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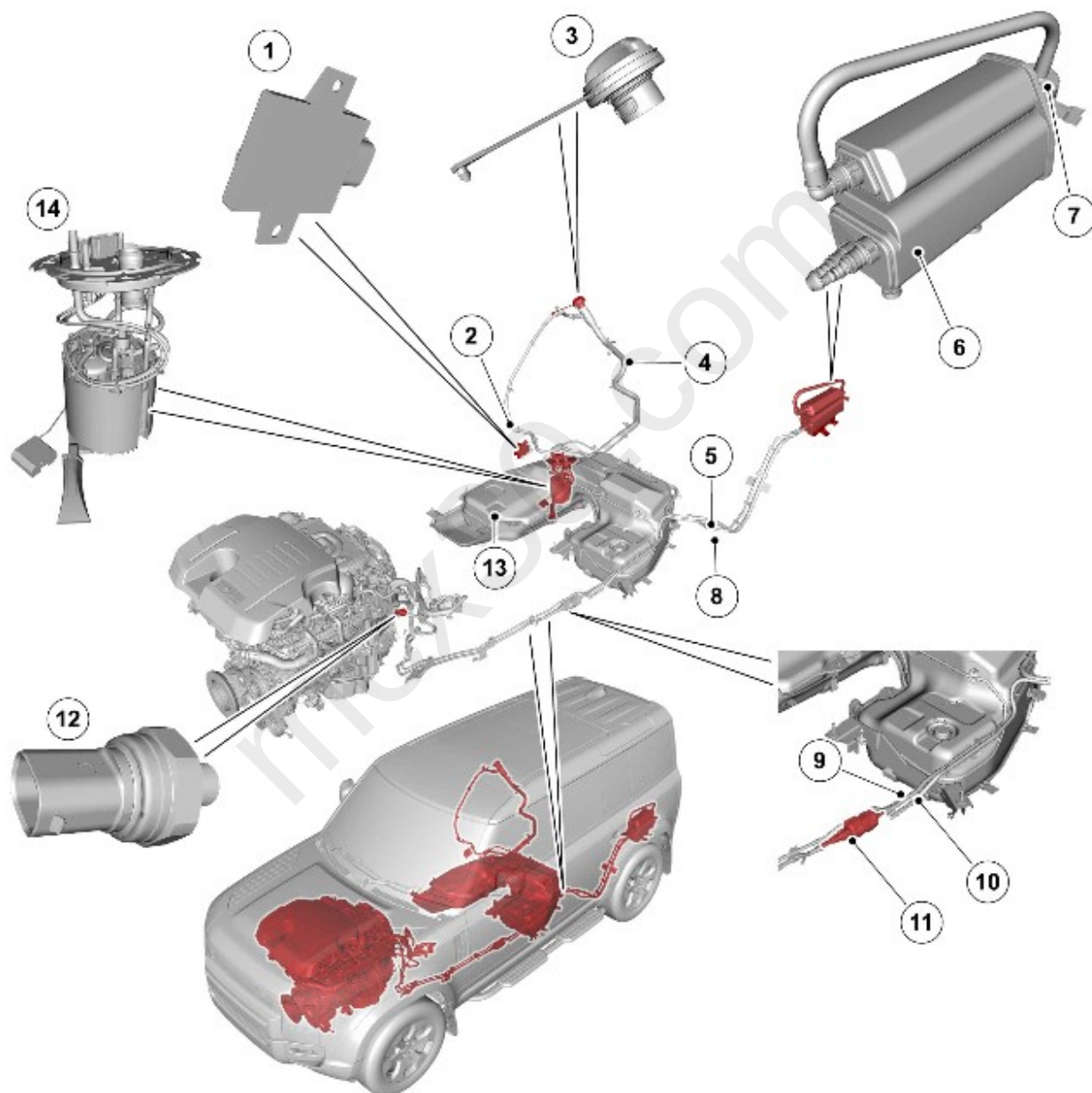
FUEL TANK AND LINES - INGENIUM I6 3.0L PETROL

[G2342515]

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COMPONENT LOCATION

COMPONENT LOCATION - 1 OF 5 - EU6C VEHICLES ONLY - VEHICLE WITH 5 DOORS

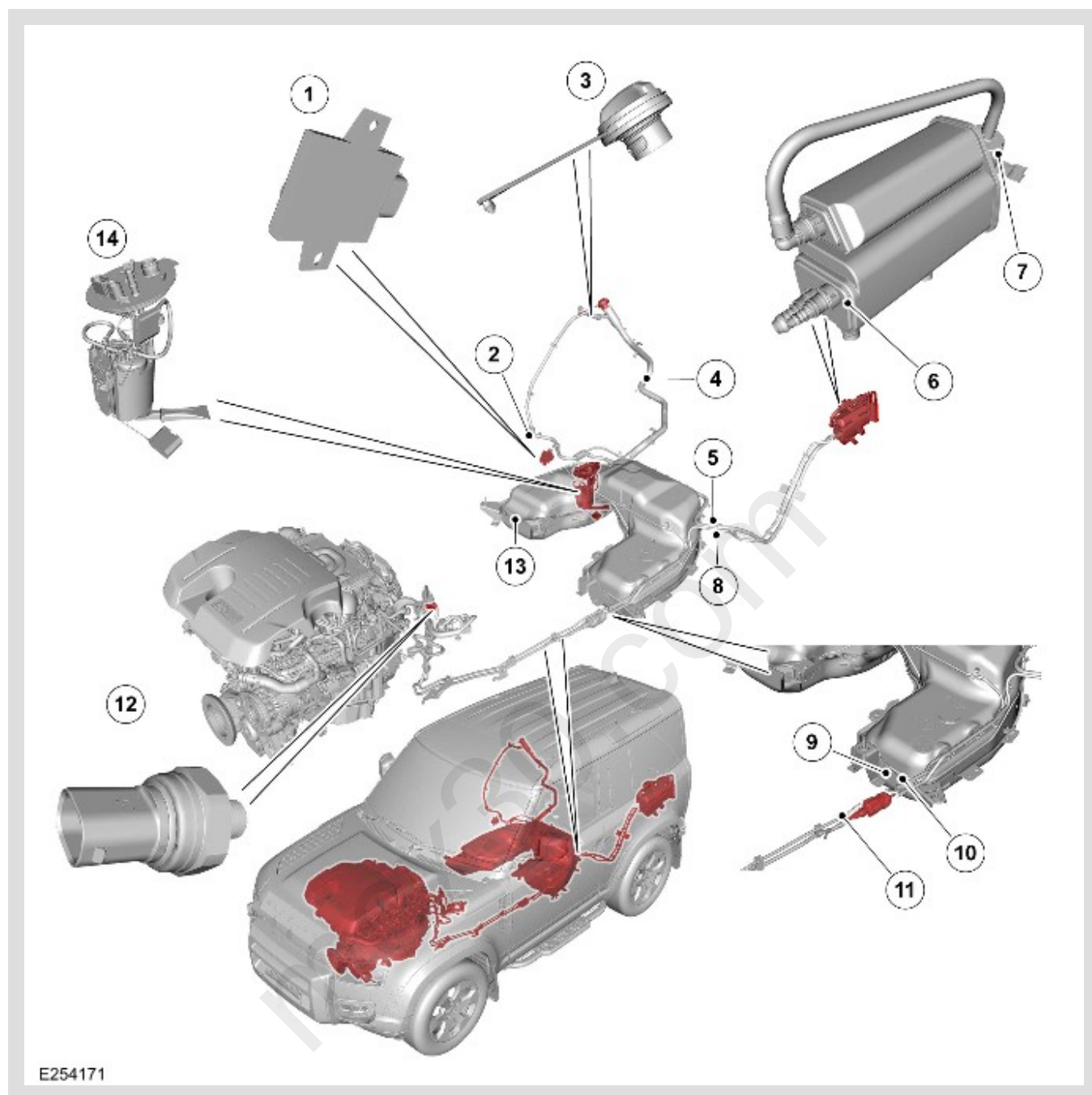


E249022

ITEM	DESCRIPTION
1	Fuel Pump Driver Module (FPDM)
2	Breather hose - Fuel tank to fuel filler neck

ITEM	DESCRIPTION
3	Fuel filler cap
4	Fuel filler hose
5	Breather pipe - Fuel tank to evaporative emission canister
6	Evaporative emission canister
7	Filter - Evaporative emission canister
8	Purge line - Evaporative emission canister to purge valve
9	Fuel delivery line - Fuel tank to engine
10	Purge line - Evaporative emission canister to purge valve
11	Purge damper
12	Low fuel pressure sensor
13	Fuel tank assembly
14	Fuel pump module

COMPONENT LOCATION - 2 OF 5 - EU6C VEHICLES ONLY - VEHICLE WITH 3 DOORS

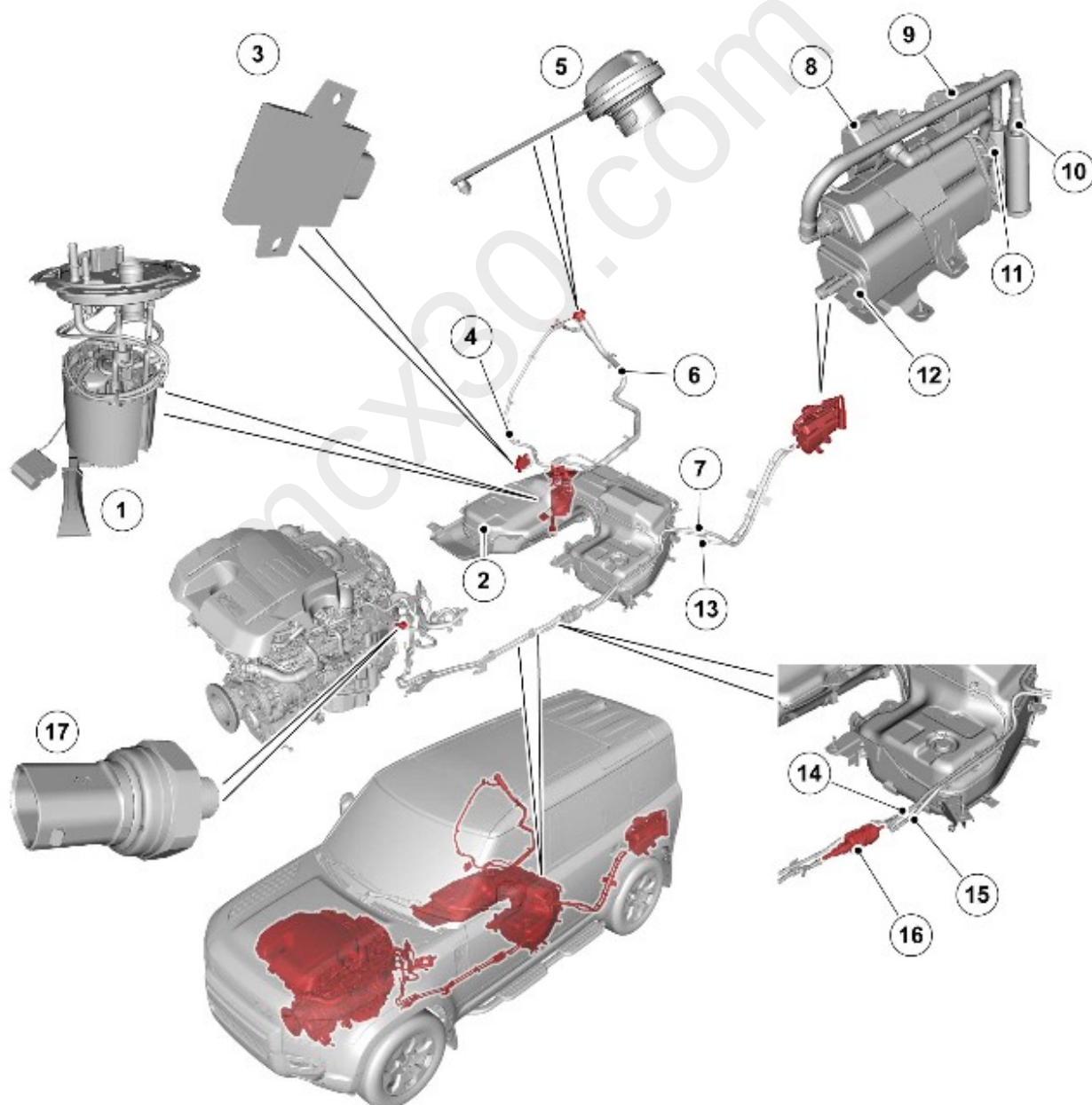


E254171

ITEM	DESCRIPTION
1	FPDM
2	Breather hose - Fuel tank to fuel filler neck
3	Fuel filler cap
4	Fuel filler hose
5	Breather pipe - Fuel tank to evaporative emission canister
6	Evaporative emission canister
7	Filter - Evaporative emission canister

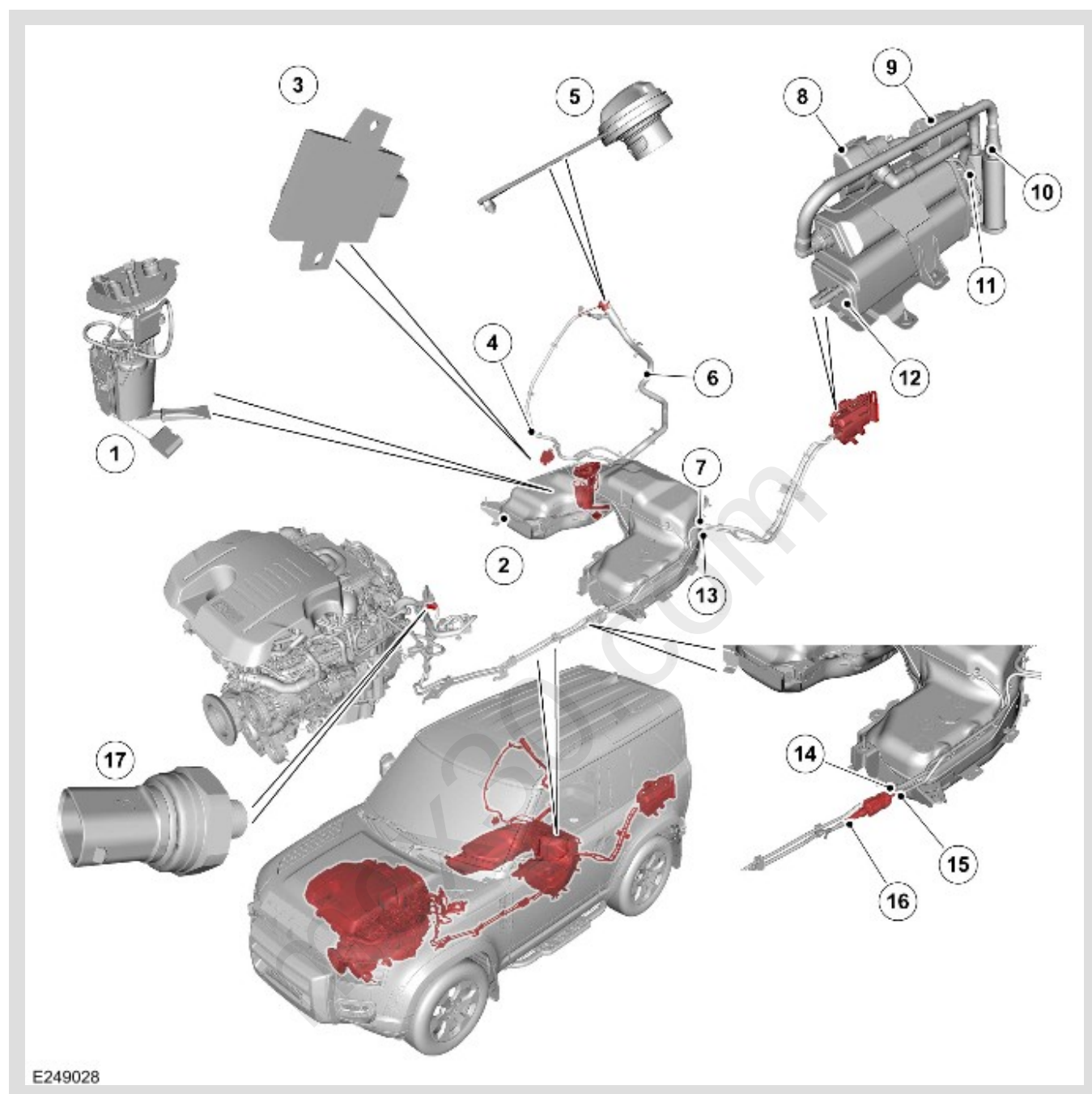
ITEM	DESCRIPTION
8	Purge line - Evaporative emission canister to purge valve
9	Fuel delivery line - Fuel tank to engine
10	Purge line - Evaporative emission canister to purge valve
11	Purge damper
12	Low fuel pressure sensor
13	Fuel tank assembly
14	Fuel pump module

COMPONENT LOCATION - 3 OF 5 - NORTH AMERICAN SPECIFICATION AND CHINA VEHICLES ONLY - VEHICLE WITH 5 DOORS



ITEM	DESCRIPTION
1	Fuel pump module
2	Fuel tank assembly
3	FPDM
4	Breather hose - Fuel tank to fuel filler neck
5	Fuel filler cap
6	Fuel filler hose
7	Breather pipe - Fuel tank to evaporative emission canister
8	Diagnostic Module Tank Leakage (DMTL) pump
9	Evaporative emission canister filter
10	Secondary evaporative emission canister
11	DMTL pump filter
12	Evaporative emission canister
13	Purge line - Evaporative emission canister to purge valve
14	Fuel delivery line - Fuel tank to engine
15	Purge line - Evaporative emission canister to purge valve
16	Purge damper
17	Low fuel pressure sensor

COMPONENT LOCATION - 4 OF 5 - NORTH AMERICAN SPECIFICATION AND CHINA VEHICLES ONLY - VEHICLE WITH 3 DOORS



ITEM	DESCRIPTION
1	Fuel pump module
2	Fuel tank assembly
3	FPDM
4	Breather hose - Fuel tank to fuel filler neck
5	Fuel filler cap
6	Fuel filler hose

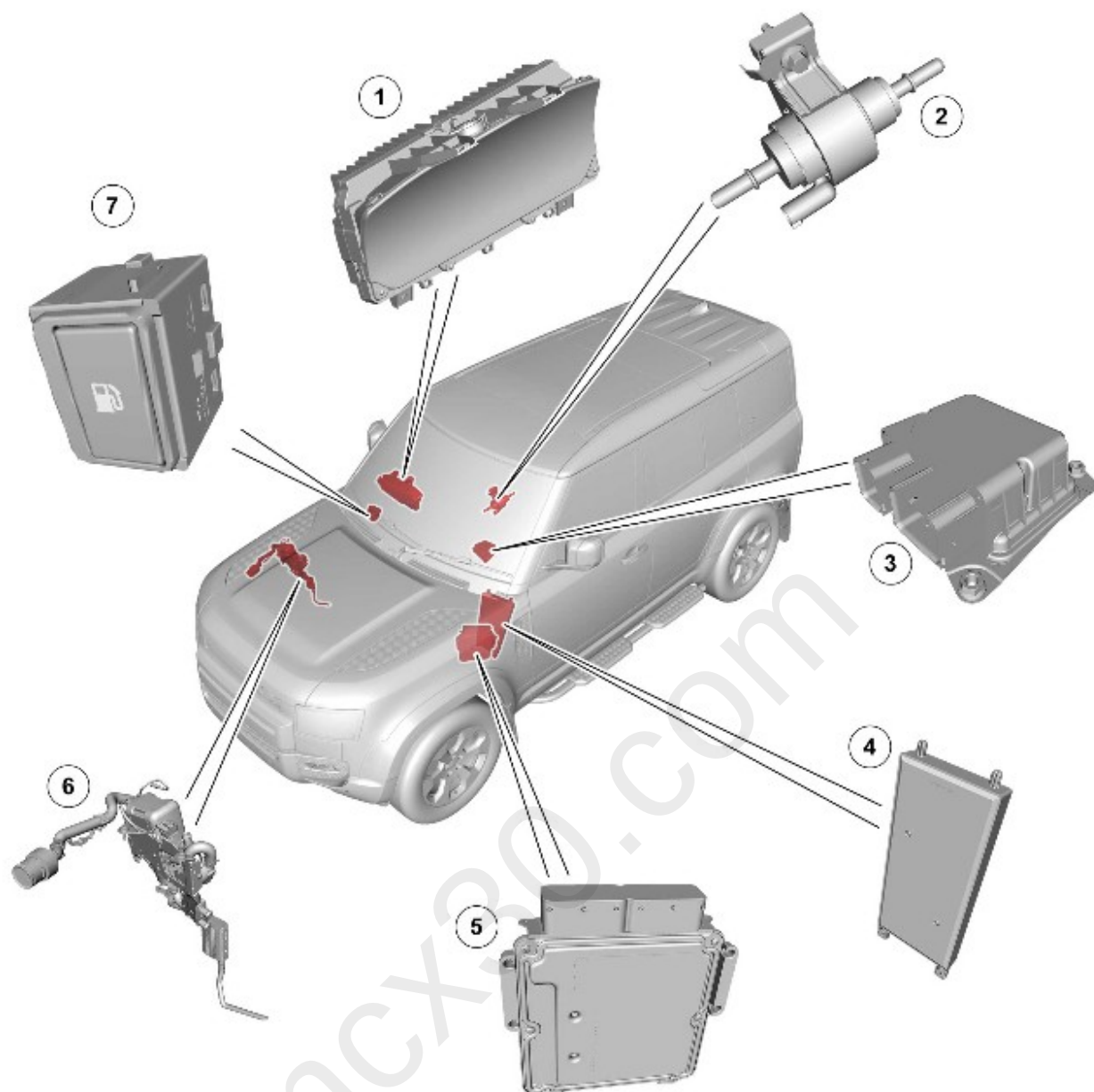
ITEM	DESCRIPTION
7	Breather pipe - Fuel tank to evaporative emission canister
8	DMTL pump
9	Evaporative emission canister filter
10	Secondary evaporative emission canister
11	DMTL pump filter
12	Evaporative emission canister
13	Purge line - Evaporative emission canister to purge valve
14	Fuel delivery line - Fuel tank to engine
15	Purge line - Evaporative emission canister to purge valve
16	Purge damper
17	Low fuel pressure sensor

COMPONENT LOCATION - 5 OF 5 - FUEL FIRED BOOSTER HEATER (IF EQUIPPED)



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E249024

ITEM	DESCRIPTION
1	Instrument Panel Cluster (IPC)
2	Fuel Fired Booster Heater (FFBH) fuel pump
3	Restraints Control Module (RCM)
4	Body Control Module (BCM)/ Gateway Control Module (GWM)
5	Powertrain Control Module (PCM)
6	FFBH assembly
7	Release switch - Fuel flap

OVERVIEW

The fuel system is divided into 2 sub systems:

- Low Pressure (LP) system
- High Pressure (HP) system
 - For additional information, refer to: [Fuel Charging and Controls](#) (303-04E Fuel Charging and Controls - INGENIUM I6 3.0L Petrol, Description and Operation).

The LP fuel system features the following components:

- Fuel tank - Molded plastic saddle type
- Fuel pump module (with integral LP fuel pump)
- Fuel level sensor (quantity 2)
- Low fuel pressure sensor
- Fuel lines
- FPDM.

The fuel system uses an electronically controlled return less fuel system. The fuel system allows the LP fuel pump to deliver fuel to the HP fuel pumps, dependent on engine demand.

For additional information, refer to: [Engine Emission Control](#) (303-08C Engine Emission Control - INGENIUM I6 3.0L Petrol, Description and Operation).

FUEL FIRED BOOSTER HEATER (IF EQUIPPED)

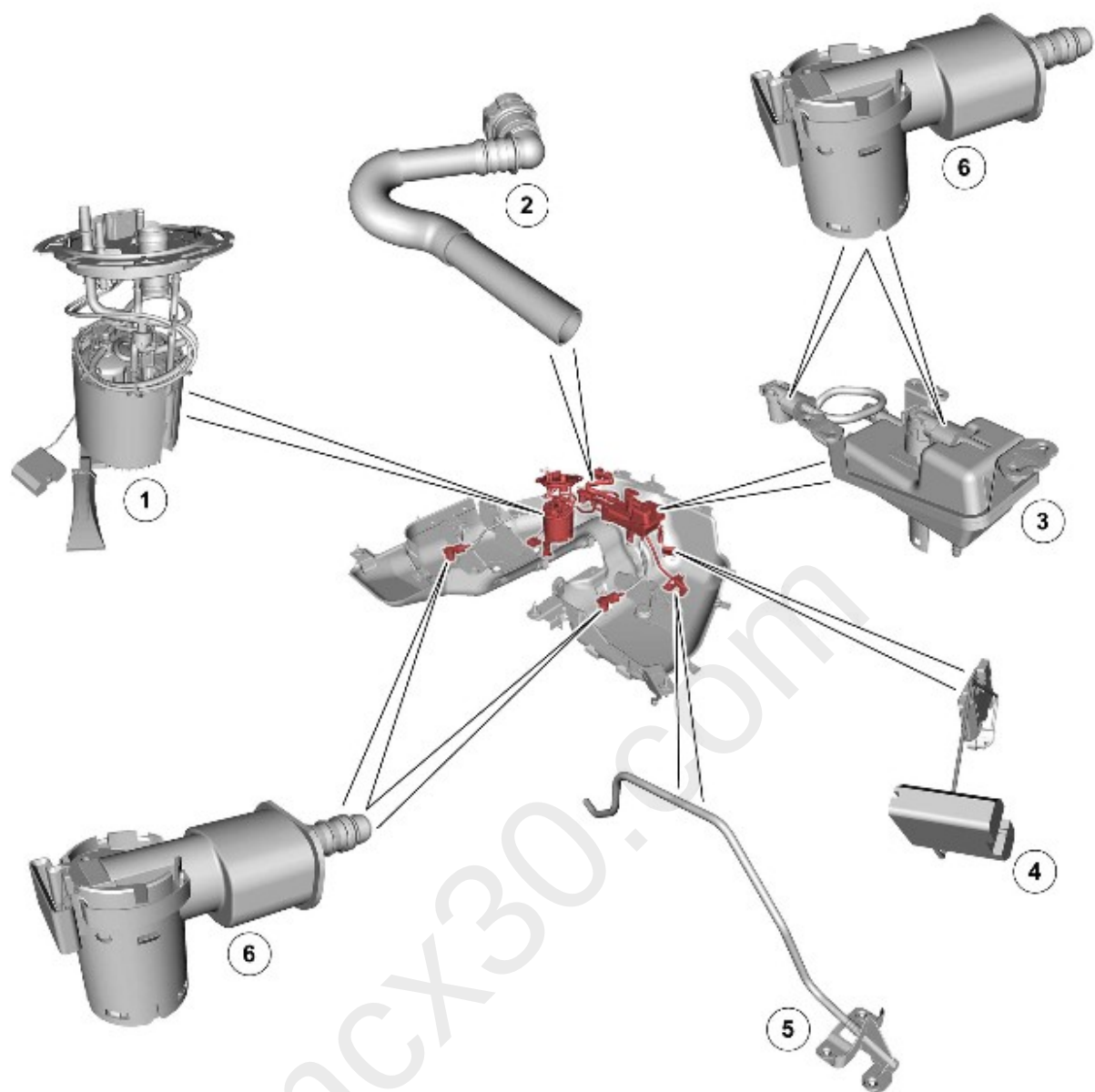
When the vehicle is equipped with a FFBH, the FFBH fuel pump is mounted on the right of the fuel tank. A separate fuel line draws fuel from the fuel pump module to the FFBH fuel pump. An additional fuel line delivers the fuel to the FFBH which is located in the front right of the engine compartment.

For additional information, refer to: [Fuel Fired Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation).

DESCRIPTION

FUEL TANK

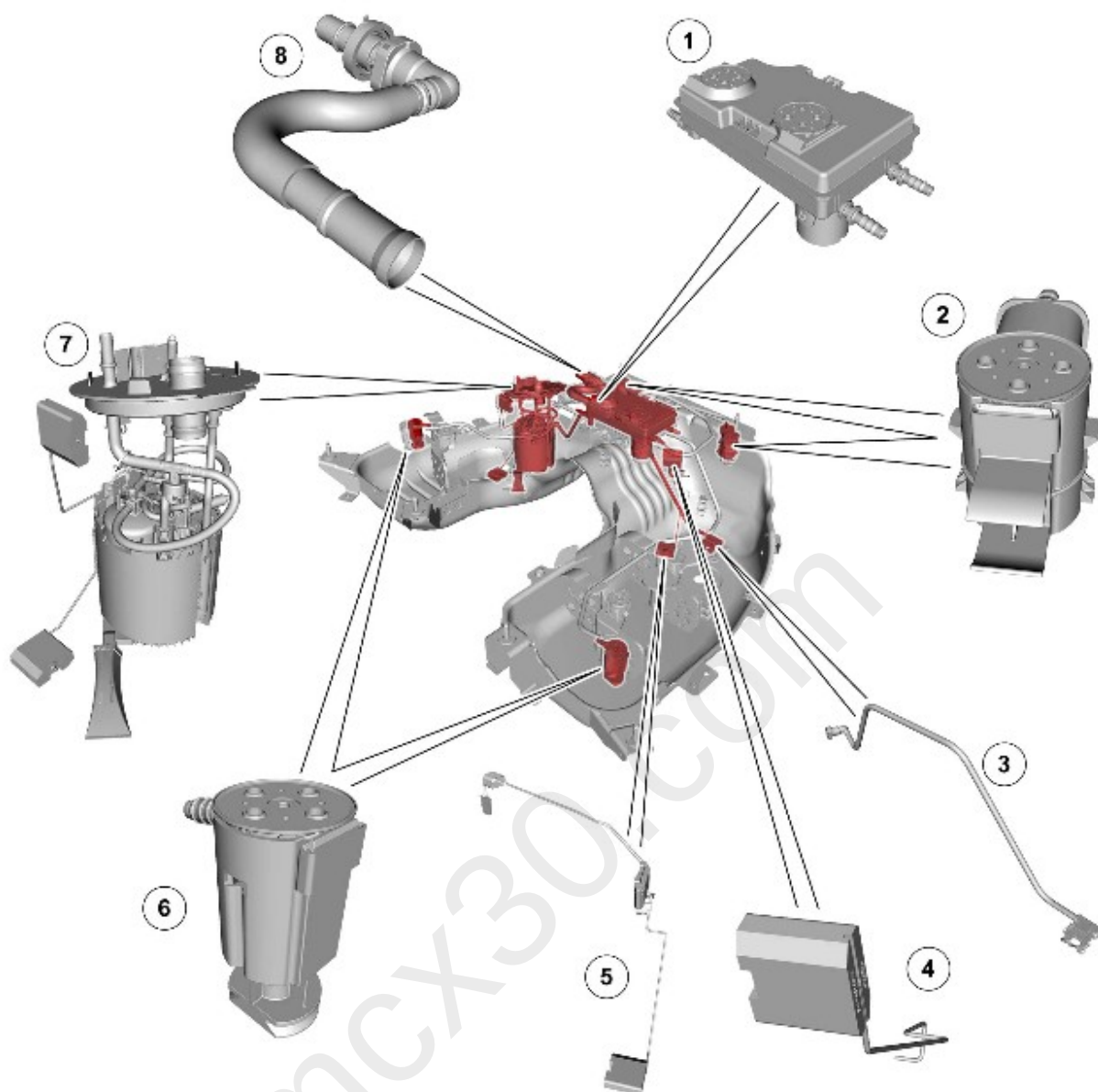
Fuel Tank Internal Components - Vehicle with 5 doors



E249025

ITEM	DESCRIPTION
1	Fuel pump module
2	Fuel tank breather pipe connection
3	Liquid Vapor Separator (LVS)
4	Fuel level sensor - Floater
5	Suction pipe
6	Roll-over valve (quantity 4)

Fuel Tank Internal Components - Vehicle with 3 doors



E248806

ITEM	DESCRIPTION
1	LVS with Fuel Limit Vent Valve (FLVV) (quantity 2)
2	Roll-over valve overfill protection (quantity 2)
3	Suction pipe
4	Passive - Fuel level sensor 'A' - Float
5	Passive - Fuel level sensor 'B' - Float
6	Roll-over valve (quantity 2)
7	Fuel pump module
8	Fuel tank breather pipe connection

The fuel tank is manufactured using 6 layer co-extruded blow-molding technology providing both high mechanical strength and complete emissions integrity. The fuel tank is mounted under the second row seat floorpan, forward of the rear suspension.

The fuel tank is a saddle tank design which is secured into a steel cradle which is bolted to the vehicle floorpan. The fuel filler neck is manufactured from stainless steel.

The fuel tank has a storage capacity of 90 liters (23 (US) gallons).

The fuel tank contains a fuel pump module which collects fuel from both sides of the tank. The pump supplies the engine's fuel demands while also supplying the fuel to power the 2 venturi. The rapid flow of fuel through the venturi nozzle creates a depression which:

- Draws fuel back across the saddle into the pump side of the tank
- Fills the fuel pump module swirl pot.

An internal bracket allows for the attachment of the left fuel pick-up and the fuel level sensor 'B'.

Fuel level inside the tank is monitored by 2 fuel level sensors.

Roll-over Valve

There are differences of roll-over valve between the vehicle of 5 door and 3 door as in the location diagrams. The fuel tank has 4 roll-over valves to allow the fuel vapor to exit and prevent pressurization of the fuel tank in normal operation. In the event of a vehicle rollover, the roll-over valves close to prevent the leakage of fuel from the fuel tank.

The fuel vapor is routed to the evaporative emission canister where it is stored before being purged at intervals to the intake manifold.

For additional information, refer to: [Evaporative Emissions](#) (303-13B Evaporative Emissions - INGENIUM I6 3.0L Petrol, Description and Operation).

Fuel Limit Vent Valve

Unwanted pressure in the fuel tank can prevent it from filling to the maximum level. To stop this, the FLVV provides an opening that allows the release of fuel vapors from the fuel tank. The fuel vapors in the fuel tank escape through an internal breather hose connected to a stub port that passes through the fuel tank casing. From this point, the fuel vapors flow through a breather pipe to the fuel filler neck or to the evaporative emission canister.

Fuel level sensors

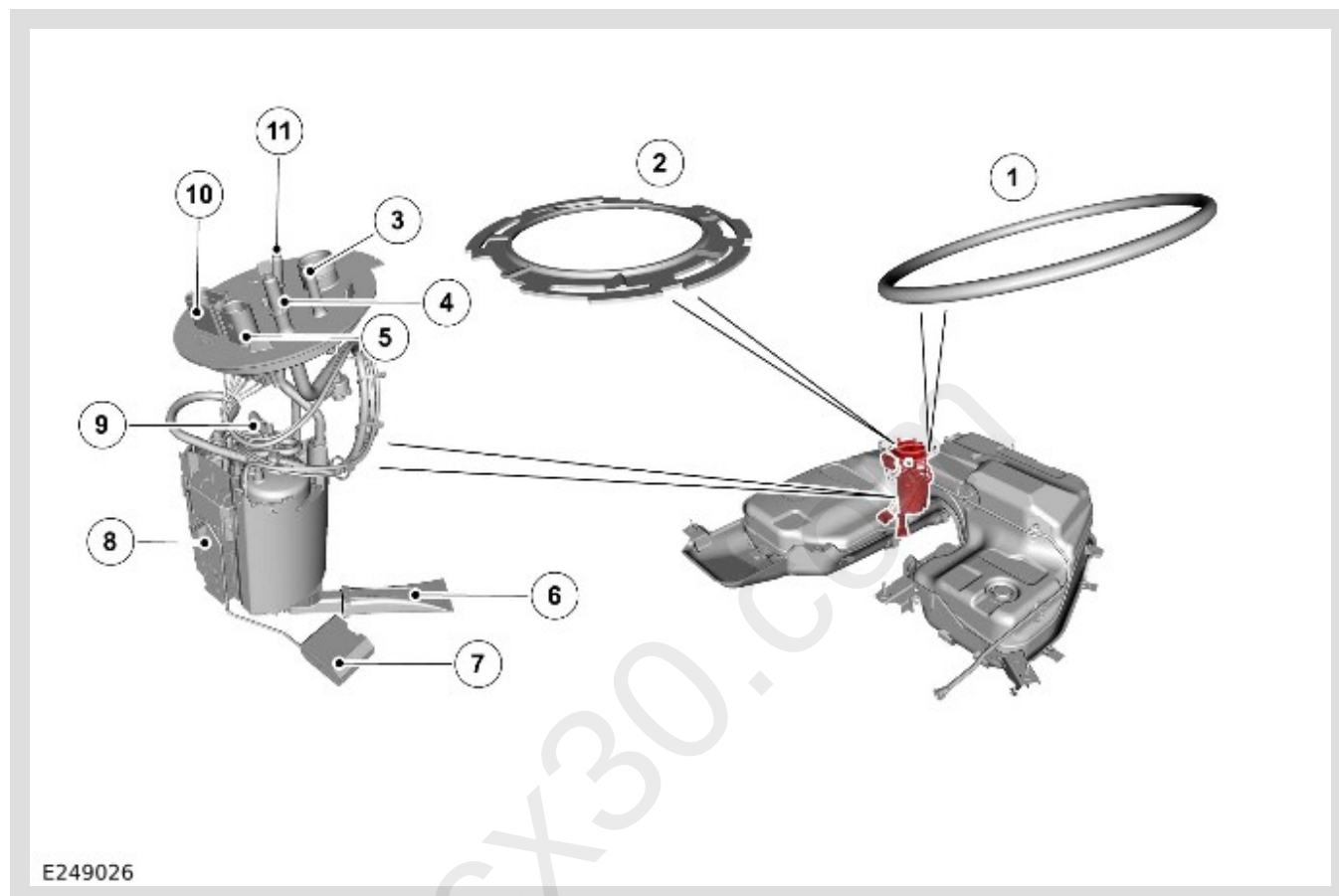
The fuel level sensors to measure the amount of fuel in the left and right sides of the fuel tank. The left passive fuel level sensor is attached to the fuel tank internal bracket. The right active fuel level sensor is attached to the outside of the fuel pump swirl pot. Both fuel level sensors are connected to the vehicle wiring harness through the wiring harness connector on the fuel pump module top flange assembly.

The fuel level sensors are hardwired to the BCM/ GWM through the wiring harness.

For additional information, refer to: [Evaporative Emissions](#) (303-13B Evaporative Emissions - INGENIUM I6 3.0L Petrol, Description and Operation).

FUEL PUMP MODULE

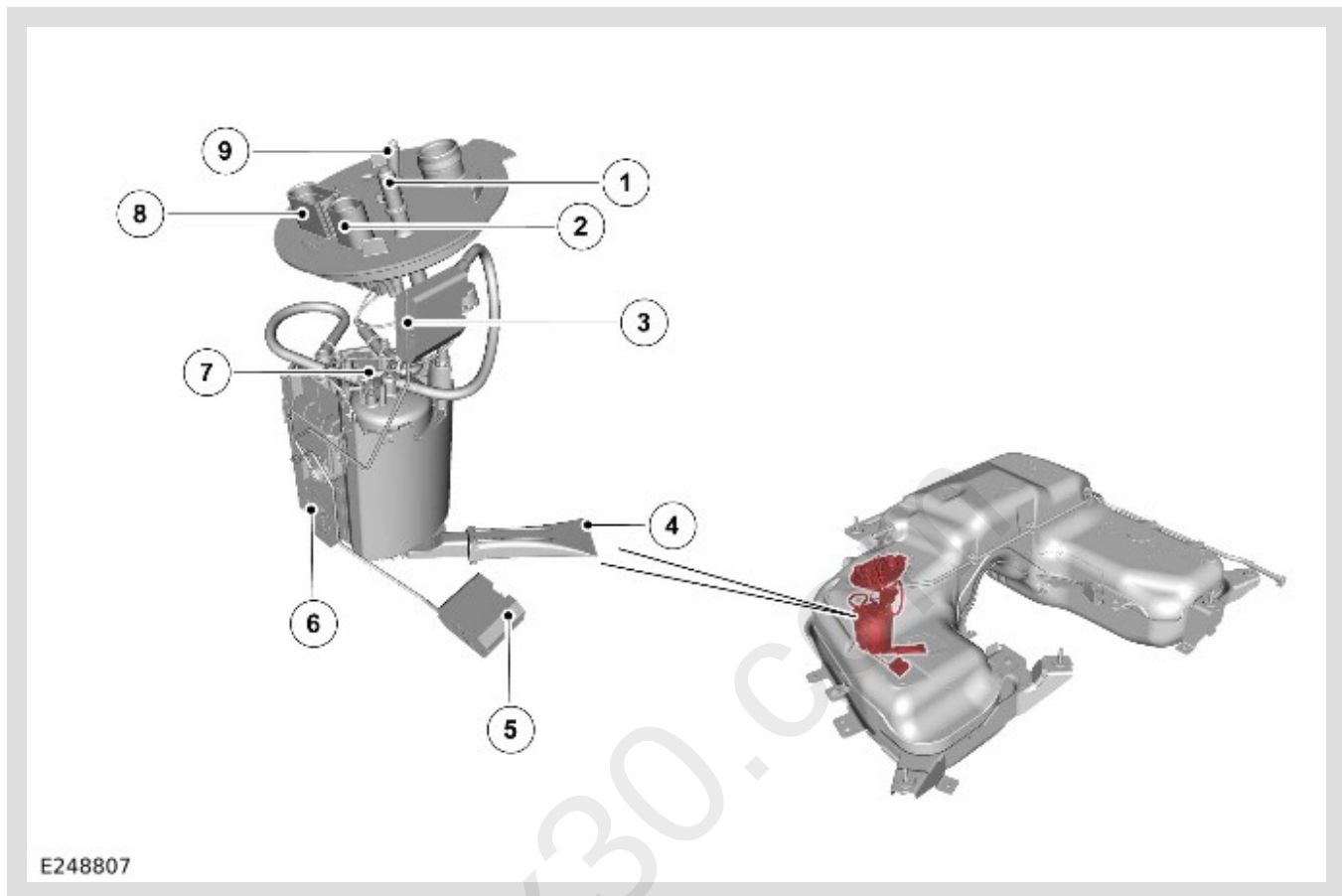
Vehicle with 5 doors



ITEM	DESCRIPTION
1	O-ring seal
2	Flange retaining ring
3	Pipe connector - Evaporative emission canister - Except North American Specification (NAS)
4	Pipe connector - Fuel delivery
5	Electrical connector - Fuel level sensor
6	Fuel filter
7	Fuel level sensor floater
8	Swirl pot
9	Pipe connector - Suction pipe
10	Electrical connector - FPDM

ITEM	DESCRIPTION
11	Pipe connector - FFBH fuel pump - If equipped

Vehicle with 3 doors



ITEM	DESCRIPTION
1	Pipe connector - Evaporative emission canister - Except NAS
2	Electrical connector - Fuel level sensor
3	Active - Fuel level sensor - High floater
4	Fuel filter
5	Active - Fuel level sensor - Low floater
6	Swirl pot
7	Pipe connector - Suction pipe
8	Electrical connector - FPDM
9	Pipe connector - FFBH fuel pump - If equipped

The fuel pump module is located in the right of the fuel tank. The fuel pump module is sealed to the fuel tank with an O-ring seal and secured with a flange retaining ring.

The top flange of the fuel pump module assembly provides the internal and external interface for the fuel tank electrical and fuel connections. The flange is formed with fuel level and LP fuel pump wiring harness connector. The connectors on the fuel pump module are for the fuel level sensors and the LP fuel pump.

The lower part of the fuel pump module forms the fuel swirl pot, and provides the location for the LP fuel pump. The swirl pot provides a constant reservoir of fuel to deliver fuel to the engine.

The LP fuel pump makes sure that sufficient fuel is delivered to the engine's HP fuel pumps. The suction pipe draws fuel from the left (passive) of the fuel tank into the swirl pot. Surplus fuel entering the fuel swirl pot overflows into the usable right of the fuel tank.

Fuel Fired Booster Heater (if equipped)



NOTE:

NAS vehicles are not equipped with the FFBH.

For cold climate market vehicles that are equipped with a FFBH and an FFBH fuel pump. The fuel pump module has a separate pipe connection for a FFBH fuel line, that connects to a FFBH fuel pump mounted on the exterior right of the fuel tank. The FFBH fuel line connection is installed with a sealed suction pipe which draws fuel from the swirl pot. An additional fuel line connects the FFBH fuel pump to the FFBH fuel inlet.

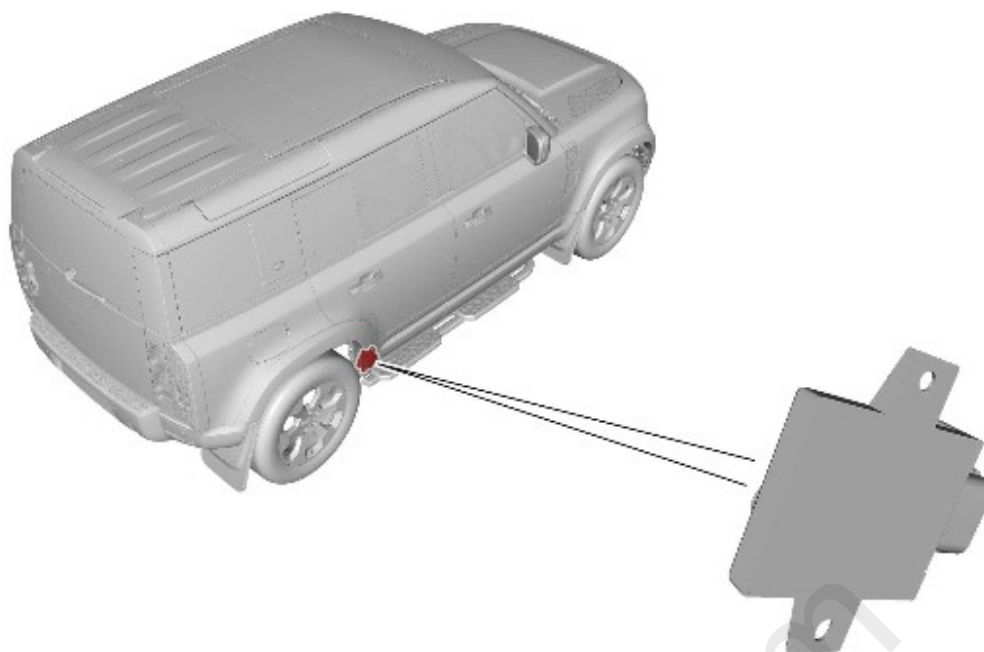
For additional information, refer to: [Fuel Fired Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation).

FUEL PUMP DRIVER MODULE



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E248808

The FPDM is located behind the rear right wheel arch liner. The FPDM is attached to a bracket and secured by 2 nuts. The bracket is secured to the rear right member reinforcement panel.

The LP fuel pump operation is controlled by the FPDM which is controlled by the PCM. The FPDM receives a Pulse Width Modulation (PWM) signal from PCM. The FPDM outputs the required power to the LP fuel pump to provide the fuel flow and pressure output.

The FPDM has a single wiring harness connector. The wiring harness connector has the following connections:

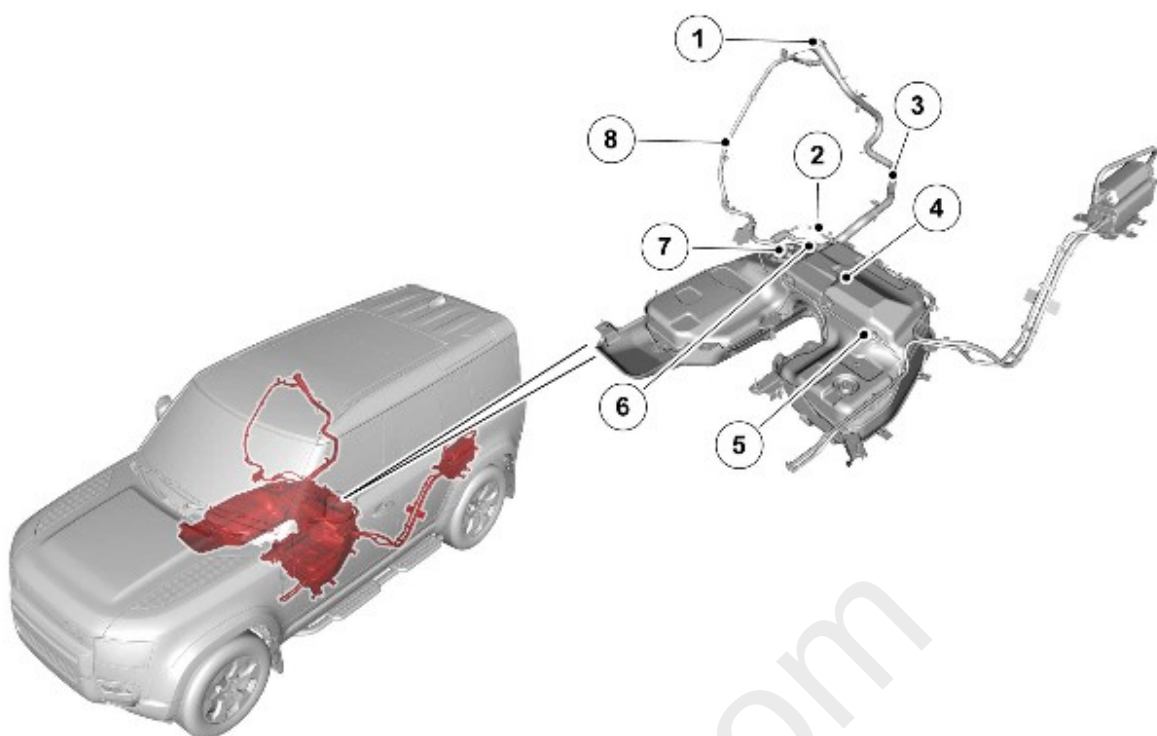
- Power supply from the fuel pump relay in the Rear Junction Box (BCMB).
- PWM signal from the PCM.
- Power to the LP fuel pump in the fuel pump module (quantity 3).
- Ground for the LP fuel pump in the fuel pump module.
- Ground.

FUEL FILLER PIPE AND BREATHER ASSEMBLY



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E249027

ITEM	DESCRIPTION
1	Fuel filler cap
2	Fuel tank breather pipe - Fuel tank to evaporative emission canister
3	Fuel filler hose
4	Fuel tank
5	Fuel delivery line - Fuel pump module to HP fuel pump
6	Fuel tank breather pipe connector
7	Fuel pump module
8	Fuel vapor pipe - Fuel tank breather pipe to fuel filler hose

The neck of the fuel filler pipe is positioned at the rear of the vehicle, above the rear right wheel. The fuel filler pipe and fuel filler cap are covered by a molded plastic fuel flap.

The fuel flap has the electrically locked when the vehicle is locked.

The fuel filler cap is a conventional screw-in type which is secured to the vehicle with a lanyard. The fuel filler cap must be securely installed to make sure the fuel tank venting system is sealed and potential fuel loss prevented. The fuel filler cap has a ratchet locking mechanism, it should be screwed in to a torque of 3 audible clicks. The clicks confirm the fuel filler cap is correctly tightened.

The fuel filler pipe is a stainless steel fabrication which is secured to the vehicle body with 3 brackets and nuts. A metal stub pipe, attached to the fuel filler neck, provides for the attachment of the breather.

The fuel filler pipe attaches to the fuel tank at the rear right side. The fuel filler pipe incorporates a check valve at the connection point. The in-line check valve is mounted inside the fuel filler hose, and is retained in the closed position by a spring. The check valve is only opened when the vehicle is refueled.

A breather is connected between the fuel filler neck and the fuel tank. The breather enables the fuel tank to be filled, allows for expansion of the fuel vapor and controls the fuel cut off during filling. The fuel vapor is routed to the evaporative emission canister.

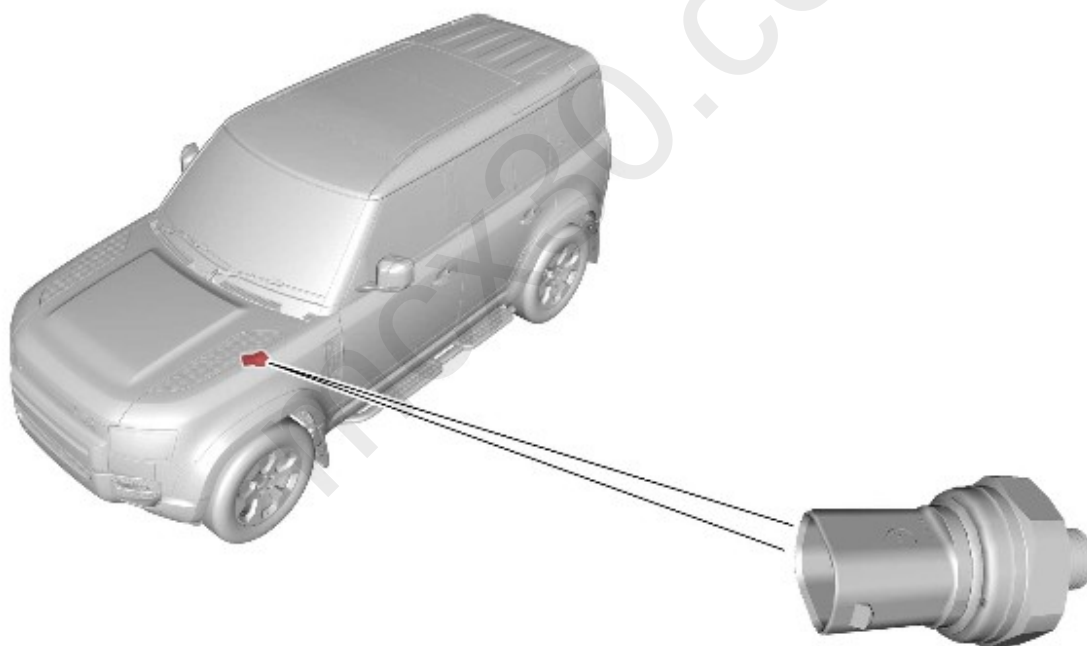
For additional information, refer to: [Evaporative Emissions](#) (303-13B Evaporative Emissions - INGENIUM I6 3.0L Petrol, Description and Operation).

LOW FUEL PRESSURE SENSOR



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E248809

The low fuel pressure sensor is located in the left of the engine compartment. The low fuel pressure sensor is attached to the bracket with 1 screw. The low fuel pressure sensor measures the fuel pressure being supplied from the fuel pump module to the HP fuel pumps. The low fuel pressure sensor is located in a connector between:

- The delivery fuel line from the fuel pump module

- The delivery fuel line to the HP fuel pumps.

The low fuel pressure sensor is hardwired to the PCM.

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

OPERATION

The petrol fuel system uses a returnless fuel system. The LP fuel pump operation is regulated by the FPDM, which is controlled by the PCM. The PCM uses a PWM signal to control the LP fuel pump output fuel flow and pressure. The FPDM:

- Regulates the fuel flow
- Pressure delivered to the engine mounted HP fuel pump by controlling the operation of the LP fuel pump.

The PCM uses the low fuel pressure sensor to make sure that the required fuel pressure is delivered by the LP fuel pump to the HP fuel pumps.

The FPDM is supplied with power through a fuel pump relay in the BCMB. The fuel pump relay is controlled by the BCM/ GWM. The fuel pump relay is active when the ignition is in all Power Modes except for Power Mode 0 (ignition OFF). The PCM is connected to the BCM/ GWM to receive a 'wake-up' message. In the event of an accident the RCM outputs a crash signal to the BCM/ GWM to disable the LP fuel pump relay.

The fuel pump relay is energized on:

- Opening the driver's door
- Pressing the start button only or
- Pressing the start button and the footbrake (which initiates engine cranking).

The FPDM supplies power to the fuel pump. The FPDM adjusts the power to control the speed of the fuel pump and the pressure and flow in the fuel line.

The PCM sends a PWM signal to the FPDM to control the speed for the LP fuel pump. The duty cycle of the PWM signal represents half the LP fuel pump speed. For example, when the PWM signal has a duty cycle of 50%, the FPDM drives the pump at 100%.

The FPDM only energizes the fuel pump when it receives a valid PWM signal, with an on duty cycle of between 4% and 50%. To switch the fuel pump OFF, the PCM transmits a PWM signal with a duty cycle of 75%.

The PCM:

- Monitors the input from the low fuel pressure sensor

- Adjusts the speed of the LP fuel pump as necessary to maintain a nominal output pressure of 4.5 bar (65.3 psi), except during engine start-up.

The output pressure from the LP fuel pump changes with changes of engine demand and fuel temperature. At engine start-up the target pressure for the fuel delivery line is 6.3 bar (91.4 psi).

When the RCM outputs a crash signal on a dedicated wire to the BCM/ GWM. The BCM/ GWM then de-energizes the fuel pump relay to prevent any further fuel being pumped to the engine.

When the PCM does not detect pressure in the fuel delivery line. The PCM stops, or refuses to start the engine and stores the appropriate Diagnostic Trouble Code (DTC).

The PCM receives a monitoring signal from the FPDM. Any DTCs produced by the FPDM are stored by the PCM.

DTCs can be retrieved from the PCM using an Jaguar Land Rover (JLR) approved diagnostic equipment. The FPDM itself cannot be interrogated by the JLR approved diagnostic equipment.

Fuel Level Sensor

Inside the fuel tank of the fuel level sensors output signals to the BCM/ GWM for fuel tank fuel level.

The electrical output signal is dependant upon the amount of fuel remaining in each side of the fuel tank and the position of the float arms. The measured resistance by the fuel level sensors and is transmitted to the BCM/ GWM which implements an anti-slosh function. The anti-slosh function monitors the signals and updates the fuel level signal to the instrument cluster at regular intervals. The anti-slosh prevents constant fuel gauge pointer movement caused by fuel movement in the fuel tank due to cornering or braking. A low level fuel warning indicator is incorporated in the instrument cluster, illuminates when the fuel level in the tank falls below a predetermined level.

The fuel level sensor signals are converted in the BCM/ GWM into High Speed (HS) Controller Area Network (CAN) Human Machine Interface (HMI) systems bus messages. The fuel level messages are used by the:

- IPC for fuel gauge and fuel warning indicator operation.
- PCM stores DTCs for mis-fire detection when the fuel level in the fuel tank is below a predetermined capacity.

North American Specification and China Vehicles Only

NAS and China (CN6) vehicles have a DMTL pump for leak detection requirements which have additional:

- Connections
- Hoses
- Pipes.

For additional information, refer to: [Evaporative Emissions](#) (303-13B Evaporative Emissions - INGENIUM I6 3.0L Petrol, Description and Operation).

DIAGNOSTICS

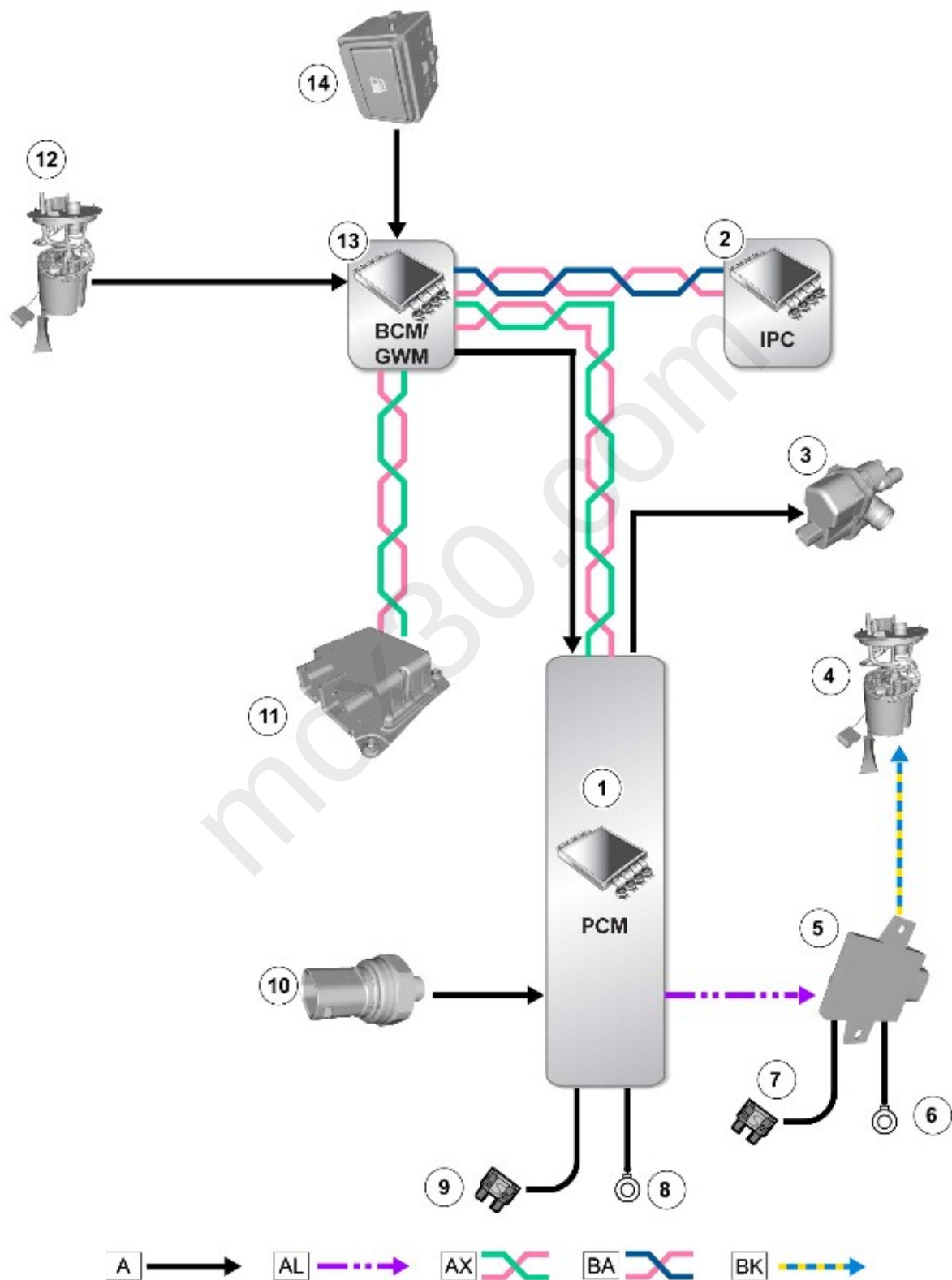
The PCM records any DTCs and related data. The DTCs and related data are read using the JLR approved diagnostic equipment.

The JLR approved diagnostic equipment enables certain components to be activated and also read live data.

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CONTROL DIAGRAM

CONTROL DIAGRAM - 1 OF 1



A = HARDWIRED: AL = PWM: AX = FLEXRAY: BA = HS CAN HMI SYSTEMS BUS: BK = LOW VOLTAGE (3-PHASE).

ITEM	DESCRIPTION
1	PCM
2	IPC
3	DMTL pump (if equipped)
4	Fuel pump module - LP pump
5	FPDM
6	Ground
7	Power supply
8	Ground
9	Power supply
10	Low fuel pressure sensor
11	RCM - Crash signal
12	Fuel pump module - Fuel level signal
13	BCM/ GWM
14	Release switch - Fuel flap