

Fuel Charging and Controls - I6 3.2L Petrol -

General Specification

Item	Specification
Recommended fuel:	
UK, Europe	91 - 98 RON
USA	Minimum 91 CLC or AKI
Fuel injectors:	
Make	Denso

Fuel Pressures

Component	bar	psi
Fuel rail - normal operating conditions - not using IDS	3.7	54
Fuel rail - normal operating conditions - using IDS	4.8	68
Fuel rail - engine off - using IDS	2.8 to 3.2	40 to 46
Fuel rail - cold start - using IDS	6.5	94

Torque Specifications

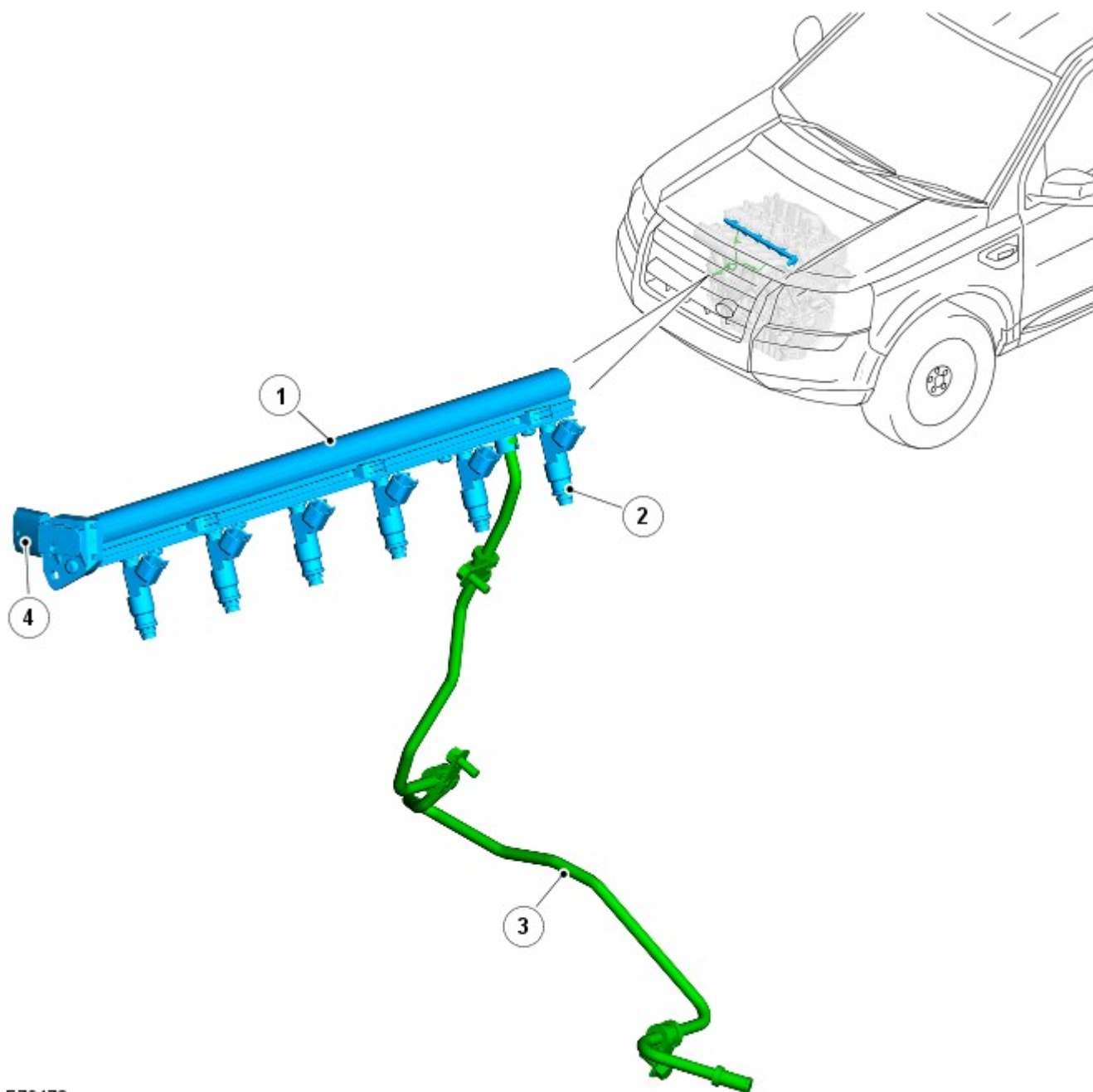
Description	Nm	lb-ft
Fuel injector clamp plate bolts	6	5
Fuel pressure regulator bolts	6	5
Fuel pump drive module retaining bolts	10	7
Fuel rail bolts	10	7
Fuel rail pressure sensor	6	5
Schreader valve bolts	6	5
Throttle body screws	8	6

Fuel Charging and Controls - I6 3.2L Petrol - Fuel Charging and Controls

Description and Operation

Authoring Template

COMPONENT LOCATION



E79478

Item	Part Number	Description
1	-	Fuel rail
2	-	Fuel injector
3	-	Fuel line
4	-	Fuel rail pressure and fuel temperature sensor

OVERVIEW

The fuel pump module, located in the fuel tank, is electronically regulated by the Engine Management System (EMS) to provide controlled pressure in the fuel rail

For additional information, refer to: [Fuel Tank and Lines](#) (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Description and Operation).

Supplying the correct amount of fuel as required by the engine at any given moment, eliminates the requirement for additional pipes returning excess fuel to the fuel tank. The benefits of this type of system are:

- Reduced load on the electrical system
- Improved fuel economy
- Eliminates the effects of fuel pressurization and depressurization
- Eliminates the effects of engine-heat causing extra fuel vapor being generated in the fuel tank by returning fuel

Closed-loop Pulse Width Modulation (PWM) control, of the fuel pump module, via the Engine Control Module (ECM) regulates the amount of fuel supplied by the fuel pump to the fuel rail. The ECM receives signals from the combined fuel rail pressure and fuel temperature sensor, located on the fuel rail to indicate the pressure of fuel in the fuel rail. In response to these signals, plus other engine and driver demand signals, the ECM calculates the amount of fuel required and requests the fuel pump module to vary the fuel pump delivery to suit the engine's requirements.

For additional information, refer to: [Electronic Engine Controls](#) (303-14A Electronic Engine Controls - I6 3.2L Petrol, Description and Operation).

The fuel pump maintains a fuel rail pressure 3.8 bar above manifold depression under normal operating conditions, though this is programmed to rise to 4.2 bar in response to either:

- cold start conditions, to improve fuel vaporization
- cold fuel conditions, as the colder the fuel the higher its viscosity

The fuel rail has an integrated pulsation damper and a connection for draining the fuel system.

The injectors supplied by the fuel rail; each have 4 micro-nozzles capable of injecting up to 18 mg of fuel under high-load conditions, the injectors also provide precision fueling across all engine speed and load conditions.

Fuel Charging and Controls - I6 3.2L Petrol - Fuel Charging and Controls

Diagnosis and Testing

Principles of Operation

For a detailed description of the fuel charging and controls, refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Fuel Charging and Controls](#) (303-04A Fuel Charging and Controls - I6 3.2L Petrol, 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.

NOTE: For diagnostic purposes the cylinders are divided into two banks: Bank 1 - Cylinder numbers 1, 2 and 3. Bank 2 - Cylinders 4, 5 and 6

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"> ● Fuel level ● Fuel leaks ● Damaged fuel lines ● Damaged push connect fittings ● Fuel contamination/grade/quality ● Throttle body ● Damaged fuel tank filler pipe cap ● Damaged fuel tank filler pipe 	<ul style="list-style-type: none"> ● Fuses ● Loose or corroded electrical connectors ● Harnesses ● 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 ● Ignition system ● Fuel system ● Electronic engine control 	<ul style="list-style-type: none"> ● Ensure the engine breather system is free from restriction and is correctly installed ● For ignition system tests. REFER to: Engine Ignition (303-07A Engine Ignition, 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 for electronic engine control tests. 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 system 	<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 ignition system tests. REFER to: Engine Ignition (303-07A Engine Ignition, Diagnosis and Testing).

Symptom	Possible Cause	Action
Difficult cold start	<ul style="list-style-type: none"> ● Engine coolant level/anti-freeze content ● Battery ● Electronic engine controls ● Fuel pump ● Purge valve 	<ul style="list-style-type: none"> ● Check the engine coolant level and condition. REFER to: Specifications (303-03A Engine Cooling - I6 3.2L Petrol, Specifications). ● Ensure the battery is in a fully charged and serviceable condition ● 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 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 control ● Purge valve ● Fuel pump ● Ignition system 	<ul style="list-style-type: none"> ● Check for injector leak, install new injector as necessary. REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation). ● 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: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). ● For ignition system tests. REFER to: Engine Ignition (303-07A Engine Ignition, Diagnosis and Testing).
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 control ● Purge valve ● Fuel pump ● Ignition system 	<ul style="list-style-type: none"> ● Check for injector leak, install new injector as necessary. REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation). ● 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: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). ● For ignition system tests. REFER to: Engine Ignition (303-07A Engine Ignition, Diagnosis and Testing).
Engine stalls soon after start	<ul style="list-style-type: none"> ● Breather system disconnected/restricted ● ECM relay ● Electronic engine control ● 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 tests. REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing). ● For ignition system tests.

Symptom	Possible Cause	Action
		<p>REFER to: Engine Ignition (303-07A Engine Ignition, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● Check for blockage in air filter element and air intake system ● Check for air leakage in air intake system ● For fuel system tests. <p>REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing).</p>
Engine hesitates/poor acceleration	<ul style="list-style-type: none"> ● Fuel pressure, fuel pump, fuel lines ● Injector leak ● Air leakage ● Electronic engine control ● Throttle motor ● Restricted accelerator pedal travel (carpet, etc) ● Ignition system ● Transmission malfunction 	<ul style="list-style-type: none"> ● For fuel system tests. <p>REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● Check for injector leak, install new injector as necessary. <p>REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).</p> <ul style="list-style-type: none"> ● Check for air leakage in air intake system ● Read DTCs and refer to DTC Index for electronic engine control tests. <p>REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● Read DTCs and refer to the DTC Index in this section for throttle motor tests ● Ensure accelerator pedal is free from restriction ● For ignition system tests. <p>REFER to: Engine Ignition (303-07A Engine Ignition, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● For transmission tests. <p>REFER to: Diagnostics (307-01 Automatic Transmission/Transaxle, Diagnosis and Testing).</p>
Engine backfires	<ul style="list-style-type: none"> ● Fuel pump/lines ● Air leakage ● Electronic engine controls ● Ignition system ● Sticking variable camshaft timing (VCT) hub 	<ul style="list-style-type: none"> ● For fuel system tests. <p>REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● Check for air leakage in intake air system ● Read DTCs and refer to DTC Index for electronic engine control tests. <p>REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● For ignition system tests. <p>REFER to: Engine Ignition (303-07A Engine Ignition, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● Read DTCs and refer to DTC Index for VCT tests. <p>REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing).</p>
Engine surges	<ul style="list-style-type: none"> ● Fuel pump/lines ● Electronic engine controls ● Throttle motor ● Ignition system 	<ul style="list-style-type: none"> ● For fuel system tests. <p>REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● Read DTCs and refer to DTC Index for electronic engine control tests. <p>REFER to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing).</p> <ul style="list-style-type: none"> ● Read DTCs and refer to DTC Index in this section for throttle motor tests. ● For ignition system tests. <p>REFER to: Engine Ignition (303-07A Engine Ignition, Diagnosis and Testing).</p>

Symptom	Possible Cause	Action
Engine detonates/knocks	<ul style="list-style-type: none"> Electronic engine controls Fuel pump/lines Air leakage Sticking VCT hub 	<ul style="list-style-type: none"> 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 fuel system tests. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing). Check for air leakage in intake air 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 Throttle motor 	<ul style="list-style-type: none"> 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 throttle motor 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 system tests. REFER to: Diagnostics (307-01 Automatic Transmission/Transaxle, Diagnosis and Testing). Check for air leakage in intake air system

DTC Index

NOTE: If the control module/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 voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current 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 that involve pinpoint tests.

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

DTC	Description	Possible Cause	Action
P008700	Fuel rail/system pressure - too low	<ul style="list-style-type: none"> Leakage at the fuel lines Fuel pressure sensor fault Fuel pump fault Fuel pump control module fault 	<p>Check the fuel system for leaks. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing).</p> <p>Rectify as necessary. Check for DTCs indicating a fuel pressure, fuel pressure sensor, pump or pump module fault.</p>
P008800	Fuel rail/system pressure - too high	<ul style="list-style-type: none"> Restricted fuel lines Fuel pressure sensor fault Fuel pump fault Fuel pump control module fault 	<p>Check the fuel system for damage/restrictions. REFER to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Diagnosis and Testing).</p> <p>Rectify as necessary. Check for DTCs indicating a fuel pressure, fuel pressure sensor, pump or pump module fault.</p>

DTC	Description	Possible Cause	Action
P008968	Fuel pressure regulator performance - algorithm based failures	<ul style="list-style-type: none"> Low fuel pressure 	Check for DTCs indicating a fuel pressure, fuel pressure sensor, pump or pump module fault.
P017068	Fuel trim, bank 1	<ul style="list-style-type: none"> HO2S control outside limits 	No action is necessary. The code will clear when the conditions no longer apply.
P017100	System too lean (bank 1)	<ul style="list-style-type: none"> Intake air leak Between MAF sensor and cylinder head Fuel system restriction MAF sensor fault Low intake flow Exhaust leak, before catalytic converter 	Check for intake air leaks. Check for low fuel pressure and MAF sensor DTCs. Rectify as necessary. Check for exhaust leaks before the catalytic converter
P017200	System too rich (bank 1)	<ul style="list-style-type: none"> Restricted air filter Oil contaminated with fuel Too many cold starts with vehicle subsequently not getting hot enough for long enough Leaking fuel injectors MAF sensor fault High intake flow Leaking evaporative emission system purge valve 	Check the condition of the air cleaner element: REFER to: Air Cleaner (303-12B Intake Air Distribution and Filtering - TD4 2.2L Diesel, Removal and Installation). Check engine the oil condition. Check for leaking injectors. Check for MAF sensor, injector and evaporative emission system DTCs.
P017368	Fuel trim (bank 2)	<ul style="list-style-type: none"> HO2S control outside limits 	No action is necessary. The code will clear when the conditions no longer apply.
P017400	System too lean (bank 2)	<ul style="list-style-type: none"> Intake air leak Between MAF sensor and cylinder head Fuel system restriction MAF sensor fault Low intake flow Exhaust leak, before catalytic converter 	Check for intake air leaks. Check for low fuel pressure and MAF sensor DTCs. Rectify as necessary. Check for exhaust leaks before the catalytic converter
P017500	System too rich (bank 2)	<ul style="list-style-type: none"> Restricted air filter Oil contaminated with fuel Too many cold starts with vehicle subsequently not getting hot enough for long enough Leaking fuel injectors MAF sensor fault High intake flow Leaking evaporative emission system purge valve 	Check the condition of the air cleaner element: REFER to: Air Cleaner (303-12B Intake Air Distribution and Filtering - TD4 2.2L Diesel, Removal and Installation). Check engine the oil condition. Check for leaking injectors. Check for MAF sensor, injector and evaporative emission system DTCs.
P018100	Fuel temperature sensor A circuit range/performance	<ul style="list-style-type: none"> Fuel temperature sensor A circuit: high resistance Fuel temperature sensor failure 	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary (the fuel temperature sensor is incorporated into the fuel rail pressure sensor). REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L Petrol, Removal and Installation).
P018200	Fuel temperature sensor A circuit low	<ul style="list-style-type: none"> Fuel temperature sensor A circuit: short circuit to ground Fuel temperature sensor A circuit: high resistance Fuel temperature sensor failure 	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary (the fuel temperature sensor is incorporated into the fuel rail pressure sensor). REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L Petrol, Removal and Installation).
P018300	Fuel temperature sensor A circuit high	<ul style="list-style-type: none"> Fuel temperature sensor A circuit: short circuit to power Fuel temperature sensor A circuit: open circuit Fuel temperature sensor failure 	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary (the fuel temperature sensor is incorporated into the fuel rail pressure sensor). REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L

DTC	Description	Possible Cause	Action
			Petrol, Removal and Installation).
P019100	Fuel rail pressure sensor A circuit range/performance	<ul style="list-style-type: none"> Fuel rail pressure (FRP) sensor A circuit: high resistance Fuel rail pressure (FRP) sensor failure Fuel pump driver module failure 	<p>Check the FRP sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary.</p> <p>REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L Petrol, Removal and Installation).</p> <p>Check for DTCs indicating fuel pump driver module faults. Rectify as necessary.</p>
P019121	Fuel rail pressure sensor A circuit range/performance - signal amplitude less than minimum	<ul style="list-style-type: none"> Fuel rail pressure (FRP) sensor A circuit: high resistance Fuel rail pressure (FRP) sensor failure 	<p>Check the FRP sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary.</p> <p>REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L Petrol, Removal and Installation).</p>
P019122	Fuel rail pressure sensor A circuit range/performance - signal amplitude greater than maximum	<ul style="list-style-type: none"> Fuel rail pressure (FRP) sensor A circuit: short circuit to power Fuel rail pressure (FRP) sensor failure 	<p>Check the FRP sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary.</p> <p>REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L Petrol, Removal and Installation).</p>
P019200	Fuel rail pressure sensor A circuit low	<ul style="list-style-type: none"> Fuel rail pressure (FRP) sensor A circuit: short circuit to ground Fuel rail pressure (FRP) sensor A circuit: open circuit Fuel rail pressure (FRP) sensor failure 	<p>Check the FRP sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary.</p> <p>REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L Petrol, Removal and Installation).</p>
P019300	Fuel rail pressure sensor A circuit high	<ul style="list-style-type: none"> Fuel rail pressure (FRP) sensor A circuit: short circuit to power Fuel rail pressure (FRP) sensor failure 	<p>Check the FRP sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary.</p> <p>REFER to: Fuel Rail Pressure (FRP) Sensor (303-14A Electronic Engine Controls - I6 3.2L Petrol, Removal and Installation).</p>
P020100	Cylinder 1 injector circuit/open	<ul style="list-style-type: none"> Injector circuit: short circuit to power Injector circuit: open circuit Injector circuit power supply: open circuit Injector failure 	<p>Check the injector and circuits. Refer to the electrical guides. Install a new injector as necessary.</p> <p>REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).</p>
P020200	Cylinder 2 injector circuit/open	<ul style="list-style-type: none"> Injector circuit: short circuit to power Injector circuit: open circuit Injector circuit power supply: open circuit Injector failure 	<p>Check the injector and circuits. Refer to the electrical guides. Install a new injector as necessary.</p> <p>REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).</p>
P020300	Cylinder 3 injector circuit/open	<ul style="list-style-type: none"> Injector circuit: short circuit to power Injector circuit: open circuit Injector circuit power supply: open circuit Injector failure 	<p>Check the injector and circuits. Refer to the electrical guides. Install a new injector as necessary.</p> <p>REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).</p>
P020400	Cylinder 4 injector circuit/open	<ul style="list-style-type: none"> Injector circuit: short circuit to power Injector circuit: open circuit Injector circuit power supply: open circuit Injector failure 	<p>Check the injector and circuits. Refer to the electrical guides. Install a new injector as necessary.</p> <p>REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).</p>
P020500	Cylinder 5 injector circuit/open	<ul style="list-style-type: none"> Injector circuit: short circuit to power Injector circuit: open circuit Injector circuit power supply: open circuit Injector failure 	<p>Check the injector and circuits. Refer to the electrical guides. Install a new injector as necessary.</p> <p>REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).</p>

DTC	Description	Possible Cause	Action
P020600	Cylinder 6 injector circuit/open	<ul style="list-style-type: none"> ● Injector circuit: short circuit to power ● Injector circuit: open circuit ● Injector circuit power supply: open circuit ● Injector failure 	Check the injector and circuits. Refer to the electrical guides. Install a new injector as necessary. REFER to: Fuel Injector (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).
P046000	Fuel level sensor A circuit	<ul style="list-style-type: none"> ● Fuel level sensor circuit: short circuit to ground ● Fuel level sensor circuit: open circuit ● Fuel level sensor circuit: short circuit to power ● Fuel level sensor failure 	Carry out a complete vehicle read for related DTCs. Rectify as necessary. Check the fuel level sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary. REFER to: Fuel Level Sender (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Removal and Installation).
P046100	Fuel level sensor A circuit range/performance	<ul style="list-style-type: none"> ● Fuel level sensor stuck/jammed 	Check the fuel level sensor for correct operation. Install a new sensor as necessary. REFER to: Fuel Level Sender (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Removal and Installation).
P046400	Fuel level sensor A circuit intermittent	<ul style="list-style-type: none"> ● Fuel level sensor A circuit: high resistance ● Fuel level sensor failure 	Check the fuel level sensor and circuits. Refer to the electrical guides. Install a new sensor as necessary. REFER to: Fuel Level Sender (310-01A Fuel Tank and Lines - I6 3.2L Petrol, Removal and Installation).
P062800	Fuel pump A control circuit low	<ul style="list-style-type: none"> ● Fuel pump module control circuit: short circuit to ground ● Fuel pump module control circuit: open circuit ● Fuel pump control module failure 	Check the fuel pump control module and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P062900	Fuel pump A control circuit high	<ul style="list-style-type: none"> ● Fuel pump module control circuit: short circuit to power ● Fuel pump control module failure 	Check the fuel pump control module and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P134600	Fuel level sensor B circuit	<ul style="list-style-type: none"> ● Fuel level sensor ejector malfunction 	Carry out a complete vehicle read for related DTCs. Rectify as necessary.
P210100	Throttle actuator control motor circuit range/performance	<ul style="list-style-type: none"> ● Throttle actuator control motor circuit: short circuit to ground ● Throttle actuator control motor circuit: open circuit ● Throttle actuator control motor circuit: short circuit to power ● Throttle actuator control motor failure 	Check the throttle motor and circuits. Refer to the electrical guides. Install a new throttle body as necessary. REFER to: Throttle Body (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).
P210177	Throttle actuator control motor circuit range/performance	<ul style="list-style-type: none"> ● Throttle body contaminated/sticking ● Throttle actuator control motor failure 	Check the throttle body condition and operation. Clean the throttle body and recheck. Install a new throttle body as necessary. REFER to: Throttle Body (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).
P210300	Throttle actuator control motor circuit high	<ul style="list-style-type: none"> ● Throttle actuator control motor circuit: short circuit to power ● Throttle actuator control motor failure 	Check the throttle motor and circuits. Refer to the electrical guides. Install a new throttle body as necessary. REFER to: Throttle Body (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).
P211800	Throttle actuator control motor current range/performance	<ul style="list-style-type: none"> ● Throttle actuator control motor circuit: short circuit to power ● Throttle actuator control motor circuit: short circuit to ground ● Throttle actuator control motor circuit: short circuit to power ● Throttle actuator control motor failure 	Check the throttle motor and circuits. Refer to the electrical guides. Install a new throttle body as necessary. REFER to: Throttle Body (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).

DTC	Description	Possible Cause	Action
P211900	Throttle actuator control throttle body range/performance	<ul style="list-style-type: none">● Throttle body contaminated/sticking	Check the condition and operation of the throttle body. Rectify as necessary. Install a new throttle body as necessary. REFER to: Throttle Body (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).

Fuel Charging and Controls - I6 3.2L Petrol - Throttle Body

Removal and Installation

Removal

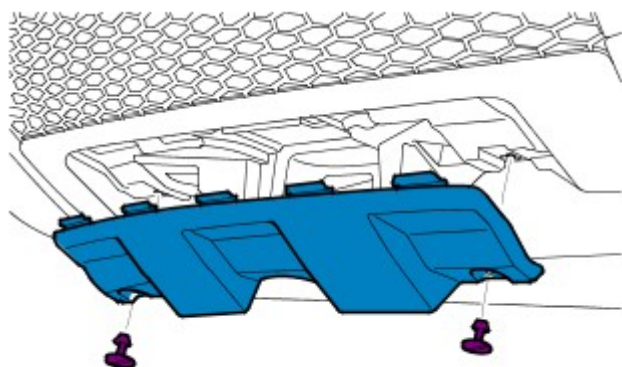
1.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Remove the engine undershield.

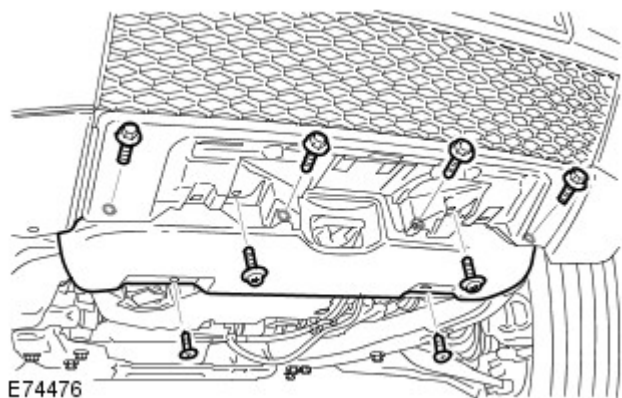
Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).

3.



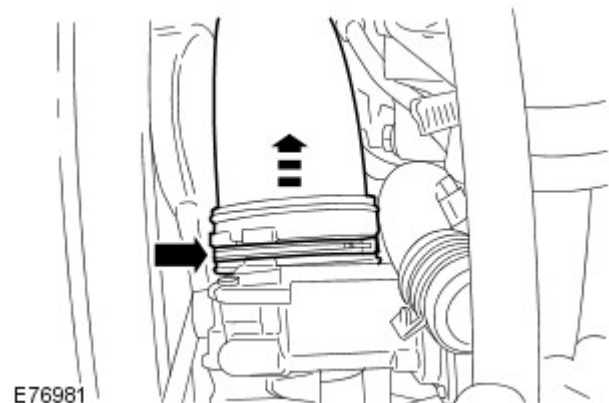
E73341

4.

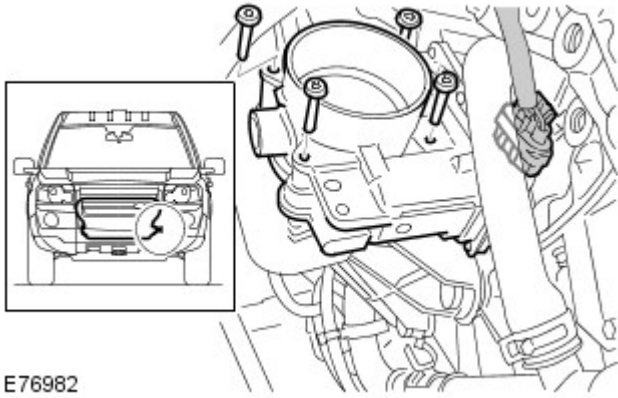


E74476

5. Release the air cleaner outlet pipe.



E76981

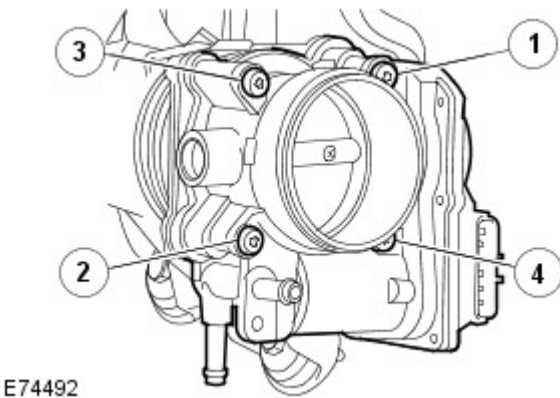



6. Remove the throttle body.

7. Remove and discard the gasket.

Installation

1. Clean the component mating faces.
2. Install a new gasket.



3.  **CAUTION:** Make sure that the mating faces are clean and free of foreign material.

Install the throttle body and tighten the screws in the sequence shown.

Torque: 8 Nm

4. Install the engine undershield.

Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).

5. Install the front undershield.
6. Install the front towing eye cover.

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Fuel Charging and Controls - I6 3.2L Petrol - Fuel Injector

Removal and Installation

Removal

NOTE: The process to remove a fuel injector is shown the the [Fuel Rail](#) procedure.

1. Remove the fuel injector.

Refer to: [Fuel Rail](#) (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).

Installation

1. Install the fuel injector.

Refer to: [Fuel Rail](#) (303-04A Fuel Charging and Controls - I6 3.2L Petrol, Removal and Installation).

Fuel Charging and Controls - I6 3.2L Petrol - Fuel Rail

Removal and Installation

Removal



WARNING: Wait for a minimum of 1 minute after the engine has stopped before carrying out any repair to the fuel injection system.

1. Remove the cover and 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. **WARNINGS:**



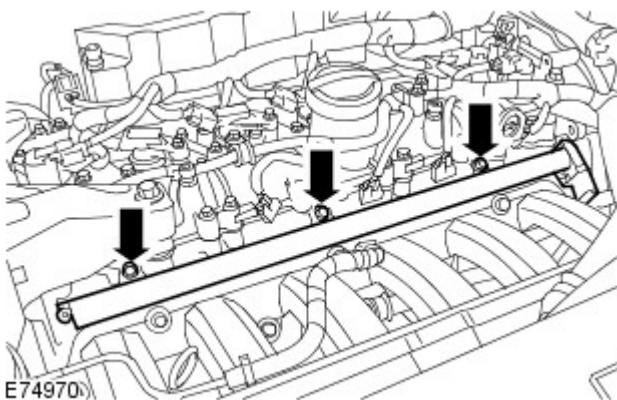
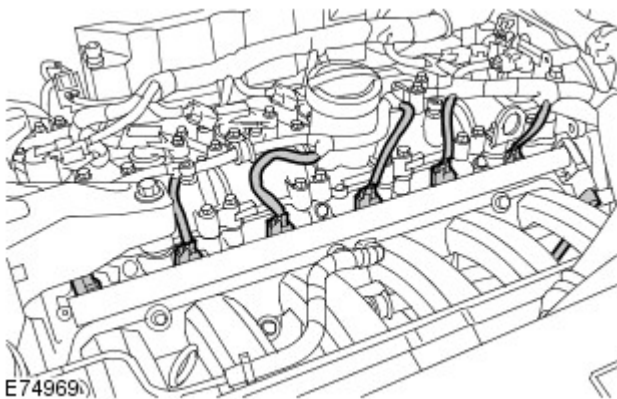
Avoid flames, sparks or lighted substances.



Be prepared to collect escaping fuel.

Release the fuel pressure.

- 4.



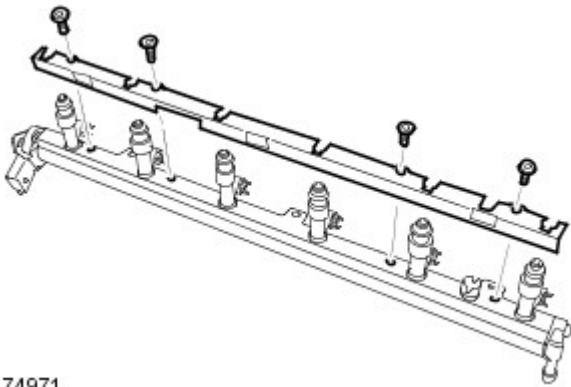
5. **CAUTIONS:**



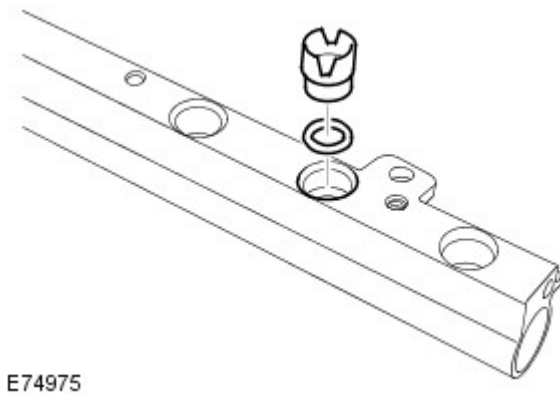
Extreme cleanliness must be exercised when handling these components.



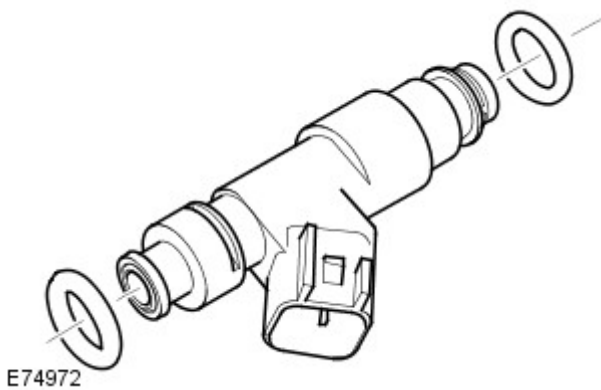
Make sure that all openings are sealed.




6. NOTE: Do not remove the fuel injectors, if the rail is being removed for access.



7.  CAUTION: A new O-ring seal is to be installed.



8.  CAUTION: Cap the fuel injector nozzle to prevent damage before storing vertically.

NOTE: Do not disassemble further if the component is removed for access only.

NOTE: If the fuel injectors are not being removed from the fuel rail only the lower O-ring seals will need to be renewed.

Remove and discard the fuel injector O-ring seals.




- 9.




10.

Installation

1.  **CAUTION:** A new O-ring seal is to be installed.
Install the fuel rail Schraeder valve.


Torque: 6 Nm

2.  **CAUTION:** A new O-ring seal is to be installed.
Install the fuel rail pressure sensor.

Torque: 6 Nm

3. **NOTE:** Install new O-ring seals.
Lubricate and install the new O-rings.

4. If removed, install the injectors.

5.  **CAUTION:** A new O-ring seal is to be installed.
Install the fuel line to fuel rail seal assembly.

6. Install the fuel injector clamp plate.

Torque: 6 Nm

7. Install the fuel rail.

Torque: 10 Nm

8. Connect and secure the electrical connectors.

9. Install the engine cover.

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

10. Connect the battery ground cable and install the cover.

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

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Fuel Charging and Controls - I6 3.2L Petrol - Fuel Pump Driver Module (FPDM)

Removal and Installation

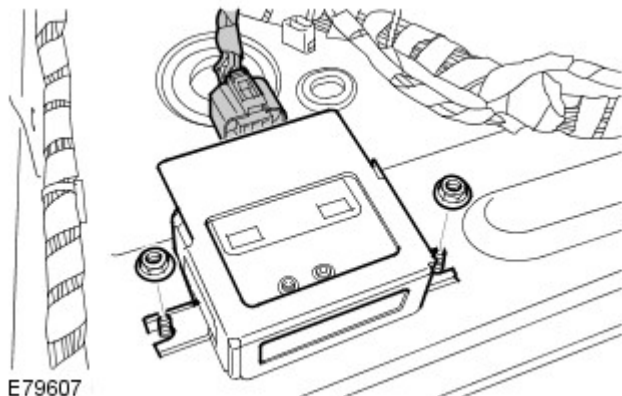
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Remove the LH rear quarter trim panel.

Refer to: [C-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. *Torque:* 10 Nm



Installation

1. To install, reverse the removal procedure.