

PUBLISHED: 09-OCT-2019

2020.0 DEFENDER (LE), 303-14B

ELECTRONIC ENGINE CONTROLS – INGENIUM I6 3.0 L PETROL (G2417641)

mcx30.com

PRINCIPLES OF OPERATION

For a detailed description of the Electric Supercharger, refer to the relevant Description and Operation section in the workshop manual. REFER to: [Electronic Engine Controls](#) (303-14B Electronic Engine Controls - INGENIUM I6 3.0L Petrol, Diagnosis and Testing).

INSPECTION AND VERIFICATION

 CAUTION:

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.

 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 that has the resolution ability to view 3 decimal places. For example, on the 2 volts range can measure 1 mV or 2 kΩ range can measure 1 Ω. 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.
- After disconnecting the power supply, it takes 3 minutes and 30 seconds for the capacitors within the electric supercharger to discharge to 12 volts.

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

Visual Inspection

MECHANICAL	ELECTRICAL
■ Engine oil level ■ Cooling system coolant level ■ Fuel level ■ Fuel contamination	■ Fuses ■ Wiring harnesses and connectors ■ Powertrain control module ■ Crankshaft position sensor

MECHANICAL	ELECTRICAL
■ Fuel leaks ■ Accessory drive belt ■ Vacuum hoses ■ Fuel injectors ■ High pressure fuel pump ■ Fuel metering valve ■ Turbocharger ■ Electric supercharger ■ Clean air duct	■ Accelerator pedal position sensor ■ Camshaft position sensors ■ Engine coolant temperature sensor ■ Cylinder block temperature sensor ■ Cylinder head temperature sensor ■ Knock sensors ■ Oil pressure and temperature sensor ■ Mass air flow and temperature sensor ■ Mass air flow sensor ■ Low fuel pressure sensor ■ Ambient air temperature sensor ■ Fuel rail pressure sensor ■ Charge air pressure sensor ■ Heated oxygen sensors ■ Ignition coils ■ Electric throttle ■ Variable camshaft timing actuators ■ Purge valve ■ Electric supercharger

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
The engine does not crank	■ Battery /charging system fault ■ Engine management 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 ■ 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
	■ Transmission system fault ■ Transmission control switch not set to Park or Neutral ■ Telematics control module (TCU) fault (where fitted) /CAN fault ■ Smart key not present /recognized ■ Starter relay fault ■ Starter motor ground circuit open circuit, high resistance ■ Starter motor solenoid circuit short circuit to ground, open circuit, high resistance ■ Starter motor circuit short circuit to ground, open circuit, high resistance ■ Engine seized	■ Set the transmission control switch to Park or Neutral and retest ■ When a start request is made, the telematics control module (where fitted) must transmit a secure ID message to the powertrain control module over the CAN bus to authorise cranking. Check the telematics control module for related DTCs and refer to the relevant DTC index. Inspect the CAN circuit between the telematics control module and the powertrain control module and repair the wiring harness as necessary ■ Check that the smart key is present and recognized ■ Check the operation of the starter relay. Rectify as necessary ■ Refer to the electrical circuit diagrams and inspect the starter motor ground circuit for open circuit, high resistance. Repair the wiring harness as necessary ■ Refer to the electrical circuit diagrams and inspect the starter motor solenoid circuit for short circuit to ground, open circuit, high resistance. Repair the wiring harness or install a new starter motor solenoid as necessary ■ Refer to the electrical circuit diagrams and inspect the starter motor power circuit for short circuit to ground, open circuit, high resistance. Repair the wiring harness or install a new starter motor as necessary ■ Check that the engine turns freely
Engine cranks but does not start	■ Positive crankcase ventilation system blocked /leaking ■ Ignition system fault ■ Fuel system fault ■ Engine management 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		

SYMPTOM	POSSIBLE CAUSES	ACTION
fires but will not start	■ Positive crankcase ventilation system blocked /leaking ■ Ignition system fault ■ Fuel system fault ■ Engine management 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 difficult to start (cold engine)	■ Battery /charging system fault ■ Engine management 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)	■ Fuel injector leaking ■ Engine management system fault ■ Evaporative emissions system fault ■ Fuel system fault ■ Ignition system fault	■ Inspect the fuel 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)	■ Fuel injector leaking ■ Engine management system fault ■ Evaporative emissions system fault ■ Fuel system fault	■ Inspect the fuel 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
	Ignition system fault	
Engine cranks too slowly	- Battery /charging system fault - Starter motor ground circuit open circuit, high resistance - Starter motor power circuit open circuit, high resistance - Starter motor internal failure - Engine oil grade incorrect	- Refer to the relevant section of the workshop manual and inspect the battery and charging system. Rectify as necessary - Refer to the electrical circuit diagrams and inspect the starter motor ground circuit for open circuit, high resistance. Repair the wiring harness as necessary - Refer to the electrical circuit diagrams and inspect the starter motor power circuit for open circuit, high resistance. Repair the wiring harness as necessary - inspect the operation of the starter motor. Rectify as necessary - Check the engine oil grade. Rectify as necessary
Engine cranks too fast	- Timing chain failure - Engine cylinder compressions too low	- Inspect the integrity of the timing chains. Rectify as necessary - Refer to the relevant section of the workshop manual and test the engine cylinder compressions. Rectify as necessary
Engine stalls soon after start	- Positive crankcase ventilation system blocked /leaking - Engine management system fault - Ignition system fault - Intake air system restricted - Air filter element restricted /blocked - Intake pipe disconnected	- 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 air system for restrictions. 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

SYMPTOM	POSSIBLE CAUSES	ACTION
	/damaged after the air cleaner ■ Fuel system fault	
Engine stalls on overrun	■ Engine management 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
Engine stalls at steady speed	■ Engine management 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
Engine stalls with speed control enabled	■ Engine management 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
Engine stalls when maneuvering	■ Engine management system fault ■ Excessive additional engine loads (power steering, air conditioning, etc) ■ Transmission 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 ■ Check for excessive loads being placed on the engine by the power steering, air conditioning, etc ■ Using the Jaguar Land Rover approved diagnostic equipment, check the transmission control module for related DTCs and refer to the relevant DTC index
Engine hesitates / poor acceleration	■ Fuel system fault ■ Fuel injector leaking ■ Intake pipe disconnected /damaged after the air cleaner ■ Engine management system fault ■ Accelerator pedal movement restricted (carpet, mats, etc) ■ Transmission system fault	■ Refer to the relevant section of the workshop manual and inspect the fuel system. Rectify as necessary ■ Inspect the fuel 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 ■ Using the Jaguar Land Rover approved diagnostic equipment, check the transmission control module for related DTCs and refer to the relevant DTC index

	CAUSES	
Engine backfires	■ Fuel system fault ■ Intake pipe disconnected /damaged after the air cleaner ■ Engine management 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 management 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 management 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 management 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
Speed control inhibited/disabled	■ Engine management 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
Accelerator response poor		■ 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 management system fault ■ Positive crankcase ventilation system blocked /leaking ■ Transmission system fault ■ Dynamic stability control event ■ Intake pipe disconnected /damaged after the air cleaner	■ 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
Malfunction indicator lamp illuminated or engine warning message displayed	■ Engine management 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

DTC INDEX

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).