Removing and installing the accelerator pedal position sensor

i 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.



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Installation

Installation shall follow the reverse sequence of the removal procedure.

5 Intake Manifold

5.1 Removing and installing the intake manifold.....246

5.1 Removing and installing the intake manifold

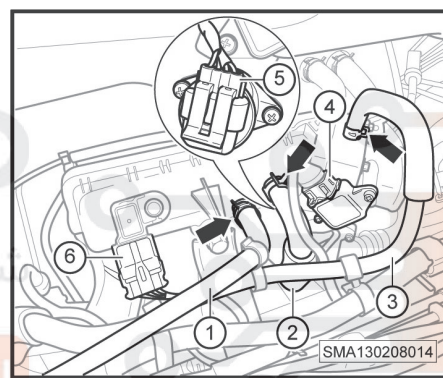
Removal

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

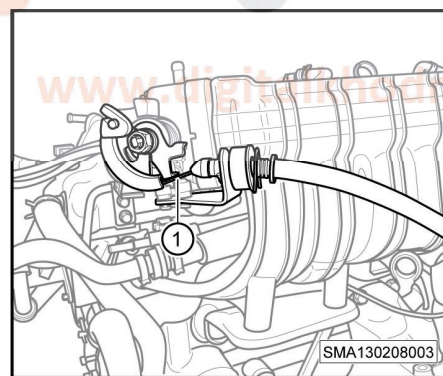
The following steps 5 to 7 are applied to vehicles equipped with mechanical throttles

02

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-).

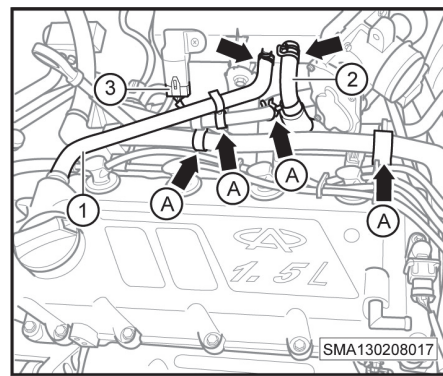


6. Loosen the mechanical throttle cable (-1-) and disconnect the cable from the bracket.

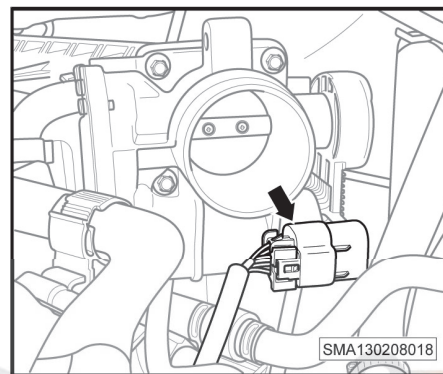


The following steps 7 and 8 are applied to vehicles equipped with electronic throttles

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-).



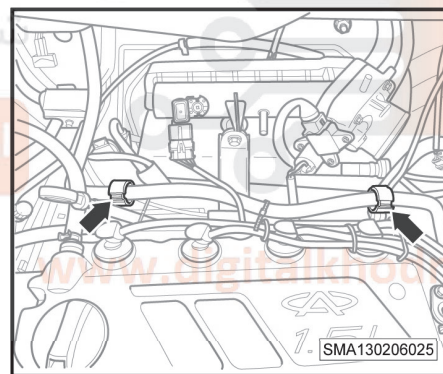
8. Disconnect the electronic throttle connector (-arrow-).



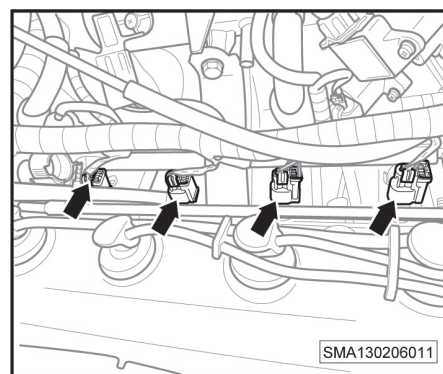
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The following steps 9 to 15 are applied to all vehicles

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

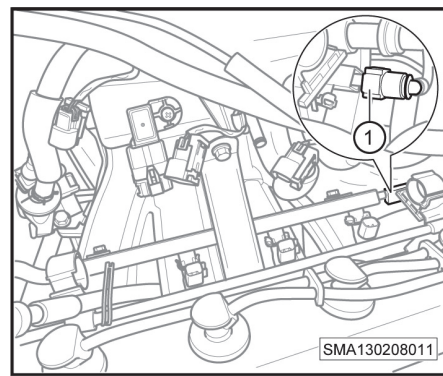


10. Disconnect the fuel injector connectors (-arrow-).



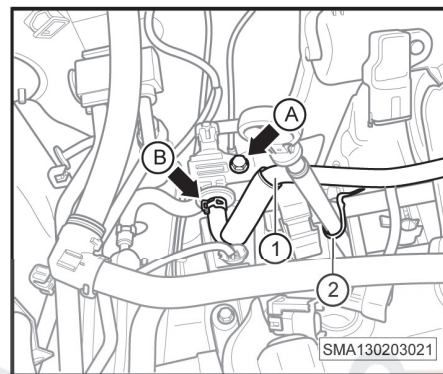
02 - Engine Mechanism

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



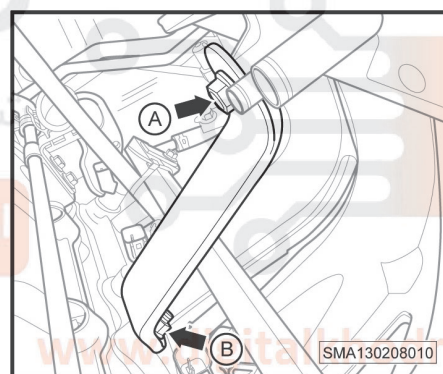
12. Unscrew the fixing bolt (-arrow A-), loosen the clamp (-arrow B-), pull out the hose (-1-) and disconnect the tie (-2-).

- Tightening torque of the activated carbon canister solenoid valve bracket fixing screw: $18 \pm 2 \text{ N}\cdot\text{m}$



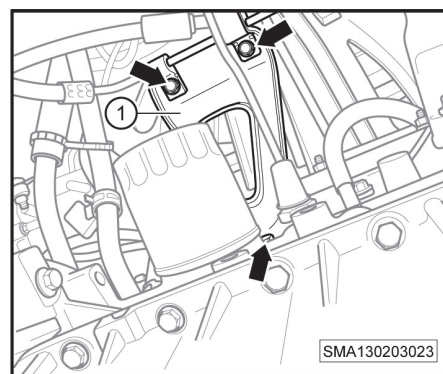
13. Unscrew the fixing bolt (-arrow A-) and the nut (-arrow B-), and remove the upper intake manifold bracket.

- Tightening torque of the upper bracket fixing bolt and nut: $18 \pm 2 \text{ N}\cdot\text{m}$



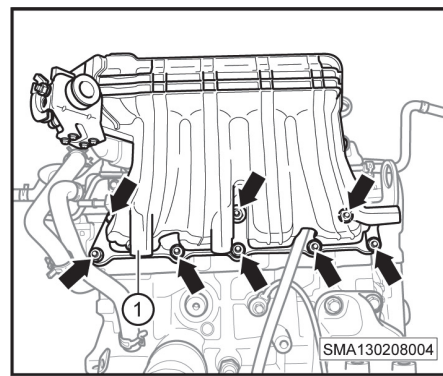
14. Unscrew the fixing bolts (-arrow-) and remove the intake manifold bracket (-1-).

- Tightening torque of the lower bracket fixing bolt (upper): $18 \pm 2 \text{ N}\cdot\text{m}$
- Tightening torque of the lower bracket fixing bolt (lower): $27 \pm 2 \text{ N}\cdot\text{m}$



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: $10 \pm 2 \text{ N}\cdot\text{m}$



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.

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