

Published: 11-May-2011

Engine Ignition -

General Specification

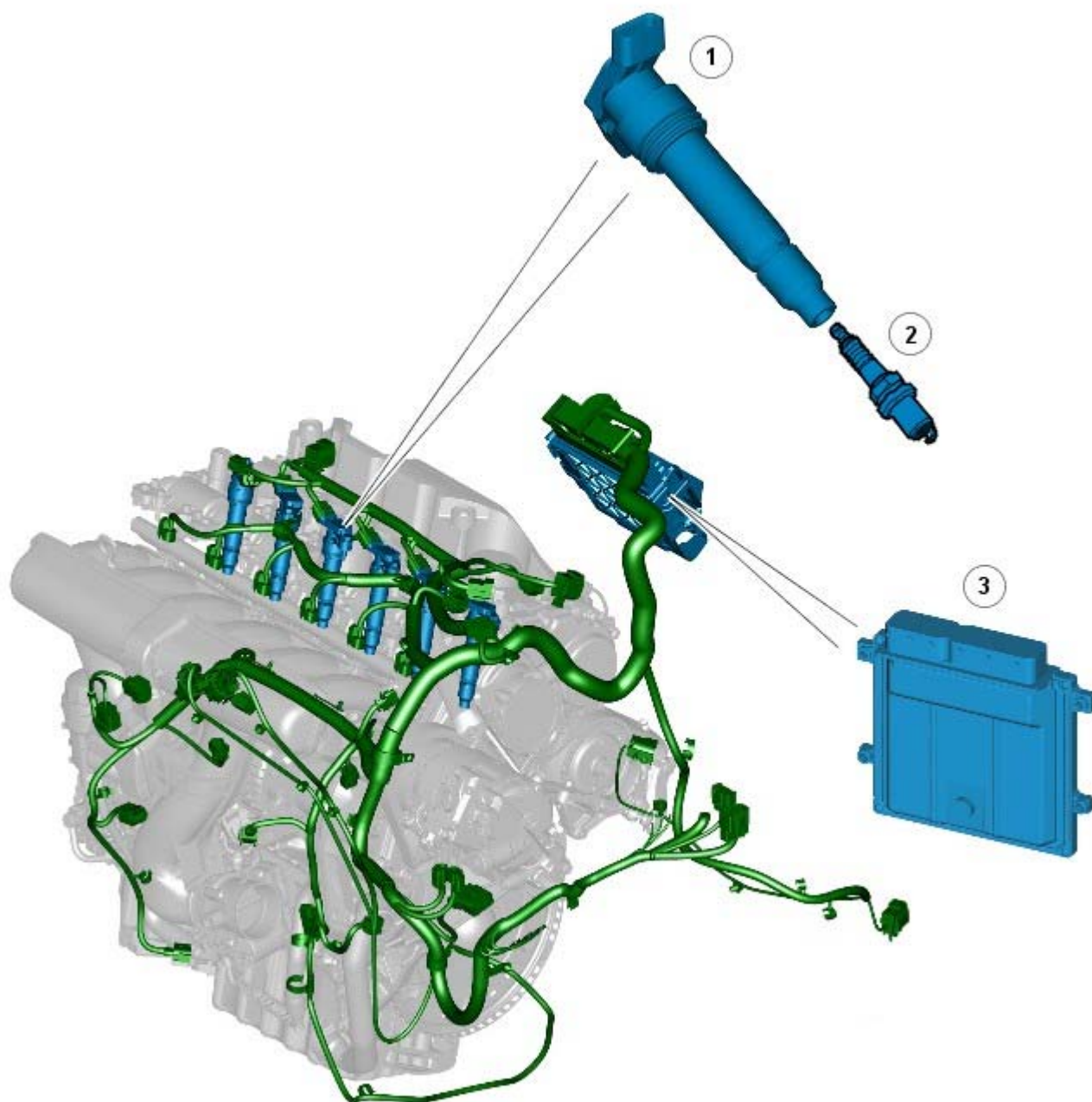
Item	Specification
Spark plugs	
Vehicles built up to VIN 7H038589	
Make	NGK
Type	LPR6D
Gap	0.6mm (non-adjustable)
Vehicles built after VIN 7H038589	
Make	NGK
Type	ILRF6B
Gap	0.75mm \pm 0.05mm
Ignition coils:	
Make	Denso
Type	Coil-on-plugs

Torque Specifications

Description	Nm	lb-ft
Ignition coil retaining bolts	10	7
Spark plugs	28	21

Part Number
Engine Ignition - Engine Ignition
 Description and Operation

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COMPONENT LOCATION

E76887

Item	Part Number	Description
1	-	Ignition coil
2	-	Spark plug
3	-	Engine Control Module (ECM)

OVERVIEW

The 3.2L Si6 engine ignition system has a single iridium tipped spark plug per cylinder, with each spark plug powered by an on-plug ignition coil. The ignition coils are directly driven by the ECM.

Power for the ignition coils is supplied from the main relay and a fuse in the BJB. A capacitor is connected in parallel with the power supplies to the ignition coils to suppress RFI (radio frequency interference).

Each ignition coil contains a power stage to switch the current in the primary circuit. The ECM controls the switching with a signal to the power stage. The ECM monitors operation of the ignition coils using a feedback signal from each of the power stages. If a fault is detected the ECM stores an appropriate fault code.

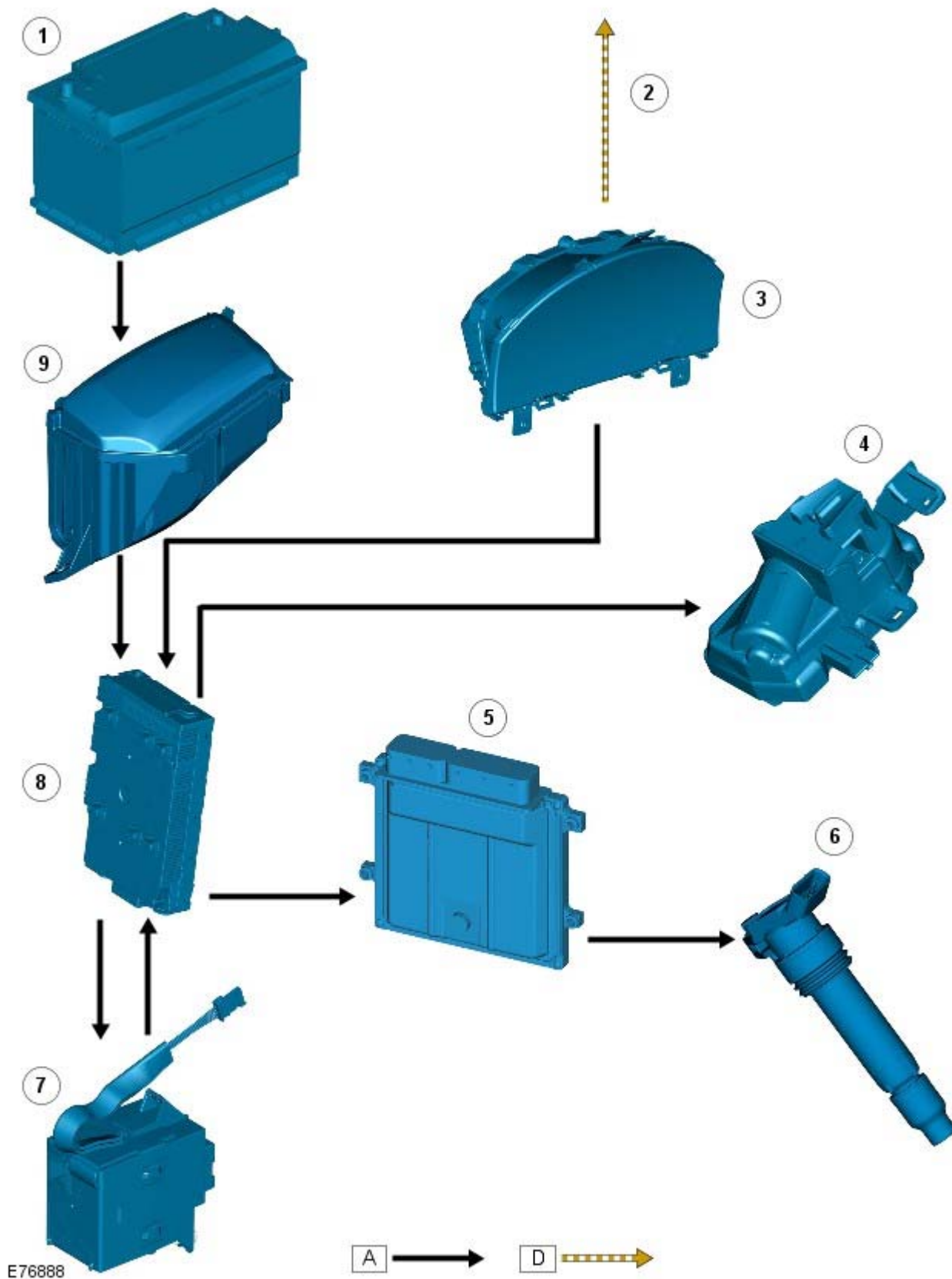
The ECM varies the dwell time of the ignition coils depending on battery voltage and engine speed, to ensure a constant energy level is produced in the secondary coil each time the power stage is switched. This ensures a good spark is always produced by the spark plug without excessive primary current flow, thus avoiding overheating or damage to the ignition coils.

The ECM calculates the ignition timing for individual cylinders from:

- Engine speed
- Camshaft position
- Engine load
- Engine temperature
- The knock control function
- On automatic transmission models, the shift control function
- The idle speed control function.

CONTROL DIAGRAM

NOTE: **A** = Hardwired; **D** = High speed CAN bus



Item		Description
1		Battery
2		CAN bus to other vehicle systems
3		Instrument cluster
4		Electronic steering column lock
5		ECM
6		Ignition coil
7		Keyless start control module and start/stop switch

8		CJB
9		BJB

Engine Ignition - Engine Ignition

Diagnosis and Testing

Principles of Operation

For a detailed description of the ignition system, refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Engine Ignition](#) (303-07A Engine Ignition, Description and Operation).

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.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> ● Engine oil level ● Cooling system coolant level ● Fuel level ● Fuel contamination/grade/quality 	<ul style="list-style-type: none"> ● Fuses ● Wiring harness ● Loose or corroded electrical connectors ● Ignition coils ● Sensor(s) ● Engine Control Module (ECM)

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.

Symptom Chart

Symptom	Possible Cause	Action
Engine cranks, but does not fire	<ul style="list-style-type: none"> ● Engine breather system disconnected/restricted ● Engine ignition system ● Fuel system ● Electronic engine controls 	<ul style="list-style-type: none"> ● Ensure the engine breather system is free from restriction and is correctly installed ● Read DTCs and refer to DTC Index in this section for engine ignition system tests ● For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). ● Read DTCs and refer to the DTC Index for electronic engine controls. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing).
Engine cranks and fires, but will not start	<ul style="list-style-type: none"> ● Evaporative emissions purge valve ● Fuel pump ● Spark plugs ● HT short to ground (tracking) check rubber boots for cracks/damage ● Ignition coil failure(s) 	<ul style="list-style-type: none"> ● For purge valve tests. REFER to: Evaporative Emissions (303-13 Evaporative Emissions, Diagnosis and Testing). ● For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). ● For spark plug tests, Visually inspect the spark plug for cracks, damage, carbon buildup or wet fouling, check the condition of the ground electrode, the center electrode tip and the spark plug HT contact and confirm that the spark plug gap is correctly set using a wire gauge taking care not to cause damage to the center or ground electrode tips. Install new spark plug(s) as required. ● For engine ignition coil circuit tests, check for DTCs and refer to the DTC Index
Difficult cold start	<ul style="list-style-type: none"> ● Engine coolant level-anti-freeze content ● Battery ● Electronic engine controls ● Fuel pump 	<ul style="list-style-type: none"> ● Check the engine coolant level and anti-freeze content. REFER to: Specifications (303-03A Engine Cooling - I6 3.2L Petrol, Specifications). ● Ensure the battery is in a fully charged and serviceable condition

Symptom	Possible Cause	Action
	<ul style="list-style-type: none"> Purge valve 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index for electronic engine controls. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). For purge valve tests. REFER to: Evaporative Emissions (303-13 Evaporative Emissions, Diagnosis and Testing).
Difficult hot start	<ul style="list-style-type: none"> Injector leak Electronic engine controls Purge valve Fuel pump Engine ignition system 	<ul style="list-style-type: none"> Check for leaking injectors Read DTCs and refer to the DTC Index for electronic engine controls. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). For purge valve tests. REFER to: Evaporative Emissions (303-13 Evaporative Emissions, Diagnosis and Testing). For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). Read DTCs and refer to DTC Index in this section for engine ignition system tests
Difficult to start after hot soak (vehicle standing, engine off, after engine has reached operating temperature)	<ul style="list-style-type: none"> Injector leak Electronic engine controls Purge valve Fuel pump Engine ignition system 	<ul style="list-style-type: none"> Check for leaking injectors Read DTCs and refer to DTC Index for electronic engine control tests. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). For purge valve tests. REFER to: Evaporative Emissions (303-13 Evaporative Emissions, Diagnosis and Testing). For fuel system tests. REFER to: Evaporative Emissions (303-13 Evaporative Emissions, Diagnosis and Testing). Read DTCs and refer to DTC Index in this section for engine ignition system tests
Engine stalls soon after start	<ul style="list-style-type: none"> Breather system disconnected/restricted Electronic engine control Engine ignition system Air intake system restricted Air leakage Fuel lines 	<ul style="list-style-type: none"> Ensure the engine breather system is free from restriction and is correctly installed Read DTCs and refer to DTC Index for electronic engine control. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). Read DTCs and refer to DTC Index in this section for engine ignition system tests Check for blockage in air filter element and air intake system For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing).
Engine hesitates/poor acceleration	<ul style="list-style-type: none"> Fuel pressure, pump and lines Injector leak Air leakage Electronic engine controls Engine ignition system Transmission malfunction Restricted pedal travel (carpet, etc) 	<ul style="list-style-type: none"> For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). Check for injector leak Check for leakage from air intake system Read DTCs and refer to DTC Index for electronic engine control tests. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). Read DTCs and refer to DTC Index in this section for engine ignition system tests For transmission tests. REFER to: Diagnostics (307-01 Automatic Transmission/Transaxle, Diagnosis and Testing). Ensure accelerator pedal is free from restriction

Symptom	Possible Cause	Action
Engine backfires	<ul style="list-style-type: none"> Fuel pump and lines Air leakage Electronic engine controls Engine ignition system Sticking Variable Camshaft Timing (VCT) hub 	<ul style="list-style-type: none"> For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). Check for leakage in air intake system Read DTCs and refer to DTC Index for electronic engine controls. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). Read DTCs and refer to DTC Index in this section for engine ignition system tests Read DTCs and refer to DTC Index for VCT tests. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing).
Engine surges	<ul style="list-style-type: none"> Fuel pump and lines Electronic engine controls Engine ignition system 	<ul style="list-style-type: none"> For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). Read DTCs and refer to DTC Index for electronic engine controls. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). Read DTCs and refer to DTC Index in this section for engine ignition system tests
Engine detonates/knocks	<ul style="list-style-type: none"> Electronic engine controls Fuel pump and lines Air leakage Sticking VCT hub 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index for electronic engine controls For fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). Check for leakage from air intake system Read DTCs and refer to DTC Index for VCT tests. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing).
No throttle response	<ul style="list-style-type: none"> Electronic engine controls 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index for electronic engine control tests
Poor throttle response	<ul style="list-style-type: none"> Breather system disconnected/restricted Electronic engine control Transmission malfunction Traction control event Air leakage 	<ul style="list-style-type: none"> Ensure the engine breather system is free from restriction and is correctly installed Read DTCs and refer to DTC Index for electronic engine control tests. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). For transmission tests. REFER to: Diagnostics (307-01 Automatic Transmission/Transaxle, Diagnosis and Testing). Check for leakage from air intake system

DTC Index

NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).

NOTE: When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

NOTE: If DTCs are recorded and, after the pinpoint tests have been carried out, the fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.


DTC	Description	Possible Cause	Action
P131500	Persistent misfire	<ul style="list-style-type: none"> ECM to ignition coil circuit fault Cylinder misfire DTCs also set Ignition coil failure Spark plug failure/fouled /incorrect gap 	Check for DTCs indicating an ignition or fuel related fault. Rectify as necessary.

DTC	Description	Possible Cause	Action
		<ul style="list-style-type: none"> Fuel delivery pressure low Fuel injector circuit faults Injector DTCs also set 	
P136700	Ignition spare	<ul style="list-style-type: none"> Ignition failure signal circuit: short circuit to ground Ignition failure signal circuit: open circuit Ignition failure signal circuit: short circuit to power Ignition coil failure 	Check the ignition failure signal circuit. Refer to the electrical guides. Rectify as necessary. Install a new coil as necessary. REFER to: Ignition Coil-On-Plug (303-07A Engine Ignition, Removal and Installation).
P136800	Ignition spare	<ul style="list-style-type: none"> Ignition failure signal circuit: short circuit to ground Ignition failure signal circuit: open circuit Ignition failure signal circuit: short circuit to power Ignition coil failure 	Check the ignition failure signal circuit. Refer to the electrical guides. Rectify as necessary. Install a new coil as necessary. REFER to: Ignition Coil-On-Plug (303-07A Engine Ignition, Removal and Installation).

Engine Ignition - Ignition Coil-On-Plug

Removal and Installation

Removal

1.  **CAUTION:** After switching of the ignition, wait for 2 minutes before disconnecting the battery. Failure to wait for 2 minutes will damage the navigation computer.

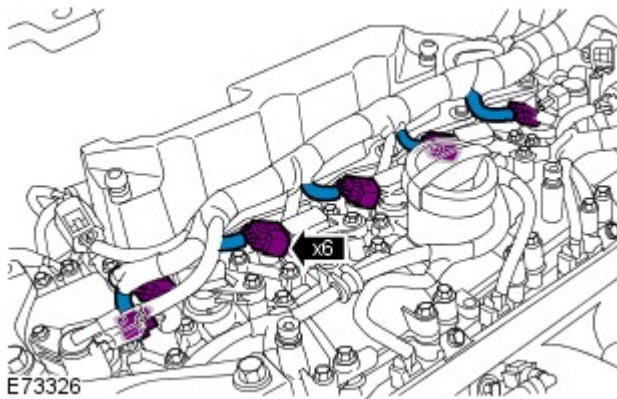
Disconnect the battery ground cable.

Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

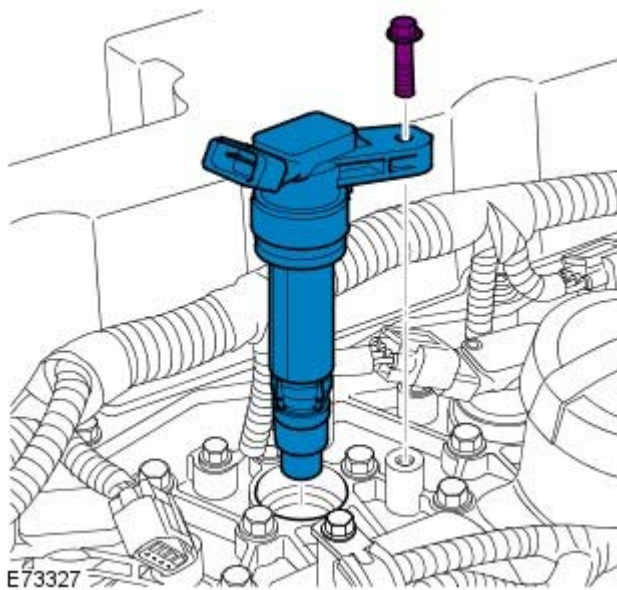
2. Remove the engine cover.

Refer to: [Engine Cover - I6 3.2L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Disconnect the 6 ignition coil-on-plugs.



- 4.



Installation

1. Install the ignition coil-on-plugs.
2. Connect the ignition coil-on-plug electrical connections.

Torque: 10 Nm

3. Install the engine cover.

Refer to: [Engine Cover - I6 3.2L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).


4. Connect the battery ground cable.

Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

Engine Ignition - Spark Plugs

Removal and Installation

Removal

1.  **CAUTION:** After switching of the ignition, wait for 2 minutes before disconnecting the battery. Failure to wait for 2 minutes will damage the navigation computer.

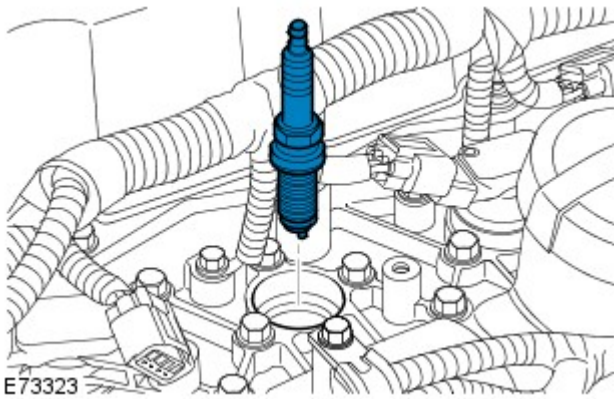
Disconnect the battery ground cable.

Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the ignition coil-on-plugs.

Refer to: [Ignition Coil-On-Plug](#) (303-07A Engine Ignition, Removal and Installation).

3. *Torque:* 28 Nm



Installation

1. To install, reverse the removal procedure.