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2020.0 DEFENDER (LE), 310-01B

FUEL TANK AND LINES - INGENIUM I6 3.0L PETROL

[G2417681]

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PRINCIPLES OF OPERATION

For a detailed description of the Fuel Tank and Lines, refer to the relevant Description and Operation section in the workshop manual. REFER to: [Fuel Tank and Lines](#) (310-01B Fuel Tank and Lines - INGENIUM I6 3.0L Petrol, Description and Operation).

INSPECTION AND VERIFICATION

**WARNINGS:**

- Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury
- Place the vehicle in a well ventilated, quarantined, area and arrange "No Smoking/Fuel Fumes" signs about the vehicle
- Before any work is completed on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete
- Do not perform any repairs to the high pressure fuel system when the engine is running. The fuel pressure can be extremely high. Failure to follow this instruction may result in personal injury.
- Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapours are always present and may ignite. Failure to follow these instructions may result in personal injury
- After carrying out repairs, the fuel system must be inspected visually for leaks. Failure to follow these instructions may result in personal injury
- If fuel is taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.
- If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.
- Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.
- This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

CAUTIONS:

- Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.
- It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.
- Make sure that the workshop area in which the vehicle is being worked on is as clean and dust-free as possible. Areas in which work on clutches, brakes or where welding or machining is performed are not suitable in view of the risk of contamination to the fuel system. Failure to follow this instruction may result in damage to the vehicle.
- Make sure that any protective clothing worn is clean and made from lint-free non-flocking material. Failure to follow this instruction may result in damage to the vehicle.
- Make sure that clean, non-plated tools are used. Clean tools using a new brush that will not lose its bristles and fresh cleaning fluid prior to starting work on the vehicle. Failure to follow this instruction may result in damage to the vehicle.
- Use a steel-topped work bench and cover it with clean, lint-free, non-flocking material. Failure to follow this instruction may result in damage to the vehicle.
- Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

NOTES:

- If a control module or a component is at fault or may be at fault and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval program is in operation, prior to the installation of a new module/component.
- When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.
- Inspect and rectify basic faults before beginning diagnostic routines involving pinpoint tests.
- When measuring fuel sender resistance values with a multimeter, it is critical to use the correct multimeter setting. The multimeter should **not** be on the 'Auto' setting and **must** be set to 'Manual'. This will help prevent incorrect diagnosis and unnecessary replacement of fuel senders. If the multimeter range is set at 'Auto' then, during a sweep of the sender from 50 Ohms to 998 Ohms, the multimeter has to change its measurement range. For approximately 1 second, during the range switch over point, the multimeter display indicates an open circuit. This can lead to a mis-diagnosis of a fuel sender fault.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

MECHANICAL	ELECTRICAL
- Fuel level - Fuel leaks - Fuel pipes and hoses - Fuel contamination/grade/quality - Fuel tank filler pipe cap - Fuel tank filler pipe	- Fuses - Wiring harnesses and connectors - Powertrain Control Module (PCM) - Body Control Module (BCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step

4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

5. Check JLR Claims submission system for open campaigns. Refer to the corresponding bulletins and SSMS which may be valid for the specific customer complaint and complete the recommendations as required

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Engine cranks but does not start	- Positive crankcase ventilation system leaking /blocked - Ignition system fault - Fuel system fault - Engine system fault	- Inspect the integrity of the positive crankcase ventilation system. Rectify as necessary - Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary - Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary - Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index
Engine cranks and fires, but will not start	- Evaporative emissions system fault - Ignition system fault - Fuel system fault - Engine system fault	- Refer to the relevant section of the workshop manual and inspect the evaporative emissions system. Rectify as necessary - Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary - Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary - Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index

SYMPTOM	POSSIBLE CAUSES	ACTION
Engine difficult to start (cold engine)	■ Battery /charging system fault ■ Engine system fault ■ Fuel system fault ■ Evaporative emissions system fault	■ Refer to the relevant section of the workshop manual and inspect the battery and charging system. Rectify as necessary ■ Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index ■ Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary ■ Refer to the relevant section of the workshop manual and inspect the evaporative emissions system. Rectify as necessary
Engine difficult to start (warm/hot engine)	■ Injector(s) leaking ■ Engine system fault ■ Evaporative emissions system fault ■ Fuel system fault ■ Ignition system fault	■ Inspect the injectors for leaks. Rectify as necessary ■ Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index ■ Refer to the relevant section of the workshop manual and inspect the evaporative emissions system. Rectify as necessary ■ Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary ■ Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary
Engine difficult to start after hot soak (vehicle standing, engine off, after engine has reached operating temperature)	■ Injector(s) leaking ■ Engine system fault ■ Evaporative emissions system fault ■ Fuel system fault ■ Ignition system fault	■ Inspect the injectors for leaks. Rectify as necessary ■ Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index ■ Refer to the relevant section of the workshop manual and inspect the evaporative emissions system. Rectify as necessary ■ Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary ■ Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary

SYMPTOM	POSSIBLE CAUSES	ACTION
Engine stalls soon after start	■ Positive crankcase ventilation system leaking /blocked ■ Engine system fault ■ Ignition system fault ■ Intake pipe restricted /blocked ■ Air filter element restricted /blocked ■ Intake pipe disconnected /damaged after the air cleaner ■ Fuel system fault	■ Inspect the integrity of the positive crankcase ventilation system. Rectify as necessary ■ Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index ■ Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary ■ Inspect the intake pipe for restrictions and blockages. Rectify as necessary ■ Install a new air filter element as necessary ■ Inspect the intake system for correct installation and damage. Rectify as necessary ■ Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary
Engine hesitates / poor acceleration	■ Fuel system fault ■ Injector(s) leaking ■ Intake pipe disconnected /damaged after the air cleaner ■ Engine system fault ■ Accelerator pedal movement restricted (carpet, mats, etc) ■ Ignition system fault ■ Transmission fault	■ Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary ■ Inspect the injectors for leaks. Rectify as necessary ■ Inspect the intake system for correct installation and damage. Rectify as necessary ■ Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index ■ Check that the accelerator pedal is free from restriction. Rectify as necessary ■ Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary ■ Using the Jaguar Land Rover approved diagnostic equipment, check the transmission control module for related DTCs and refer to the relevant DTC index

SYMPTOM	POSSIBLE CAUSES	ACTION
Engine backfires	- Fuel system fault - Intake pipe disconnected /damaged after the air cleaner - Engine system fault - Ignition system fault - Variable camshaft timing system stuck active	- Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary - Inspect the intake system for correct installation and damage. Rectify as necessary - Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index - Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary - Inspect the operation of the variable camshaft timing system. Rectify as necessary
Engine surges	- Fuel system fault - Engine system fault - Ignition system fault	- Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary - Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index - Refer to the relevant section of the workshop manual and inspect the ignition system. Rectify as necessary
Engine detonates/knocks	- Engine system fault - Fuel system fault - Intake pipe disconnected /damaged after the air cleaner - Variable camshaft timing system stuck active	- Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index - Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary - Inspect the intake system for correct installation and damage. Rectify as necessary - Inspect the operation of the variable camshaft timing system. Rectify as necessary
No accelerator response	Engine system fault	Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index

SYMPTOM	POSSIBLE CAUSES	ACTION
Accelerator response poor	- Engine system fault - Positive crankcase ventilation system leaking /blocked - Transmission fault - Dynamic stability control event - Intake pipe disconnected /damaged after the air cleaner	- Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module for related DTCs and refer to the relevant DTC index - Inspect the integrity of the positive crankcase ventilation system. Rectify as necessary - Using the Jaguar Land Rover approved diagnostic equipment, check the transmission control module for related DTCs and refer to the relevant DTC index - No fault - Accelerator pedal response may be temporarily reduced or inhibited when the dynamic stability control is active - Inspect the intake system for correct installation and damage. Rectify as necessary
Fuel gauge reading empty with fuel in the fuel tank	- Active fuel level sensor circuit open circuit - Passive fuel level sensor circuit open circuit - Instrument cluster internal failure	- Refer to the electrical circuit diagrams and inspect the active fuel level sensor circuit for open circuit, high resistance. Repair the wiring harness or install a new active fuel level sensor as necessary - Refer to the electrical circuit diagrams and inspect the passive fuel level sensor circuit for open circuit, high resistance. Repair the wiring harness or install a new passive fuel level sensor as necessary - Using the Jaguar Land Rover approved diagnostic equipment, perform routine - Fuel Level Sensor Test
Fuel gauge not reading empty with no fuel in the fuel tank	Jet pump fault or fuel crossover tube blocked or leaking	Using the Jaguar Land Rover approved diagnostic equipment, check datalogger signals - Fuel Level Sensor Pump Voltage - Raw - Fuel Level Sensor Eject Voltage - Raw. Make sure the sensors read the same. If the readings vary, check that the jet pump is transferring fuel from the left side to the right side. Rectify as necessary

CONTROL MODULE CAVITY

CONTROL MODULE CAVITY	DESCRIPTION	DTC
Circuit reference - I_FUEL_SENSOR_PUMP	Fuel sender No.1 active	- B1A75-11 - B1A75-15 - B1A75-1C

CONTROL MODULE CAVITY	DESCRIPTION	DTC
Circuit reference - I_FUEL_SENSOR_EJECT	Fuel sender No.2 passive	■ B1A76-11 ■ B1A76-15 ■ B1A76-1C
Circuit reference - O_FUEL_PUMP_CONTROL	Fuel pump control supplied to the fuel pump relay	■ P0230-12 ■ P0230-52
Circuit reference - O_FUEL_FLAP_LOCK	Fuel flap lock	■ B1C91-11 ■ B1C91-12 ■ B1C91-15 ■ B1C91-19 ■ B1C91-52
Circuit reference - O_FUEL_FLAP_UNLOCK	Fuel flap unlock	■ B1C91-11 ■ B1C91-12 ■ B1C91-15 ■ B1C91-19 ■ B1C91-52

DATALOGGER SIGNALS

DATALOGGER SIGNAL	DESCRIPTION	ACTION
0x4287	Fuel Level Sensor Pump Voltage - Raw	■ Voltage of the fuel level sensor (pump side) input - to be used in connectivity and fuel level sensor function checks
0x4287	Fuel Level Sensor Eject Voltage - Raw	Voltage of the fuel level sensor (eject side) input - to be used in connectivity and fuel level sensor function checks
0x41DD	Fuel Pump Supply Status - Fuel Pump Supply Enabled	To be used during Body Control Module (BCM) replacement and fuel tank removal/replacement to enable fuel pump output
0x41DD	Fuel Pump Supply Status - Fuel Pump Supply Disabled	To be used during Body Control Module (BCM) replacement and fuel tank removal/replacement to disable fuel pump output
0x428A	Fuel Flap Output Control - Lock	To be used for fuel flap actuator function and connectivity checks
0x428A	Fuel Flap Output Control - Unlock	To be used for fuel flap actuator function and connectivity checks

For a list of Diagnostic Trouble Codes (DTCs) that could be set on this vehicle, please refer to Section 100-00.
REFER to: [Diagnostic Trouble Code Index - INGENIUM I6 3.0L Petrol, Vehicles With: MHEV, DTC: Powertrain Control Module \(PCM\) B1087-88 to P0634-00](#) (100-00 General Information, Description and Operation).

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