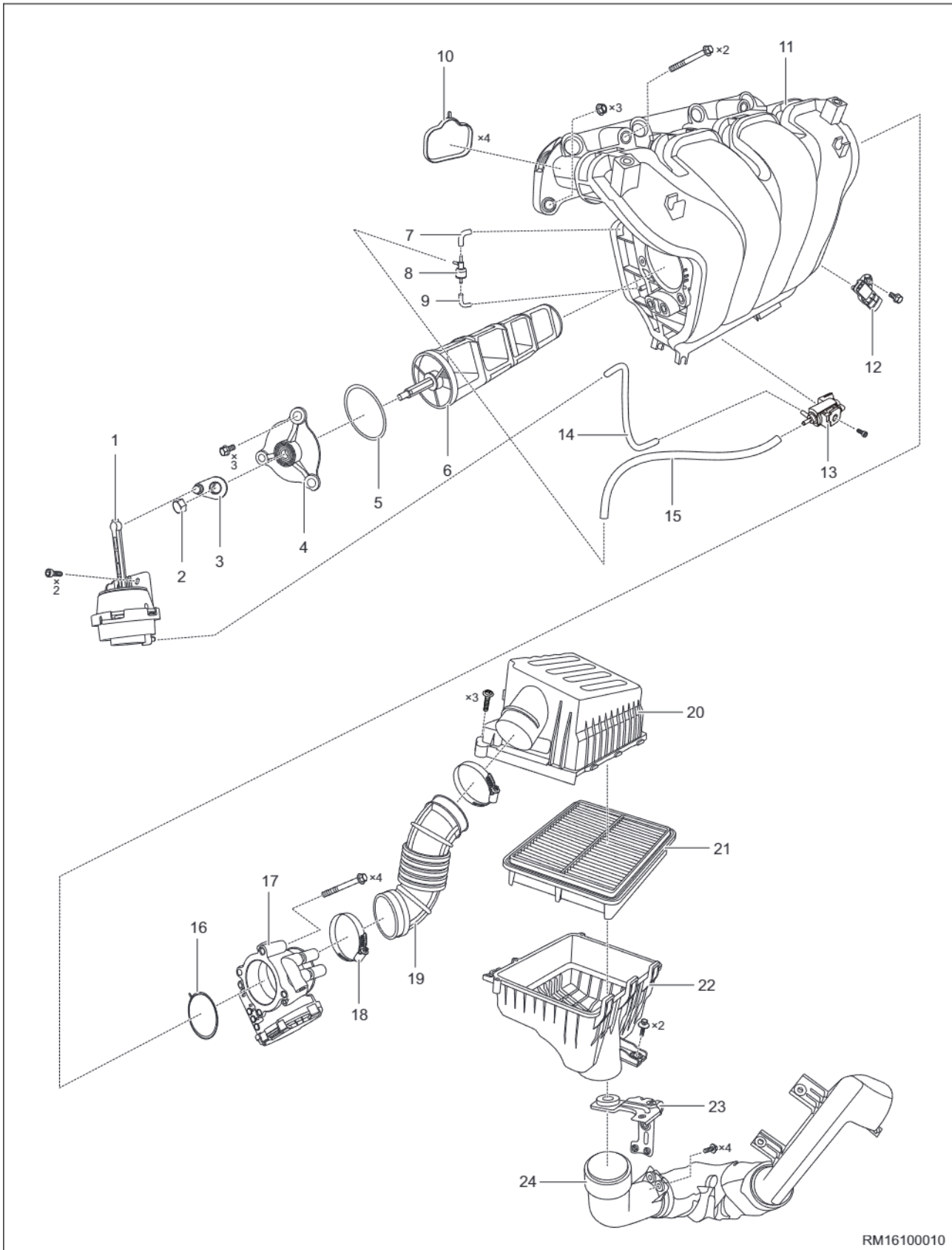


SQRE4G16 INTAKE SYSTEM

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GENERAL INFORMATION

Description



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RM16100010

1 - Vacuum Actuator	2 - Swing Arm Fixing Nut
3 - Swing Arm	4 - Rotary Valve Cap
5 - Rotary Valve O-Ring	6 - Rotary Valve
7 - Intake Manifold Vacuum Cavity Vacuum Hose	8 - Check Valve
9 - Intake Manifold Resonant Cavity Vacuum Hose	10 - Intake Manifold Gasket
11 - Intake Manifold Assembly	12 - Intake Pressure/Temperature Sensor
13 - Variable Intake Air Solenoid Valve	14 - Vacuum Hose (Air Inlet)
15 - Vacuum Hose (Air Outlet)	16 - Electronic Throttle Assembly Gasket
17 - Electronic Throttle Assembly	18 - Worm Clamp
19 - Intake Hose	20 - Air Filter Upper Housing
21 - Air Filter Element	22 - Air Filter Lower Housing
23 - Air Filter Bracket	24 - Air Direct Pipe Assembly

Intake system mainly consists of air direct pipe, air filter assembly, intake pressure/temperature sensor, intake hose, electronic throttle assembly and intake manifold assembly, etc.

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Intake system uses air filter to filter the particles and dust in air. The air filtered flows into the intake manifold through electronic throttle assembly and mixes with fuel at the end of intake manifold assembly port to form flammable gas mixture, which is transmitted to each cylinder uniformly to coordinate with engine operation.

Electronic throttle assembly is a critical part for engine intake system. Its main function is to adjust intake passage area according to driver's driving intention. It controls intake air volume to meet intake requirement of engine in different operating conditions, and sends back position signals of throttle valve plate to control unit to achieve accurate control and run the engine under the optimal control state.

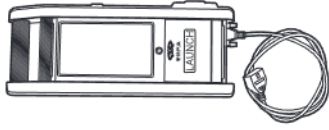
Specifications

Torque Specifications

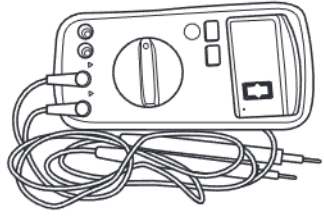
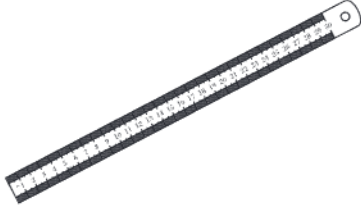
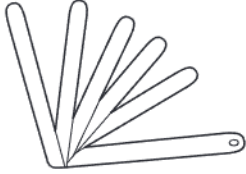
Description	Torque (N·m)
Coupling Screw Between Air Filter Upper Housing and Lower Housing	1.3 ± 0.2
Air Filter Assembly Fixing Bolt	7 ± 1
Air Direct Pipe Assembly Fixing Bolt	7 ± 1
Air Filter Bracket Fixing Bolt	7 ± 1
Electronic Throttle Assembly Fixing Bolt	8 + 3
Engine Trim Cover Bracket	8 ± 1
Intake Manifold Assembly Fixing Nut	20 + 5
Vacuum Actuator Fixing Bolt	8 + 3
Rotary Valve Fixing Bolt	8 + 3
Variable Intake Air Solenoid Valve Fixing Bolt	8 + 3
Electronic Accelerator Pedal Fixing Bolt	10 ± 2
Worm Clamp	3 ± 0.5

Tools

Special Tool

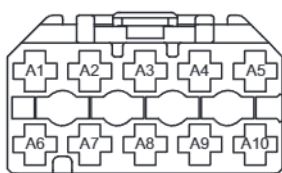
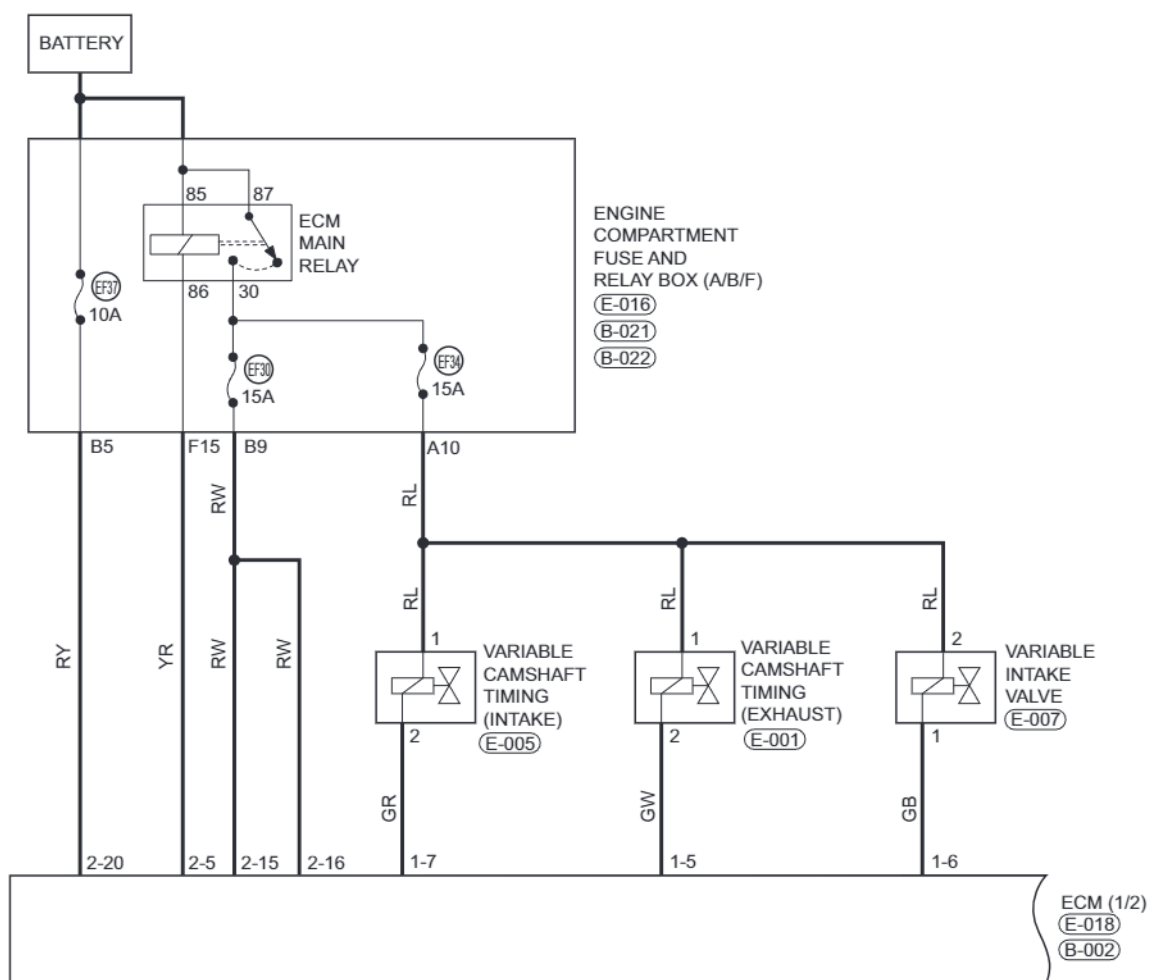
X-431 3G Diagnostic Tester	 RCH0000001
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General Tools

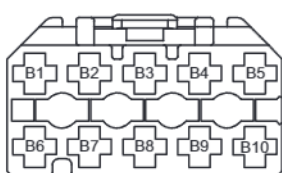
Digital Multimeter	 RCH0000002
Precision Ruler	 RCH0000063
Feeler Gauge	 RCH0000060

Circuit Diagram

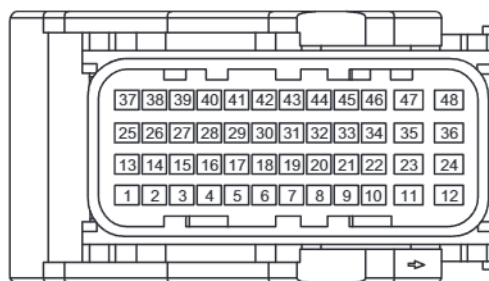
Intake System (Page 1 of 3)



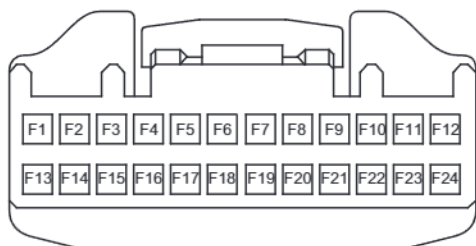
(E-016)
Gr



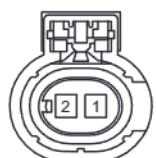
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Y



(E-018)
B



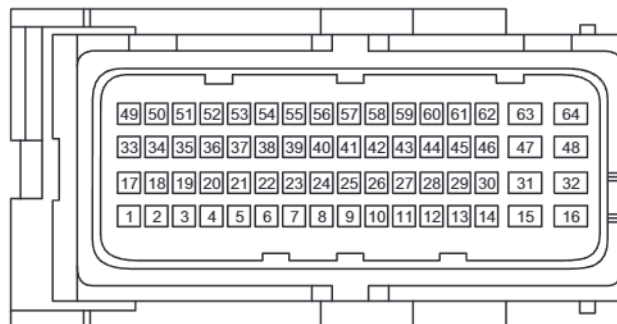
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W



(E-001)
B



(E-005)
B

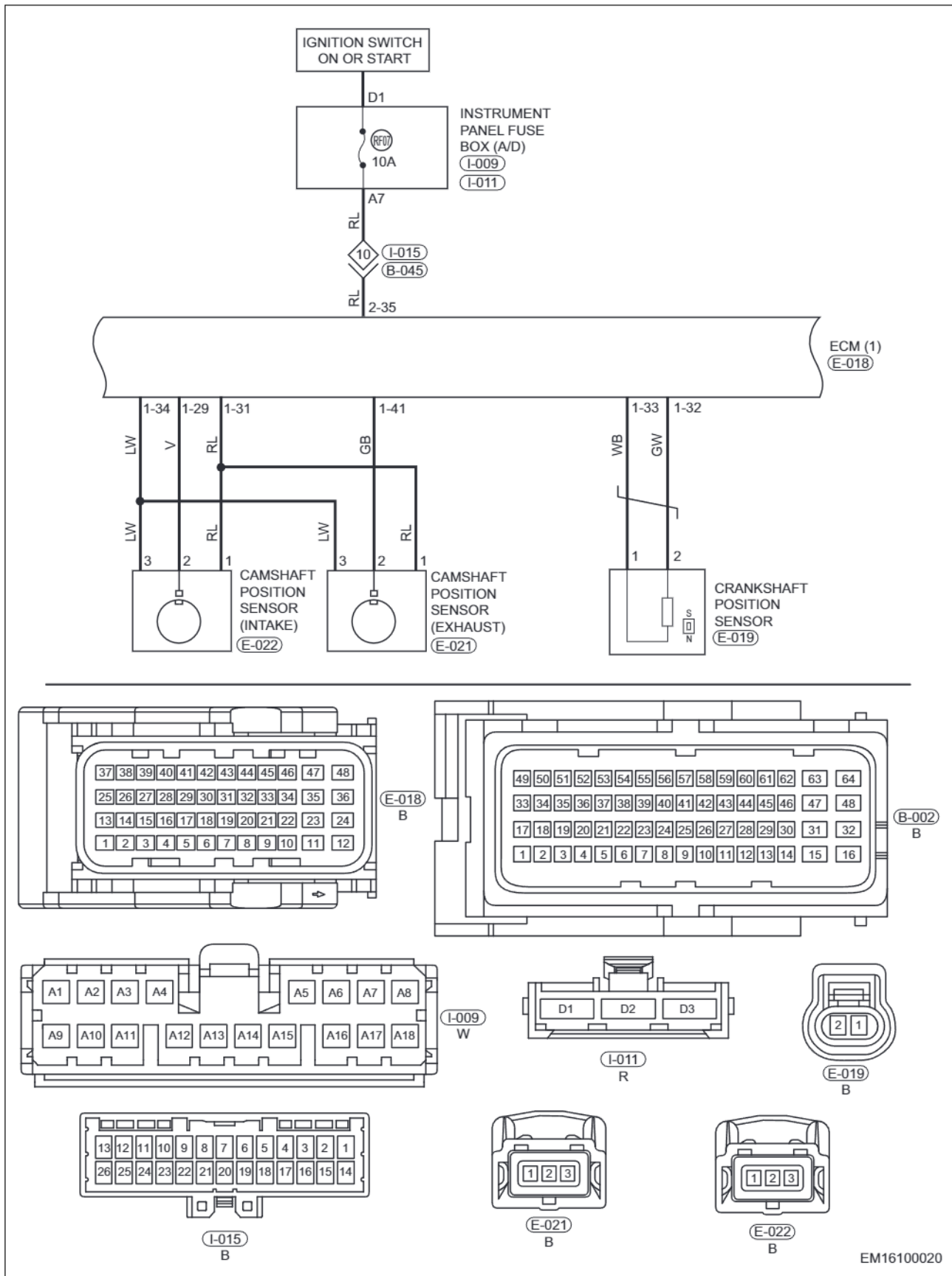


(B-002)
B

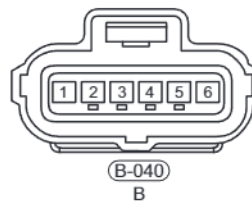
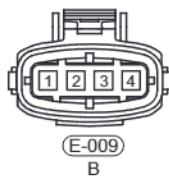
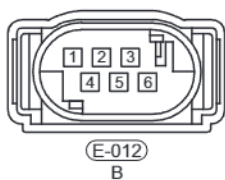
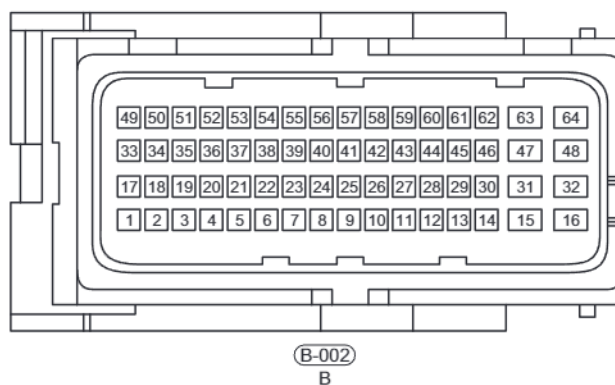
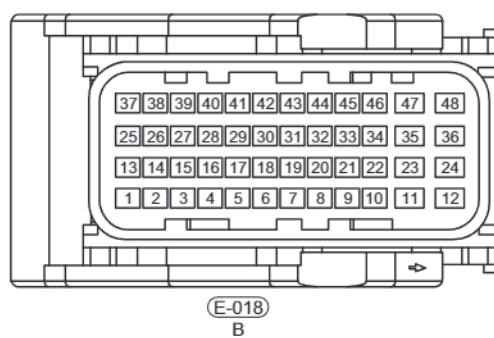
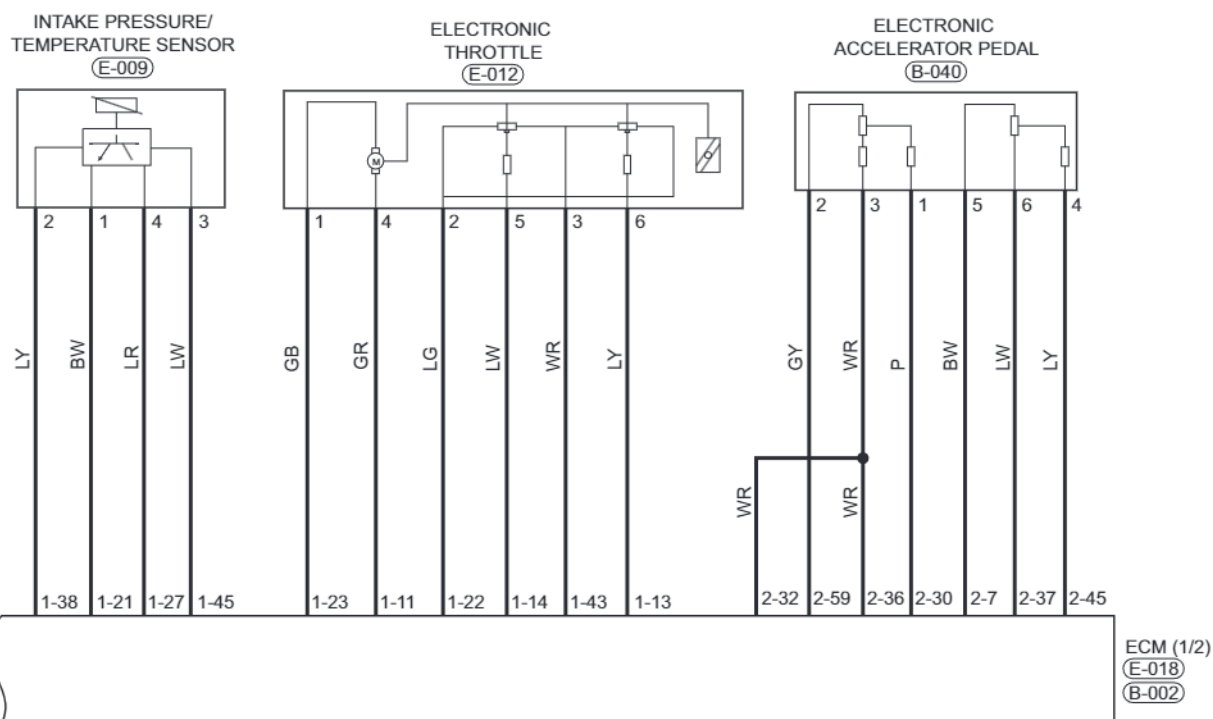
EM16100010

Intake System (Page 2 of 3)

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Intake System (Page 3 of 3)



EM16100030

DIAGNOSIS & TESTING

Problem Symptoms Table

HINT:

Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair or adjust faulty components, or replace as necessary.

Symptom	Suspected Area	See page
Engine idles roughly	Electronic throttle assembly (dirty)	10-14
	Intake manifold assembly (broken, leaked)	10-20
	Activated charcoal canister solenoid valve (remains on)	09-7
	Intake pressure/temperature sensor	06-273
	Throttle gasket (damaged)	10-15
	Fuel rail injector assembly (installed incorrectly)	08-26
Intake system leaks	Air filter (broken, leaked)	10-12
	Intake manifold assembly (broken, leaked)	10-20
	Electronic throttle assembly	10-14
	Crankcase vent tube	-
	Intake line or component connection	-
Intake system blocked	Air filter element (damaged, blocked)	10-10
	Intake line (blocked)	-

ON-VEHICLE SERVICE

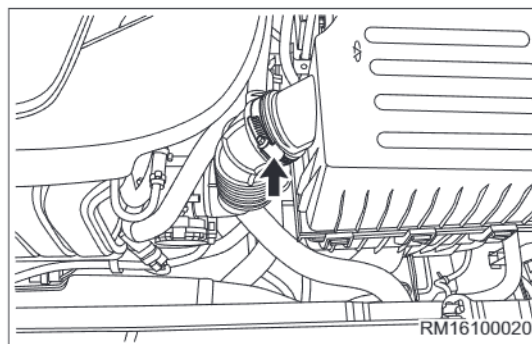
Air Filter Element

Removal

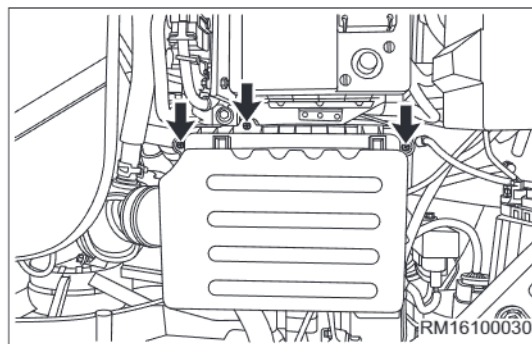
CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

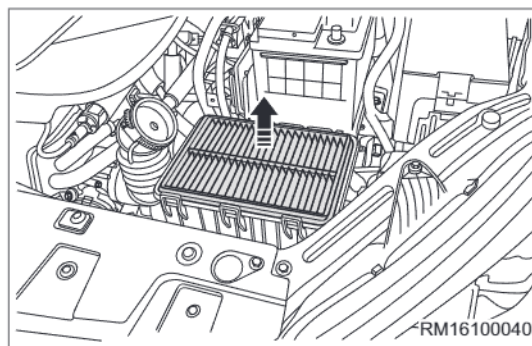
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the air filter element.
 - a. Loosen the worm clamp (arrow) and disconnect the connection between intake hose and air filter upper housing.
(Tightening torque: $3 \pm 0.5 \text{ N}\cdot\text{m}$)



- b. Remove 3 coupling screws (arrow) between air filter upper housing and lower housing.
(Tightening torque: $1.3 \pm 0.2 \text{ N}\cdot\text{m}$)



- c. Remove the air filter upper housing.
- d. Remove the air filter element.



Installation

1. Clean the air filter upper housing and lower housing.
2. Install a new air filter element.
3. Other installation procedures are in the reverse order of removal.



ENVIRONMENTAL PROTECTION

- Wasted air filter element should be handled by the specialized department according to local laws and regulations. Never discard it at will.

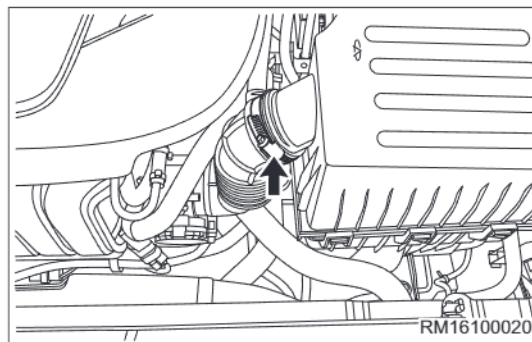
Air Filter Assembly

Removal

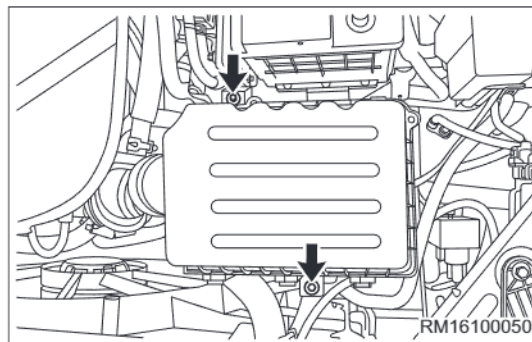
CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the air filter assembly.
 - a. Loosen the worm clamp (arrow) and disconnect the connection between intake hose and air filter upper housing.
(Tightening torque: $3 \pm 0.5 \text{ N}\cdot\text{m}$)



- b. Remove 2 fixing bolts (arrow) from air filter assembly.
(Tightening torque: $7 \pm 1 \text{ N}\cdot\text{m}$)



- c. Remove the air filter assembly from bracket.

Installation

Installation is in the reverse order of removal.

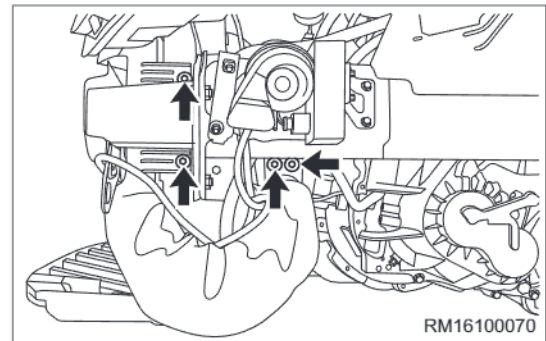
Air Direct Pipe Assembly and Air Filter Bracket

Removal

CAUTION

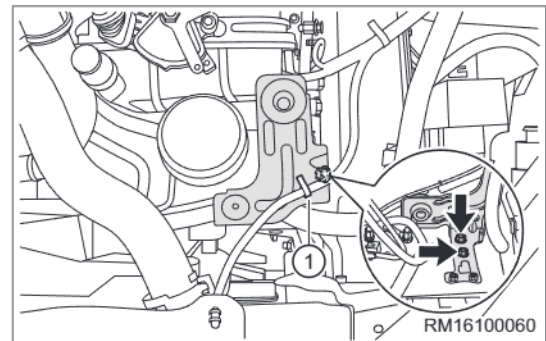
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the air direct pipe assembly.
 - a. Remove the front bumper assembly ([See page 49-8](#)).
 - b. Remove the front bumper lower protector ([See page 49-21](#)).
 - c. Remove 4 fixing bolts (arrow) from air direct pipe assembly.
(Tightening torque: 7 ± 1 N·m)



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- d. Remove the air direct pipe assembly.
4. Remove the air filter bracket.
 - a. Remove the air filter assembly ([See page 10-12](#)).
 - b. Remove the wire harness fixing clip (1) from air filter bracket.
 - c. Remove 2 fixing bolts (arrow) from air filter bracket.
(Tightening torque: 7 ± 1 N·m)



- d. Remove the air filter bracket.

Installation

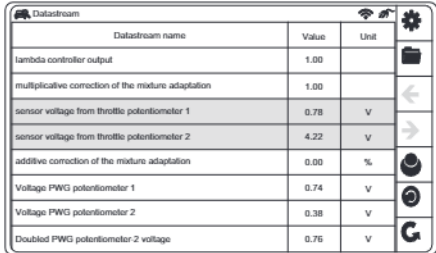
Installation is in the reverse order of removal.

Electronic Throttle Assembly

On-vehicle Inspection

1. Check the electronic throttle assembly
 - a. Throttle valve plate should be in NLP position with power off and can rotate smoothly when flipping it by hand. If catching occurs, it indicates that internal components may be damaged, and replace the electronic throttle assembly.
 - b. Connect X-431 3G diagnostic tester to Data Link Connector (DLC).
 - c. Turn ignition switch to ON and turn on the X-431 3G diagnostic tester.
 - d. Read datastream on X-431 3G diagnostic tester.
 - Accelerator pedal released

Datastream Name	Specification (V)
Sensor voltage from throttle potentiometer 1	0.78
Sensor voltage from throttle potentiometer 2	4.22



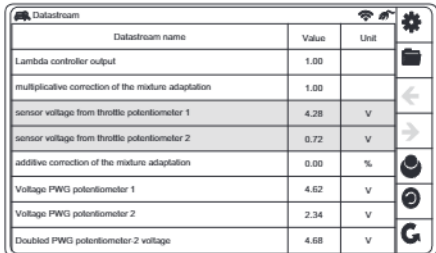
Datastream name	Value	Unit
Lambda controller output	1.00	
multiplicative correction of the mixture adaptation	1.00	
sensor voltage from throttle potentiometer 1	0.78	V
sensor voltage from throttle potentiometer 2	4.22	V
additive correction of the mixture adaptation	0.00	%
Voltage PWD potentiometer 1	0.74	V
Voltage PWD potentiometer 2	0.38	V
Doubled PWD potentiometer 2 voltage	0.76	V

RM16100080

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- Accelerator pedal depressed

Datastream Name	Specification (V)
Sensor voltage from throttle potentiometer 1	4.28
Sensor voltage from throttle potentiometer 2	0.72



Datastream name	Value	Unit
Lambda controller output	1.00	
multiplicative correction of the mixture adaptation	1.00	
sensor voltage from throttle potentiometer 1	4.28	V
sensor voltage from throttle potentiometer 2	0.72	V
additive correction of the mixture adaptation	0.00	%
Voltage PWD potentiometer 1	4.62	V
Voltage PWD potentiometer 2	2.34	V
Doubled PWD potentiometer 2 voltage	4.68	V

RM16100090

If result is not as specified, check wire harness, ECM, or replace electronic throttle assembly.

Removal

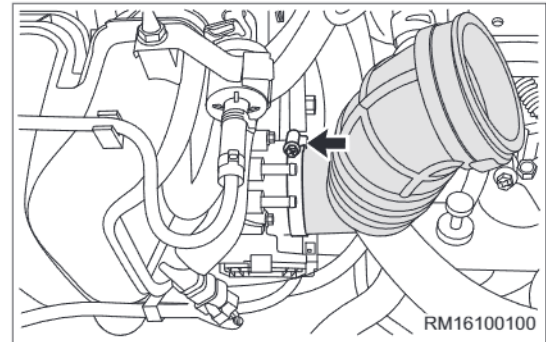
CAUTION

- The temperature of exhaust system is very high when engine is running. Before removal, you must make sure that engine has shut off, and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

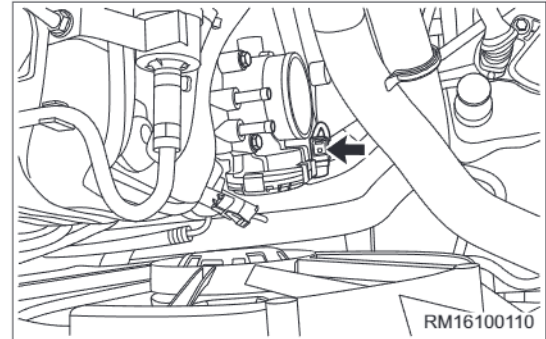
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the air filter assembly (See page 10-12).

5. Remove the electronic throttle assembly.

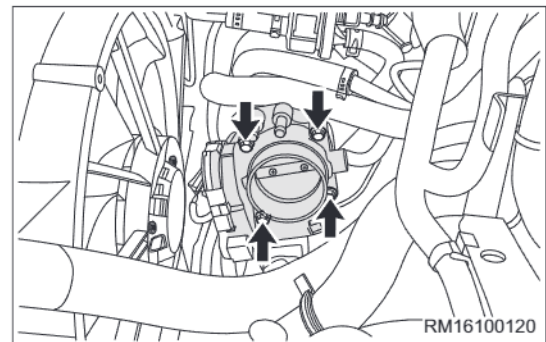
- a. Loosen the worm clamp (arrow), disconnect the connection between intake hose and electronic throttle assembly and move away the intake hose.
(Tightening torque: $3 \pm 0.5 \text{ N}\cdot\text{m}$)



- b. Disconnect the electronic throttle assembly connector (arrow).



- c. Remove 4 fixing bolts (arrow) from electronic throttle assembly.
(Tightening torque: $8 + 3 \text{ N}\cdot\text{m}$)



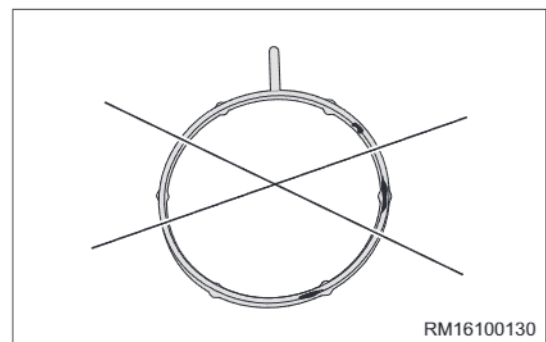
- d. Remove the electronic throttle assembly, and remove the gasket from intake manifold assembly.

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Inspection

1. Check the electronic throttle assembly gasket.

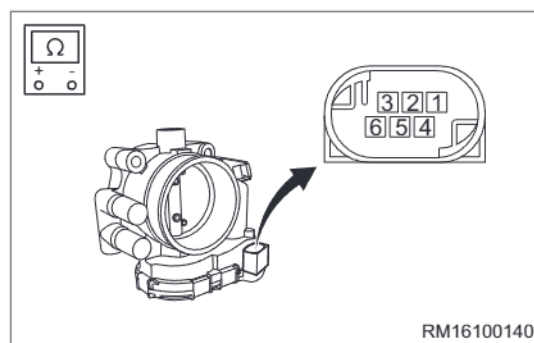
Check electronic throttle assembly gasket for wear or deterioration. If there is wear or deterioration, replace electronic throttle assembly gasket.



2. Check the electronic throttle assembly.

Measure electronic throttle assembly resistance according to the table below.

Multimeter Connection	Condition	Specified Condition
Terminal 3 - Terminal 2	Normal temperature	1.067 k Ω
Terminal 6 - Terminal 2 Terminal 6 - Terminal 3	Throttle turned	Resistance between terminals 6 and 2 increases as throttle opens; resistance between terminals 6 and 3 decreases as throttle opens.
Terminal 5 - Terminal 2 Terminal 5 - Terminal 3	Throttle turned	Resistance between terminals 5 and 2 decreases as throttle opens; resistance between terminals 5 and 3 increases as throttle opens.



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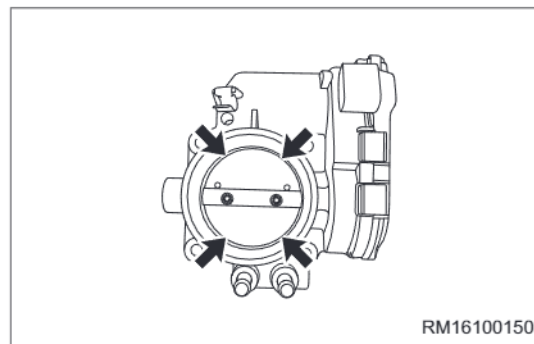
Cleaning

Cleaning Tool

- Thin stick: used to support throttle valve plate for cleaning the carbon deposited on contact wall between valve plate and throttle. Please use plastic, wooden or bamboo thin stick. Do not use metal thin stick to avoid scratching or deforming the valve plate.
- Clean cloth or paper towel.

Cleaning Process

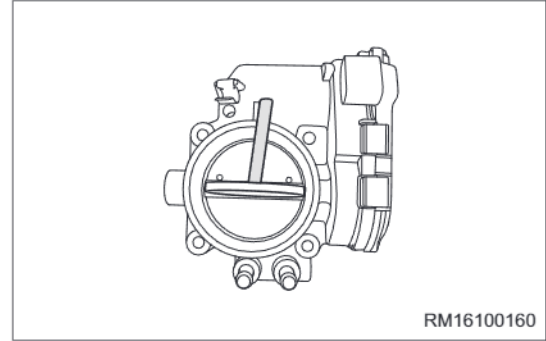
- Remove the electronic throttle assembly, and make the valve plate face upward in free condition. Avoid cleaner flowing into electronic element through valve plate shaft, resulting in functional failure.
- Start to clean when it is as shown in the illustration.



⚠ WARNING

- Cleaner is a kind of flammable and corrosive fluid. Follow safety cautions to prevent accidents, and avoid skin contacting with the cleaner.

3. Apply appropriate amount of cleaner to the inner wall of throttle valve body, and remove the carbon with clean cloth.
4. Support the throttle valve with a thin stick, and clean the carbon on valve plate and throttle valve body inner wall.



5. Turn over the throttle 180°, and clean with the same procedures as above. Repeat several times until it is clean.
6. Push the valve plate by hand, and check if it rotates smoothly. If it is stuck, clean again according to the cleaning procedures.
7. After cleaning, wipe off the cleaner in throttle valve body with absorbent paper.

Installation

Installation is in the reverse order of removal.

CAUTION

- Clean fitting surface of electronic throttle assembly.
- Perform throttle self-learning procedures after installation ([See page 06-21](#)). After self-learning is completed, start the vehicle and check for proper operation.

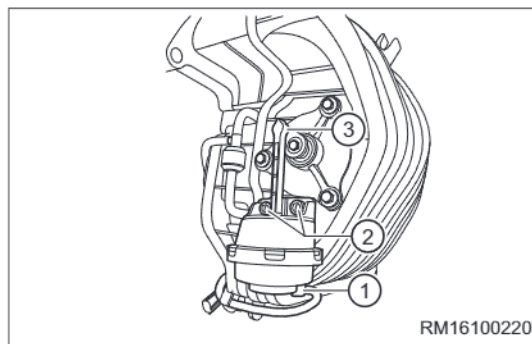
Variable Intake System (VIS)

Removal

CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent interior from being scratched during removal and installation.

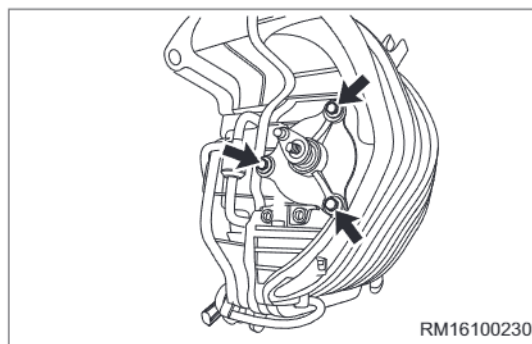
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the vacuum actuator.
 - a. Disconnect the coupling hose (1) from vacuum actuator.
 - b. Remove 2 fixing bolts (2) from vacuum actuator. (Tightening torque: 8 + 3 N·m)
 - c. Disconnect the connection between vacuum actuator and rotary valve, and remove the vacuum actuator (3).



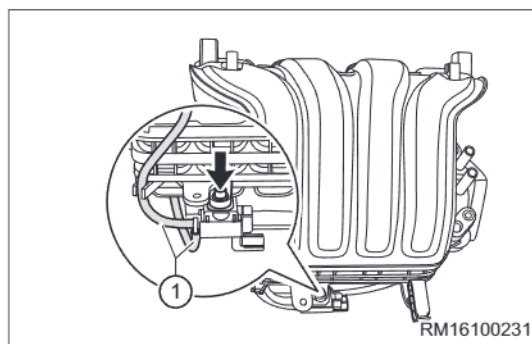
5. Remove the rotary valve.
 - a. Remove 3 fixing bolts (arrow) from rotary valve. (Tightening torque: 8 + 3 N·m)

HINT:

For models with electronic assist steering, the rotary valve can be removed directly from vehicle; for models with hydraulic assist steering, remove the rotary valve with intake manifold assembly removed.



6. Remove the variable intake air solenoid valve.
 - a. Disconnect the coupling hoses (1) from variable intake air solenoid valve.
 - b. Remove the variable intake air solenoid valve fixing bolt (arrow), and remove the variable intake air solenoid valve. (Tightening torque: 8 + 3 N·m)

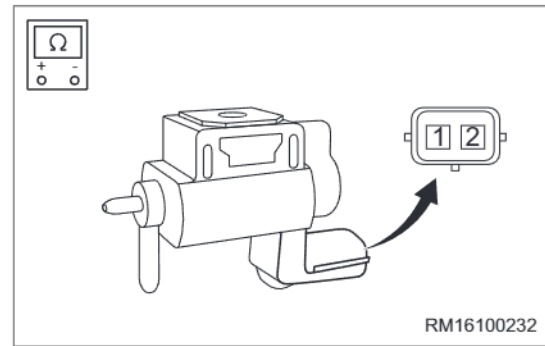


Inspection

1. Check the variable intake air solenoid valve.
 - a. Adjust the multimeter to ohm band and check the resistance of variable intake air solenoid valve.

Multimeter Connection	Condition	Specified Condition
Terminal 1 - Terminal 2	Normal temperature	30 Ω

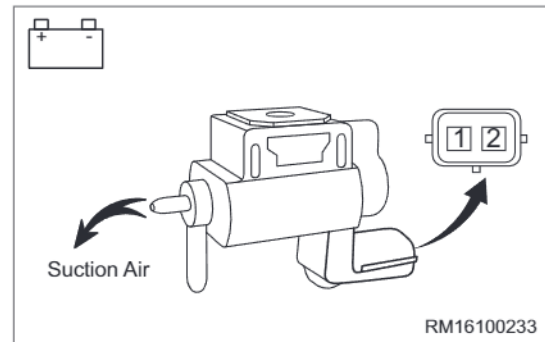
If resistance value of variable intake air solenoid valve exceeds the specified range, replace with a new one.



- b. Apply battery voltage to terminals 2 and 1 of variable intake air solenoid valve, and check if the variable intake air solenoid valve turns on.

Battery Connection	Condition	Specified Condition
Battery positive (+) - Terminal 2 Battery negative (-) - Terminal 1	Connected	On
Battery positive (+) - Terminal 2 Battery negative (-) - Terminal 1	Disconnected	Off

If resistance value of variable intake air solenoid valve is not as specified, replace with a new one.



Installation

Installation is in the reverse order of removal.

Intake Manifold Assembly

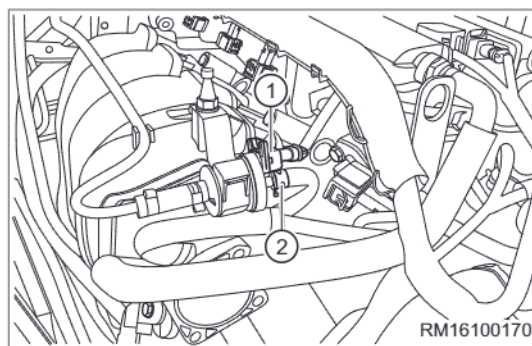
Removal

CAUTION

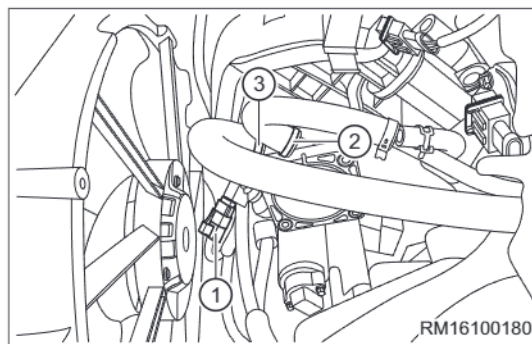
- The temperature of exhaust system is very high when engine is running. Before removal, you must make sure that engine has shut off, and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Release the fuel system pressure ([See page 08-10](#)).
2. Turn off all electrical equipment and the ignition switch.
3. Disconnect the negative battery cable.
4. Remove the engine trim cover.
5. Remove the fuel rail injector assembly ([See page 08-26](#)).
6. Remove the air filter assembly ([See page 10-12](#)).
7. Remove the electronic throttle assembly ([See page 10-14](#)).
8. Remove the intake manifold assembly.

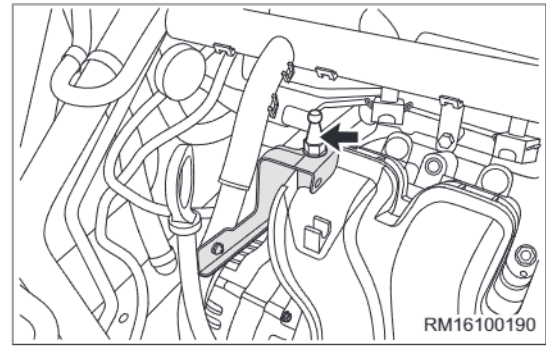
- a. Disconnect the charcoal canister solenoid valve connector (1).
- b. Loosen the elastic clamp (2) and disconnect the connection between canister solenoid valve and its air outlet hose.



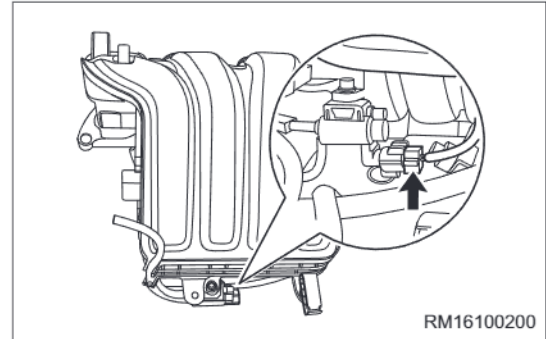
- c. Move away the canister solenoid valve from bracket, and move away the canister solenoid valve and its line from intake manifold.
- d. Disconnect the intake pressure/temperature sensor (1).
- e. Loosen the hose clamp (2) and disconnect the connection between vacuum booster hose and intake manifold assembly.
- f. Loosen the hose clamp (3) and disconnect the connection between positive crankcase vent hose and intake manifold assembly.



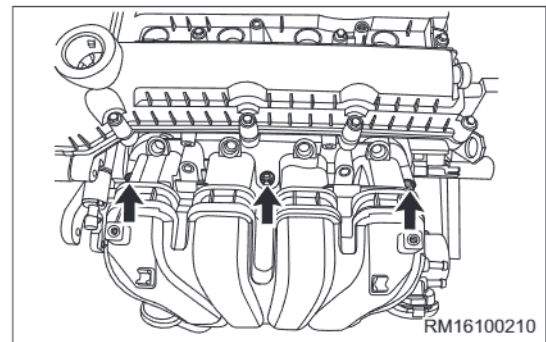
- g. Remove the engine trim cover bracket (arrow) fixing the oil level dipstick tube.
(Tightening torque: 8 ± 1 N·m)



- h. Move away the engine wire harness from intake manifold wire harness bracket.
i. Disconnect the variable intake air solenoid valve connector (arrow).



- j. Remove 3 fixing nuts (arrow) from intake manifold assembly.
(Tightening torque: $20 + 5$ N·m)

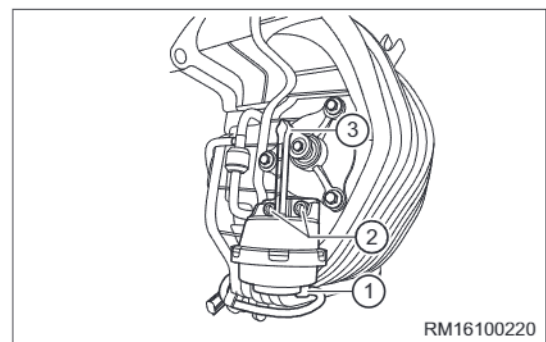


- k. Remove the intake manifold assembly.

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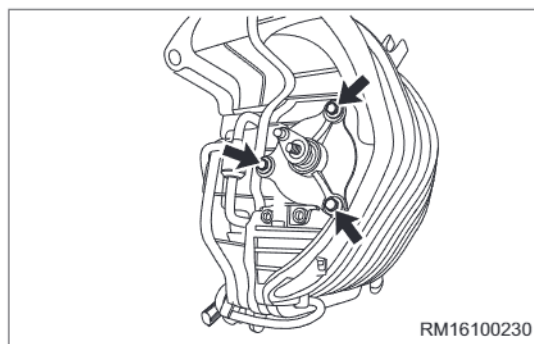
Disassembly

1. Remove the vacuum actuator.
 - a. Disconnect the coupling hose (1) from vacuum actuator.
 - b. Remove 2 fixing bolts (2) from vacuum actuator.
(Tightening torque: $8 + 3$ N·m)
 - c. Disconnect the connection between vacuum actuator and rotary valve, and remove the vacuum actuator (3).



2. Remove the rotary valve.

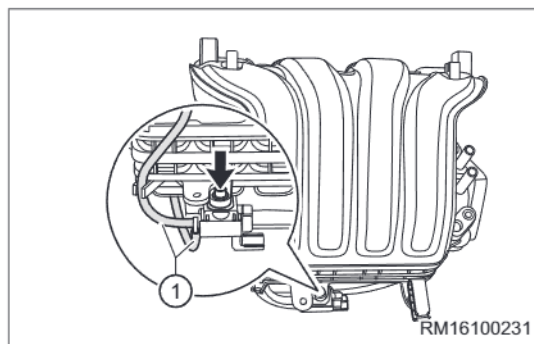
- a. Remove 3 fixing bolts (arrow) from rotary valve.
(Tightening torque: $8 + 3 \text{ N}\cdot\text{m}$)



- b. Remove the rotary valve.

3. Remove the variable intake air solenoid valve.

- a. Disconnect the coupling hoses (1) from variable intake air solenoid valve.
- b. Remove the variable intake air solenoid valve fixing bolt (arrow), and remove the variable intake air solenoid valve.
(Tightening torque: $8 + 3 \text{ N}\cdot\text{m}$)

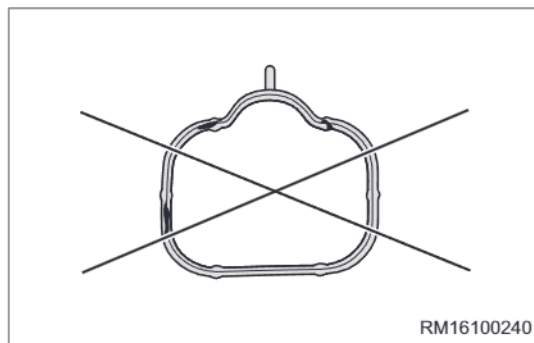


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Inspection

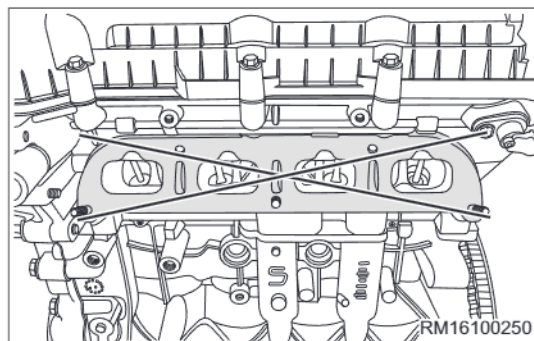
1. Check the intake manifold gasket.

Check the intake manifold gasket, and replace if it is deteriorated or damaged.



2. Check for warpage on intake surface of cylinder head.

- a. Clean and check the fitting surface between intake manifold assembly and cylinder head.
- b. As shown in the illustration, measure warpage on intake surface of cylinder head diagonally with a precision ruler and a feeler gauge. If warpage on the surface is greater than 0.04 mm, replace it.



Assembly

Assembly is in the reverse order of disassembly.

Installation

Installation is in the reverse order of removal.

CAUTION

- Clean the inner wall and fitting surface of intake manifold assembly.
- Replace the intake manifold gasket if it is damaged during installation.

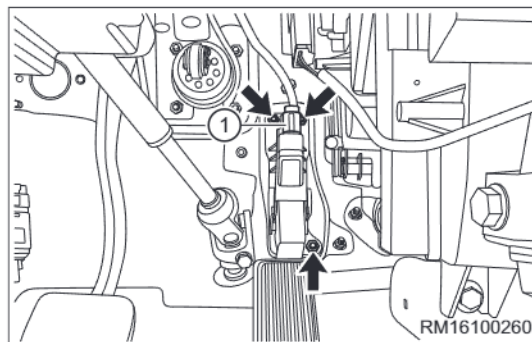
Electronic Accelerator Pedal

Removal

CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent interior from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the electronic accelerator pedal.
 - a. Disconnect the electronic accelerator pedal connector (1).
 - b. Remove 3 fixing nuts (arrow) from electronic accelerator pedal.
(Tightening torque: 10 ± 2 N·m)



- c. Remove the electronic accelerator pedal.

Installation

Installation is in the reverse order of removal.

