

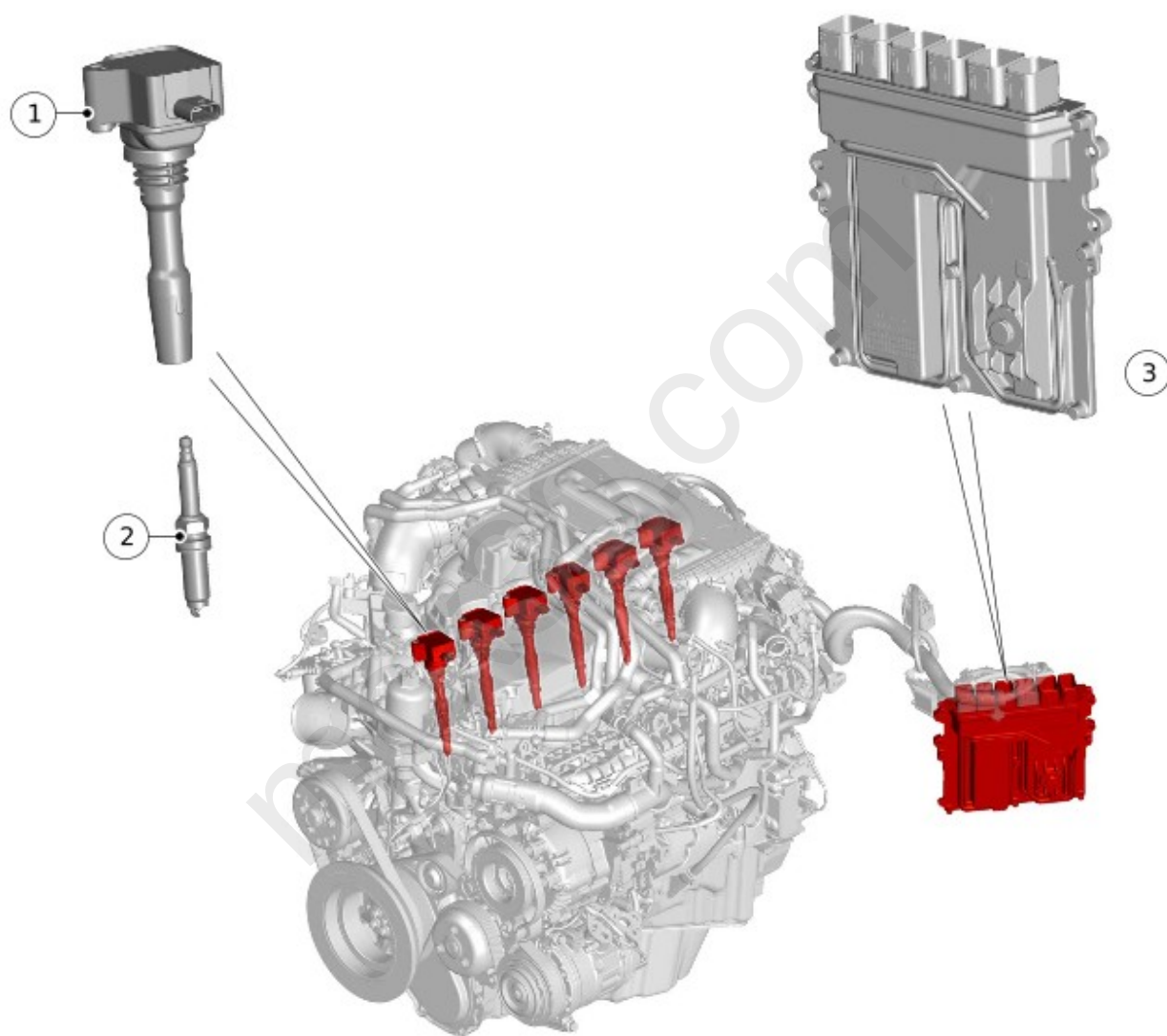
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2020.0 DEFENDER (LE), 303-07C

ENGINE IGNITION – INGENIUM I6 3.0L PETROL (G2341948)

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COMPONENT LOCATION



E236479

ITEM	DESCRIPTION
1	Ignition coil (quantity 6)
2	Spark plug (quantity 6)
3	Powertrain Control Module (PCM)

The Ingenium I6 3.0L Petrol ignition system is a coil on-plug system, which can operate as multi spark system during cold start and certain part load operating conditions. The ignition system is controlled by the Powertrain Control Module (PCM).

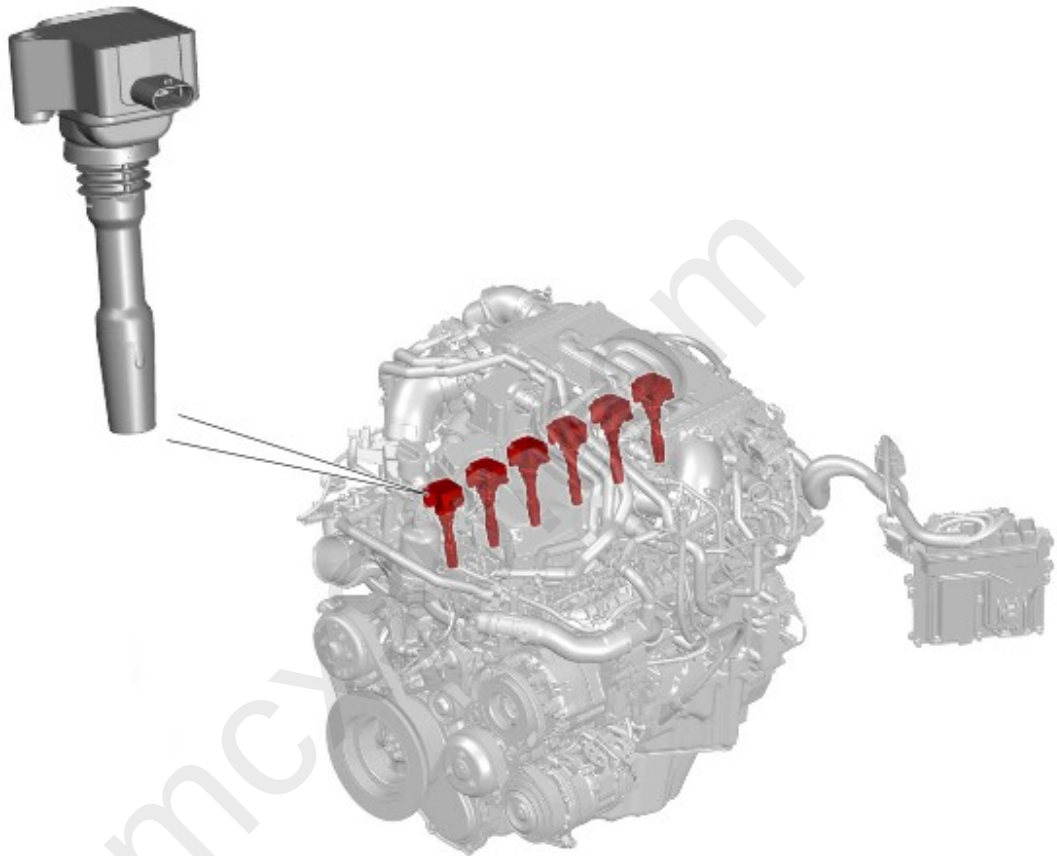
The spark plug is a device for delivering electric current from the ignition system to the combustion chamber. The spark plug is supplied with high voltage generated by the ignition coil. In the spark ignition (petrol) engine an electric spark ignites the compressed fuel/air mixture in the combustion chamber.

For additional information, refer to: [Electronic Engine Controls](#) (303-14B Electronic Engine Controls - INGENIUM I6 3.0 L Petrol, Description and Operation).

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DESCRIPTION

IGNITION COIL



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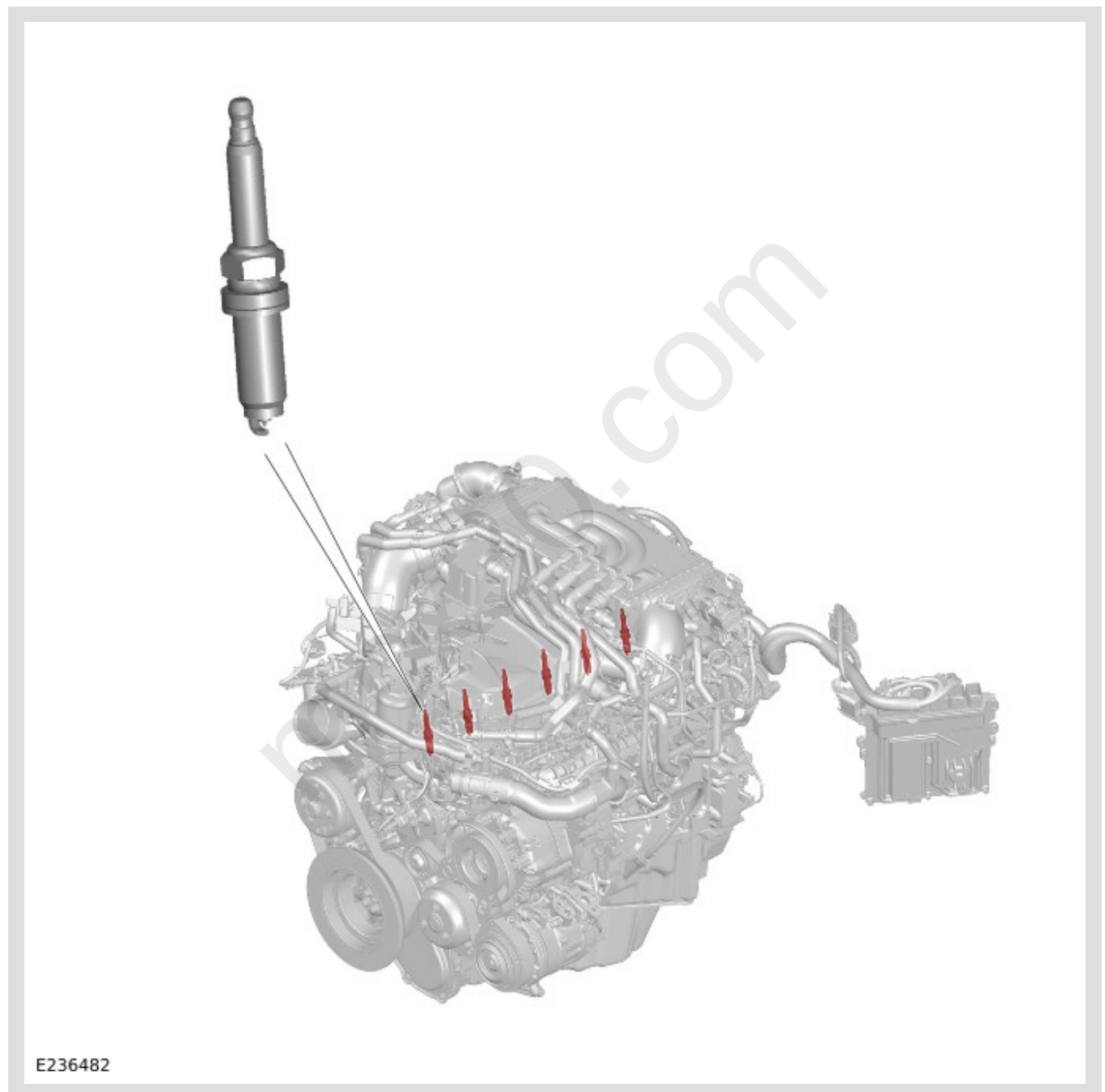
The 6 ignition coils are attached directly to the spark plugs and are located in the center of the camshaft carrier. The ignition coils are secured to the camshaft carrier with screws. Each ignition coil incorporates a 3 pin electrical connector for connection to the engine wiring harness.

Each ignition coil contains a primary and a secondary winding. A power stage in the primary winding allows the Powertrain Control Module (PCM) to control the primary current. The Powertrain Control Module (PCM) controls the spark timing and production by switching the power stage of each coil to ground. This method allows to the coil to charge up and then discharge at the appropriate time. This induces a high voltage in the secondary winding and thus the spark plug.

A diode in the ground side of the secondary winding reduces any undesirable switch-on voltage, to prevent misfiring into the combustion chamber. The diode limits the maximum voltage and current in the primary winding, to protect the power stage and limit the voltage in the secondary winding.

The PCM monitors the ignition coil control wires for faults and can store fault related Diagnostic Trouble Codes (DTCs). These DTCs can be retrieved using the Jaguar Land Rover (JLR) approved diagnostic equipment.

SPARK PLUG



A spark plug is installed to every cylinder, between the intake and exhaust valves. An ignition coil is installed on each spark plug. The spark plug is a device for delivering electric current from the ignition system to the combustion chamber. The spark plugs feature an Iridium tipped center electrode, and a platinum tipped ground electrode.

The spark plug is connected to the secondary winding within the ignition coil. As the current flows from the coil, a voltage develops between the center and ground electrodes. When the voltage differential equals the required voltage, then the spark plug produces a spark and the stored energy within the ignition coil is dissipated.

OPERATION

The ignition coils are supplied with electrical power from the Powertrain Control Module (PCM) relay in the Engine Junction Box (EJB). The PCM controls the operation of the PCM relay.

Each ignition coil has a 3 pin connector, which incorporates the following connections:

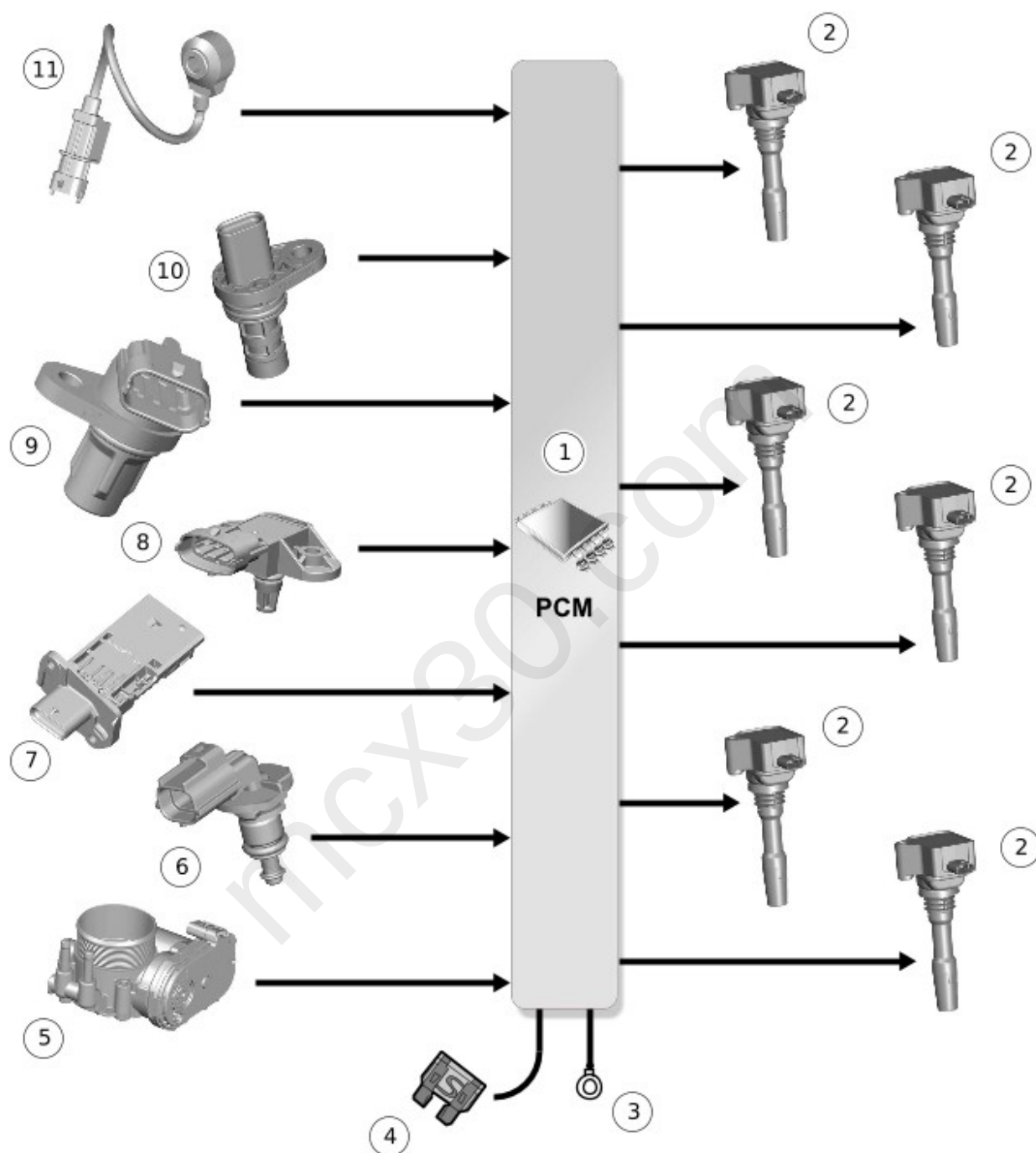
- A fused power supply from the EJB by the PCM relay.
- A ground path, which allows the secondary winding to connect to ground.
- A signal connection from the PCM, to control the ignition coil power stage switching (to open and close the primary circuit).

The PCM sends a separate signal to each ignition coil to trigger the power stage switching. The PCM calculates the dwell time from the startup battery voltage and engine speed. This provides a constant energy level, which is produced in the secondary winding each time the power stage is switched. Thus sufficient spark energy is available without excessive primary current flow, which avoids overheating and damage to the ignition coils.

The PCM calculates the ignition timing for individual cylinders from:

- Engine speed from the Crankshaft Position (CKP) sensor.
- Camshaft position from exhaust and intake Camshaft Position (CMP) sensors.
- Engine load.
- Engine temperature.
- The knock control function.
- The shift control function.
- The idle speed control function.

CONTROL DIAGRAM



A →

A = HARDWIRED.

ITEM	DESCRIPTION
1	Powertrain Control Module (PCM)
2	Ignition coil
3	Ground
4	Power supply
5	Electric throttle - Throttle Position Sensor (TPS)
6	Engine Coolant Temperature (ECT) sensor
7	Mass Air Flow and Temperature (MAFT) sensor
8	Manifold Absolute Pressure and Temperature (MAPT) sensor
9	Camshaft Position (CMP) sensor (quantity 2)
10	Crankshaft Position (CKP) sensor
11	Knock sensor (quantity 3)

cmjjaGFyZG1vbnRvbjsyMDIwLTA5LTE2VDlyOjM3OjI0LjE0OVo7OTAuMTk5LjEyMS4xMTc7