

New Product Introduction

2006 S-TYPE

Technical Guide



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S-TYPE 2006 Model Year Update

Changes introduced at 2006 model year (MY) include the following systems:

- Introduction of Tire Pressure Monitoring System (TPMS).
- Changes to the braking system.
 - Installation of non-active brake booster.
 - Introduction of single piston brake calipers to all vehicles.
 - Revised brake disc fitment.
 - Introduction of vacuum assist.
 - Two new hydraulic control unit and anti-lock brake system (ABS) modules.
- New variable displacement power steering pump fitted to diesel vehicles.
 - Negates the requirement for a power steering fluid cooler.
- Introduction of variable valve timing to supercharged vehicles.
- Installation of secondary air injection for emission reduction.
- Revised petrol catalysts loadings to further improve exhaust emissions.
 - Assists in compliance from EU Stage 3 to EU Stage 4 petrol emission standards.
 - Assists in compliance to Low Emission Vehicle (LEV) II Standards and North American Ultra Low Emission Vehicle (ULEV) II Standards.
- Relocation of evaporative emission canister purge valve.
 - Assists in cabin noise reduction.
- Bluetooth® telephone communications network system.

Terminology Glossary

The following abbreviations and acronyms are used in this publication:

Abbreviation / Acronym	Description
ABS	Anti-lock Brake System
ACC	Adaptive Cruise Control
CAN	Controller Area Network
CO	Carbon Monoxide
DPF	Diesel Particulate Filter
DSC	Dynamic Stability Control
GHz	GigaHertz
GTR	Global Technical Reference
ECM	Engine Control Module
EGR	Exhaust Gas Recirculation
EU	European Union
HC	Hydrocarbon
km/h	kilometers per hour
LEV	Low Emission Vehicle
LF	Low Frequency
MHz	MegaHertz
MY	Model Year
mph	miles per hour
NAS	North American Specification
PCM	Powertrain Control Module
PSE	Portable Support Electronics module
REM	Rear Electronics Module
RF	Radio Frequency

Abbreviation / Acronym	Description
SCP	Standard Corporate Protocol
TPMS	Tire Pressure Monitoring System
ULEV	Ultra Low Emission Vehicle
VVT	Variable Valve Timing
VACM	Voice Activated Control Module
WDS	Worldwide Diagnostic System

Tire Pressure Monitoring System (TPMS)

The purpose of the Tire Pressure Monitoring System (TPMS) is to assist the driver in maintaining the vehicle's tire pressures at the optimum level in order to:

- improve fuel consumption
- maintain ride and handling characteristics
- reduce the risk of rapid tire deflation – which may be caused by under inflated tires
- comply with legislation in relevant markets.

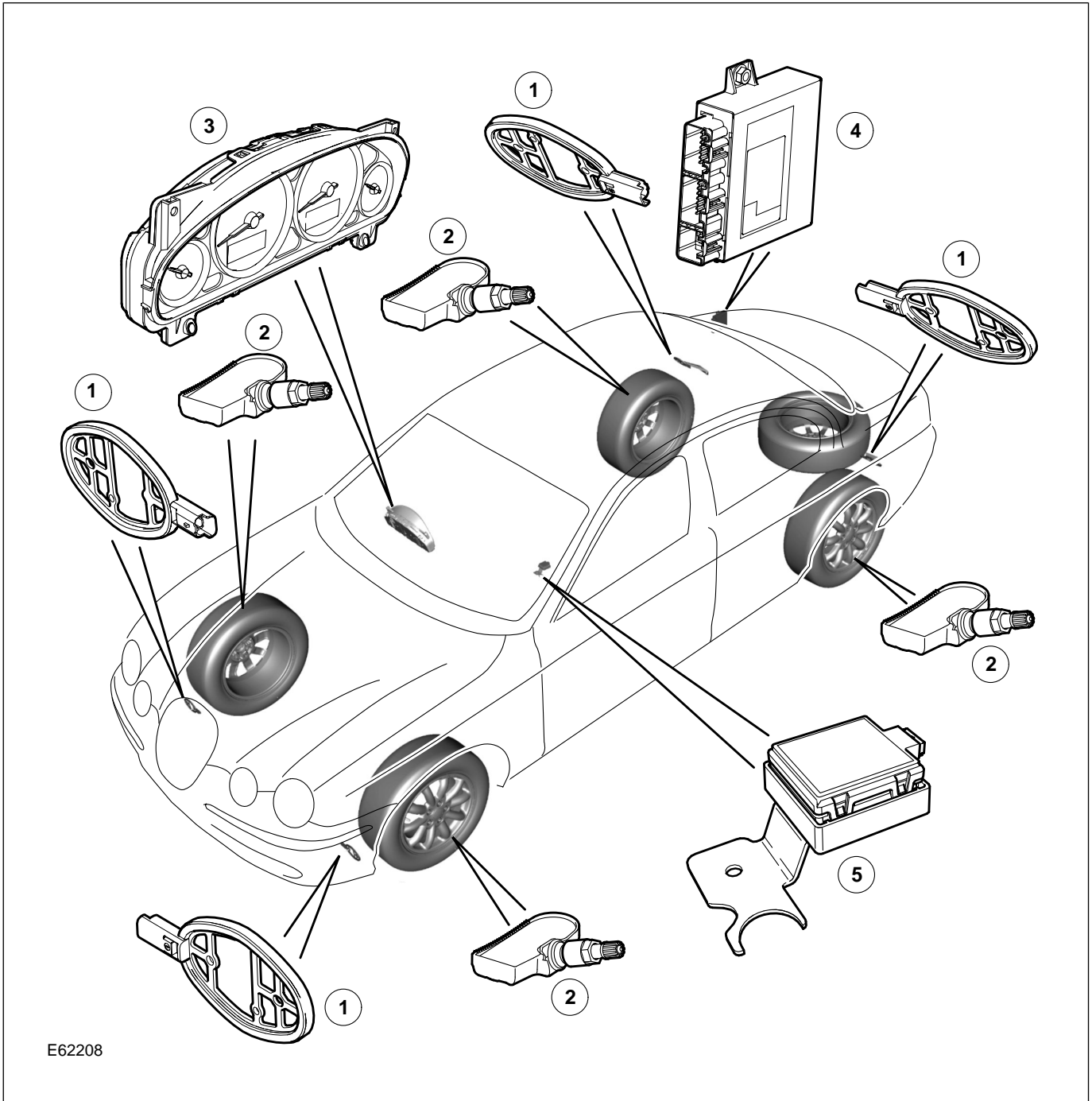
The TPMS measures the pressure in each of the tires on the vehicle (including the full size spare, if fitted) and issues a warning to the driver if any of the pressures deviate from a defined tolerance.

NOTE: During a 'blow out' a very rapid reduction in pressure is experienced. The system is not intended to warn the driver of a 'blow out', since it is not possible to give the driver sufficient warning that such an event is occurring, due to its short duration. The design of the TPMS is to assist the driver in keeping the tires at the correct pressure, which will tend to reduce the likelihood of a tire 'blow out' occurring.

The instrument cluster displays warnings to the driver through the use of the low tire pressure warning indicator, the secondary amber warning indicator and the text message display.

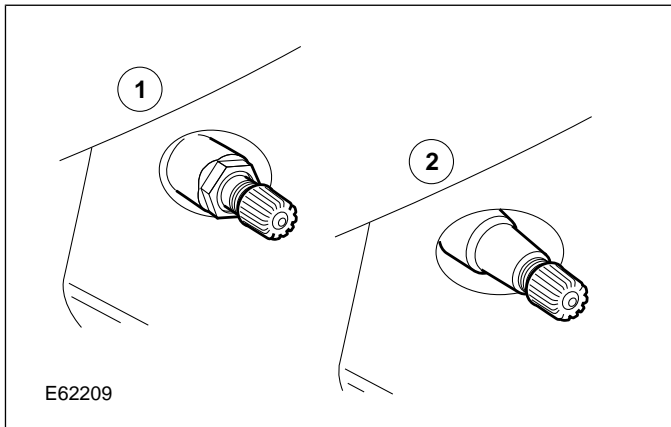
The location of the tire with a pressure outside of the set limits is identified by a text message displayed in the instrument cluster message center. In addition the text message display will scroll through messages if more than one tire has reached the low tire pressure threshold.

Tire Pressure Monitoring System - Component Location



Item	Description	Item	Description
1	Initiator	4	TPMS module
2	Tire low pressure sensor	5	Receiver
3	Instrument cluster		

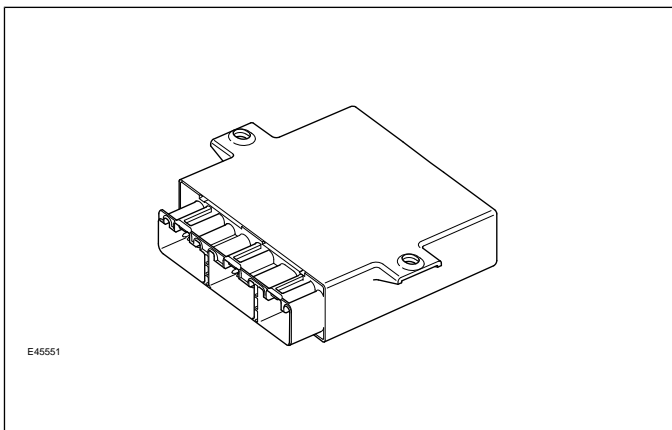
Visual Identification



Wheels fitted with TPMS can be visually identified by the external metal lock nut and valve (1). All Jaguar non-TPMS wheels have a rubber valve fitted (2).

The TPMS monitors pressure in each tire including the full size spare tire (temporary-use spare wheels are not fitted with sensors and are consequently not monitored).

TPMS Module



The TPMS module is located in the right-hand side of the luggage compartment of the vehicle. The TPMS module is fixed in position to a shared mounting bracket using retaining nuts. The connectors of the TPMS module point towards the front of the vehicle.

The TPMS module's main function is to detect the following:

- the tire pressure is below the recommended low tolerance value – under inflated tire
- the location of the tire on the vehicle.

The TPMS module also communicates with the vehicle instrument cluster to provide the driver with appropriate warnings and indicate the status/failure of TPMS components.

Tire Location

Because of the requirement for different pressure targets and thresholds for the front and rear tires, the TPMS module can identify the position of the tires on the vehicle.

The TPMS module then assigns a received tire low pressure sensor identification to a specific position on the vehicle (i.e. FL (front left), FR (front right), RL (rear left) or RR (rear right)).

Tire location is performed automatically by the module using an auto-location function. This function requires no manual intervention by the driver. The TPMS module can automatically learn the position of tires on the vehicle if the tire low pressure sensors or their positions are changed on the vehicle.

The TPMS module can automatically detect, under normal operating conditions, the following:

- one or more tire low pressure sensors have been replaced
- one or more tire low pressure sensor identifications are missing
- one or more 'alien' identifications are being received, i.e. the module can reject identifications from tire low pressure sensors that do not belong to the vehicle
- the spare tire and one of the tires in use on the vehicle have exchanged position on the vehicle.

Spare Tire Identification

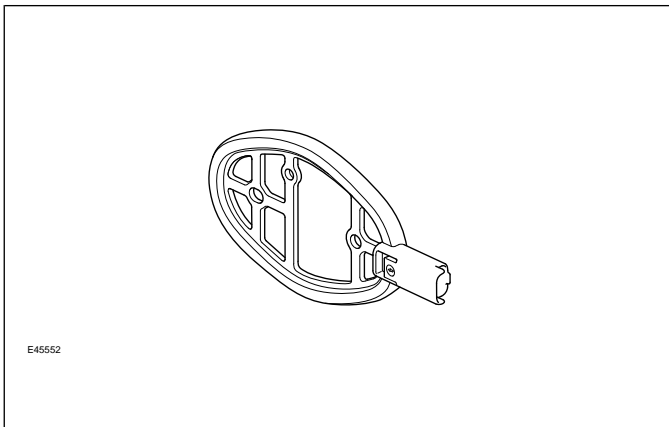
Depending on the vehicle specification, the spare tire may or may not be fitted with a tire low pressure sensor.

Temporary-use spare wheels are not fitted with a tire low pressure sensor and therefore pressures cannot be monitored.

When a full size spare wheel is fitted with a tire low pressure sensor, the TPMS module can detect it, determine that it is the spare tire and monitor its pressure and issue warnings to the driver accordingly. If the TPMS module does not detect a spare tire with a tire low pressure sensor, the module will not show a fault to the driver, however a fault code will be stored in the TPMS module.

If the spare tire is being monitored and the driver replaces a flat 'running' tire with the spare tire, the module will not continually warn the driver that the original flat tire (now in the spare position) is flat. This prevents distraction of the driver by constant warnings being issued. This warning will only be displayed for the first 20 seconds when the ignition switch is turned to the ON position.

Initiator

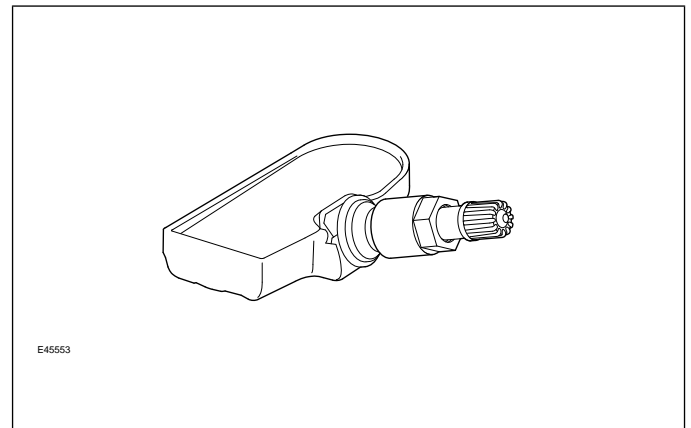


The initiators are located at the front of the front wheel arches and at the rear of the rear wheel arches. The TPMS system has four initiators. Each initiator has a connector which connects with the body harness.

The initiator is a passive, LF transmitter. Each initiator is controlled by the TPMS module and provides an auto-location feature to identify tire positions on the vehicle.

The TPMS module energizes each initiator in turn using LF drivers. The corresponding tire low pressure sensor detects the resulting LF transmission and responds by modifying the mode status within the RF transmission. This data is received by the TPMS module through the external RF receiver. The module then determines which sensor is transmitting and its location on the vehicle.

Tire low Pressure Sensor



The TPMS system uses 'active' tire low pressure sensors which are mounted on each wheel, inside the tire cavity. The sensor is retained in position by the valve attachment to the wheel structure. The sensors transmit RF signals at either 315 MHz or 433 MHz dependent on market requirements.

The sensors periodically measure the pressure and temperature of the air inside the tire. Pressure and temperature measurements are transmitted periodically to the external RF receiver in the vehicle.

The tire low pressure sensors are self-contained units which have no electrical connections into or out of the sensor.

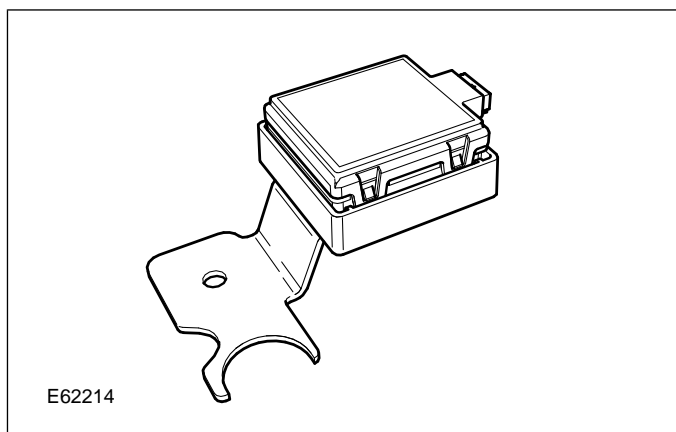
Care must be taken when changing a tire to avoid damage to the tire low pressure sensor. If the tire low pressure sensor is removed, the valve cap, valve core, nut, seal and washer must also be replaced and the tire low pressure sensor tightened to the correct torque value.

The valve cap, valve core, nut, seal and washer are replaced at every tire change.

The RF transmission from the sensor contains a unique identification code in its transmission data, so that the TPMS module can identify the tire on the vehicle. If the sensor is replaced on a 'running' wheel, the new sensor identification will be learnt when the vehicle is first driven at a speed of more than 20 km/h (12.5 mph) for 15 minutes. If a new sensor is fitted to the spare wheel, the identification for that sensor must be programmed into the TPMS module using the approved Jaguar diagnostic system or that wheel will not be monitored. The code is provided on a label with the complete wheel and tire assembly when new and is also printed on the casing of each sensor.

In order to conserve battery power, the tire low pressure sensor uses different transmission rates when the wheel is stationary or moving. The vehicle speed required to change between the stationary and moving transmission rates is approximately 20 km/h (12.5 mph).

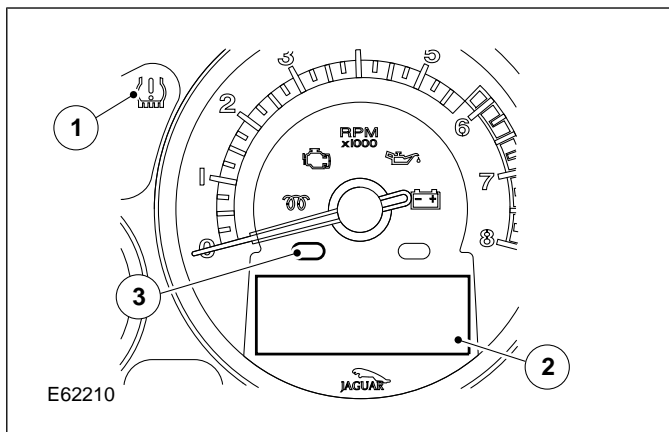
Receiver



The TPMS receiver is located under the center console. The unit receives the tire pressure, temperature and acceleration readings from each tire and interfaces with the TPMS module. The TPMS module then transmits the appropriate messages to the instrument cluster.

The unit also receives further information from each tire pressure sensor concerning wheel identification, what current mode status the tire pressure sensor is in and the condition of the tire pressure sensor battery.

Instrument Cluster Indications



Item	Description
1	Low tire pressure warning indicator
2	Message center
3	Secondary amber warning indicator

Warnings are conveyed by the low tire pressure warning indicator, the secondary amber warning indicator and a text message displayed in the message center.

The warning indicators are driven by Controller Area Network (CAN) messages from the TPMS module. The warning indicators are illuminated by the cluster software for 3 seconds when the ignition is switched to position II for a bulb check.

NOTE: If the vehicle is not fitted with the TPMS, the warning indicators will not illuminate at any time.

The following table shows the warning indicator functionality for given events.

Message	Meaning
"CHECK PRESSURE RH or LH FRONT or REAR TIRE" + secondary amber warning indicator + low tire pressure warning indicator	Tire is significantly under-inflated. Stop as soon as safely possible to check tires and inflate to the recommended pressure.
"CHECK PRESSURE SPARE TIRE" + secondary amber warning indicator, displayed for 20 seconds only at ignition.	Spare tire is significantly under-inflated. Inflate spare tire to the recommended pressure.
"TIRE PRESSURE SENSOR FAULT" + secondary amber warning indicator	Temporary spare tire fitted. Limit vehicle speed to 80 kilometers per hour (km/h) (50 miles per hour (mph)). Replace the temporary spare tire with a correctly inflated full size tire as soon as possible.
	A tire low pressure sensor has become defective, an unapproved accessory is interfering with the TPMS or a wheel and tire which does not have a tire low pressure sensor has been fitted.
"TIRE PRESSURE SYSTEM FAULT" + secondary amber warning indicator	Wheel and tire which does not have a tire low pressure sensor has been fitted. Stop as soon as safely possible and have tire low pressure sensor fitted to the wheels and tires.
	Tire low pressure sensors have become defective, an unapproved accessory is interfering with the TPMS or a general fault has been detected in the TPMS.
"TIRE PRESSURES LOW FOR SPEED" + secondary amber warning indicator + low tire pressure warning indicator NOTE: This warning will only occur on non-NAS vehicles.	Tire pressures are not suitable for high speed driving. Reduce vehicle speed and stop as soon as safely possible to check tires and inflate to the recommended pressure for high speed driving.

System Operation

The tire low pressure sensor transmits by Radio Frequency (RF) (315 MegaHertz (MHz) or 433 MHz depending on market) signal. These signals contains data which corresponds to tire low pressure sensor identification, tire pressure, tire temperature, acceleration and tire low pressure sensor mode.

Each time the vehicle is driven, the TPMS module activates each Low Frequency (LF) initiator in turn. The corresponding tire low pressure sensor detects the LF signal and responds by modifying the mode status within the RF transmission.

The system enters 'parking mode' after the vehicle speed has been less than 20 kilometers per hour (km/h) (12.5 miles per hour (mph)) for 12 minutes. In parking mode the tire low pressure sensors transmit a coded signal to

the module once every 13 hours. If the tire pressure decreases by more than 0.06 bar (1 lbf/in²) the sensor will transmit more often as pressure is lost.

The spare tire sensor transmits a signal every 13 hours in the same manner as the road wheels when in parking mode. If the tire pressure decreases by more than 0.06 bar (1 lbf/in²) the sensor will transmit more often as pressure is lost.

As each wheel responds to the LF signal from the TPMS module, it is assigned a position on the vehicle and is monitored for the remainder of that drive cycle in that position.

When the vehicle has been parked for more than 15 minutes and then driven at a speed of more than 20 km/h (12.5 mph), the initiators fire in turn for 6 seconds on all except North American Specification (NAS) market vehicles or for 18 seconds on NAS only vehicles in the following order:

- Front left
- 6 second pause (for the TPMS module to detect a response from the tire low pressure sensor)
- Front right
- 6 second pause
- Rear right
- 6 second pause
- Rear left
- 6 second pause.

Each tire low pressure sensor responds in turn so the module can establish the sensor positions at the start of the drive cycle. This process is repeated up to three times but less if the sensor positions are already known in the module. This process is known as 'Auto Location' and takes 3 to 4 minutes on all except NAS vehicles and 7 to 8 minutes on NAS vehicles to complete. During this period the tire low pressure sensors transmit at regular intervals, once every 5 seconds on all except NAS vehicles and once every 15 seconds on NAS vehicles. For the remainder of the drive cycle the tire

low pressure sensors transmit once every 60 seconds or if a change in tire pressure is sensed until the vehicle stops and the system returns to parking mode.

Once the wheel position is established, the initiators stop firing and do not fire again until the vehicle has been parked for more than 15 minutes. The signal transmissions from each tire low pressure sensor continue at 1 minute intervals whilst the vehicle is being driven. This transmission is to monitor the tire pressure. The warning occurs at 25% deflation and comprises the message center amber secondary warning light, the low tire pressure warning indicator and an appropriate message displayed in the instrument cluster message center. The message center will also display additional information about the position of the affected wheel(s).

Braking System - Introduction

The 06 model year (MY) update incorporates a new braking system comprising the following components and functions:

- Dynamic stability control (DSC).
 - Incorporates all new hardware.
 - For additional information, refer to: Hydraulic Control Unit and Anti-lock Brake System (ABS) Module.
- New foundation brake system components.
 - For additional information, refer to: Brake System Components.
- New supercharger brake system components.
 - For additional information, refer to: Brake System Components.

Brake System Components

The brake system components is an all new for both foundation and supercharger braking systems and further enhance the vehicle's braking capability.

The modifications to the system are:

Front calipers:

- All vehicles:- 60 mm (2.36 in) single-piston sliding arrangement.

Front brake discs:

- Foundation:- 326 x 30 mm (12.83 x 1.18 in) ventilated brake discs.
- Supercharger:- 355 x 32 (13.98 x 1.26 in) ventilated brake discs.

Rear calipers:

- All vehicles:- 45 mm (1.77 in) single-piston sliding arrangement with a self-adjusting mechanism.
- All vehicles:- utilize single caliper for electric parking brake actuation.

Rear brake discs:

- All vehicles:- 326 x 20 (9.29 x 0.78 in) ventilated brake discs.

Steel-braided brake hoses are installed as standard to the braking systems providing the following advantages over conventional hoses:

- reduced expansion under pressure
- light-weight design
- reduced permeability.

Non-Active Brake Booster

A non-active brake booster is now fitted to the vehicle.

On the previous MY vehicles an active booster was required to assist in a faster response at low temperatures whilst Speed Control and/or Stability Assist were in operation. The Speed Control and Stability Assist are now supported solely by the Dynamic Stability Control (DSC) module which incorporates the anti-lock brake system (ABS) hydraulic control unit.

The active brake booster required a brake booster travel switch and a pressure sensor. The non-active brake booster system has no need for the brake booster travel switch and sees the pressure sensor integrated into the ABS hydraulic control unit.

There are two brake boosters available, one for vehicles with and one for vehicles without a vacuum assist. For additional information, refer to: Vacuum Assist.

For vehicles fitted with vacuum assist, the booster is fitted with a vacuum sensor. The sensor identifies when the system vacuum is below the required value and operates the ABS hydraulic control unit to bring the system brake fluid line pressure within defined limits.

Vacuum Assist

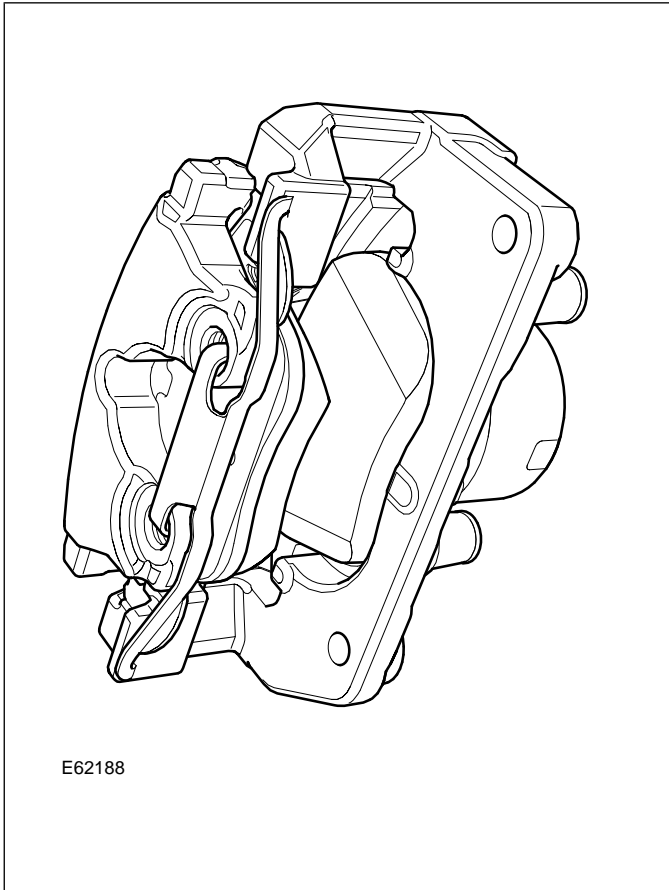
To assist braking effort at low temperatures the vehicle is fitted with a vacuum assist to supply additional pressure in the brake fluid line when required.

When the vehicle engine temperature is low and the required braking assistance is not available, the vacuum assist becomes operational when the vacuum sensor fitted to the brake booster determines that there is insufficient brake booster vacuum and requests additional pressure in the brake fluid line. This additional brake fluid line pressure ensures the driver can brake with confidence at all times.

Vehicles fitted with a 3.0 ltr V6 or a 3.5 ltr V8 engine require a vacuum assist.

V6, V8 N/A and Diesel Vehicles

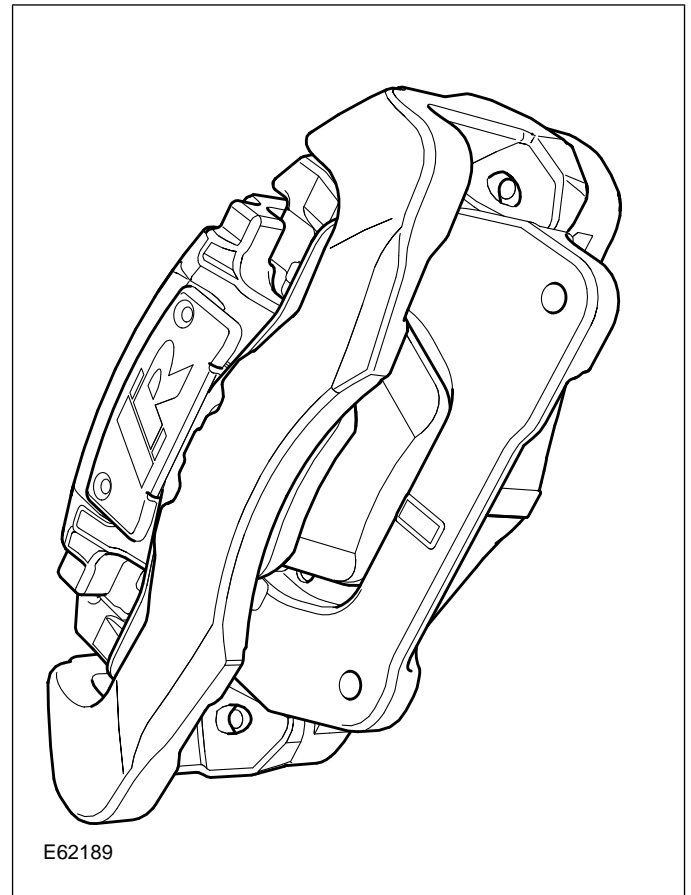
Foundation level brake caliper assemblies for 06 model year (MY) are now made from cast iron. The caliper is now a single 60 mm (2.36 in) piston.



With the increased caliper piston size, the brake discs have also been enlarged from 300 mm to 326 mm.

Supercharged Vehicles

Supercharged vehicles brake calipers are also a single 60 mm (2.36 in) piston, but the caliper is a composite design made from an aluminum piston side housing and a cast iron bridge/frame and caliper anchor plate.



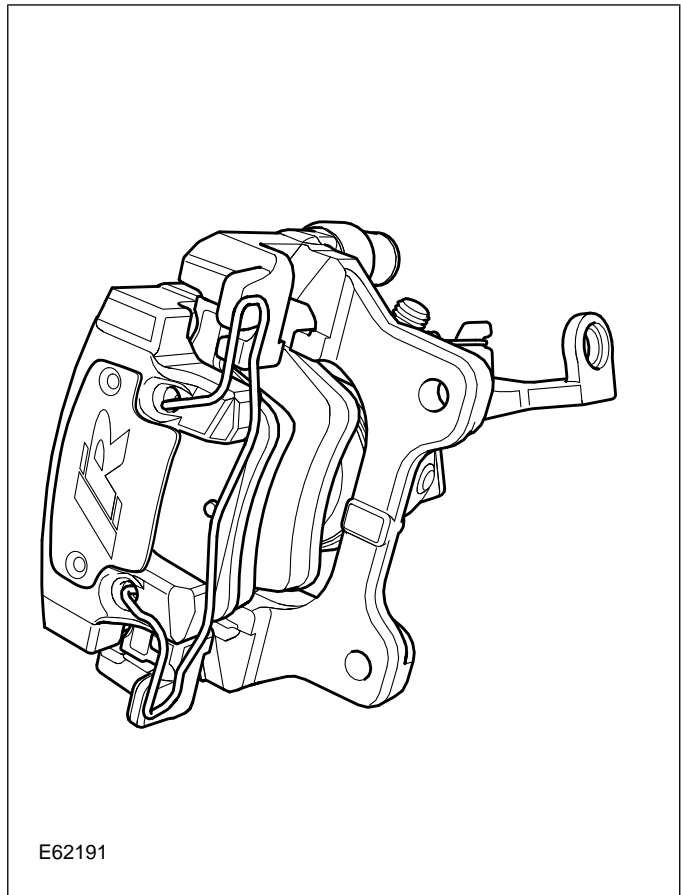
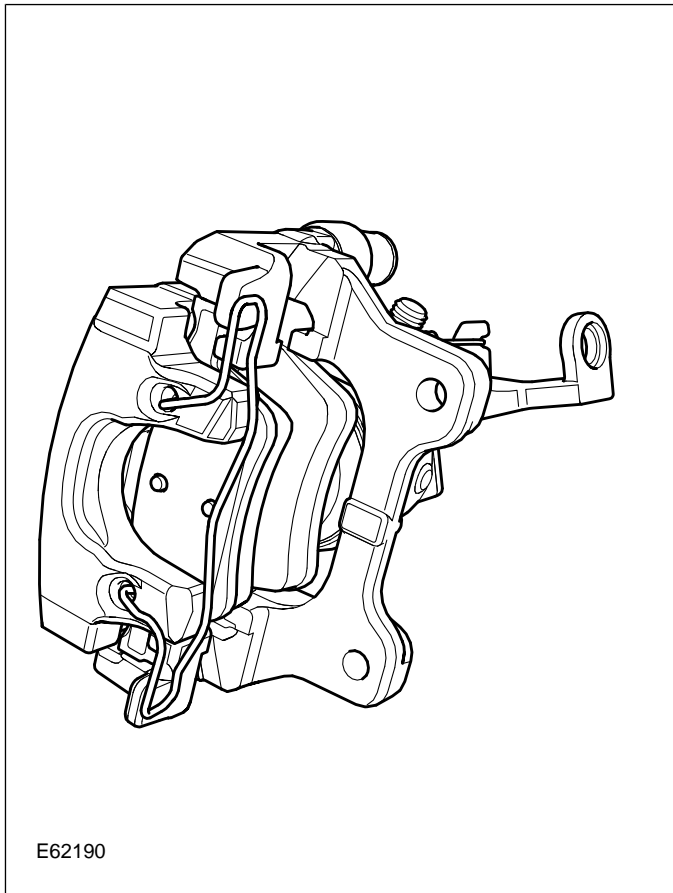
The brake discs are larger than the foundation brake discs at 355 mm.

The supercharged vehicles also have an “**R**” branded anti-rattle spring fitted to the caliper.

V6, V8 N/A and Diesel Vehicles

Foundation level brake calipers for this model year (MY) are now made from aluminum. The caliper has a single 45 mm (1.77 in) piston.

The brake caliper still contains the park brake mechanism.



The brake discs are also 326 mm.

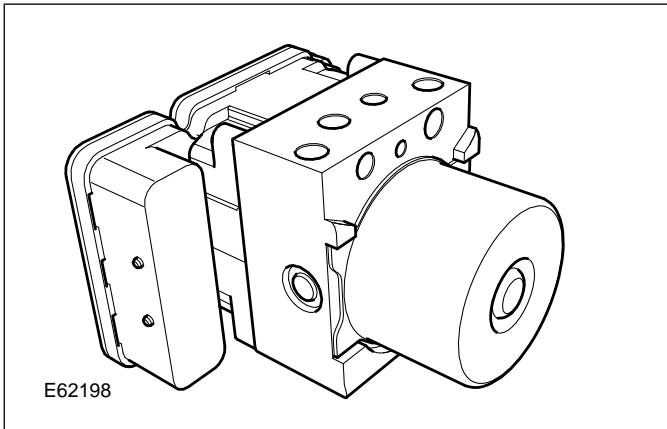
The supercharged vehicles also have an “R” branded logo plate fitted to the caliper.

There is now only one size of brake disc available for foundation level brakes at 326 mm.

Supercharged Vehicles

On previous MY supercharged vehicles Brembo brakes were fitted, which required an additional park brake caliper. These have been superseded by the single piston brake caliper with park brake mechanism as fitted to foundation level brakes.

Hydraulic Control Unit and Anti-lock Brake System (ABS) Module



This model year (MY) vehicle sees the introduction of two variants of the hydraulic control unit and anti-lock brake system (ABS) module. The two hydraulic control unit and ABS modules are for non-adaptive cruise control (ACC) and ACC equipped vehicles.

The operation of the hydraulic control unit and ABS module is fundamentally the same as previous MY, but with the additional functionality for vacuum assist. This feature is only active when brake vacuum is low, and in the first five minutes after the engine is switched on.

Vacuum assist uses the hydraulic control unit pump to supply additional pressure in the brake fluid line when required to improve braking effort. For additional information, refer to: Brake System.

The hydraulic control unit and ABS module controls the brake lamp illumination only when ACC is operational. Brake lamp illumination is controlled by the hydraulic control unit and ABS module using the multiplex network.

Due to removal of active brake booster, (for additional information, refer to: Brake System) the brake pedal no longer moves when the ACC system is braking the vehicle, therefore the brake lamp switches no longer operate the brake lights in ACC mode. The hydraulic control unit and ABS module request that the brake lamps are operated using controller area network (CAN)

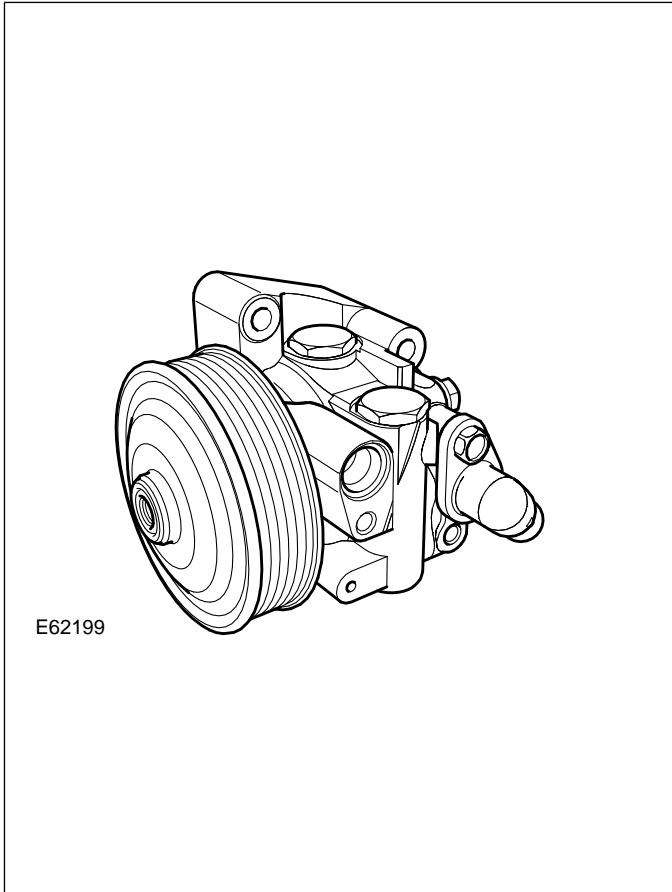
to the instrument cluster and then the standard corporate protocol (SCP) network to the rear electronics module (REM).

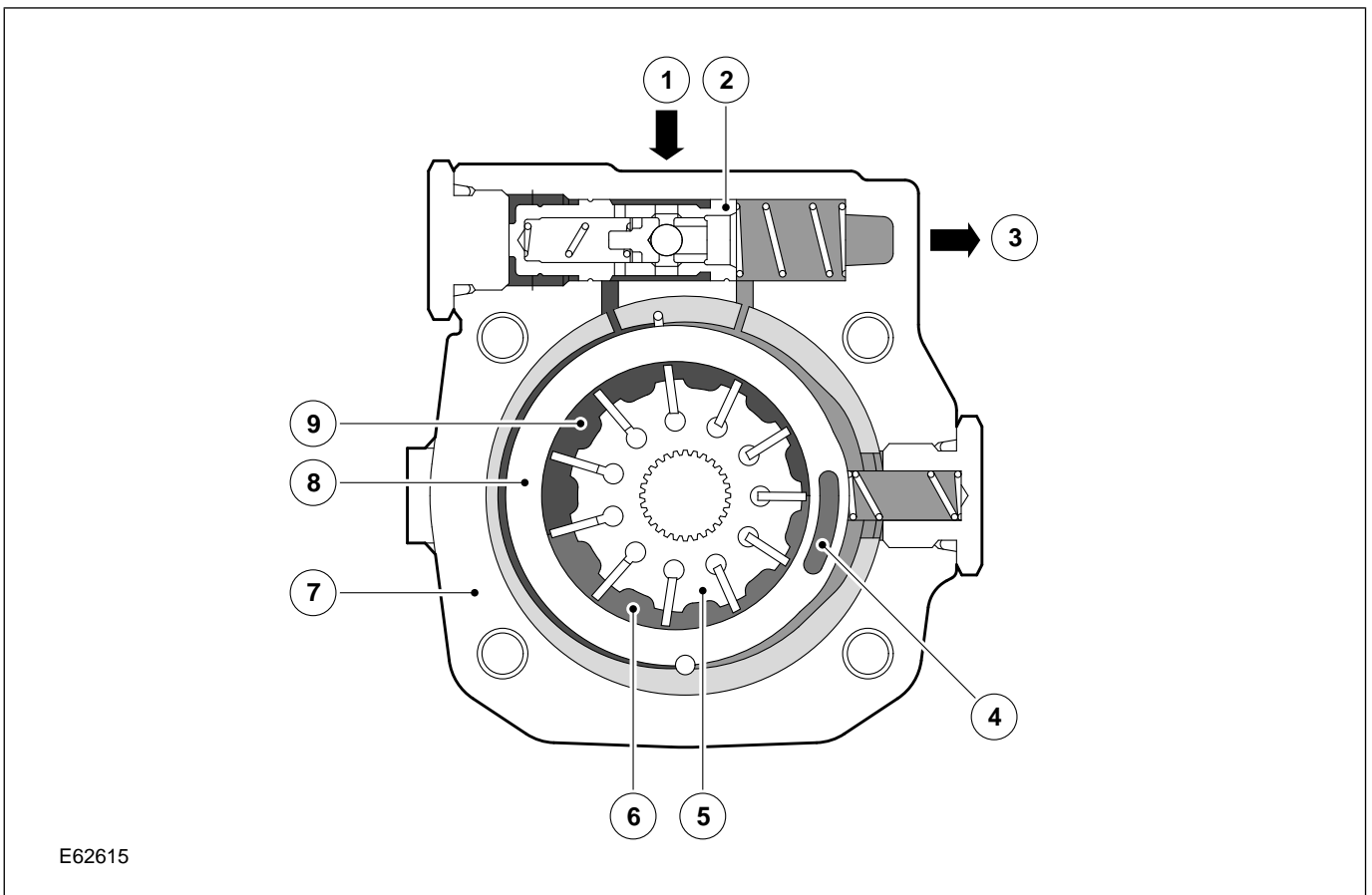
Variable Displacement Power Steering Pump

Vehicles with Diesel engine

A variable displacement power steering pump has replaced the previously fitted fixed displacement power steering pump.

A variable displacement power steering pump provides a constant delivery of power steering fluid as does the fixed displacement pump fitted to previous model year (MY), but a variable displacement power steering pump achieves its delivery in a different way.





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Item	Description	Item	Description
1	Power steering fluid inlet port	6	Delivery Port
2	Control valve	7	Adapter
3	Power steering fluid outlet port	8	Cam Ring
4	Variable Orifice	9	Suction Port
5	Pump rotor		

A variable displacement power steering pump operates by drawing power steering fluid through the inlet port (1), through the Adapter (7) and into the suction Port (9).

As the engine speed is increased there is movement of the pump camring (8) about a pivot. This changes the degree of eccentricity between the camring (8) and the pump rotor (5) which houses the vane set.

This therefore reduces the displacement of the steering pump in such a way that only the required level of power steering fluid flow is generated.

This means there is no excess power steering fluid flow. Due to this the engine power which would have previously been consumed by the fixed power steering pump is reduced and this consequently reduces fuel consumption.

Additionally because there is less fluid displacement in the steering pump, less heat is generated by the power steering system and the operating temperature is reduced.

As the power steering system operating temperature has been lowered a power steering fluid cooler is no longer required.

The power steering pump is mounted to the engine and is driven by the accessory drive belt. The pump provides a constant flow rate of 7.5 liters per minute and has a maximum pressure of 110 bars. The fluid reservoir incorporates an internal filter to ensure cleanliness of the system.

Power Steering Fluid Cooler

Vehicles with Diesel engine

The reduction in the power steering system operating temperature means the fluid does no longer reach the high temperatures achieved by a system fitted with a fixed displacement power steering pump. Therefore a power steering fluid cooler is no longer required on this vehicle.

Variable Valve Timing (Vehicles with supercharger)

The continuous variable valve timing (VVT) as seen on the naturally aspirated engine has been introduced to the super charged engine for this model year update. VVT offers improved low and high-speed engine performance and excellent idle quality.

The VVT system changes the phasing of the intake valves, relative to the fixed timing of the exhaust valves, to alter:

- the mass of air-flow into the engine's cylinders,
- the engine's torque response and emissions.

The VVT system uses a vane device to control the camshaft angle, refer to VVT Operation in this section. The system operates over a range of 48° and is advanced or retarded to the optimum angle within this range.

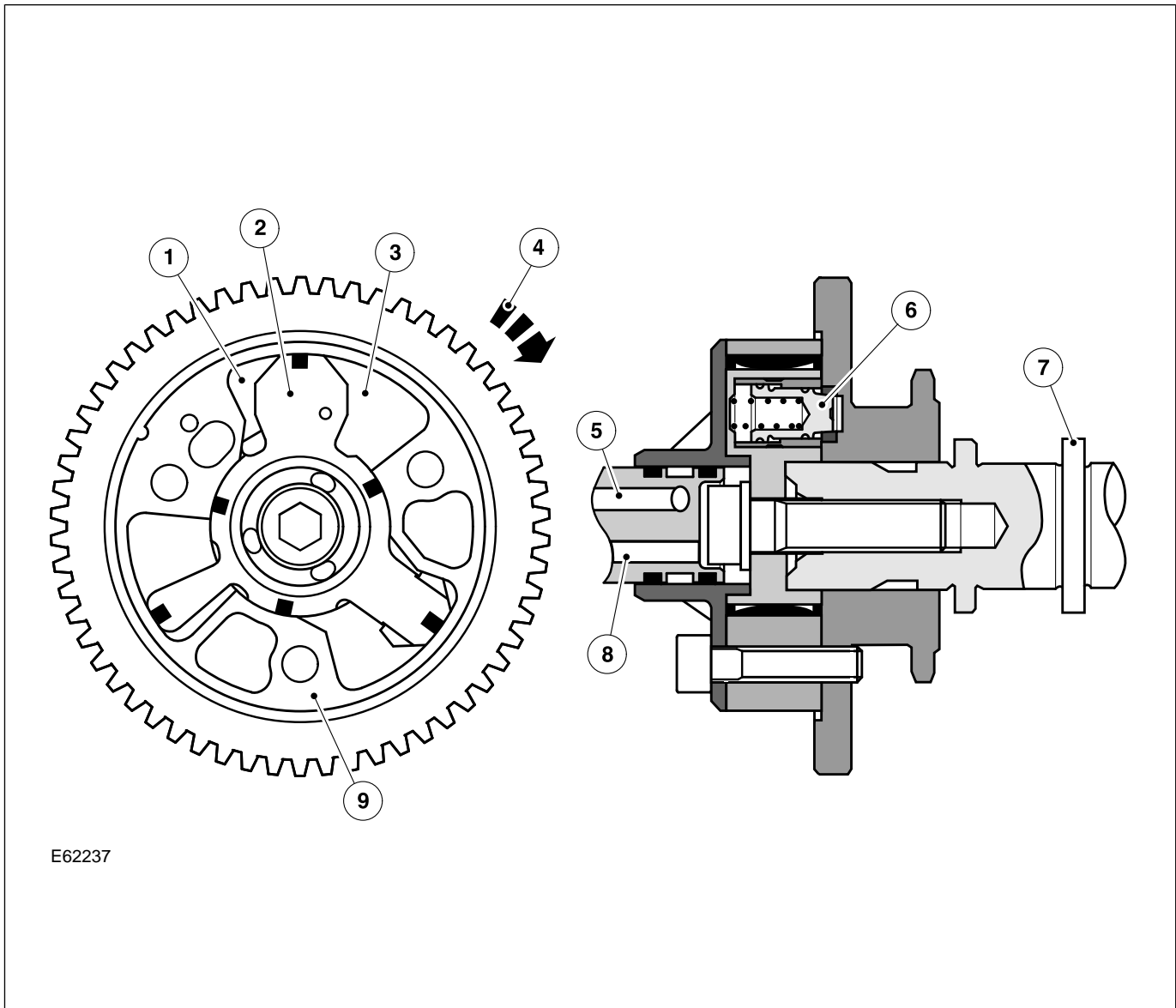
The engine control module (ECM) controls the VVT, using engine control signals pertaining to engine speed and load, and engine oil temperature to calculate the appropriate camshaft position.

The continuous VVT system provides the following advantages:

- Reduces engine emissions and fuel consumption by further optimizing the camshaft timing. This improves the engine's internal exhaust gas recirculation (EGR) effect over a wider operating range.
- Improves full-load torque characteristics as the camshaft timing is optimized at all engine speeds for superior volumetric efficiency.
- Improves fuel economy by optimizing torque over the engine's speed range.

This system also has the added benefits of operating at a lower oil-pressure and faster response time.

VVT Operation



Item	Description	Item	Description
1	Vane housing	6	Stopper pin
2	Vane shaft	7	Intake camshaft
3	Retard chamber	8	Retard chamber oil channel
4	Rotation direction	9	Advance chamber
5	Advance chamber oil channel		

The VVT unit is a hydraulic actuator mounted on the end of the intake camshaft, which advances or retards the intake camshaft timing and thereby alters the

camshaft to crankshaft phasing. The oil control solenoid, controlled by the ECM, routes oil pressure to either the advance or retard chambers located either side of the three vanes interspersed within the machined housing of the unit.

The VVT unit is driven by the primary chain and rotates relative to the exhaust camshaft sprocket. When the ECM requests the camshaft timing to advance, the oil control solenoid is energized moving the shuttle valve to the relevant position to allow engine oil pressure, via a filter, into the VVT unit's advance chambers. When the camshaft timing is requested to retard, the shuttle valve moves position to allow oil pressure to exit the advance chambers, while simultaneously routing the oil pressure into the retard chambers.

When directed by the ECM, the VVT unit will be set to the optimum position between full advance and retard for a particular engine speed and load. This is achieved by the ECM sending the energizing signal to the oil control solenoid until the target position is met. At this point, the energizing signal is reduced to hold the solenoid position, and as a result the position of the shuttle valve. This function is under closed-loop control, where the ECM will assess any decrease in shuttle-valve oil-pressure, via signals from the camshaft position sensor. The ECM will increase the energizing signal, when required, to maintain the shuttle-valve hold position.

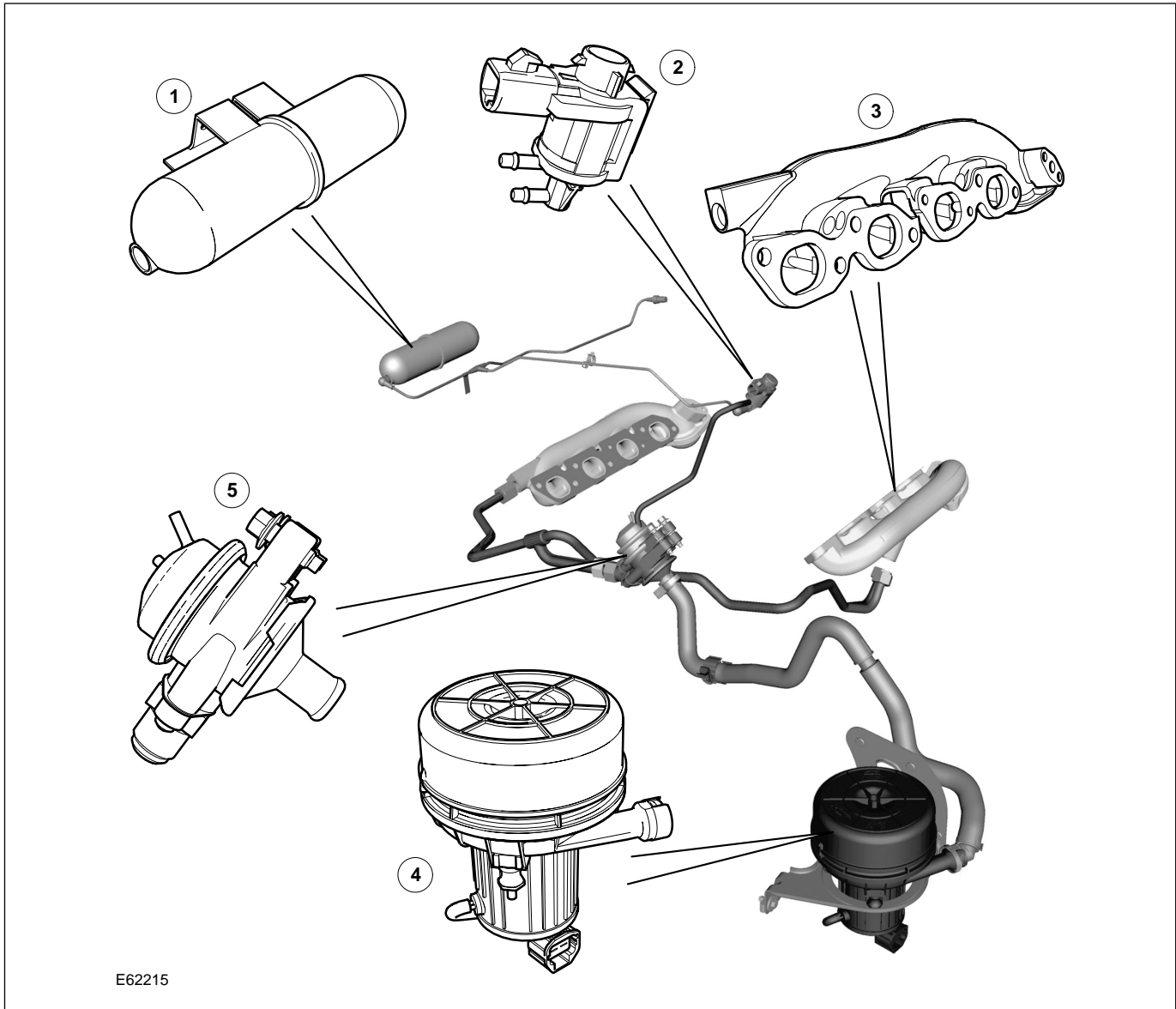
Engine oil properties and temperature can affect the ability of the VVT mechanism to follow demand changes to the cam phase angle. At very low oil-temperatures, movement of the VVT mechanism is sluggish due to increased viscosity, and at high oil-temperatures the reduced viscosity may impair operation if the oil pressure is too low. To maintain satisfactory VVT performance, an increased capacity oil pump is installed, plus an engine oil temperature sensor to enable monitoring by the ECM. The VVT system is normally under closed-loop control except in extreme temperature conditions, such as cold starts

below 0° Celsius. At extremely high oil-temperatures, the ECM may limit the amount of VVT advance to prevent the engine from stalling when returning to idle speed.

The VVT does not operate when engine oil-pressure is below 1.25 bar, as there is insufficient pressure to release the VVT unit's internal stopper pin. This usually occurs when the engine is shutting-down and the VVT has returned to the retarded position. The stopper pin locks the camshaft to the VVT unit to ensure camshaft stability during the next engine start-up.

Secondary Air Injection (AIR)

To assist in the reduction of exhaust emissions to meet European Union (EU) Stage 4 and Federal petrol Emission standards, secondary air injection (AIR) is now fitted to the vehicle.



E62215

NOTE: V8 secondary air injection system shown, V6 similar.

Item	Description	Item	Description
1	Secondary air injection vacuum reservoir	4	Secondary air injection pump
2	Secondary air injection vacuum solenoid valve	5	Secondary air injection control valve
3	Secondary air injection exhaust manifold		

The secondary air injection pump is used to provide a supply of air into the exhaust manifolds during the cold start period. The hot unburnt fuel particles leaving the combustion chamber mix with the air injected into the exhaust manifolds and heat up due to a chemical reaction known as a exothermic reaction.

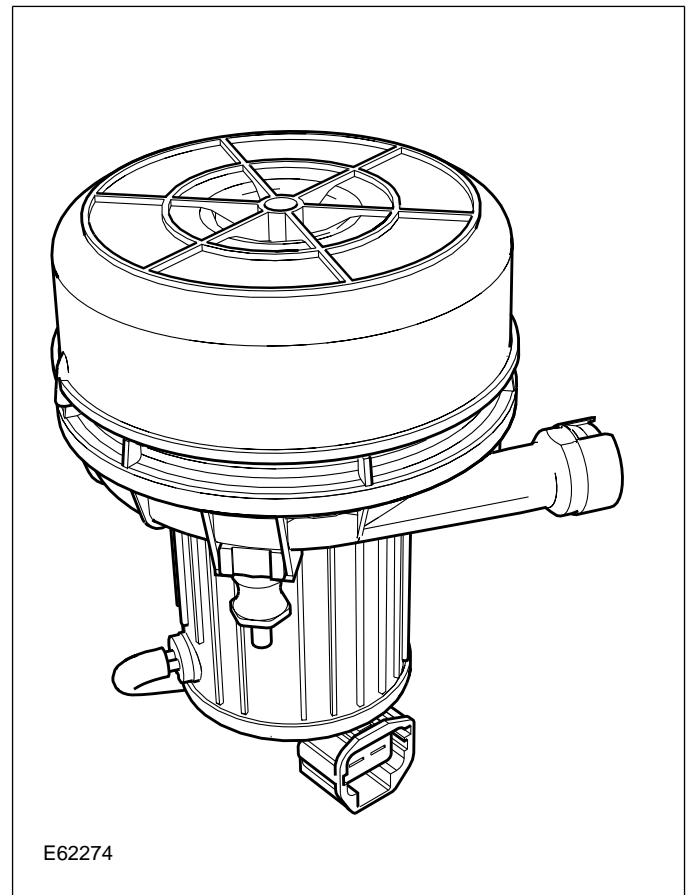
The additional heat generated in the exhaust manifold also provides rapid heating of the exhaust system catalytic converters. The additional oxygen which is delivered to the catalytic converters also generate an exothermic reaction which causes the catalytic converters to reach their optimum operating temperature and 'light off' quickly.

The catalytic converters only start to provide effective treatment of emission pollutants when they reach an operating temperature of approximately 250°C (482°F) and need to be between temperatures of 400°C (752°F) and 800°C (1472°F) for optimum efficiency. Consequently, the heat produced by the secondary air injection exothermic reaction reduces the time delay before the catalysts reach an efficient operating temperature.

The secondary air injection system comprises the following components:

- Secondary air injection pump
- Secondary air injection vacuum solenoid valve
- Secondary air injection control valve
- Secondary air injection vacuum reservoir
- Secondary air injection pump relay
- Secondary air injection pressure switch (North American Specification (NAS) vehicles only).

Secondary Air Injection Pump



The secondary air injection pump is located behind the left-hand side of the front bumper cover. The pump is fitted on rubber mountings to help suppress noise generated by secondary air injection pump operation. The secondary air injection pump is powered from the battery by a dedicated relay and supplies approximately 10-15 kg/hr (22-33 lb/hr) of air when the vehicle is at idle on initial start up from 20°C (68°F).

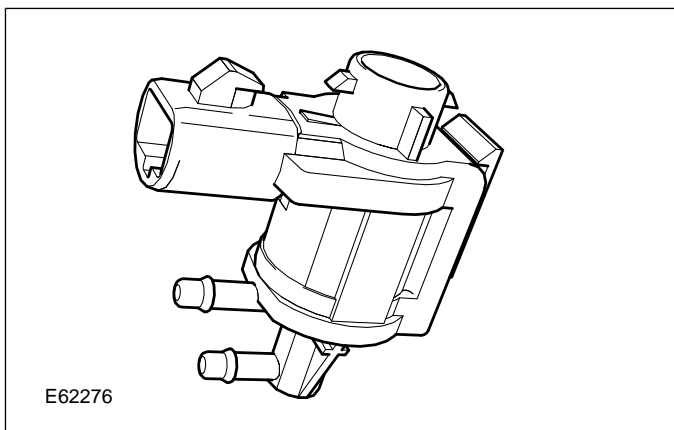
Air is drawn into the secondary air injection pump through vents in its front cover and is then passed through a foam filter. The air is delivered to the exhaust manifold on each side of the engine through a combination of plastic pipes and stainless steel tubes.

At the same time the secondary air injection pump is started, the engine control module (ECM) operates a secondary air injection vacuum solenoid valve, which opens to allow vacuum from the secondary air injection vacuum reservoir to be applied to the vacuum operated secondary air injection control valve. When the vacuum is applied to the secondary air injection control valve, it opens to allow the air from the secondary air injection pump through to the exhaust manifolds.

When the ECM operates the secondary air injection vacuum solenoid valve, the vacuum supply to the secondary air injection control valve is cut-off and the valve closes to prevent further air being injected into the exhaust manifold. At the same time as the secondary air injection vacuum solenoid valve is closed, the ECM operates the secondary air injection pump relay and this stops the secondary air injection pump.

If the secondary air injection pump is found to be malfunctioning the system can be checked using Worldwide Diagnostic System (WDS).

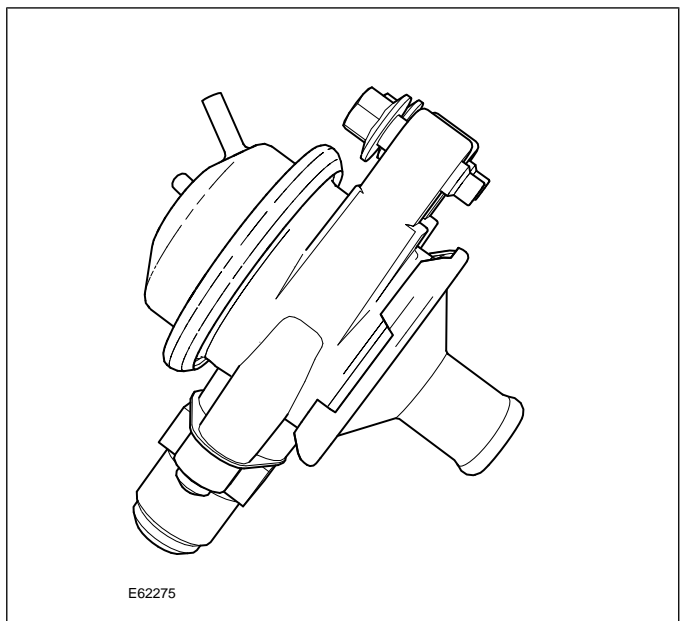
Secondary Air Injection Vacuum Solenoid Valve



The ECM switches on the secondary air injection vacuum solenoid valve at the same time as initiating secondary air injection pump operation. When the secondary air injection vacuum solenoid valve is open, a steady vacuum supply is allowed through to open the vacuum operated secondary air injection control valve. When the ECM de-energizes the secondary air injection vacuum solenoid valve, the valve closes and immediately shuts off the vacuum supply to the secondary air injection control valve at the same time as secondary air injection pump operation is terminated.

When the secondary air injection vacuum solenoid valve is de-energized, the vacuum supply line opens to atmosphere. This causes the secondary air injection vacuum solenoid valve to close automatically to prevent further air injection.

Secondary Air Injection Control Valve



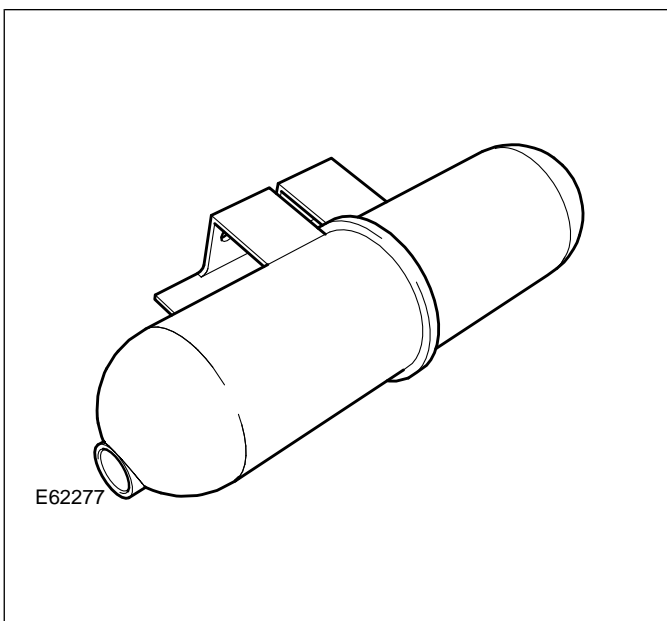
Forced air from the secondary air injection pump is controlled by the secondary air injection control valve. This allows the correct amount of air to be injected directly into the exhaust manifolds. The secondary air injection control valve prevents exhaust gases from blowing back into the secondary air injection pump.

The secondary air injection control valve is provided a vacuum from the secondary air injection vacuum reservoir located in the right-hand side of the engine bay. This allows the secondary air injection pump to run with less load, which reduces noise levels produced by the secondary air injection pump.

When the pressure in the exhaust system is higher than in the secondary air injection system, the secondary air injection control valve closes the circuit. This protects the secondary air injection system from exhaust gasses flowing back into the secondary air injection system.

Vacuum to the secondary air injection vacuum solenoid valve is supplied from the intake manifold vacuum by the secondary air injection vacuum reservoir. A small bore vacuum hose provides the vacuum route between the secondary air injection vacuum reservoir and secondary air injection vacuum solenoid valve. A further small bore vacuum hose is used to connect the secondary air injection vacuum solenoid valve to the secondary air injection control valve.

Secondary Air Injection Vacuum Reservoir



A secondary air injection vacuum reservoir is located on the right-hand side of the engine bay.

The secondary air injection vacuum reservoir is included in the vacuum supply line between the intake manifold and the secondary air injection vacuum solenoid valve.

The secondary air injection vacuum reservoir contains a one-way valve to stop vacuum leaking back towards the intake manifold side of the system. The secondary air injection vacuum reservoir holds a constant vacuum so that the secondary air injection control valve opens instantaneously as soon as the secondary air injection solenoid valve is energized.

Secondary Air Injection Pump Relay

The secondary air injection pump relay is located in the engine compartment junction box. The ECM controls operation of the secondary air injection pump by energizing or de-energizing the secondary air injection pump relay.

The secondary air injection pump receives its voltage supply from the secondary air injection pump relay. The ECM monitors the state of the relay for correct operation as part of its system diagnosis.

Secondary Air Injection Pressure Switch

The secondary air injection pressure switch is fitted to North American Specification (NAS) market vehicles only. The secondary air injection system is monitored by observing the system pressure by using the secondary air injection pressure switch at several instances during its cycle of operation.

Secondary air injection system pressure is measured before operation of the secondary air injection pump. The secondary air injection pump is then switched on simultaneously with the opening of the secondary air injection vacuum solenoid valve. After a delay to allow the secondary air injection system to stabilize, the system pressure is measured again, this time by taking the average of a 1 second duration of readings, and normalizing for variations in battery voltage and

atmospheric pressure. If the system pressure measured at this time has not risen enough with respect to the initial secondary air injection pressure reading then a failure will be flagged.

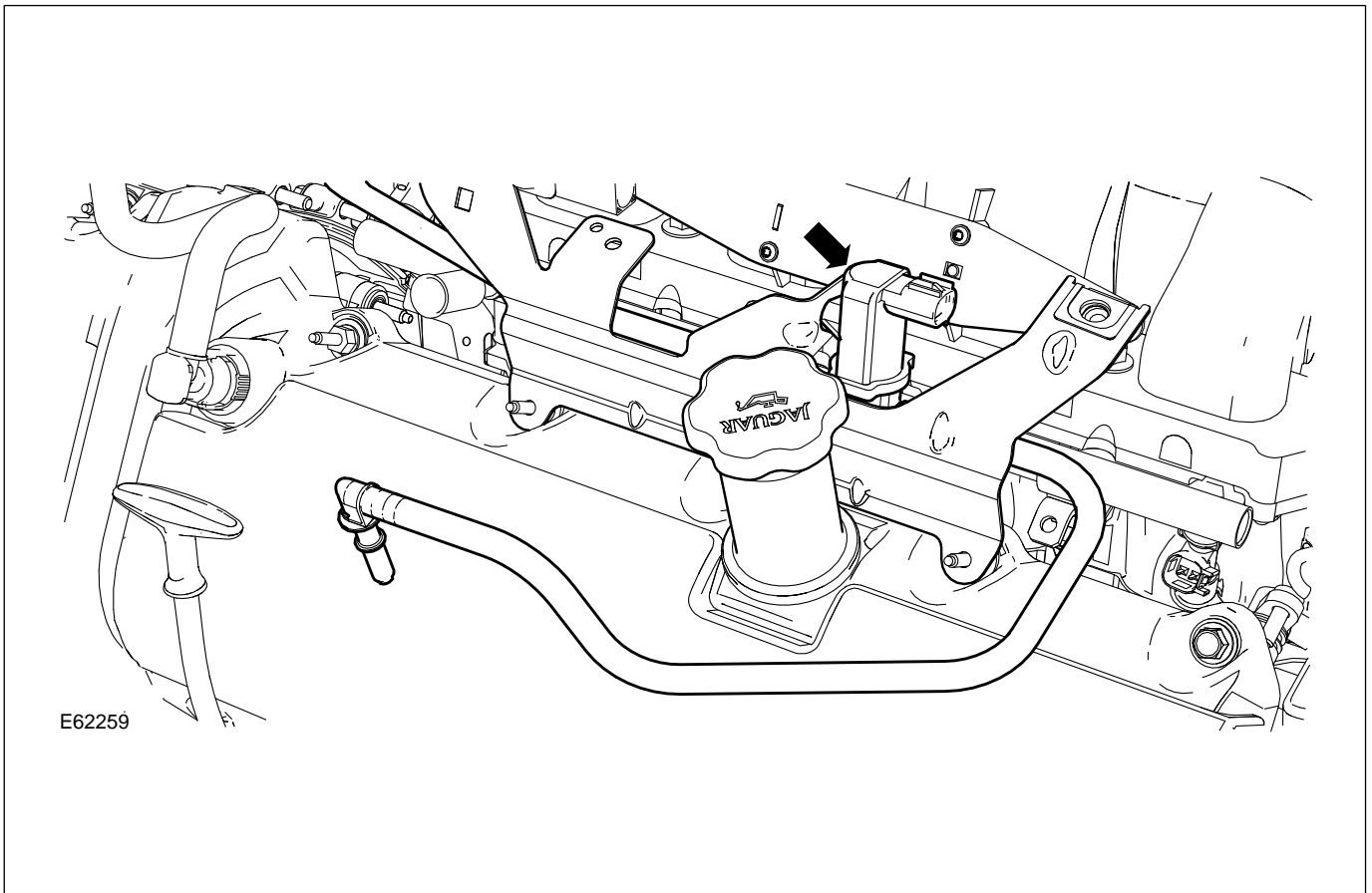
A second pressure measurement is made after the requirement for secondary air injection into the exhaust system has expired, but continuing on from the same period of secondary air injection pump operation. In this instance the pump is left running, against a closed secondary air injection vacuum solenoid valve. Again this pressure measurement is the average of a 1 second duration of readings normalized for variations in battery voltage and atmospheric pressure. If the system pressure measured at this time has not risen enough or has risen too much with respect to the system pressure during normal operation of secondary air injection then a failure will be flagged.

A final pressure reading is taken after the secondary air injection system has been switched off to ensure the system shuts down.

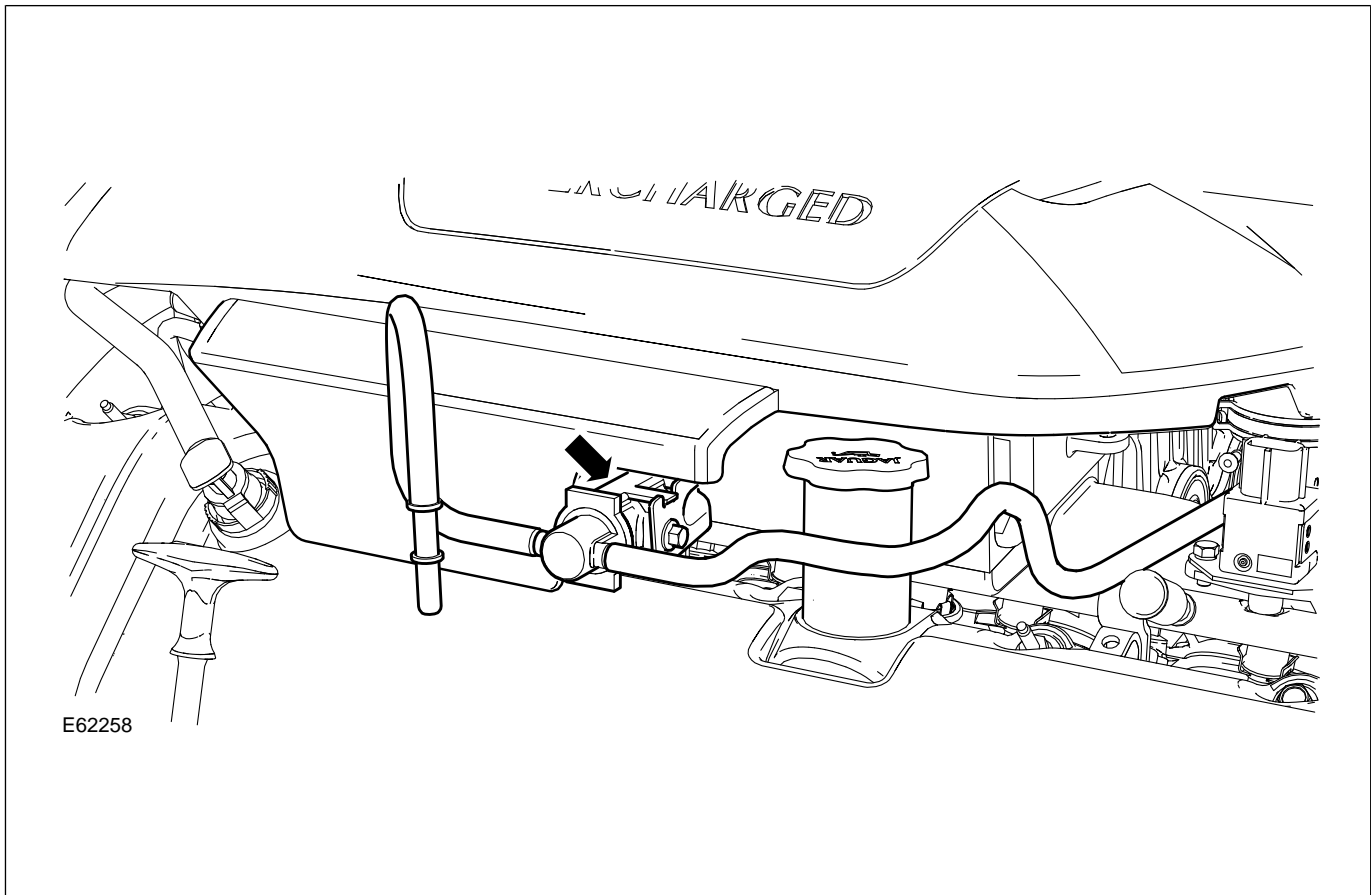
Evaporative Emission Canister Purge Valve

The evaporative emission canister purge valve has now been located on the engine in the left-hand bank cylinder head area. This has reduced noise emissions previously encountered when the valve was located on the engine compartment bulkhead.

Vehicles without supercharger



Vehicles with supercharger



The Engine Control Module (ECM) operates the valve to purge fuel vapor from the evaporative emission canister into the engine for combustion. Purge rates (the extent that the purge valve opens) are determined by the engine operating conditions and the vapor concentration level. The purge rates are adjusted to maintain vehicle, driving characteristics and exhaust emissions at optimum levels.

The engine operating conditions that affect the purge rate are:

- speed and load
- coolant temperature
- time from engine start-up
- closed loop fueling.

To determine the vapor concentration level, the ECM applies stepped opening signals to the purge valve and monitors the subsequent fueling correction. This is

usually performed before purging, so when purging starts, the purge valve can immediately be set to the optimum position. If the ECM is unable to determine the vapor concentration before purging, it uses a default value, which it modifies while purging is in process.

NOTE: A test port, for use in North American Specification (NAS) markets only, is provided on the purge valve line to enable leak test diagnosis of the fuel system.

Variable Valve Timing (Vehicles with supercharger)

The Engine Control Module (ECM) controls the fully-variable phase change system which acts on the intake camshafts.

- The target position of both camshafts is optimized to provide the best compromise between performance, refinement, fuel economy, and emissions.
- During transient operation the rate of change of the camshaft position is controlled to provide a smooth vehicle operation.
- Operation of variable valve timing (VVT) will be restricted if environmental conditions exist that could affect normal operation of the VVT, for example very low ambient temperatures.
- Provision is made to ensure that the intake camshafts are restrained in the retard position during engine start.
- The ECM will detect a VVT mechanical malfunction, and act to compensate for the malfunction.

Three-way Catalytic Converter

Petrol vehicles use three-way catalytic converters. These three-way catalytic converters use honeycomb structured monolithic elements known as substrates. The substrates are coated with palladium which converts hydrocarbons, carbon monoxide and nitrogen oxides into harmless products (carbon dioxide, water and nitrogen).

In order to meet more stringent European Union (EU) Stage 4 Petrol Emission standards and North American Low Emission Vehicle (LEV) II Ultra Low Emission Vehicle (ULEV) II standards, the catalyst substrates have been changed so that all engine derivatives employ 2 x 44 in³ catalyst substrates in each downpipe, the front having 900 cells/in² and the rear 400 cells/in². They have also received additional coatings of palladium.

Please see the below tables for the improvements in the exhaust emissions.

Oxidizing Catalytic Converter

Diesel vehicles use oxidizing catalytic converters. These oxidizing catalytic converters use a honeycomb structured element known as a monolithic structure.

The monolithic structure is coated with platinum which converts hydrocarbons, carbon monoxide and nitrogen oxides into harmless products (carbon dioxide, water and nitrogen).

To further assist in the reduction of exhaust emissions to meet EU Stage 4 Diesel Emission standards, a diesel particulate filter has been introduced, see Diesel Particulate Filter in this document.

Exhaust Emission Comparison EU Stage 3 to EU Stage 4

Vehicles with Petrol Engine

EU Emissions Standard	HC (Hydrocarbon)	NOx (Nitric oxide and nitrogen dioxide)	CO (Carbon monoxide)
Stage 3	0.20 grammes per km at 80,000 km	0.15 grammes per km at 80,000 km	2.30 grammes per km at 80,000 km
	0.20 grammes per 0.62 mile at 49,600 miles	0.15 grammes per 0.62 mile at 49,600 miles	2.30 grammes per 0.62 mile at 49,600 miles
Stage 4	0.10 grammes per km at 100,000 km	0.08 grammes per km at 100,000 km	1.0 grammes per km at 100,000 km
	0.10 grammes per 0.62 mile at 62,000 miles	0.08 grammes per 0.62 mile at 62,000 miles	1.0 grammes per 0.62 mile at 62,000 miles

Vehicles with Diesel Engine

EU Emissions Standard	NOx (Nitric oxide and nitrogen dioxide)	HC (Hydrocarbon) and NOx	CO (Carbon monoxide)	Particulates
Stage 3	0.50 grammes per km at 80,000 km	0.56 grammes per km at 80,000 km	0.64 grammes per km at 80,000 km	0.05 grammes per km at 80,000 km
	0.50 grammes per 0.62 mile at 49,600 miles	0.56 grammes per 0.62 mile at 49,600 miles	0.64 grammes per 0.62 mile at 49,600 miles	0.05 grammes per 0.62 mile at 49,600 miles
Stage 4	0.25 grammes per km at 100,000 km	0.30 grammes per km at 100,000 km	0.50 grammes per km at 100,000 km	0.025 grammes per km at 80,000 km
	0.25 grammes per 0.62 mile at 62,000 miles	0.30 grammes per 0.62 mile at 62,000 miles	0.50 grammes per 0.62 mile at 62,000 miles	0.025 grammes per 0.62 mile at 49,600 miles

Exhaust Emissions North America

Exhaust Emissions to Ultra Low Emission Vehicle (ULEV) II Standards.

Vehicles without Supercharger

Emissions Standard	Hydrocarbons
ULEV II	0.055 grammes per mile at 120,000 miles

Exhaust Emissions to North American Low Emission Vehicle (LEV) II Standards.

Vehicles with Supercharger

Emissions Standard	Hydrocarbons
LEV II	0.090 grammes per mile at 100,000 miles

Diesel Particulate Filter

Diesel emissions are 90% lower today than they were in the 1980s; however exhaust regulations based on statistical studies dealing with the health impact of diesel emissions continue to demand even lower emissions. Therefore, in order to comply with the strict EU Stage

4 Diesel Emission standards emission limits, which now stipulate a further 84% reduction in gaseous and particulate emissions, an exhaust emission control system is used on the S-Type 2.7L Diesel.

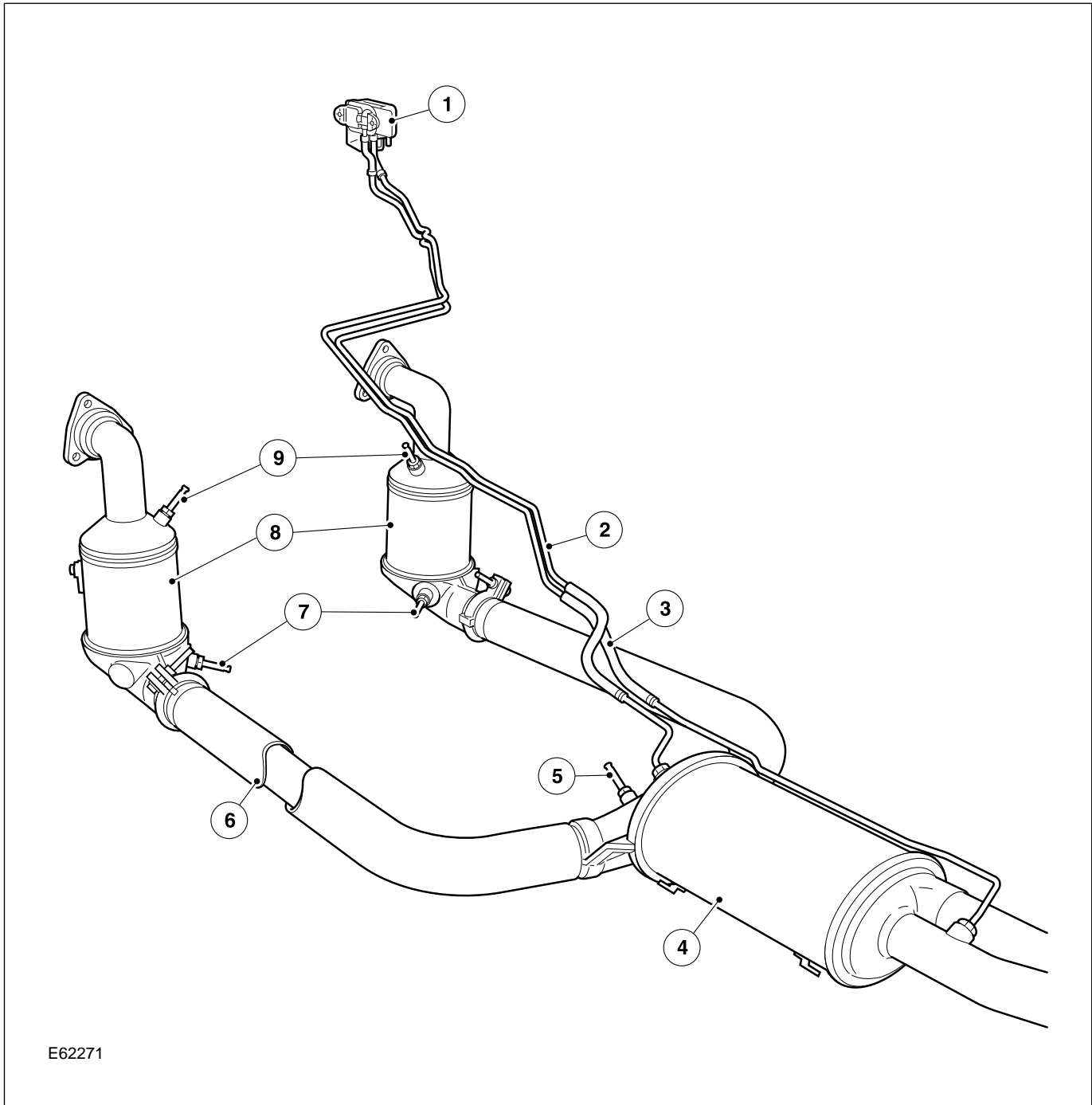
The primary component of the system is the Diesel Particulate Filter (DPF), which has been proven to be effective in reducing particulate emissions to negligible levels. The main ability of the particulate filter is its

capacity for regeneration, destroying the particulates trapped in the filter at calculated intervals, in such a way

that the process is unnoticed by the driver.

Diesel Particulate Filter Operation

Diesel Particulate Filter and Sensors



Item	Description	Item	Description
1	Differential pressure sensor	6	Double skin pipe
2	High pressure pipe	7	Temperature sensor - catalyst downstream
3	Low pressure pipe	8	Oxidation catalytic converter
4	Diesel Particulate Filter (DPF)	9	Temperature sensor - catalyst upstream
5	Temperature sensor – DPF		

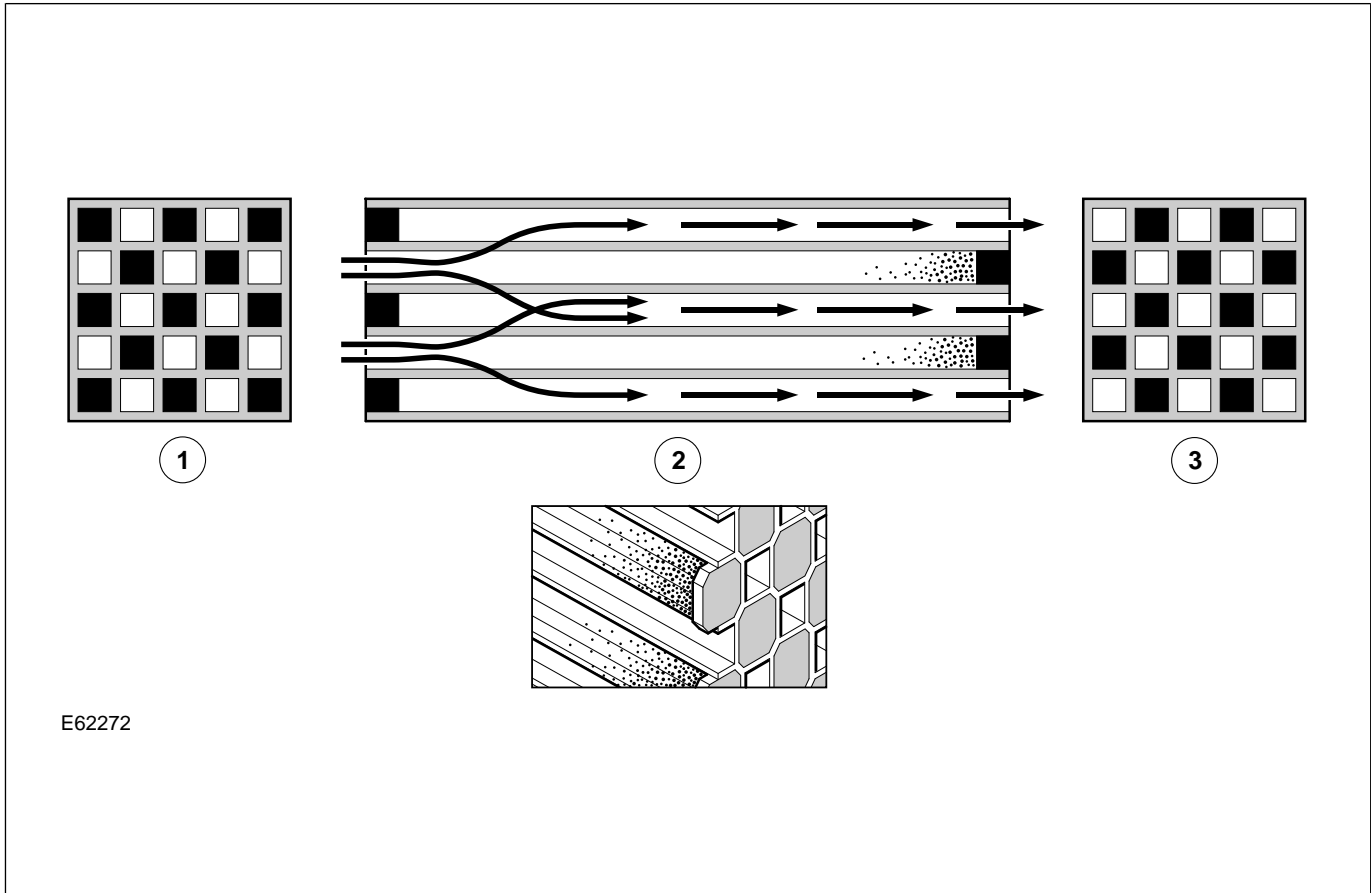
Diesel particulate emissions are a complex mixture of solid and liquid components although mainly consisting of carbon microspheres on which hydrocarbons from the fuel and lubricant condense. Particulates are responsible for the characteristic black exhaust fumes that are emitted from the diesel engine.

The DPF uses new filter technology based on a combined filter and oxidation catalytic converter to store, and when conditions determine, destroy the particulates. Made of silicon carbide the filter has good thermal shock resistance and thermal conductivity properties, plus a flexible range of porosity. When considering exhaust system design, filter porosity is an

important factor in maintaining the most favorable exhaust back pressure and therefore the porosity is customized to the engine's requirements.

The porous substrate in the filter's interior consists of thousands of "storage" channels, closed at one end. Exhaust gasses pass through the porous substrate, leaving the particulates behind that are too big to pass through the pores. Composition of the filter also includes a wash coating to the surface of the filter with platinum and other active components; materials used in the manufacture of oxidation catalytic converters. The catalytic coating promotes particulate combustion and oxidizes carbon monoxide and hydrocarbon emissions.

Diesel Particulate Filter Internals



E62272

Item	Description
1	Front Face (showing alternate closed cells)
2	Side View (showing exhaust gas flow through the filter and particulate build-up)
3	Rear Face (showing alternate closed cells)

DPF Module

The DPF module is incorporated in the engine control module (ECM).

The DPF module monitors and supervises the operation of the DPF system while also monitoring diagnostic data. The DPF module is divided into three sub-modules controlled by the coordinator module. The DPF coordinator module manages the operation of different features when a forced regeneration is requested or stopped by the supervisor module.

- The DPF supervisor module is a subsystem of the coordinator module.
- The DPF fuel-management module calculates the timing and quantity for four injections as well as the injection pressure during regeneration.
- The DPF air-management module contains the control for EGR, boost pressure, air pressure in the intake manifold.

Once a regeneration request is set by the supervisor module the coordinator requests EGR cut off. It awaits a feedback signal from the EGR system indicating that the valve is shut. It switches to a state waiting for an

accelerator pedal release manoeuvre from the driver. If this occurs or a calibratable time elapses, the regeneration process starts.

DPF Fuel Management Module

The fuel management module controls:

- Timing and quantity of four split injections per stroke (pilot, main, and two post injections).
- Injection pressure and transition between two different levels of injection. These are dependent on the state of the close-coupled catalysts and the state of the DPF.

DPF Air Management Module

The DPF air management module consists of:

- EGR control shut off
- Boost pressure control by throttling and turbocharger vane movement.

During regeneration, the EGR feature is shut off. The module controls the level of boost required in the intake manifold, it decides which form of closed loop control is best to achieve the desired change. This is required to achieve correct in-cylinder conditions for a stable and robust combustion of the post-injected fuel as well as maintaining tight turbine temperature tolerances.

The module controls the intake air pressure during regeneration by actuating the intake throttle as well as adjustment of turbocharger vane position.

The DPF module monitors the load status of the particulate filter based on driving style, distance driven, and by signals from the differential pressure sensor. When the particulate loading in the filter reaches a threshold, the filter is actively regenerated by adjusting, in accordance with requirements, various engine-control functions, such as:

- fuel injection
- intake-air throttle
- exhaust-gas recirculation
- boost-pressure control.

This control function is made possible by the flexibility of the common-rail fuel injection system in providing the precise control of:

- fuel-flow
- fuel pressure
- injection timing.

All are essential requirements for an efficient regeneration process.

Two process are used to regenerate the particulate filter, “passive regeneration” and “active regeneration”:

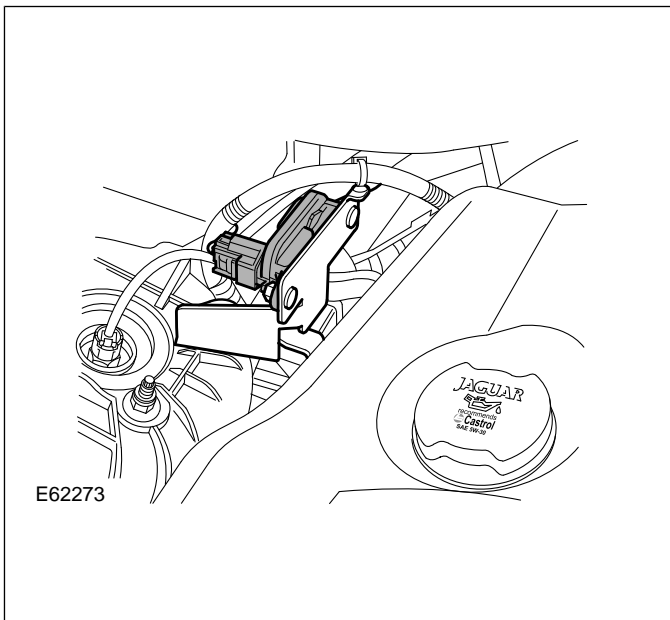
Passive regeneration involves the slow environment-protecting conversion of the particulates deposited in the filter into carbon dioxide (CO₂). This regeneration process comes into effect when the filter’s temperature reaches approximately 250 °C and occurs continuously when the vehicle is being driven at high engine loads and speeds. No special engine management intervention is initiated during passive regeneration, allowing the engine to operate as normal. Only a portion of the particulates are converted to CO₂ during passive regeneration and due to chemical reaction this process is only effective within the temperature range of 250 °C to 400 °C. Above this temperature range the conversion efficiency of the particulates into CO₂ subsides as the temperature of the filter increases.

Active regeneration commences when the particulate loading in the filter reaches a threshold as monitored and determined by the DPF module; based on driving style, distance driven and exhaust back pressure signals supplied by the differential pressure sensor. Active regeneration generally occurs approximately every 800 kilometers (500 miles) although this will depend on how the vehicle is driven. If the vehicle has operated for a length of time at low-loads, active regeneration will be

initiated more often. This is due to a more rapid build-up of particulates in the filter than if the vehicle has been driven periodically at greater speeds, where passive regeneration would have occurred.

A mileage trigger incorporated within the DPF module is used as a backup for initiating active regeneration. If regeneration has not been activated by estimated soot loading after a threshold distance has been driven; regeneration will then be requested on the basis of distance driven.

Differential Pressure Sensor



Active regeneration of the particulate filter is started by raising the temperature in the particulate filter up to the combustion temperature of the particulates. A principal method of increasing the exhaust gas temperature is by introducing post-injection, that is after the pilot and main injections have taken place.

- First post-injection retards combustion inside the cylinder to increase the heat of the exhaust gas.
- Second post-injection injects fuel late; fuel partly combusts in the cylinder but also sweeps down the exhaust where unburned fuel continues to burn in the catalyst, raising the filter's temperature further.

Active regeneration takes approximately 20 minutes to complete. The first phase is to raise the temperature of the close coupled catalysts. In the second phase the temperature of the filter is increased to 600 °C, the optimum particulate combustion temperature. This temperature is maintained for 15 to 20 minutes to ensure complete destruction of the particulates captured in the filter. The combusted particulates produce CO₂ and water (H₂O).

The system compensates for all climatic and altitude changes. Active regeneration aims to achieve a target temperature of 600 °C at the inlet of the DPF without exceeding the temperature limits of the turbochargers and close-coupled catalysts; refer to **Active Regeneration Protection Limits** below.

During the active regeneration period:

- The turbochargers are maintained in the fully open position to minimize heat transmission from the exhaust gas to the turbochargers. This enables optimum heating of the particulate filter. If the driver demands a higher torque the turbochargers will respond by closing the vanes as required.
- The throttle is used to assist in boost pressure control whilst the turbochargers are in the fully open position.
- The exhaust gas recirculation (EGR) valves are closed as the turbine gas temperature would overheat the EGR valves, also with high levels of throttling the engine would consume uncontrollable levels of exhaust gas.

⚠ WARNING: Care should be taken when working within the vicinity of the DPF as it can reach temperatures of up to 1000 °C during regeneration. Failure to follow this instruction may result in personal injury.

Active Regeneration Protection Limits

For engine and other component protection and durability the DPF module implements some limits during the active regeneration phase, in particular:

- Temperature before the turbocharger inlet must remain below 830 °C for turbocharger protection.
- Close-coupled catalyst in-brick temperatures must not exceed 800 °C and exit temperature must remain below 750 °C.

Oil Degradation

A downside of active regeneration is oil dilution due to small amounts of fuel entering the engine crankcase during the post-injection phases. This has made it necessary, in extreme circumstances, to reduce the oil service intervals. The driver is alerted to this by the instrument-cluster message center.

The DPF module monitors driving style, active regeneration frequency and duration. Using this information the module predicts the level of oil dilution. When the oil dilution level reaches a threshold value, a warning will be displayed in the instrument cluster.

Depending on driving style, this will mean that some vehicles will need oil changes more frequently than the standard 15,000 miles interval.

Fuel Consumption

There will be a small increase in fuel consumption due to active regeneration of the DPF. During regeneration the fuel consumption approximately doubles. However, because regeneration happens relatively infrequently the overall increase in fuel consumption is small.

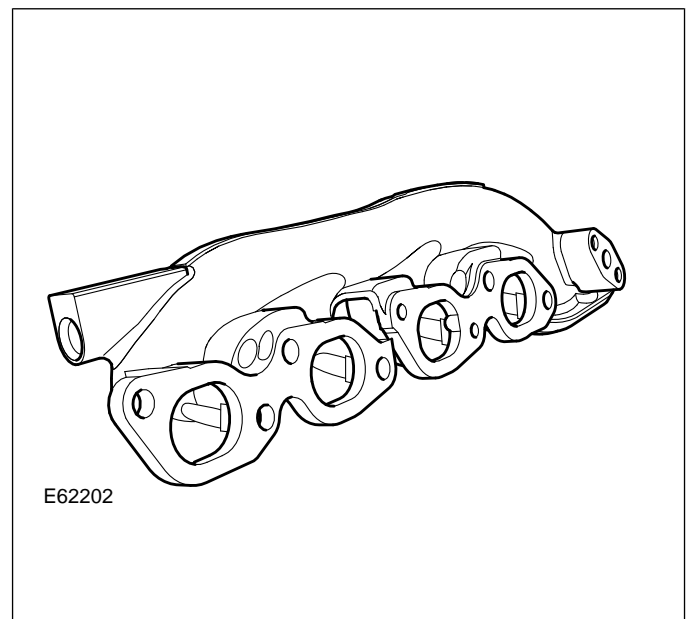
Dealer Intervention

For drivers who run frequent short journeys at low speeds, it may not be possible to effectively regenerate the DPF. In this case, the DPF module will detect a particulate overload condition and a warning message will be displayed to the driver in the instrument cluster message center.

This message will read "DPF FULL SEE HANDBOOK" accompanied, initially, by an amber warning. The driver will be given the opportunity to regenerate the particulate filter by driving at a moderate speed with the engine fully warmed. If this is ignored the amber warning indicator will change to red and the vehicle must then be taken to an authorised dealer for the filter to be regenerated. For additional information refer to GTR.

There is no requirement to remove ash or other stubborn compounds during the full life of the filter under normal operation.

Exhaust Manifold



Due to the introduction of secondary air injection, this vehicle has been fitted with revised exhaust manifolds.

These manifolds have a threaded union which the stainless steel secondary air injection tubes attach to.

If a vehicle is not fitted with secondary air injection, these threaded unions are fitted with a blanking cap to seal the exhaust system.

Bluetooth

2006 model year (MY) sees the introduction of a Bluetooth® communications network system to the S-TYPE.

Bluetooth is a way of communicating with various electronic devices that are equipped with specialized chips using a short-range radio link. It allows most devices to converse with one another by creating a universal language. The devices then form a private network known as a "personal area network".

Interaction between Bluetooth devices can take place without direct human intervention whenever two or more Bluetooth devices are within each other's range. This then enables the Bluetooth transceiver chip to trigger an automatic connection to deliver and accept a flow of data.

Bluetooth devices operate on a radio frequency band known as the Industrial, Scientific, and Medical frequency. The Industrial, Scientific, and Medical radio frequency band is 2.40 GigaHertz (GHz) to 2.48 GHz which is divided into 79 channels, each carrying a bandwidth of 1 MegaHertz (MHz).

The devices use the 79 individual randomly chosen channels within the frequency band, changing from one to another on a regular basis. The Bluetooth transmitters change frequencies approximately 1,600 times every second, meaning that more devices can utilize the limited slice of the radio frequency.

Since every Bluetooth transmitter uses this technique automatically, it's most unlikely that two transmitters will be on the same frequency at the same time. This technique minimizes the risk of disruption to Bluetooth devices, as any interference on a particular frequency will last only a fraction of a second.

The Bluetooth system comprises of:

- A Bluetooth upgrade module
- A Portable Support Electronics (PSE) module

- A voice activated control module
- A microphone
- Steering wheel telematics control switches
- The audio unit.

The Bluetooth upgrade module allows the driver to integrate their personal cellular phone to the vehicle. When a cellular phone is paired to the vehicle, it allows the storage of up to 500 individual phone numbers and 40 related voice tags to the voice activated control module. These stored phone numbers can then be accessed using the audio unit control buttons, the audio unit touch screen (if fitted) or steering wheel telematics control switches. The voice tags can be accessed by using the steering wheel telematics control switches when utilizing the voice activation facility.

If a cellular phone has been paired to the vehicle and an additional cellular phone is also paired to the vehicle, the new stored phone numbers and voice tags will overwrite the previous phones stored data.

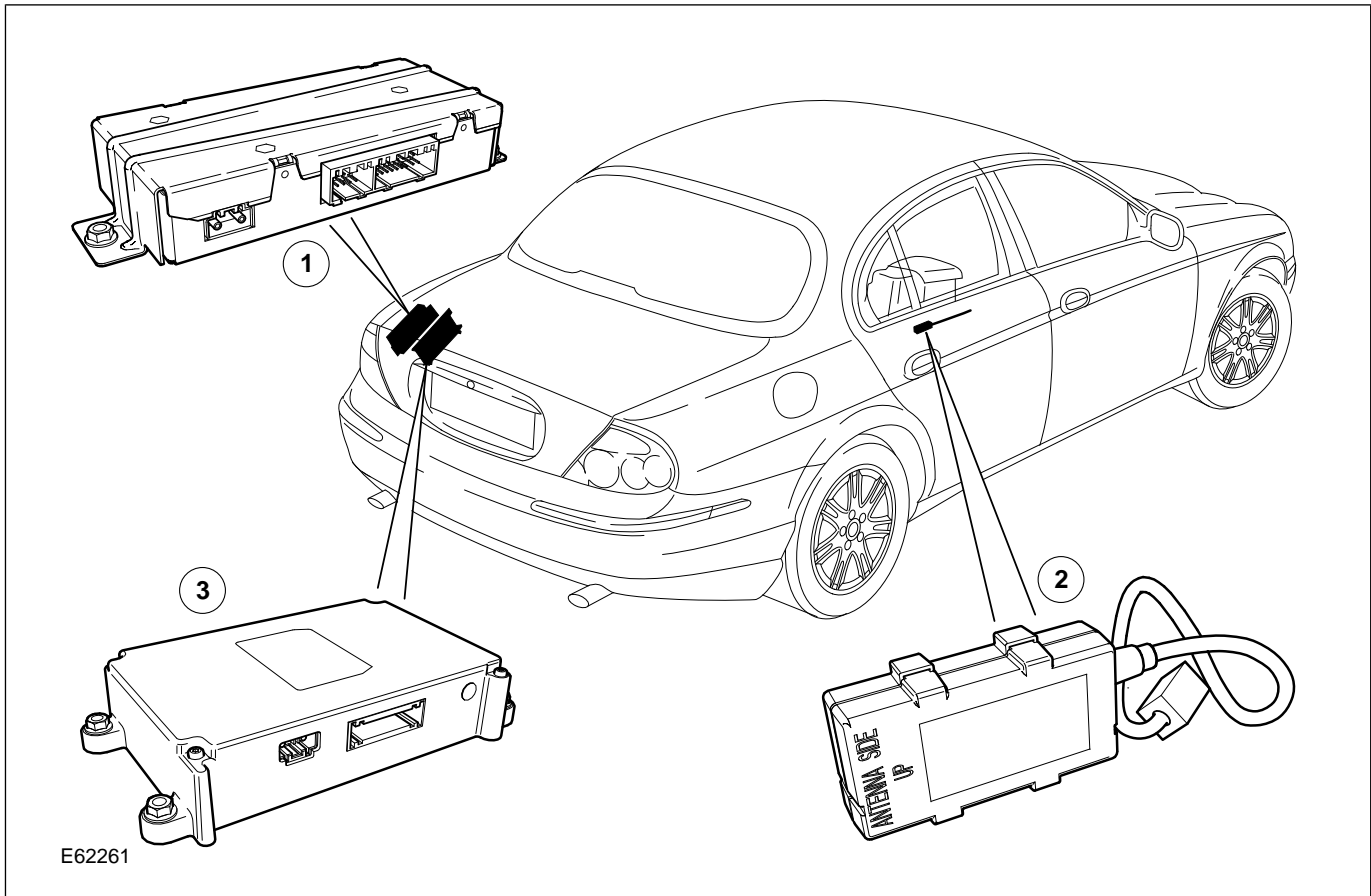
Phone numbers stored to the PSE and voice tags stored to the voice activated control module need to be manually updated should alterations be required. If a new phone number has been added to the cellular phone memory, it will need to be added manually to the vehicle memory.

Once stored to the vehicle, the phone numbers can be viewed on the audio unit screen. The audio unit and touch screen operates as per previous models.

For vehicles fitted with a touch screen controlled audio unit it is possible to memory redial the last 10 dialed phone numbers from the vehicle. For vehicles fitted without a touch screen controlled audio unit it is only possible to memory redial the last dialed phone number from the vehicle. These dialed phone numbers are stored in the PSE module memory and not from the cellular phone's memory.

The Bluetooth system does not require a phone cradle or it's own individual vehicle antenna. As a consequence

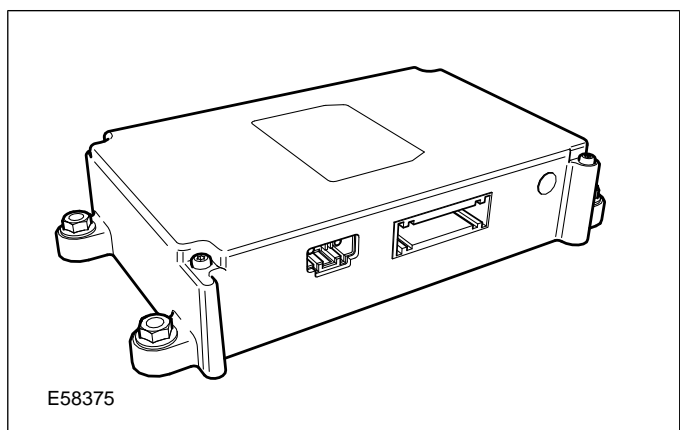
of this, there is no cellular phone signal amplification or in-car charging facilities.



Item	Description
1	Voice activated control module
2	Bluetooth upgrade module
3	Portable Support Electronics (PSE)

Portable Support Electronics (PSE) Module

The Portable Support Electronics (PSE) module is located in the left-hand side of the luggage compartment.



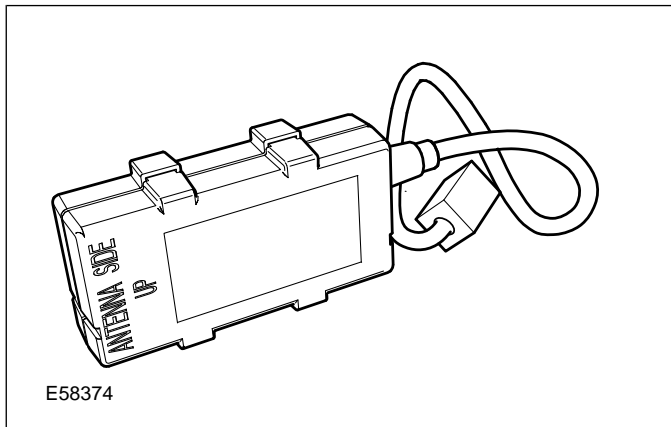
The PSE module is fixed to a bracket which also supports the Voice Activation Control Module (VACM) and the navigation control module.

The PSE module has one electrical connector and one optical connector. The module is unique to Jaguar, but utilizes carry over hardware.

The PSE module stores up to 500 phone numbers and the last 10 dialed phone numbers from the vehicle.

Bluetooth Upgrade Module

The Bluetooth upgrade module is located under the center console and is attached to the center console using velcro.

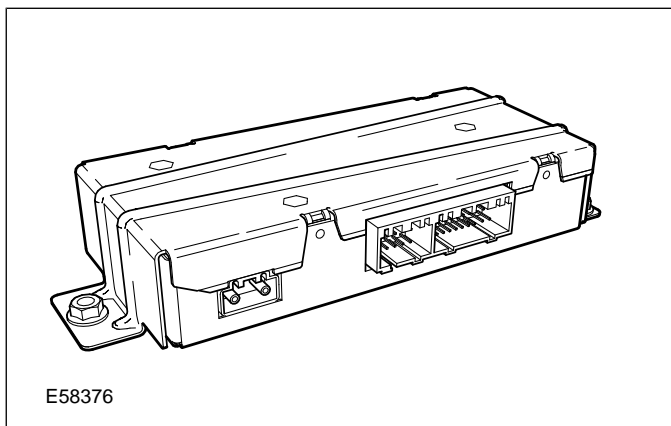


The Bluetooth upgrade module has one electrical connector and communicates with the PSE module by its own proprietary communications bus.

The Bluetooth upgrade module communicates with the driver's cellular phone and integrates it into the vehicle system transferring information such as call status and phonebook information to the PSE.

Voice Activated Control Module

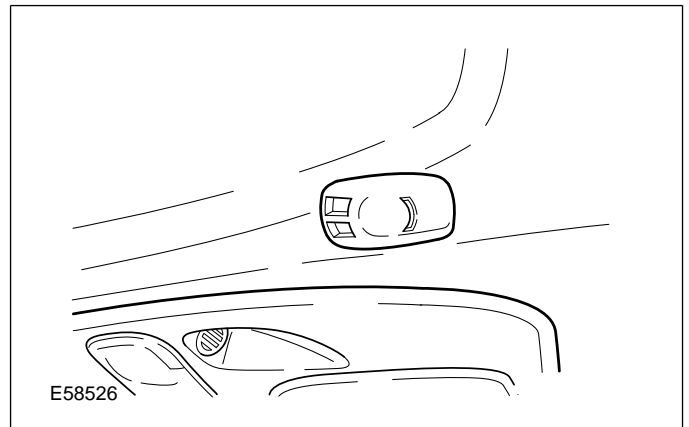
The voice activated control module is located in the left-hand side of the luggage compartment.



The voice activated control module is fixed to a bracket which also supports the PSE and the navigation control module.

The voice activated control module stores up to 40 voice tags.

Microphone



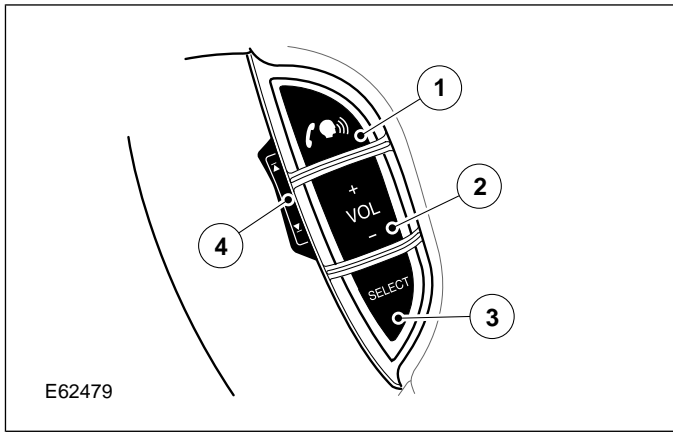
The microphone is located above the driver and is attached to the headliner.

Steering Wheel Telematics Control Switches

To ensure minimum disruption to concentration when driving, limited control of audio, telephone and voice activation systems is possible using the steering wheel telematics control switches.

The control switches provide the following phone functionality:

- Answer phone call/end handsfree calls
- Increase or decrease volume
- Cycle through phone memory.



Item	Description
1	Press to start voice session, or mute when voice is not fitted. Answer phone call when ringing. Send/End when in phone mode.
2	Press as required to increase or decrease volume.
3	Press and hold for 2 seconds to select Phone Ready mode.
4	In phone mode main screen, press to scroll up or down through the numbers stored in the phone memory.