# 02 -Engine

# Fuel System

## Mechanical systems

### General specifications

| | |
|---|---|
| Capacity of fuel tank | (55±3)L |
| Model of fuel | 92# |
| Normal pressure of fuel | (400±10)KPa |
| Resistance of oil level sensor (the highest value) | (30±2)Ω |
| Resistance of oil level sensor (the lowest value) | (300±3)Ω |



### Torque Specifications

| Name | Torque range | |
|---|---|---|
| | Metric(Nm) | British (lb-ft) |
| Tap bolt for fuel tank | 23 | 17 |
| Tap bolt for carbon tube stand | 23 | 17 |
| Fuel filter support fixing bolt | 9 | 7 |
| Fuel tank cap | 60 | 44 |

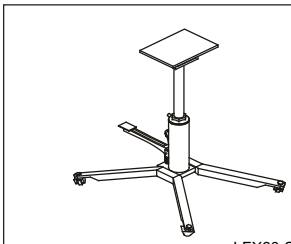
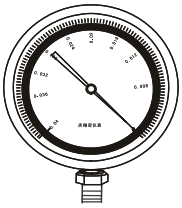
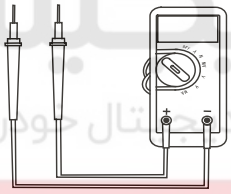
# Precautions

## Precautions

1. No matter whether the gasoline engine is running or not, do not connect any part (such as any cable of battery, injector, electrical fuel pump, ignition system wire, electrical control unit (ECU) circuit, air-condition circuit, etc.) in the system during the ignition switch is on.
2. No smoking and keep away from open fire during the operation of fuel system. Keep ventilated and make the corresponding fire extinguishers available on the maintenance site.
3. After the engine stops, a higher residual pressure still keeps in the fuel system. During the removal of any element of fuel system, be sure to release the pressure of fuel system first, so as to prevent the fuel from spraying out of the system, and avoid any personal injury or fire accident.
4. Before disconnecting any fuel pipe, it's required to clean the pipe and remove the dust or dirt near to it.
5. After disconnecting the fuel pipe, it's required to seal the pipe joint to avoid the entry of foreign substance into it.
6. During the maintenance, replace all the cracked, scratched or damaged nylon fuel pipes, and don't attempt to repair each section of nylon fuel pipe.
7. Carry out the emptying work before installing the fuel system.
8. During the installation of any new fuel pipe, don't hit any fuel pipe bundle clamp directly with a hammer, otherwise it may damage the nylon pipe, resulting in fuel leakage.
9. When connecting the fuel pipeline, make sure put a few drops of clean oil on the oil pipe joint to ensure the oil pipes connected correctly and prevent leakage ( In correct operation, the O-ring in the socket will expand.If not lubricating it, it is not possible to install it correctly).
10. Prevent any rubber or leather tool or part from contacting the gasoline.
11. In order to avoid unexpected fire accident or explosion, don't pour the fuel into the opened container.

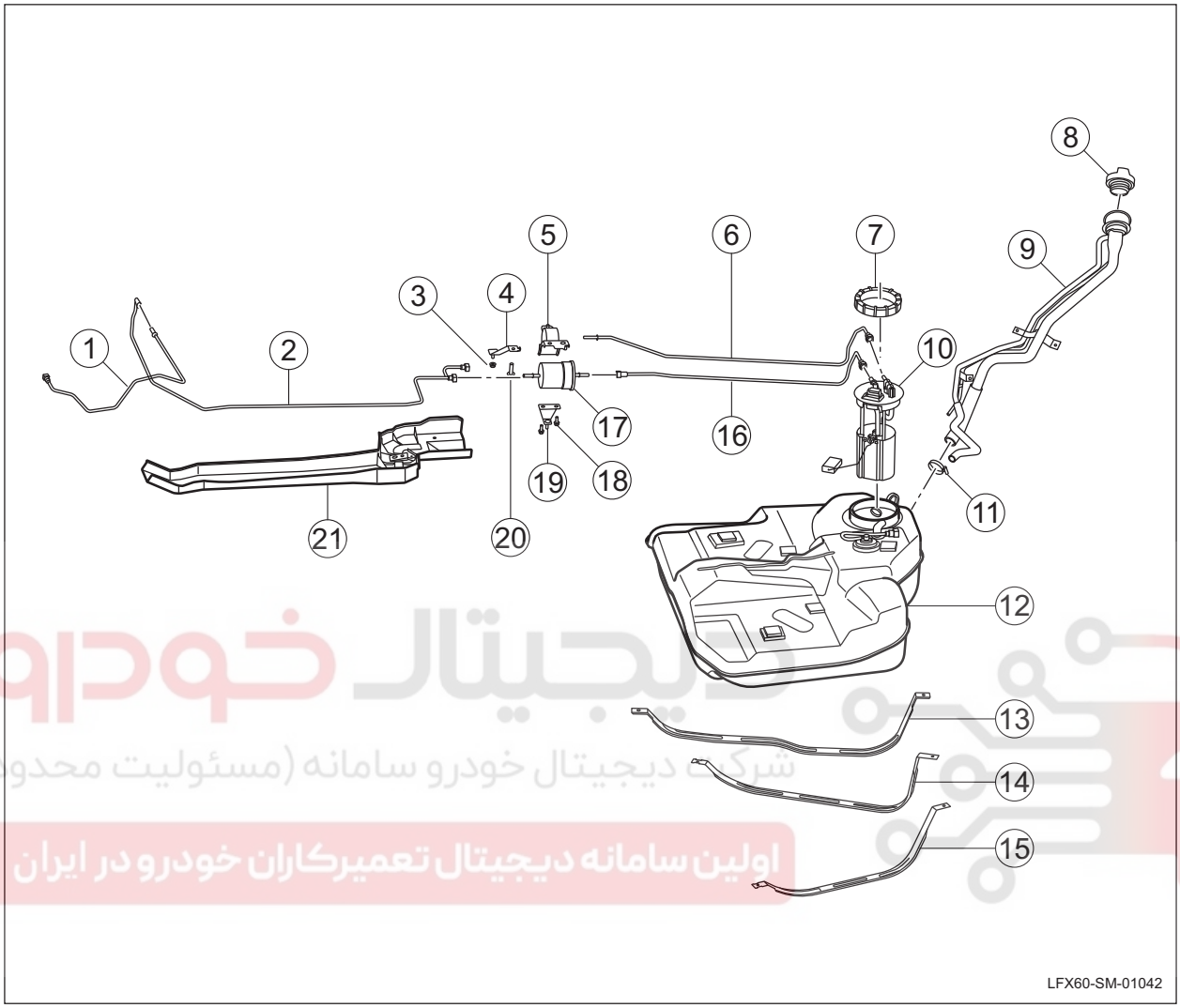
# Preparation

## General maintenance tools

| No. | Tool name | Tool figure | Tool code | Remarks |
|---|---|---|---|---|
| 1 | Bracket |  LFX60-SM-01039 | - | Lift up the parts. |
| 2 | Oil pressure gauge |  LFX60-SM-01040 | - | Measure the pressure of fuel in the fuel system. |
| 3 | Digital universal meter |  LFX60-SM-01041 | - | Measure the current, voltage and resistance |

# Structure and installation location

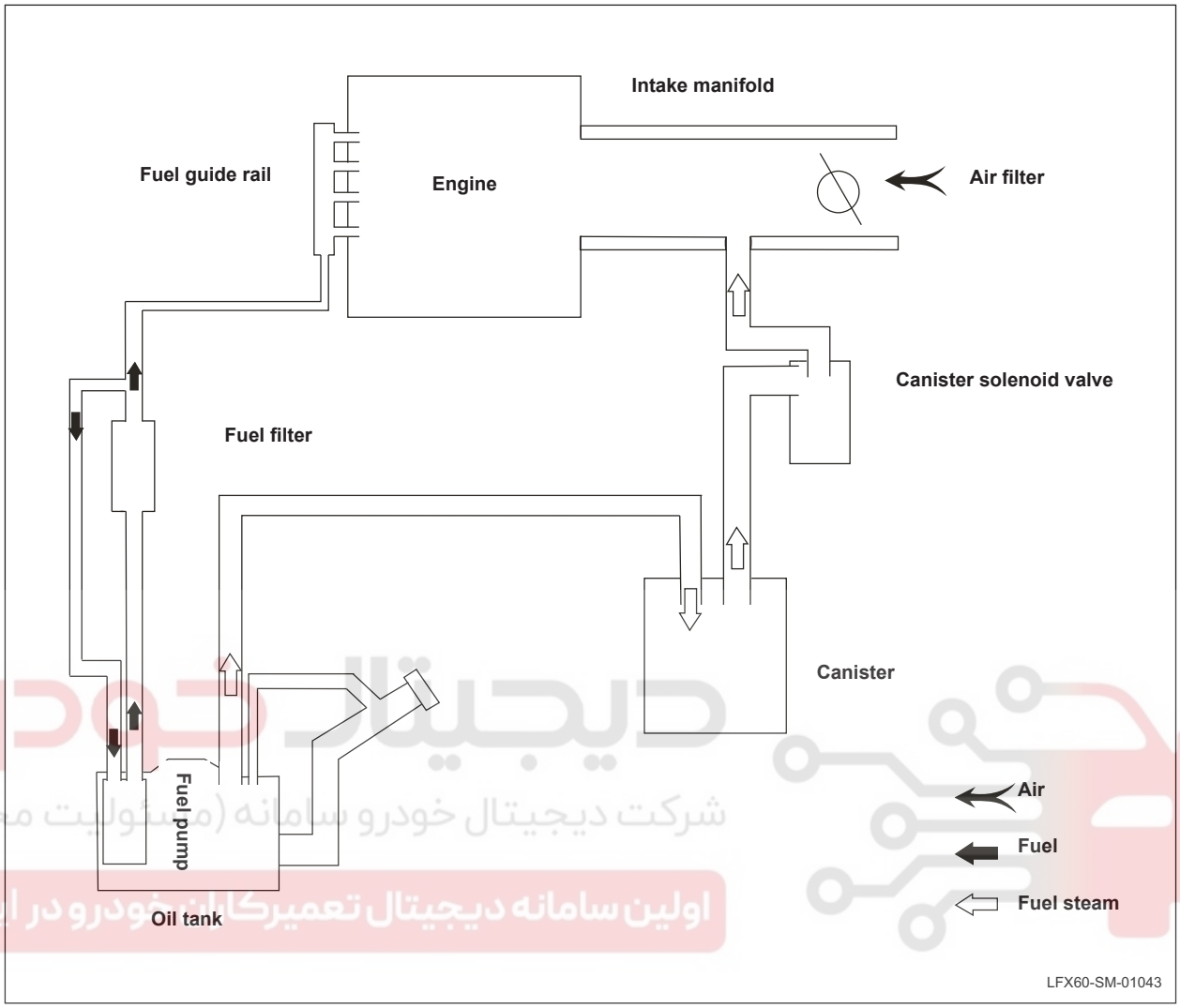
## Component Location Plan




| No. | Part Name |
|---|---|
| 1 | Engine sucker |
| 2 | Fuel pipe assembly |
| 3 | Stand grip nut |
| 4 | Filter support |
| 5 | Filter support |
| 6 | Filter outlet tube assembly |
| 7 | Fuel pump upper cover |
| 8 | Filler cap |
| 9 | Fuel filling pipe assembly |
| 10 | Fuel pump assembly |
| 11 | Clamp |

| No. | Part Name |
|---|---|
| 12 | Fuel tank assembly |
| 13 | Fuel tank bracket assembly |
| 14 | Fuel tank bracket assembly |
| 15 | Fuel tank bracket assembly |
| 16 | Fuel tank output pipe assembly |
| 17 | Fuel filter assembly |
| 18 | Bolt |
| 19 | Filter bracket |
| 20 | Bolt |
| 21 | Backplate of fuel braking line |
| | |

## Functional diagram



## General Inspection

**⚠Warning:**

**Gasoline or its boil-off gas is highly combustible.In order to avoid fire or explosion, keep far away from fire.The operator is forbidden to use a cell phone when performing this procedure.The discharged gasoline should not be stored in an open vessel. Prepare a dry chemical extinguisher nearby before executing this procedure.**

**Inspection of fuel pump assembly**

1. Check if the fuel pump gasket ring is broken.If yes, replace it.
2. Unplug the harness plug and check if the pins of fuel pump plug are bent or corroded.If yes, replace the fuel pump assembly.

**Inspection of fuel filter**

1. Check if the fuel filter bolts are loose.If yes, reinstall them.
2. Check if the exterior housing of fuel filter is broken or there is leakage.If yes, replace the fuel filter.
3. Check if there is leakage at the joint of fuel filter pipeline.If yes, clean up the fuel filter and pipeline joint, then reinstall them.If there is still leakage, replace the fuel filter and connecting pipeline.

**Inspection of filler cap and oil filing pipe**

1. Undo the filler cap and check if there is obvious stain on the accessories of oiling port.Check if the gasket of oiling port is broken.If yes, replace the oil filing pipe and filler cap.
2. Check if the exterior housing of filler cap and string are broken.If yes, replace the filler cap.

**Inspection of fuel tank**

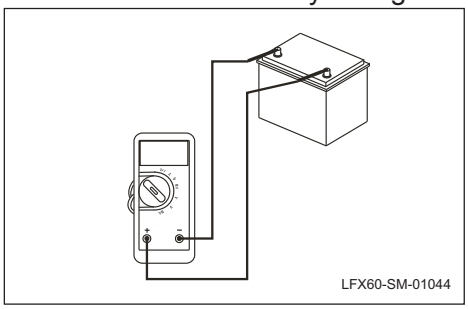
1. Check if the fuel tank bolts and nuts are loose.If yes, tighten them according to the regulation.
2. Check if there is leakage in the fuel tank.If yes, replace the fuel tank assembly.

**Fuel supply pipeline and connecting parts**

1. Check if the joint of fuel supply pipeline is corrected assembled.If not, reassemble it.
2. Check if the fuel supply pipeline and connecting parts are broken.If yes, replace the broken parts.

**Test of fuel system pressure**

a. Release the fuel system pressure.
b. Check if the battery voltage is around 12V.




**ℹNote:**

**High or low voltage has direct influence on the supply pressure of fuel pump.**

c. Disconnect the fuel track sucker.

**ℹNote:**

**• After the pressure in the fuel system is released, there may be a little of fuel in the pipe; therefore, when the fuel pipe is disconnected, its connector should be wrapped with a cloth, to prevent fuel leakage.**

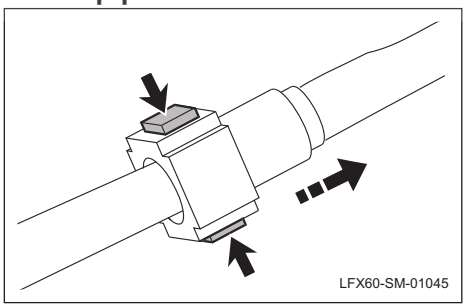
**• Do not bend or twist the resin duct.**

**• If the fuel sprays, clean up the sprayed fuel to aovid the rubber or leather tools or parts from contacting gasoline.**

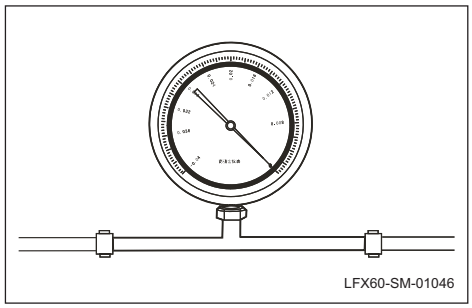
d. Connect the special oil pressure gauge to the fuel system.

**ℹNote:**

**As shown in the diagram, press down the raised part at the resin duct joint and pull out the oil pipe.**




e. The connecting method of special oil pressure gauge is shown in the diagram (sketch)




f. Start the engine and maintain it at idling.

**ℹNote:**

**Before starting the engine, accumulate the pressure.Switch on the ignition switch to fill up the fuel pipeline before starting the engine.**

g. Read the value on the pressure gauge.If it does not meet the requirement, replace the fuel pump.

**Fuel pressure: XXX**

h. Switch off the ignition switch.

i. Release the fuel pressure.

j. Remove the special oil pressure gauge, recover the fuel pipeline.

**ℹNote:**

**• When hearing a sharp click, it means the resin oil duct joint is in place.**

**• Pull out the oil duct joints at the two ends of oil pressure gauge and take the gauge out.**

k. Start the engine after the fuel pressure is accumulated.

# Diagnostic Information and Procedures

## Diagnosis Instructions

Before trouble-shooting, first understand and get familiar with the working principle of fuel system. This is helpful to determine the correct procedures of trouble-shooting when the trouble occurs. More important, it is also helpful to determine if the status described by the client is normal operation.

Any trouble-shooting for the fuel system shall start from the inspection for the fuel system, then guide the maintenance personnel to take next logic procedure to perform trouble-shooting.

Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

## General equipment

| |
|---|
| Digital multimeter |
| Diagnostic equipment of vehicle |
| Fuel pressure gauge |

## Visual Inspection

1. Confirm the customer's question.
2. Visually check for obvious signs of mechanical or electrical damage.

## Visual inspection table

| Mechanical | Electrical |
|---|---|
| • Fuel filter not installed correctly<br>• Fuel filter broken<br>• Oil filling pipe of fuel tank broken<br>• Filler cap of fuel tank broken<br>• Fuel feed pipe broken<br>• Fuel tank broken | • Electrical fuel pump fuse<br>• harness connector<br>• Electrical fuel pump relay<br>• Electrical fuel pump circuit<br>• Electric fuel pump |

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

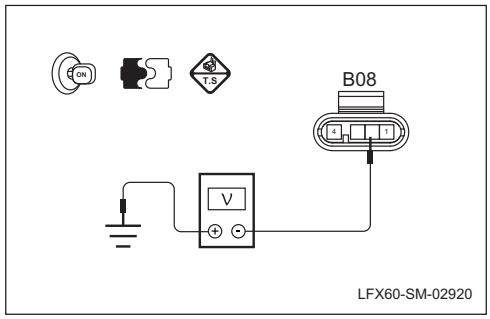
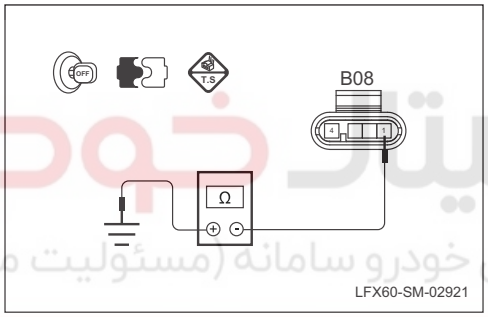
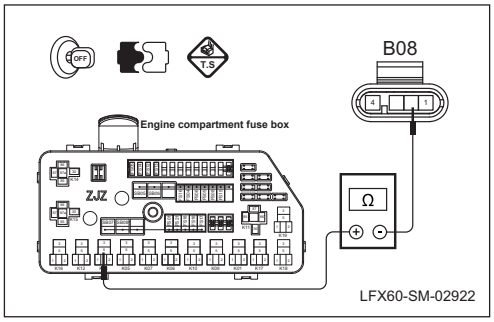
**List of fault symptoms**

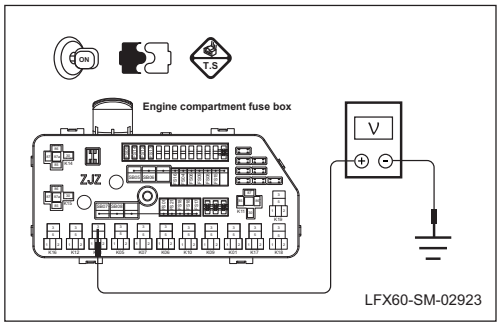
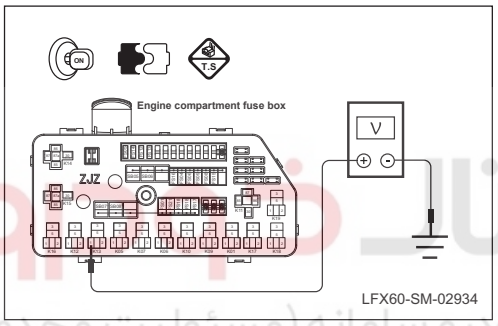
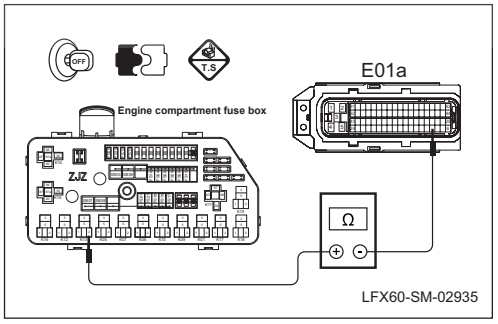
If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

| Symptom | Possible Cause | Recommended Measures |
|---|---|---|
| Fuel pressure low | • Fuel line leak | • Repair or replace the fuel line |
| | • Electrical fuel pump trouble | • Replace electrical fuel pump. **Reference: electrical fuel pump** |
| Fuel system pressure high | • Fuel pipe blocked | • Repair fuel pipe |
| Heavy fuel smell | • Fuel line leak | • Repair or replace the fuel line |
| | • Filler cap seal abnormal | • Replace filler cap |
| | • Fuel filter joint leaking | • Replace fuel filter or pipe |
| | • Fuel steam pipe leaking | • Repair or replace fuel steam pipe |
| | • Carbon tank of fuel tank broken | • Replace the canister |
| | • Electromagnetic valve of carbon tank broken | • Replace the canister solenoid valve |
| | • Engine working abnormal and combustion not compeletely | • Check engine working condition |
| Fuel gauge indicator abnormal | • Harness or plug | **Refer to: Trouble-shooting for fuel gauge indicator abnormal** |
| | • Fuel tank | |
| | • Fuel level sensor | |
| | • Instrument cluster | |
| Failure of electrical fuel pump | • Fuel pump fuse | **Refer to: electric fuel pump out of operation diagnosis flow** |
| | • Harness or plug | |
| | • Fuel pump relay | |
| | • Fuel pump circuit | |
| | • Electric fuel pump | |
| | • ECM | |

**Trouble-shooting for electrical fuel pump not working**

| Test condition | Details/results/measures |
|---|---|
| 1. Check the engine DTC. | |
| | A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter.<br>B. Operate the ignition switch to turn the power to ON state.<br>C. Turn on the diagnostic meter and check the engine system.<br>If it is related to the fuel control?<br>→**Yes**<br>**Refer to:Diagnostic trouble code (DTC) list.**<br>**Perform DTC diagnostic procedure.**<br>→**No**<br>To step 2. |
| 2. Check the electrical fuel pump fuse. | |
| | A. Operate the ignition switch to turn the power to OFF state.<br>B. Check the electrical fuel pump fuse FS17in the forecabin electrical box.<br>**Fuse rated capacity: 15A**<br>Is it OK after checking?<br>→**Yes**<br>To step 3.0.<br>→**No**<br>Replace the fuse of electrical fuel pump. |
| 3. Check the electrical fuel pump relay. | |
| | A. Operate the ignition switch to turn the power to OFF state.<br>B. Dismount the relay K13 of electrical fuel pump in the broken vehicle and install it on a normal vehicle.<br>If the vehicle operates normally.<br>→**Yes**<br>To step 4.<br>→**No**<br>The electrical fuel pump relay is in trouble.Replace it. |

| Test condition | Details/results/measures |
|---|---|
| 4. Perform the active test for the electrical fuel pump. | |
|  | A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter.<br>B. Disconnect the plug B08 of electrical fuel pump.<br>C. Operate the ignition switch to turn the power to ON state.<br>D. Switch on the automobile diagnosis equipment, select the input and output function control and perform the electrical fuel pump to start circulation.<br>E. Measure the voltage between No.2 terminal of electrical fuel pump plug B08 and the reliable grounding with a multimeter.<br>**Standard value:11 ~ 14V**<br>Is the voltage normal?<br>→**Yes**<br>To step 5.<br>→**No**<br>To step 6. |
| 5. Check the grounding circuit of electrical fuel pump. | |
|  | A. Operate the ignition switch to turn the power to OFF state.<br>B. Disconnect the battery negative connector.<br>C. Measure the resistance between No.1 terminal of electrical fuel pump plug B08 and the reliable grounding with a multimeter.<br>**Standard value:Less than 5Ω**<br>Is the resistance normal?<br>→**Yes**<br>Replace the electrical fuel pump.<br>**Refer to:Replacement of electric fuel pump**<br>→**No**<br>Check if the grounding circuit of electrical fuel pump is in trouble.Replace the harness if necessary. |
| 6. Check the power supply circuit of electrical fuel pump. | |
|  | A. Operate the ignition switch to turn the power to OFF state.<br>B. Disconnect the battery negative connector.<br>C. Remove the electric fuel pump relay K13.<br>D. Disconnect the plug B08 of electrical fuel pump.<br>E. Measure the resistance between No.2 terminal of electrical fuel pump plug B08 and No.5 terminal of electrical fuel pump relay K13 in the forecabin electrical box with a multimeter.<br>**Standard value:Less than 5Ω**<br>Is the resistance normal?<br>→**Yes**<br>To step 7.<br>→**No**<br>Check if there is any problem in the circuit between the electrical fuel pump and forecabin relay.Replace the harness if necessary. |

| Test condition | Details/results/measures |
|---|---|
| 7. Check the power supply of electrical fuel pump relay K13. | |
|  | A. Operate the ignition switch to turn the power to OFF state.<br>B. Remove the electric fuel pump relay K13.<br>C. Measure the voltage between No.3 terminal of electrical fuel pump relay K13 in the forecabin electrical box and the reliable grounding with a multimeter.<br>**Standard value:11 ~ 14V**<br>Is the voltage normal?<br>**→Yes**<br>To step 8.<br>**→No**<br>Check if there is any problem in the power supply circuit of electrical fuel pump relay K13.Replace the harness if necessary. |
| 8. Check the control power supply of electrical fuel pump relay. | |
|  | A. Operate the ignition switch to turn the power to OFF state.<br>B. Remove the electric fuel pump relay K13.<br>C. Operate the ignition switch to turn the power to ON state.<br>D. Measure the voltage between No.1 terminal of electrical fuel pump relay K13 in the forecabin electrical box and the reliable grounding with a multimeter.<br>**Standard value:11 ~ 14V**<br>Is the voltage normal?<br>**→Yes**<br>To step 9.<br>**→No**<br>Check if there is any problem in the control power supply of electrical fuel pump relay.If yes, replace the harness. |
| 9. Check the control circuit of electrical fuel pump relay. | |
|  | A. Operate the ignition switch to turn the power to OFF state.<br>B. Disconnect the battery negative connector.<br>C. Remove the electric fuel pump relay K13.<br>D. Disconnect the ECM harness connector E01b.<br>E. Measure the resistance between No.2 terminal of electrical fuel pump relay K13 in the forecabin electrical box and No.9 terminal of ECM harness with a multimeter.<br>**Standard value:Less than 5Ω**<br>Is the resistance normal?<br>**→Yes**<br>To step 10.<br>**→No**<br>Check if there is any problem in the control power supply of electrical fuel pump relay.If yes, replace the harness. |

| Test condition | Details/results/measures |
|---|---|
| 10. Check ECM. | |
| | A. Replace ECM.<br>**Refer to:REPLACEMENT OF ECM**<br>Confirm the fault is eliminated |

# Removal and Installation

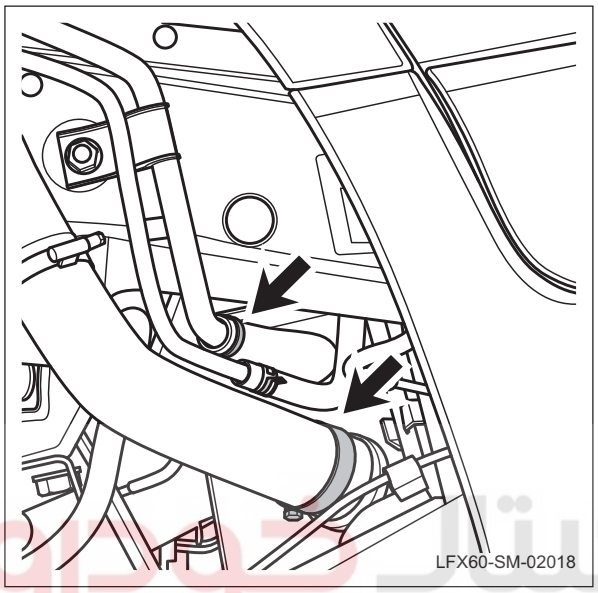
## Replacement of fuel tank assembly

### Removal

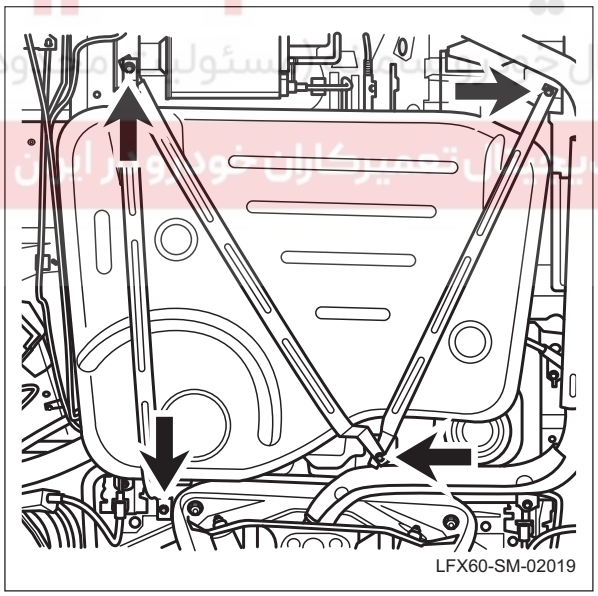
**1. Dismount the fuel tank assembly.**

(a). Lift the vehicle.

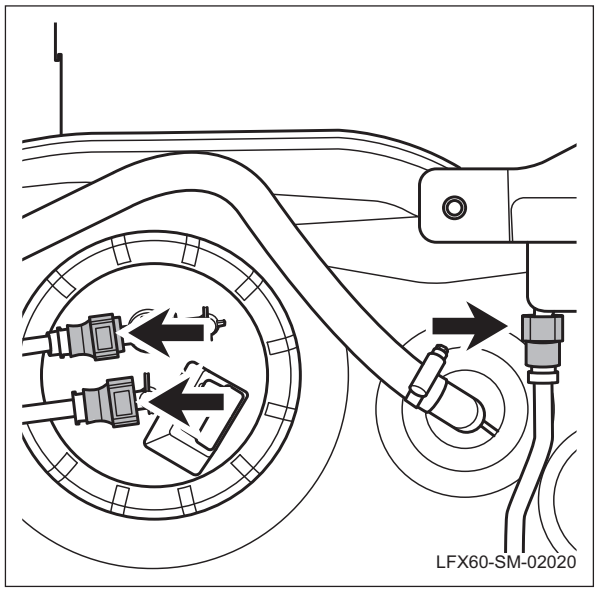
(b). Dismount the bar clasp of fuel filler pipe and breather pipe.




(c). Lift the plane jack to support the fuel tank.




(d). Dismount the tap bolts of fuel tank assembly.




(e). Slowly lower the jack partially.
(f). Disconnect the harness plug of fuel pump.
(g) Disconnect the pipe of fuel tank.
(h). Detach the fuel tank assembly.



**Installation**

**1. Install the fuel tank assembly.**
(a). The installation sequence is the reverse of the disassembly order.

**Replacement of fuel filter.**

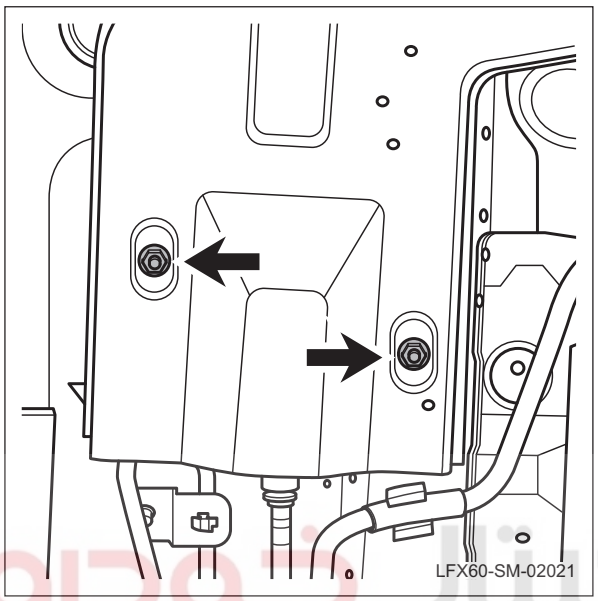
**Removal**

**1. Remove the fuel filter.**

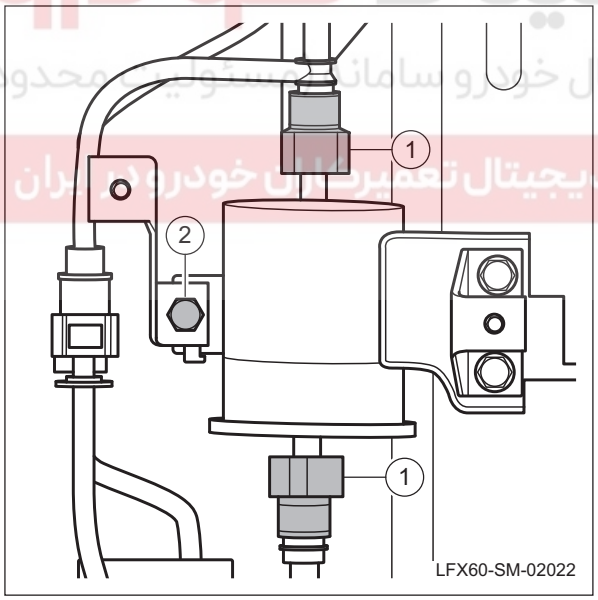
**Note:**

**Release the pressure of fuel system before operation.**

(a). Lift the vehicle.




(b). Dismount the grip nuts of lower backplate of fuel filter.




(c). Disconnect the input and output pipe 1 of fuel filter.

(d). Dismount the tap bolt 2 of fuel filter and detach the filter.

**Installation**

**1. Installation the fuel filter.**

(a). The installation sequence is the reverse of the disassembly order.

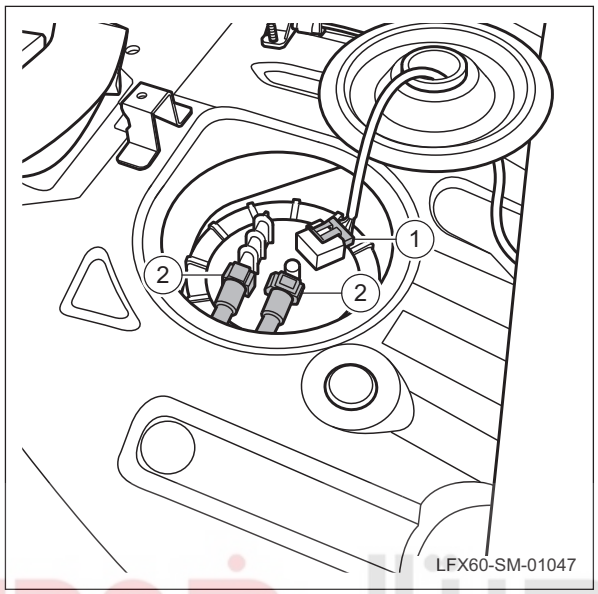
## Replacement of electrical fuel pump

### Removal

**1. Dismout the electrical fuel pump.**

(a). Dismount C column decorative sheet.**Reference:replacement of C column decorative sheet.**

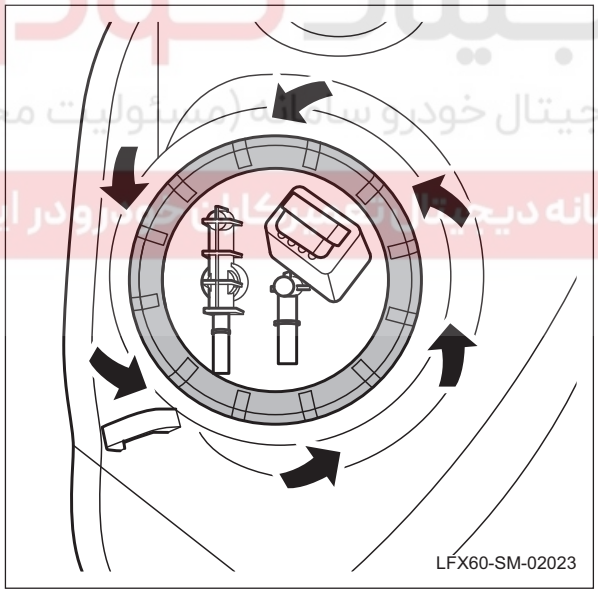
(b). Open the cushions of rear row seats and carpet.




(c). Open the upper cover of electrical fuel pump.

(d). Disconnect the harness plug 1 of electrical fuel pump.

(e). Detach the oil pipe 2 of electrical fuel pump.




(f). Dismount the clamping ring of electrical fuel pump.

(g). Lift the electrical fuel pump up and take it out.

### Installation

**1. Install the electrical fuel pump.**

(a). The installation sequence is the reverse of the disassembly order.