FORD **TRAINING**

Technical Service Training

FORD **Focus**

New Model Introduction - Supplement

P346 R010 01

CGAPA/S en

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Please remember that our training literature has been prepared for FORD TRAINING PURPOSES only. Repairs and adjustments MUST always be carried out according to the instructions and specifications in the workshop literature. Please make full use of the training offered by Ford Technical Training Courses to gain extensive knowledge of both theory and practice.

Ford-Werke GmbH
Service training programs D-F/GT1 (GB)

The 2016 Focus RS is the latest in a line of iconic cars developed by Ford. Experts in small-car engineering, the Ford Performance Team has consistently pioneered innovative performance technologies.

Featuring the new Ford performance All-Wheel Drive with Dynamic Torque Vectoring, the RS offers the next level in handling capability.

The RS has taken the 2.3L engine to another level with its unique turbo charger, cooling and exhaust. With well in excess of 257 kW and 440 Nm of torque, with the ability to over boost to an output of 470 Nm of torque.

Configuration of the RS drive options will enable street or on track performance:

Select Normal, Sport, Track, or the special Drift mode control that lets you achieve controlled oversteer drifts under track conditions

With enhanced aerodynamic redesigns of the front grille and the rear diffuser and the unique spoiler addition, Focus RS creates zero lift overall for optimum high-speed handling

The high-performance character also comes through with its sleek interior design.

The details are simply impressive with a new flat-bottomed steering wheel that has a soft-feel leather covered rim, RECARO® sport seats, alloy pedals and unique instrument graphics.

Course Objectives

At the conclusion of the course, the technician will be able to identify the unique vehicle features and systems on the 2016 Focus RS.

Course Outcomes

At the conclusion of this course the Technician will be able to:

- Identify the 2.3 EcoBoost engine features and operation
- Identify the front and rear suspension
- Identify the dynamic suspension system
- Identify the wheel and tire options
- Identify the braking system
- Identify the manual transmission
- Identify the all wheel drive system
- Identify the exhaust system
- Identify the instrument panel
- Identify the adaptive exterior lighting
- Identify the front seats
- Identify the instrument panel and console
- Identify changes to the body structure

Course Materials

In order to participate in this New Model Training course you will require the following material:

- Integrated Study Guide (ISG)
- Pen and/or highlighter

Preface

This ISG contains information for the training course and for future reference, however, some of the information contained in this publication may not be covered in the training. In time, the information contained in this ISG may also become superseded and therefore inaccurate and/or obsolete. Always refer to the current Workshop Manual (WSM) and Owner Guide along with the latest Technical Service publications to obtain the most accurate and up to date information.

- Always read the ISG again soon after completing the training course
- Arrive early and be prepared to participate in the training
- Always refer to current Service Publications for further information

Table of Contents

Lesson 4 – Electrical

Lesson 5 – Body and Paint

Introduction

Key Vehicle Features

Chassis

- Front and rear suspension
- Wheels and tires
- Dynamic Suspension
- Braking - Brembo
- Power steering EPAS

Powertrain

- Engine
  - 2.3L EcoBoost 257 Kw
- Manual transmission MMT6
- AWD (all-wheel drive)
- Exhaust System

Electrical

- Instrument panel
- Adaptive exterior lighting

Body

- Instrument panel and console
- Vehicle body strengthening

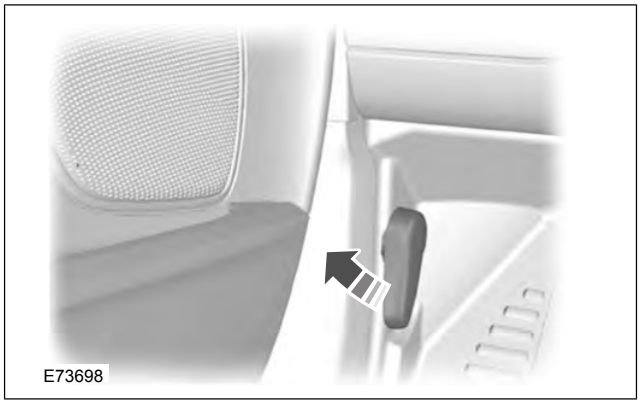
Vehicle Exterior

1 Front fog lamps
2 Trapezoid grille
3 Bi - Xenon head lamps

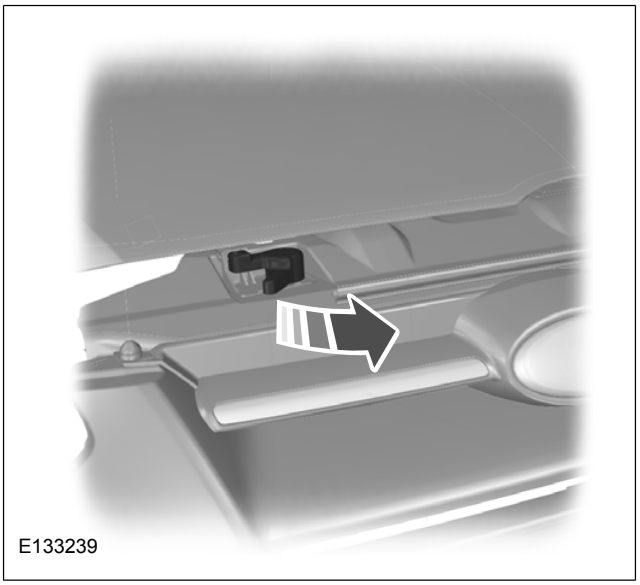
1 Twin exhaust system
2 Rear spoiler with RS branding
3 Rear diffuser
4 Rear LED fog light

NOTE: Rear LED fog light market dependant

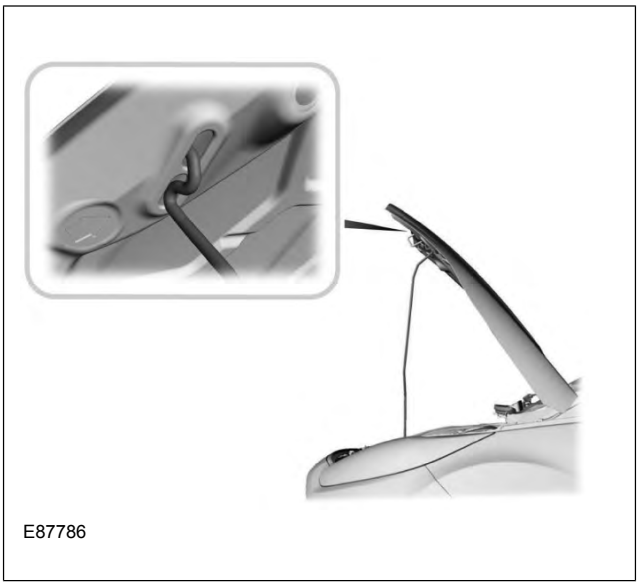
Opening the Hood and Closing the Hood



- Pull the handle to unlatch the bonnet



- Move the yellow catch to the right

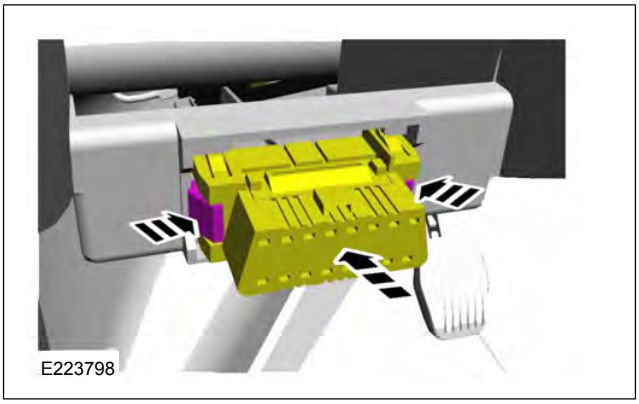

E87786

- Support the hood using the prop rod

⚠ **WARNING: Make sure that the bonnet is closed properly.**

- To close the hood and allow it to drop under its own weight from the last 20 – 30 centimetres

Data Link Connector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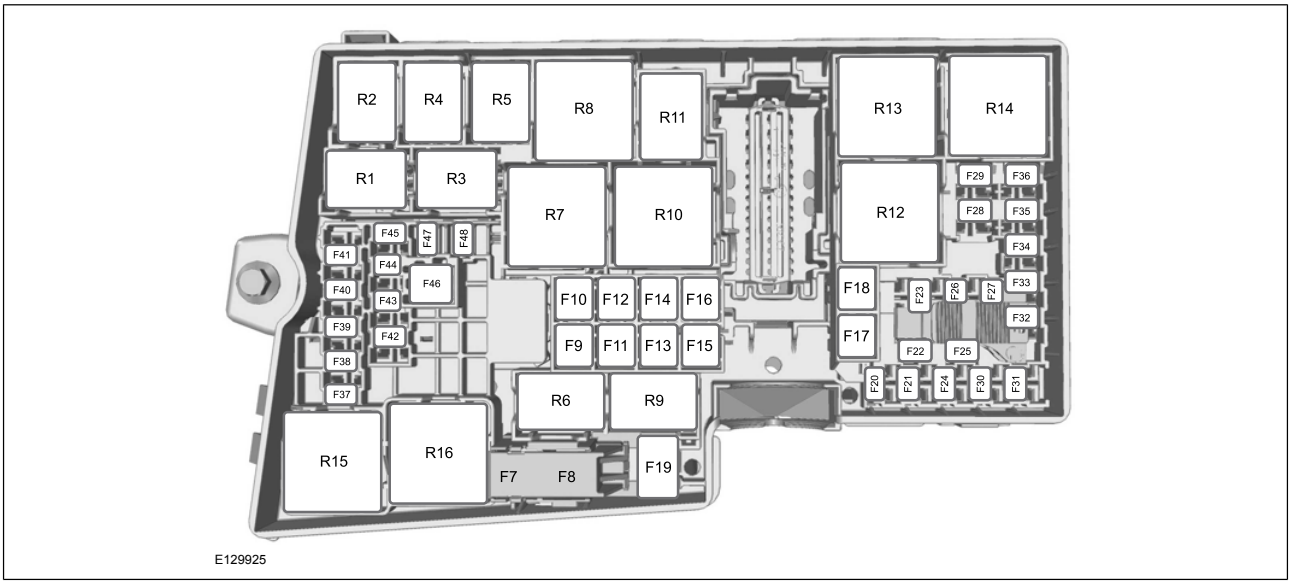
Engine Compartment Fuse Box

NOTE: Only additional fuses and relays which are fitted to the RS are listed below.



F17 30A Rear drive unit control

F30 20A Pump electronic module 2 feed

F36 7.5A Exhaust valve

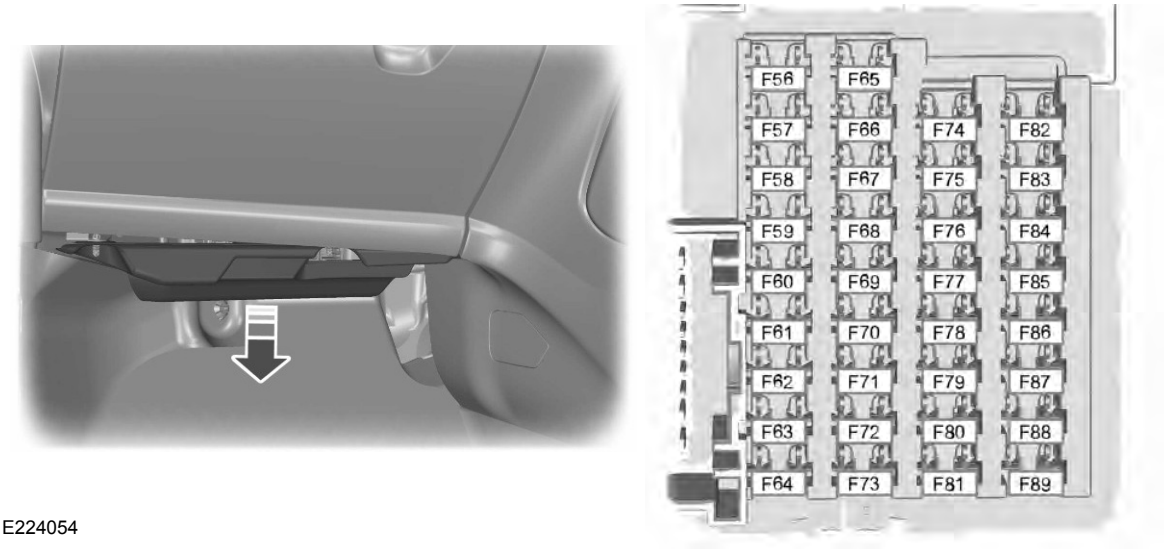
R1 Pump electronic module 2 feed

R3 Cooling fan control 5

R5 Cooling fan control 4

Passenger Compartment Fuse Box

The passenger compartment fuse box is located behind the glove box. The fuse box is incorporated int the BCM (body control module).



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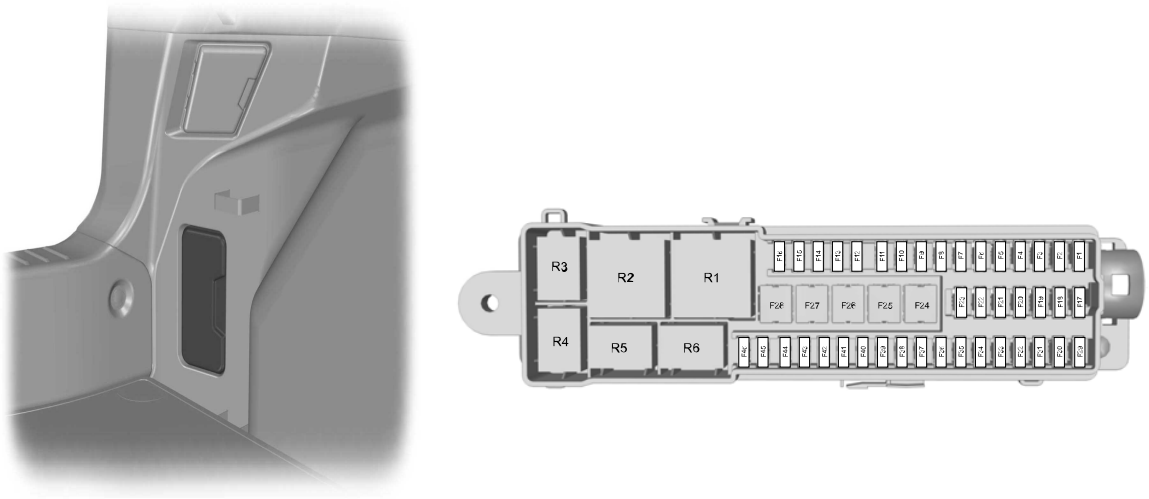
Load Compartment Fuse Box

NOTE: Only additional fuses and relays which are fitted to the RS are listed below.



E224216

F21 15A Fuel control relay. Damper control relay

F22 10A Active noise cancellation. Electronic sound enhancement

R4 Fuel control module. Damper control module

Capless Fuel Filler

E135935

WARNING: If you use a high pressure spray to wash your vehicle, only spray the fuel filler flap briefly from a distance not less than 20 centimetres.

NOTE: When you insert the fuel nozzle, a spring loaded inhibitor will open if the correct size nozzle is detected. This helps to avoid filling up with the wrong fuel.

Press the flap to open it. Open the flap fully until it engages

Keyless Remote Control Battery Replacement

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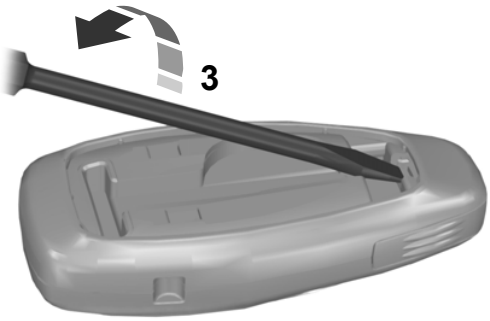
- Press and hold the buttons on the key edges (1) to release the cover. Carefully remove the cover
- Remove the key blade (2)

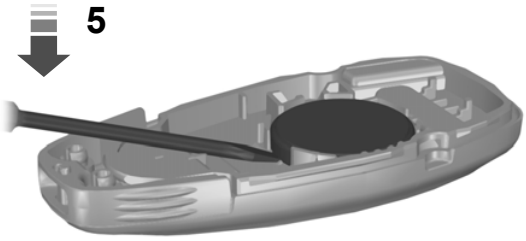


E105362

- Twist the screwdriver in the position shown (3) to separate the two halves of the remote control

E119190

- Carefully insert the screwdriver in the position shown to open the remote control

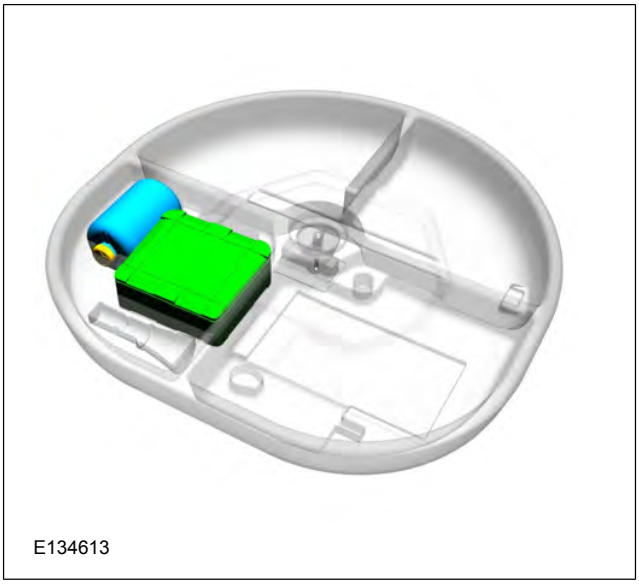


E125860

NOTE: Do not touch the battery contacts or the printed circuit board with the screwdriver.

- Carefully prise out the battery with the screwdriver
- Install a new battery (3V CR 2032) with the + facing downwards
- Assemble the two halves of the remote control
- Install the key blade and cover

Tire Repair Kit



E134613

This vehicle is equipped with a tire repair kit as standard. The tire repair kit is stowed in the spare wheel well.

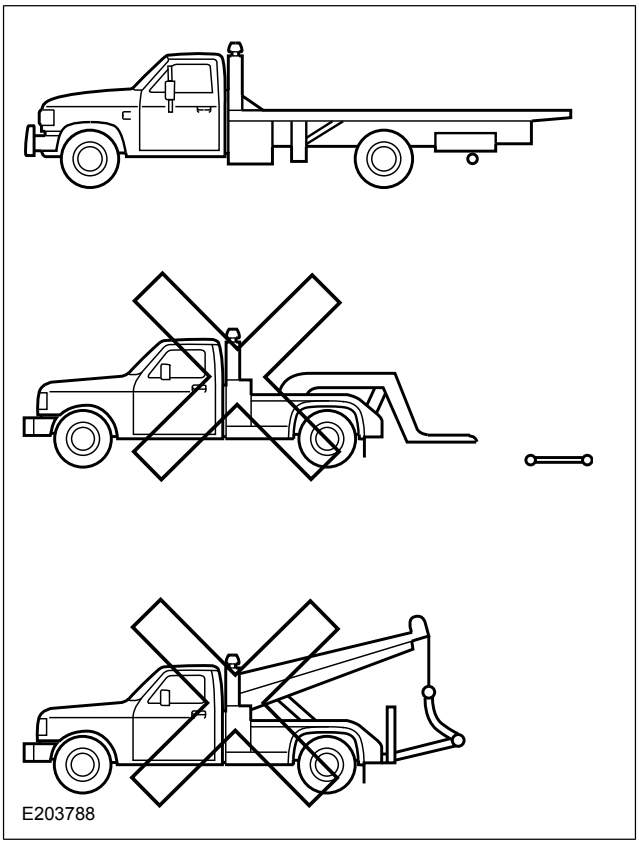
The tire repair kit consists of:

- Compressor with a pressure gauge
- Power supply cable which plugs into the cigarette lighter
- Air hose
- Tire sealant

A tire filled with sealant must be replaced with a new tire after 200 km (approx).

NOTE: Instructions on using the tire repair kit can be found in a separate manual that is enclosed with the tire repair kit.

Towing

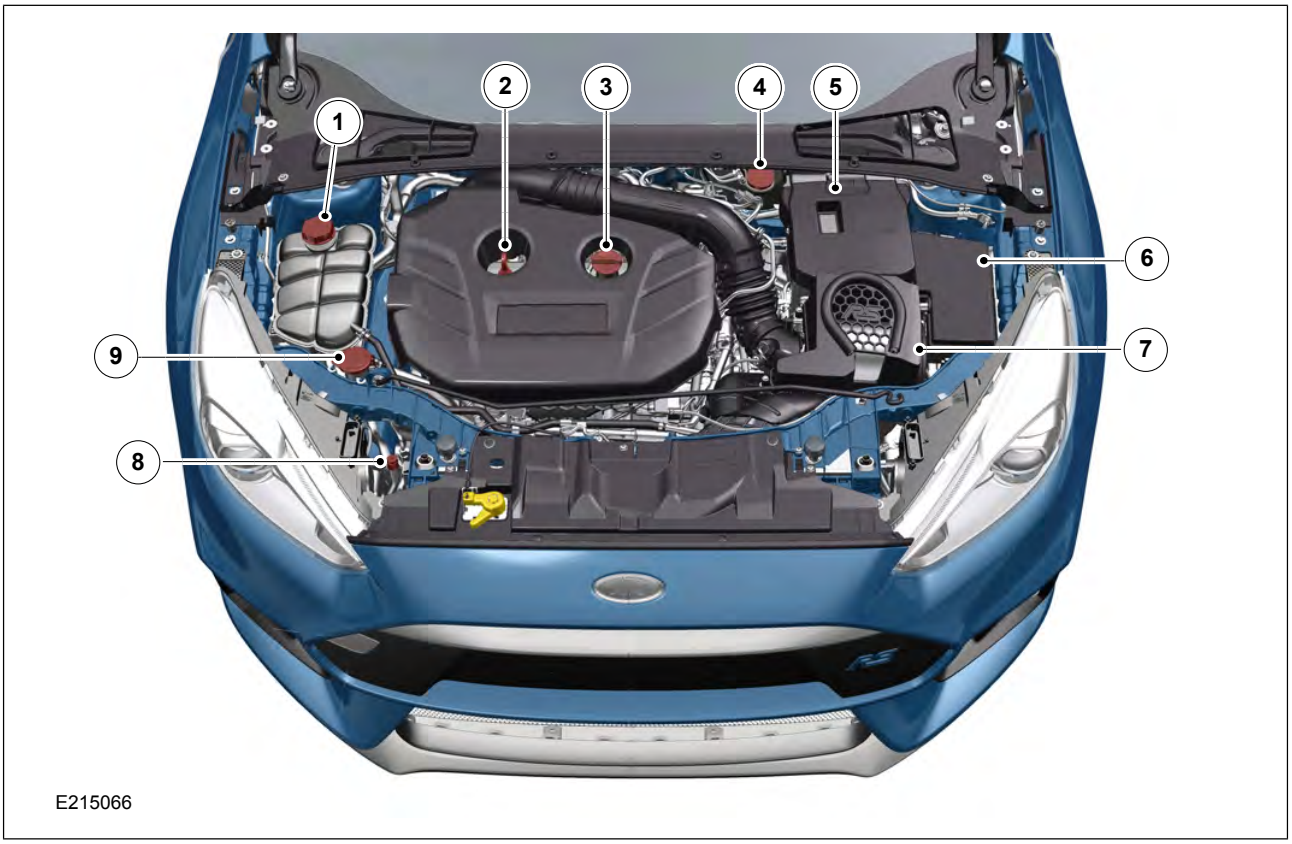


Vehicles CANNOT be flat-towed (all wheels on the ground) as vehicle or transmission damage may occur.

Tow the vehicle using flatbed towing equipment only.

Service Points

2.3L EcoBoost



1 Coolant reservoir
2 Oil dipstick
3 Oil filler cap
4 Brake fluid reservoir
5 Battery
6 BJB (battery junction box)
7 Air cleaner housing
8 Air conditioning connection
9 Windshield washer reservoir

Transport Mode

Transport Mode Deactivation

After vehicle build, some vehicle modules are set in Transport mode including the IPC and the BCM.

Transport mode reduces battery drain during longer periods where the vehicle is not used.

While in transport mode, the IPC displays TRANSPORT MODE CONTACT DEALER in the message center.

Various systems may be altered or are disabled when in the transport mode. The vehicle automatically reverts to normal operation mode after being driven for more than 201 km .

The vehicle can be manually taken out of Transport mode using the following procedure.

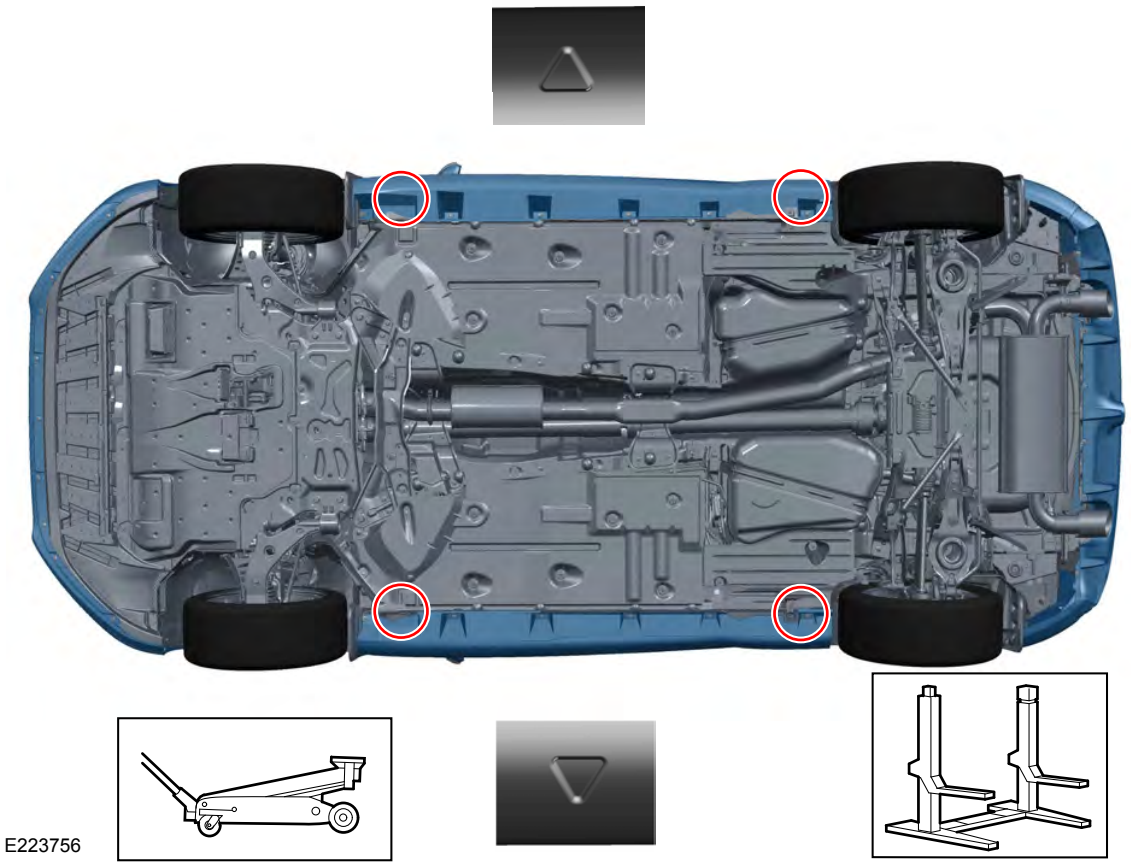
Deactivation Using Passive Key

1. Place the ignition in the OFF position
2. On vehicles with Push-Button Start, place a programmed passive key in the PATS backup starting location. Place the ignition in the ON position

3. Press and release the brake pedal 5 times
4. Press and release the hazard switch 2 times
5. Place the ignition in the OFF position
6. Start the engine

NOTE: When exiting Transport mode, the IPC message center will indicate NORMAL MODE when the procedure has been successfully completed.

Jacking and Lifting



Only the specified jacking points may be used for jacking and supporting the vehicle.

WARNINGS:

⚠ **Position the hoist lift arms on the lift points that sre shown on the above diagram. Incorrect positioning could result in vehicle slipping or falling causing significant damage to the vehicle.**

⚠ **Never get underneath a vehicle that is supported only by a jack. The jack could unintentionally lower. Always support vehicle with floor stands.**

⚠ **Identify the correct jacking points by locating the triangle stamped on the sill panel. Place the hoist pads on the point shown on the vehicle. (The triangles are a guide to indicate the position of the jacking points that are under the vehicle) .**

⚠ **Only raise the vehicle when positioned on a hard, level surface. Attempting to raise the vehicle on an uneven or soft surface may result in vehicle slipping or falling from the jack or jackstand..**

⚠ **When jacking or lifting the vehicle use a block to all wheels remaining on the ground activate the parking brake. These actions help prevent unintended vehicle movement.**

NOTICE:

⚠ **The jack provided with the vehicle is intended to be used in an emergency for changing a deflated tire. To avoid damage to the vehicle, never use the jack to lift the vehicle for any other purpose.**

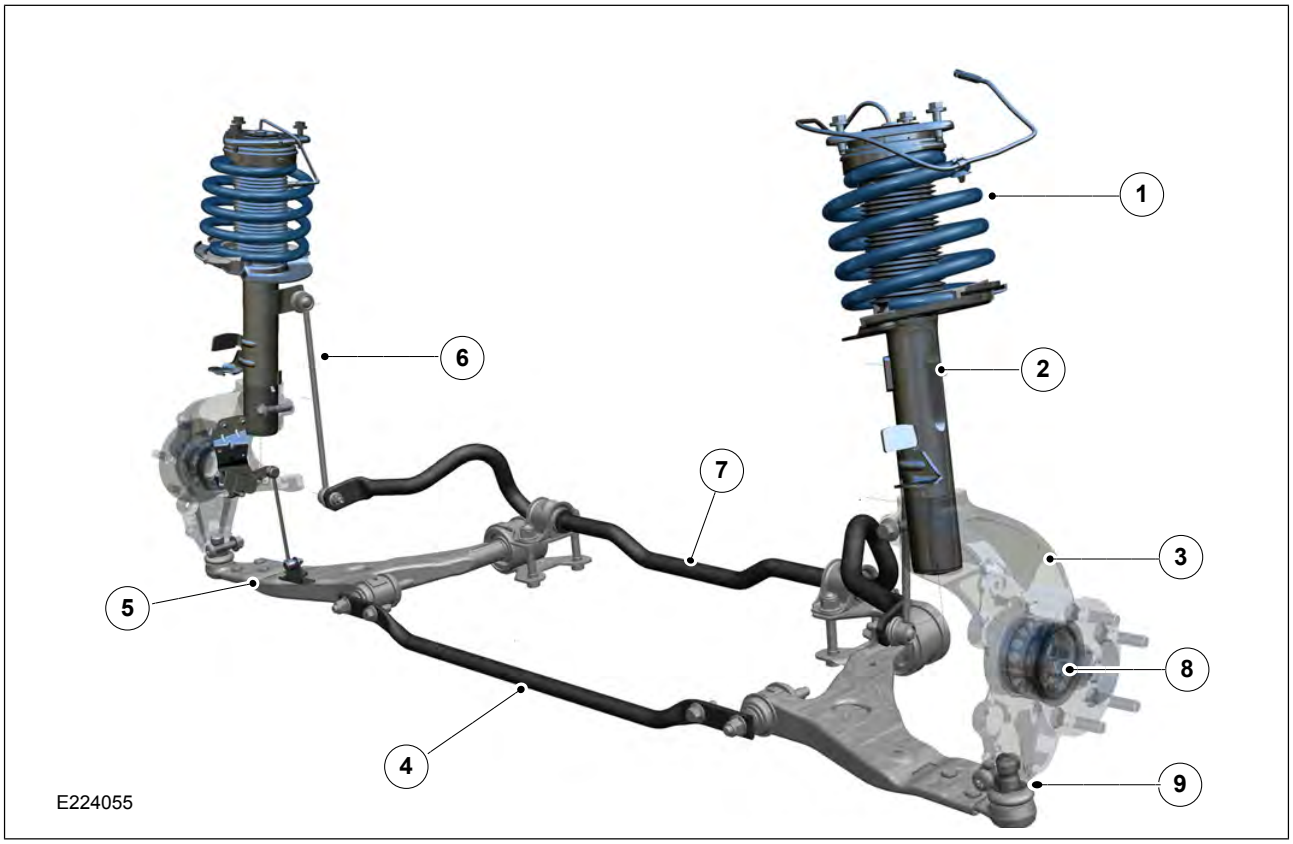
⚠ **Place blocks underneath the lifting points if a two-post hoist is used.**

⚠ **Damage to the suspension, exhaust or steering linkage components will occur if care is not exercised when positioning the hoist adapters prior to lifting the vehicle.**

⚠ **To prevent possible damage to the underbody, do not drive the vehicle onto a four post hoist without first checking for possible interference.**

⚠ **When raising a vehicle on a two-post hoist, use care when positioning the vehicle so that the hoist arms do not interfere with underbody components.**

Front Suspension



1 Modified springs with firmer spring rate
2 Front strut and spring assembly - with electronic shock absorbers
3 Torsion-resistant steering knuckle
4 Front suspension brace
5 Shorter lower arm and reinforced mounts
6 Larger front stabilizer bar links
7 Front stabilizer bar
8 Front hub
9 Ball joint

The front suspension consists of the following components:

- Lower arms
- Stabilizer bar, bushings and links
- Strut and spring assemblies
- Wheel bearings
- Wheel hubs
- Wheel knuckles
- Wheel studs

The front suspension uses a MacPherson strut system. This suspension system incorporates a strut assembly that takes the place of the upper arm and ball joint. The strut performs the function of a shock absorber and is encompassed by a coil spring. The strut and spring assembly carries the sprung weight of the vehicle and is also the pivot point for the steering knuckle.

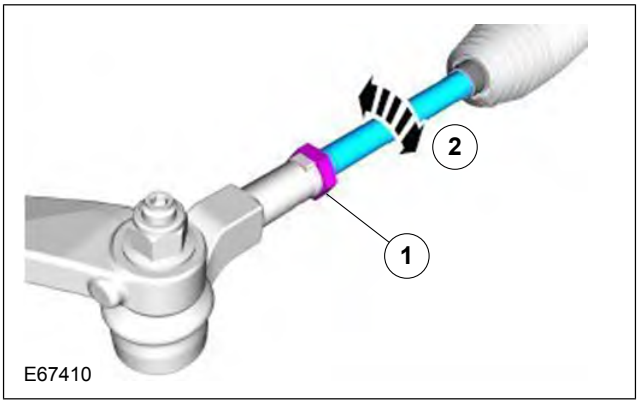
This system uses a lower control arm and ball joint for the lower (unloaded) pivot point of the steering knuckle.

The Focus RS has an improved front suspension system with spring rates, bushes and anti-roll-bars all of which are stiffer than those found in the Focus ST. Featured front suspension system changes are listed below:

- Modified springs with firmer spring rate
- Electronic front shock absorbers - Two-mode shock absorbers with normal and a firmer setting for track driving
- Torsion-resistant steering knuckles
- Shorter wishbones and reinforced mounts
- Larger front anti-roll bar

Front Suspension Alignment and Adjustment

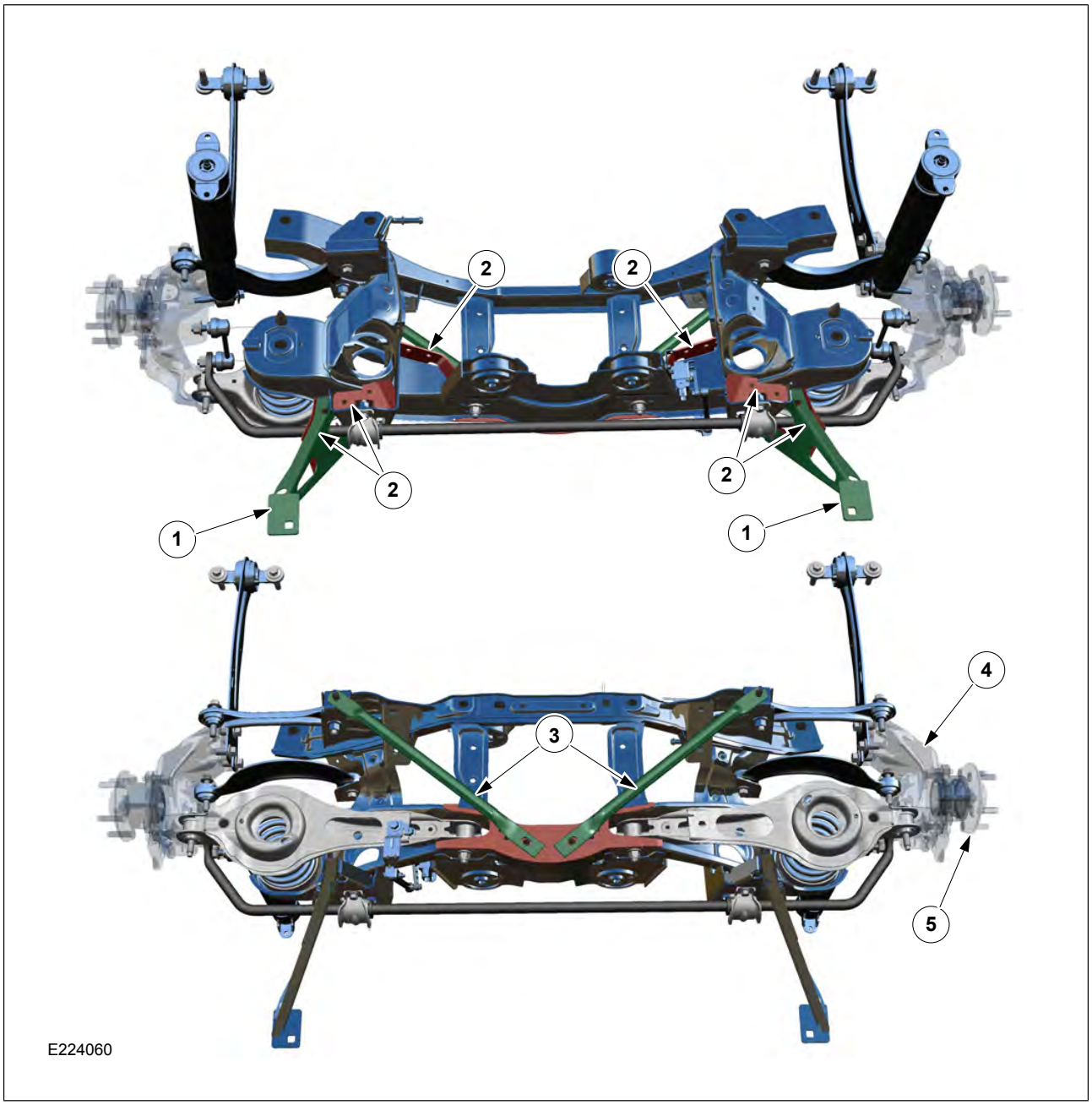
Front Toe Adjustment



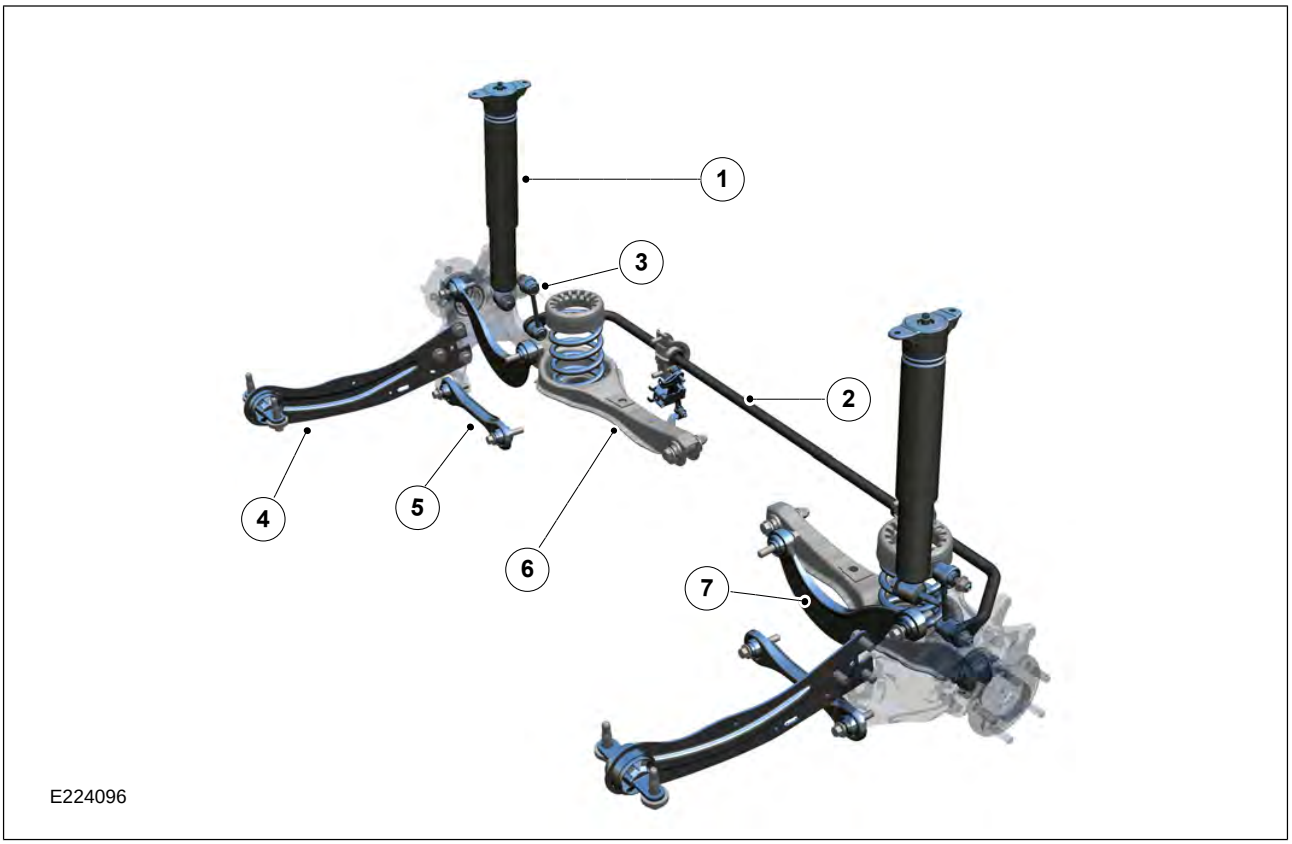
1 Outer tie-rod locknut

2 Inner tie-rod adjustment rotate either clockwise or counterclockwise

Rear Suspension



1 Upper arm
2 Reinforced areas
3 Reinforced lower connecting rods
4 Wheel knuckle
5 Wheel bearing and hub (AWD)



1 Rear shock absorbers - electronic
2 Rear stabilizer bar
3 Rear stabilizer bar links
4 Rear lower trailing arms
5 Rear front lower arms
6 Rear lower arms
7 Rear Upper arms

The rear suspension uses 3 parallel arms (one upper and 2 lower). Each arm has a mounting position to the chassis and an attachment at the wheel knuckle. This suspension allows the wheels to react to road imperfections independent of each other. The shock absorber mounts to the wheel knuckle and along with the spring, controls vertical movement. The stabilizer bar and links control suspension lean/sway.

One of the main objectives is to make the new Focus RS more resistant to torsion, which has been achieved by strengthening and adding reinforced components to the rear suspension system. The following rear suspension system changes have been made:

- Modified side members
- Reinforced subframe areas
- Reinforced lower connecting rods
- Electronic rear shock absorbers
- Larger rear anti-roll bar
- Provision in the subframe to mount the rear drive unit
- Wheel knuckles to support drive shafts

Wheels and Tires

1 'Ronal' light alloy rim, available in silver or matte magnetized (standard 8 x 19 RO50

2 'Dicastal' forged light alloy rim, available in black (optional) 8 x 19 RO50

The vehicle is fitted with tires designed to optimize the performance.

Due to their lower profile they can be are more susceptible to damage due to poor road conditions.

The following tires are available

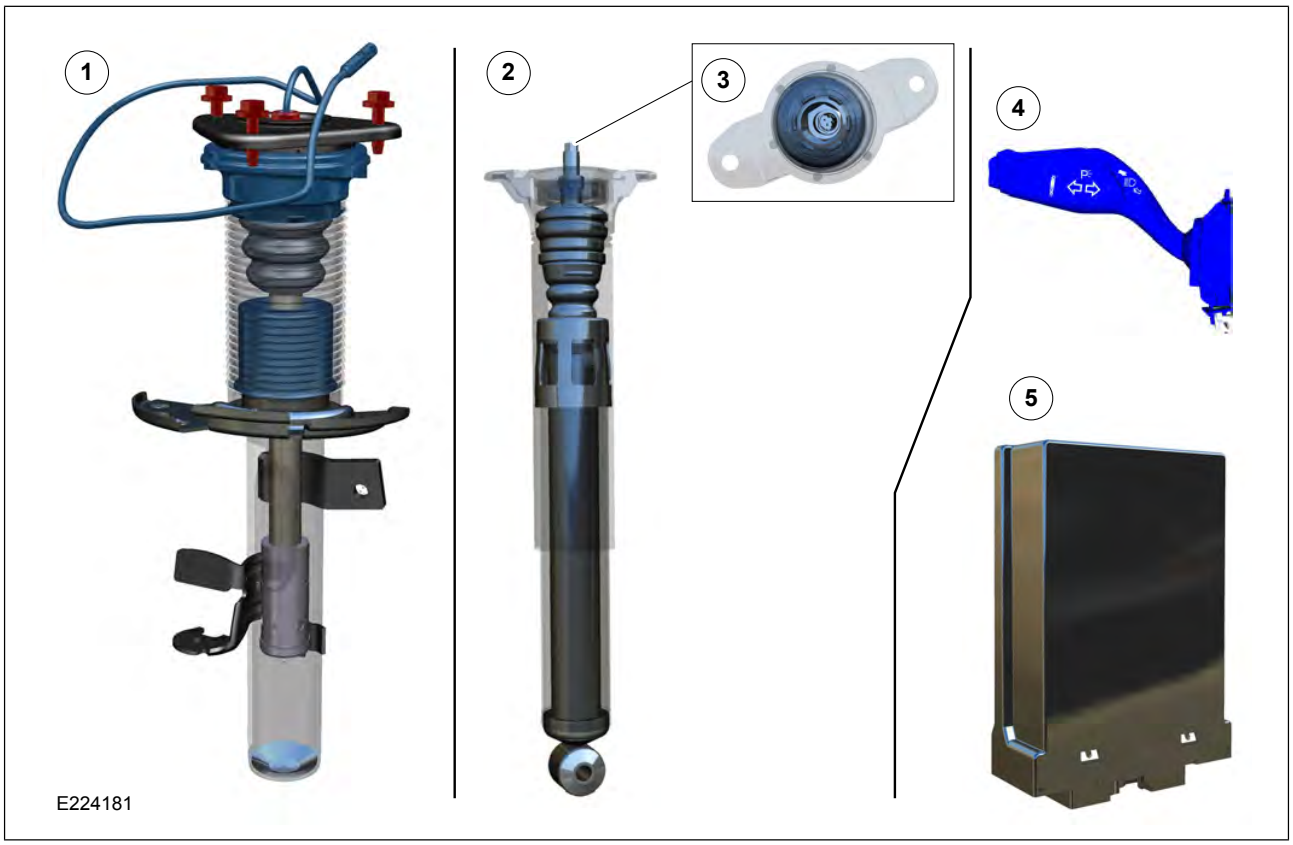
- 235/35 R19 91Y Michelin Pilot Super Sport
- 235/35 R19 91Y Michelin Pilot Sport Cup 2 (only in combination with the Dicastal forged rim)

The Dicastal forged wheels are much lighter than cast wheels. They also have a better mass ratio (unsprung masses). This optimizes the vehicle's suspension, performance, and road holding, especially when cornering and driving on poor road surfaces. The forged rim has a lower rotational torque and therefore lower inertia, which means that less power is absorbed during acceleration and better performance is achieved during braking. The structural strength of the light alloy rims gives them a weight advantage of 600 grams.

Instead of an emergency spare wheel. The vehicle is equipped with a tire repair kit.

Vehicle Dynamic Suspension

Dual Mode Damper System



1 Electronic shock absorbers front
2 Electronic shock absorbers rear
3 Electrical connection rear shock absorber
4 Electronic shock absorber switch
5 Shock absorber control module

Selecting Damping Modes

The Focus RS is equipped with a dual mode damper suspension system that allows the driver to choose between a comfort and sport ride.

The suspension mode selection is made via a switch on the steering column control stalk. The driver can select between a normal setting and a sport setting as listed below:

- **Normal** - Default setting each time the vehicle starts. Vehicle damping is tuned for street driving delivering sporty, comfortable handling on ordinary roads
- **Sport** - For spirited and aggressive driving where damping is tuned for performance. Sport mode gives firmer damper characteristics optimizing the feedback to the driver and the handling on race tracks

Inside the shock absorber is an electromagnetic, infinitely variable bypass valve. Control is performed via the magnitude of the control current to the shock absorber bypass valve as supplied by the shock absorber control module.

A low control current results in soft damping, a high adjusted current results in hard damping.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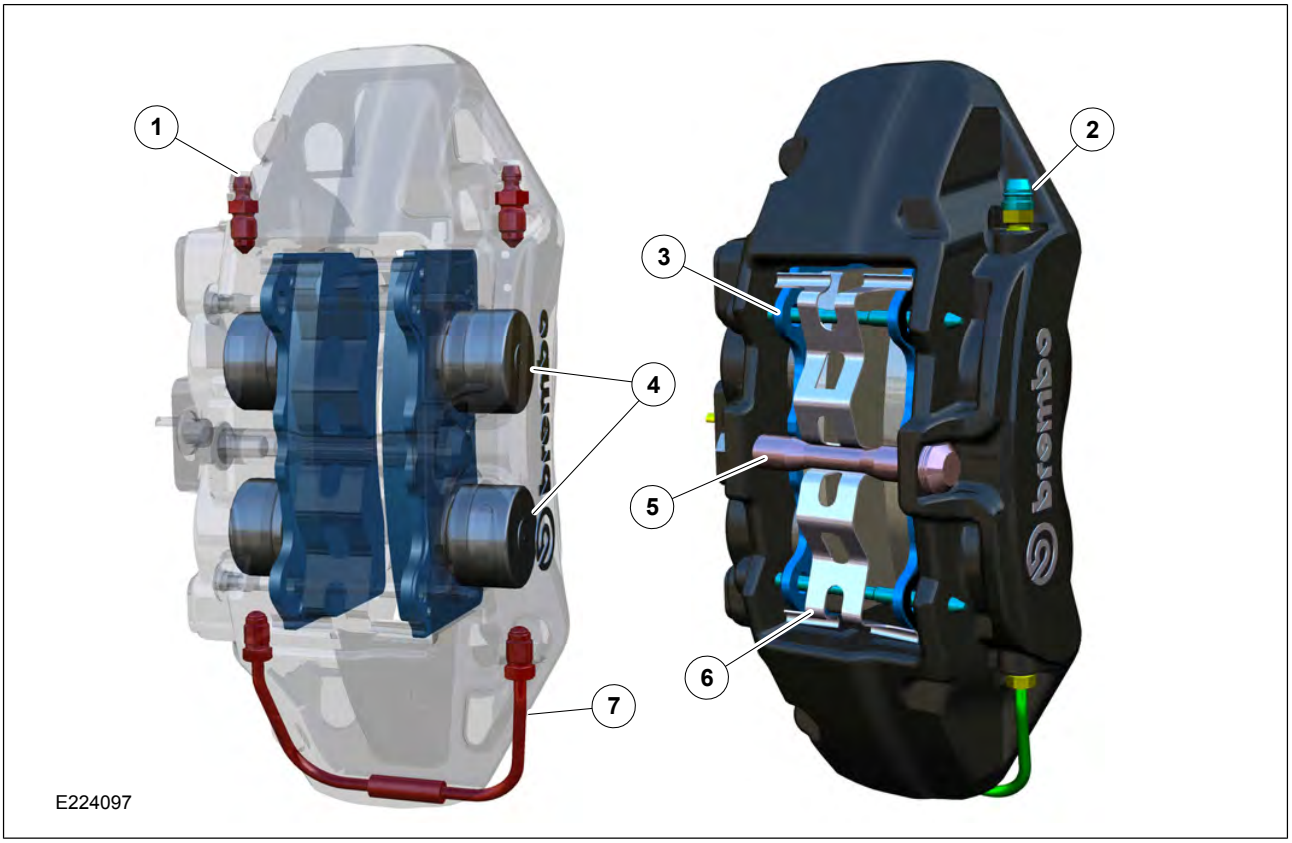
To select Normal or Sport damping, do the following:

- Press the button on the end of the direction indicator lever
  - The current setting appears in the information display (Normal/Sport)

Brake System



E224097

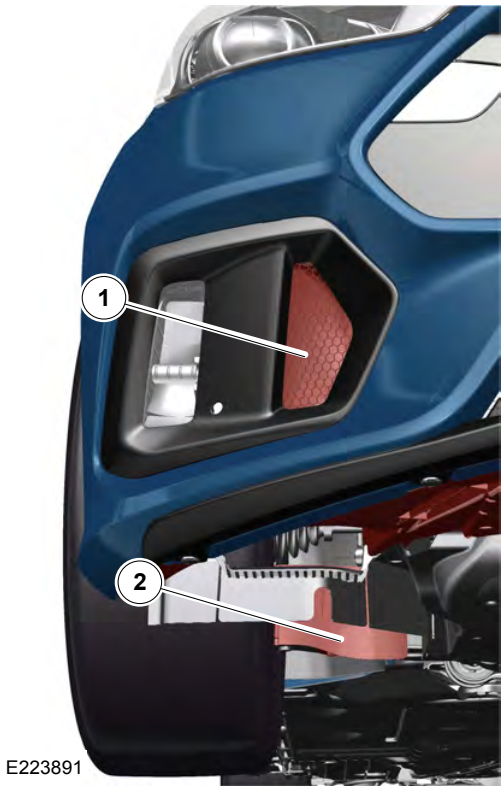
1 Left side bleeder valve
2 Right side bleeder valve
3 Brake pad
4 Caliper pistons
5 Anti rattle plate holding pin
6 Anti rattle plate
7 Brake fluid crossover pipe

The Focus RS is fitted with Brembo® four-piston monoblock brake calipers at the front axle. The housing is made from a single piece. There is a steel pin in the center of the brake caliper to reinforce it.

Brembo® front brakes are fitted with four-piston painted calipers with performance pads and 350 mm brake rotors.

Rear brakes are fitted with single-piston sliding calipers and 302 mm rear brake rotors.

Front Brake Cooling Air Ducts



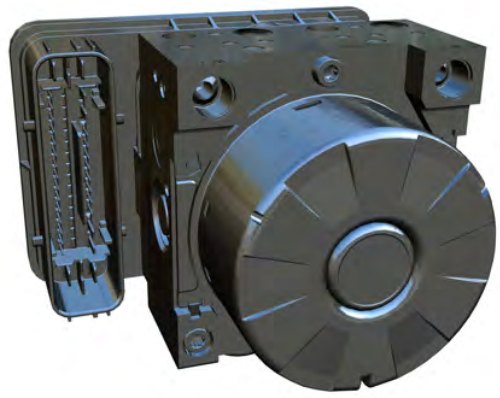
1 Air duct

2 Air deflector

An air duct has been developed to provide additional cooling to the front brakes, by directing fresh air onto the brake caliper and rotor. The air duct runs from the front bumper to the inner wheel well. The inlet to the air duct is located in the front bumper fascia next to the front fog lamp.

There is also an air deflector which is used to diverted additional air to the brake system from under the vehicle.

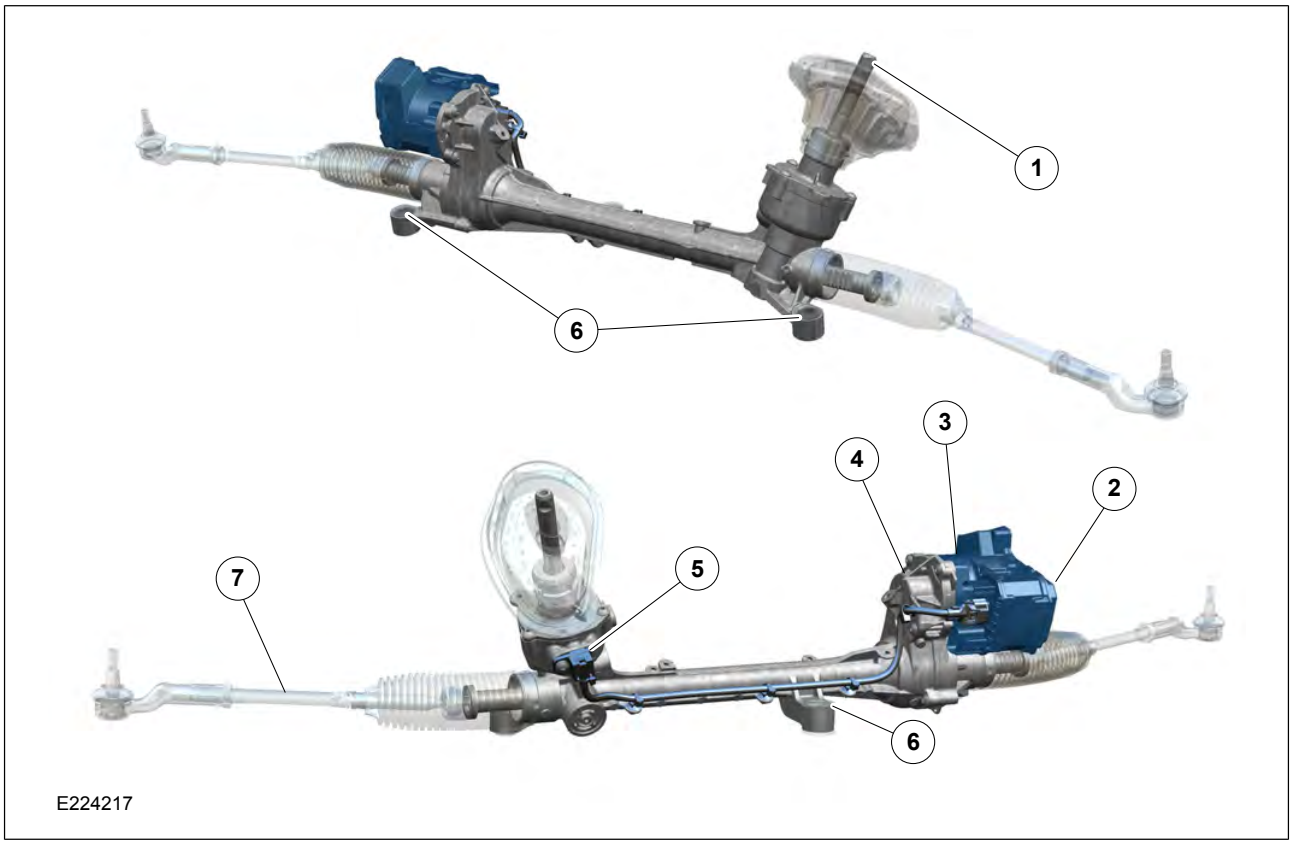
Anti-Lock Brake System (ABS) Module



The MK100 module is 20 percent smaller than the unit fitted to the Focus ST and integrates sensor clusters such as yaw rate and acceleration sensors.

The MK100 ABS (anti-lock brake system) may be disconnected from the HCU (hydraulic control unit) during servicing. Diagnosis is performed using the IDS (Integrated Diagnostic System)

Power Steering



1 Torque shaft
2 EPS module
3 EPS motor
4 Housing steering assistance drive
5 Torsional shaft with steering torque sensor
6 Securing bolts steering gear

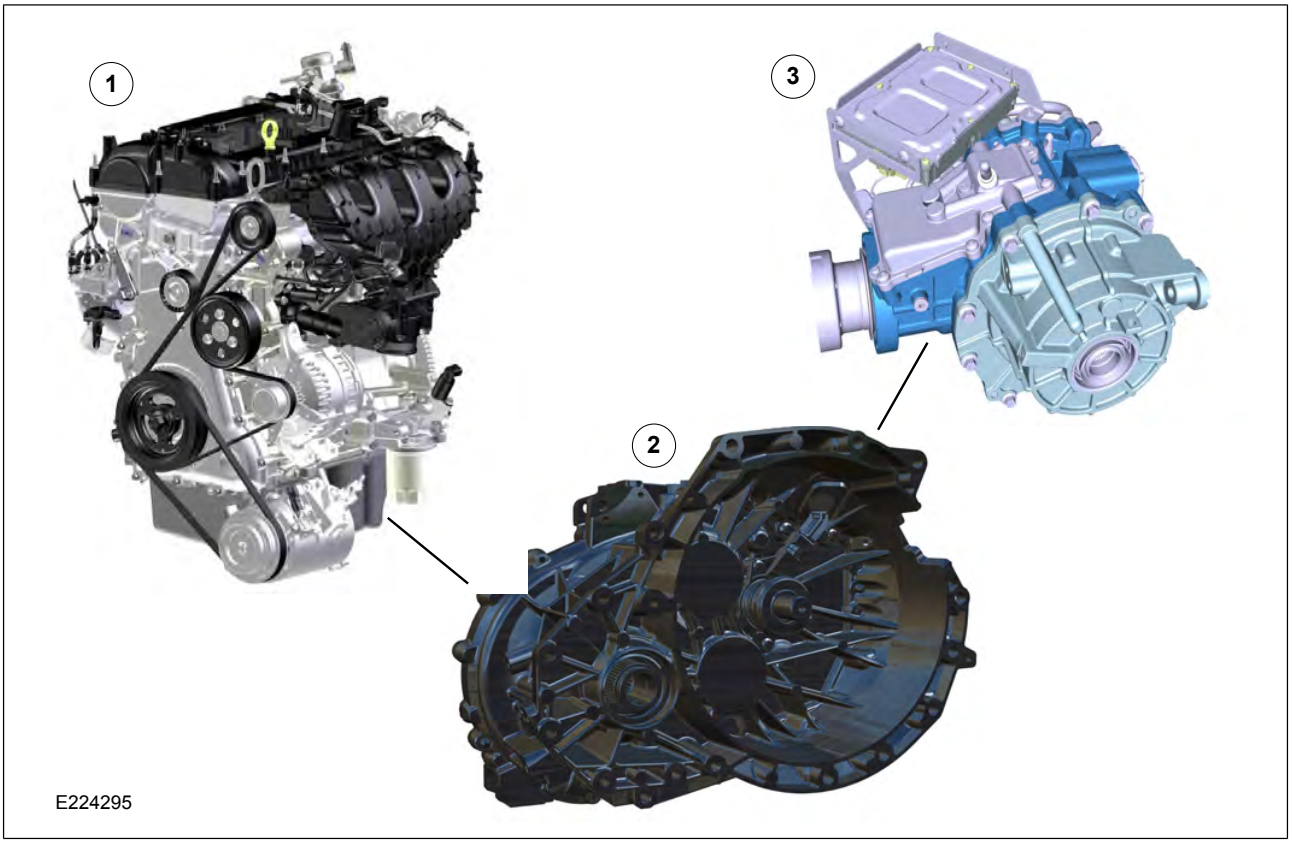
A tuned electric power-assisted steering system works in combination with a more rigid front suspension knuckle design and shorter-link arms to deliver connected and responsive steering with outstanding feel.

The steering gear is mounted lower due to the AWD (all-wheel drive). The torsion shaft with steering gear pinion has been extended by 2 cm.

This extension of the torque shaft is to compensate for the lowering of the EPAS to a lower position on the sub frame.

Engine

Powertrain



1 2.3L EcoBoost engine
2 MMT6 transmission
3 Rear drive unit

The 2015 Focus RS is available with the following powertrain components.

Engine:

- 2.3L EcoBoost four cylinder engine

Transmission:

- MMT6, 6 speed manual transmission (incorporating transfer case)

AWD System:

- Electronically controlled AWD system incorporating TWINSTER® rear drive unit

2.3L EcoBoost Engine

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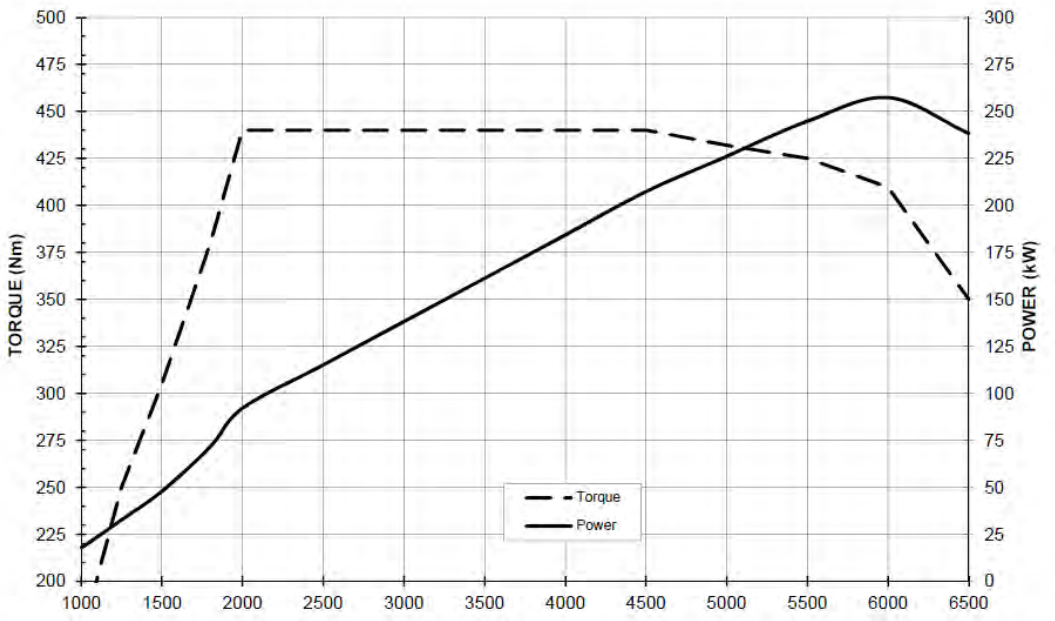
The new Ford Focus RS engine shares its fundamental structure with the all-aluminium four-cylinder 2.3-litre engine in the all-new Mustang.

This engine has, however, been significantly upgraded through a comprehensive package of design changes. Increased output is generated by a new low-inertia twin-scroll turbocharger with larger compressor that delivers significantly greater air flow, along with a much bigger intercooler to maximise charge density.

Engine breathing also is enhanced through a less restrictive intake system design and a large-bore high performance exhaust system.

The 2.3L Gasoline Turbocharged Direct Injection 4-cylinder engine has the following features:

- Dual overhead camshafts
- Four valves per cylinder
- Composite intake manifold
- Aluminum cylinder head
- Aluminum engine block
- Direct fuel injection
- Twin-scroll turbocharger with internal wastegate
- Twin Independent Variable Camshaft Timing (Ti-VCT)



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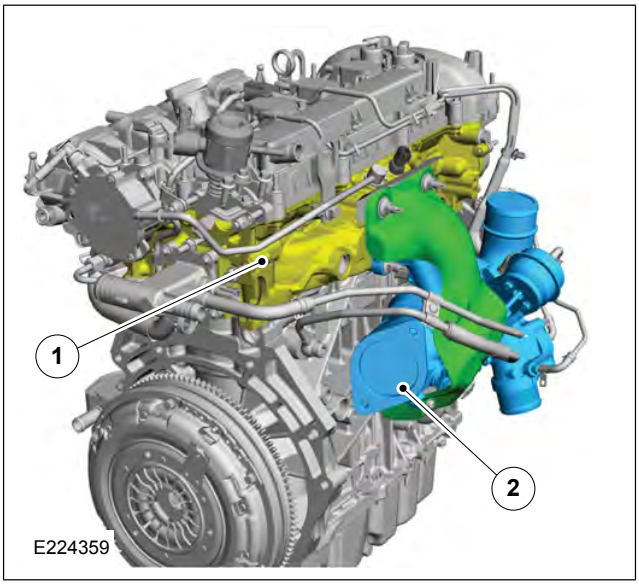
The engine has a maximum power output of 257 kW at a torque value of 440 Nm, with the ability to increase engine torque to 470 Nm using the overboost function.



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1 Cylinder Head

2 Turbocharger

The cylinder head is produced from an upgraded alloy material capable of withstanding higher temperatures and is mounted on a more robust head gasket with improved thermal capability.

The cylinder block employs stronger high-tensile cast iron liners.

Meticulous calibration work has ensured that the power unit delivers excellent low-end responsiveness with a powerful mid-range pull, climbing to a free-revving top-end up to a maximum rev limit of 6,800 rpm.

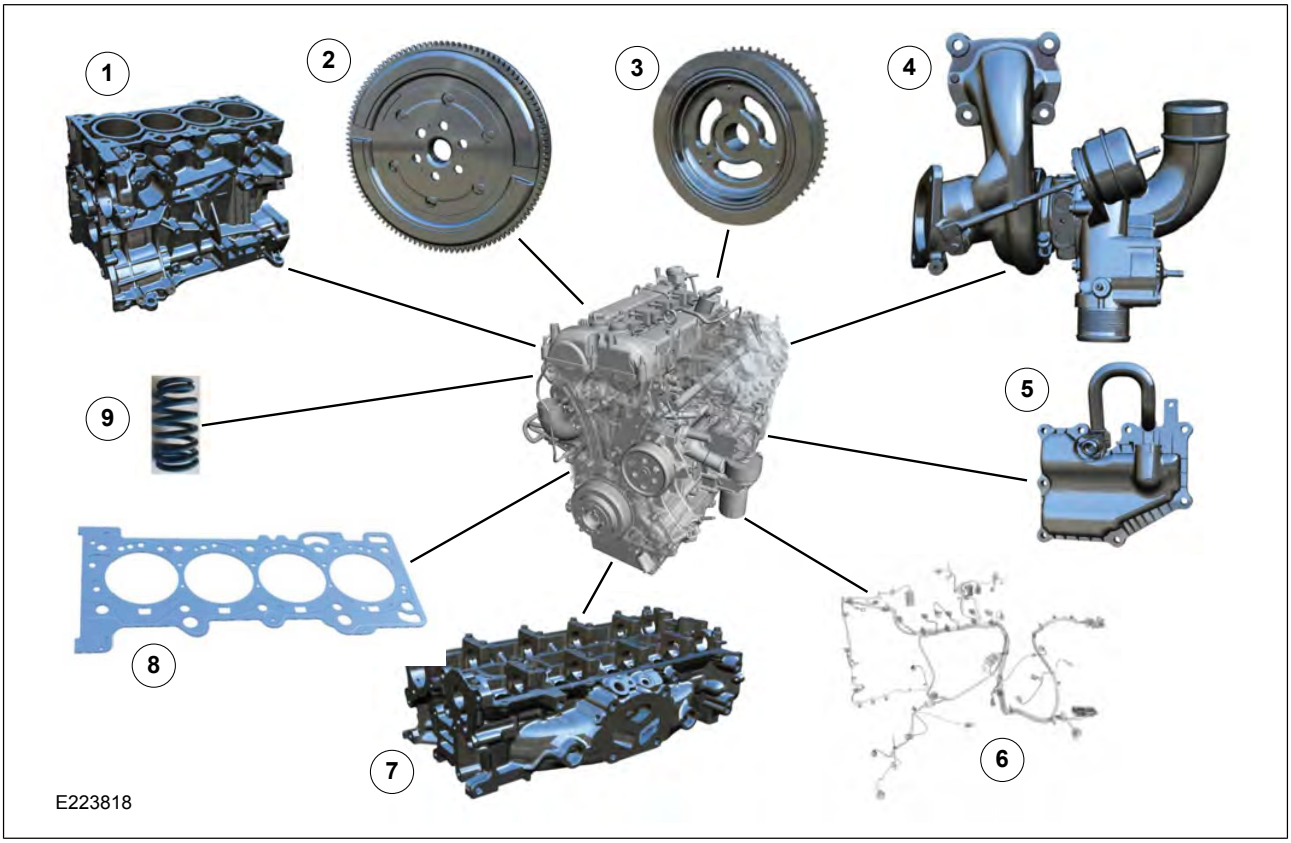
With its high-efficiency EcoBoost design featuring direct fuel injection, twin independent variable camshaft timing, advanced turbocharging and Auto-Start-Stop fitted as standard the engine also delivers significantly improved fuel consumption.

The 2.3L EcoBoost engine delivers a spontaneous response in the lower engine speed range, develops a high torque of 440 Nm at medium engine speeds and makes it constantly available between 2000 and 4500 rpm, and peaks at 6800 rpm.

The overboost control increases the maximum torque to 470 Nm for 15 seconds under full acceleration.

The 2.3L EcoBoost engine requires a full synthetic 0W-40 engine oil.

Engine Structural Changes



1 High tensile engine block to reduce wear under high temperature and load

2 Dual mass flywheel

3 Crankshaft pulley specially adapted to the RS engine

4 Turbocharger with larger compressor wheel (from 60 mm to 63 mm) and new turbine wheel

5 PCV (positive crankcase ventilation) flow increased from 17 liters per minute to 45 liters per minute

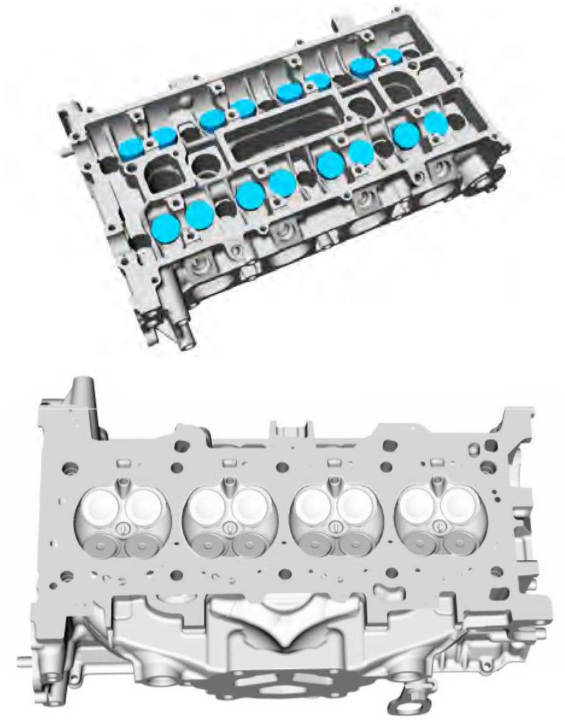
6 New wiring loom with increased plug security

7 Cylinder head with new aluminum alloy to improve heat dissipation

8 Cylinder head gasket with higher heat tolerance

9 Higher strength exhaust valve springs

Cylinder Head



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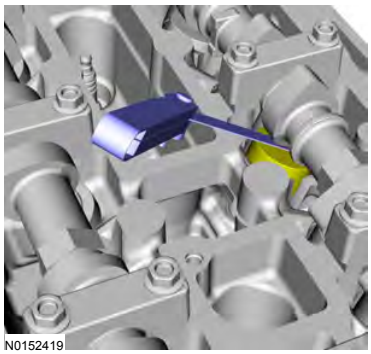
Cylinder head made of cast aluminum with integrated exhaust manifold with 16 valve 4 valves per cylinder.



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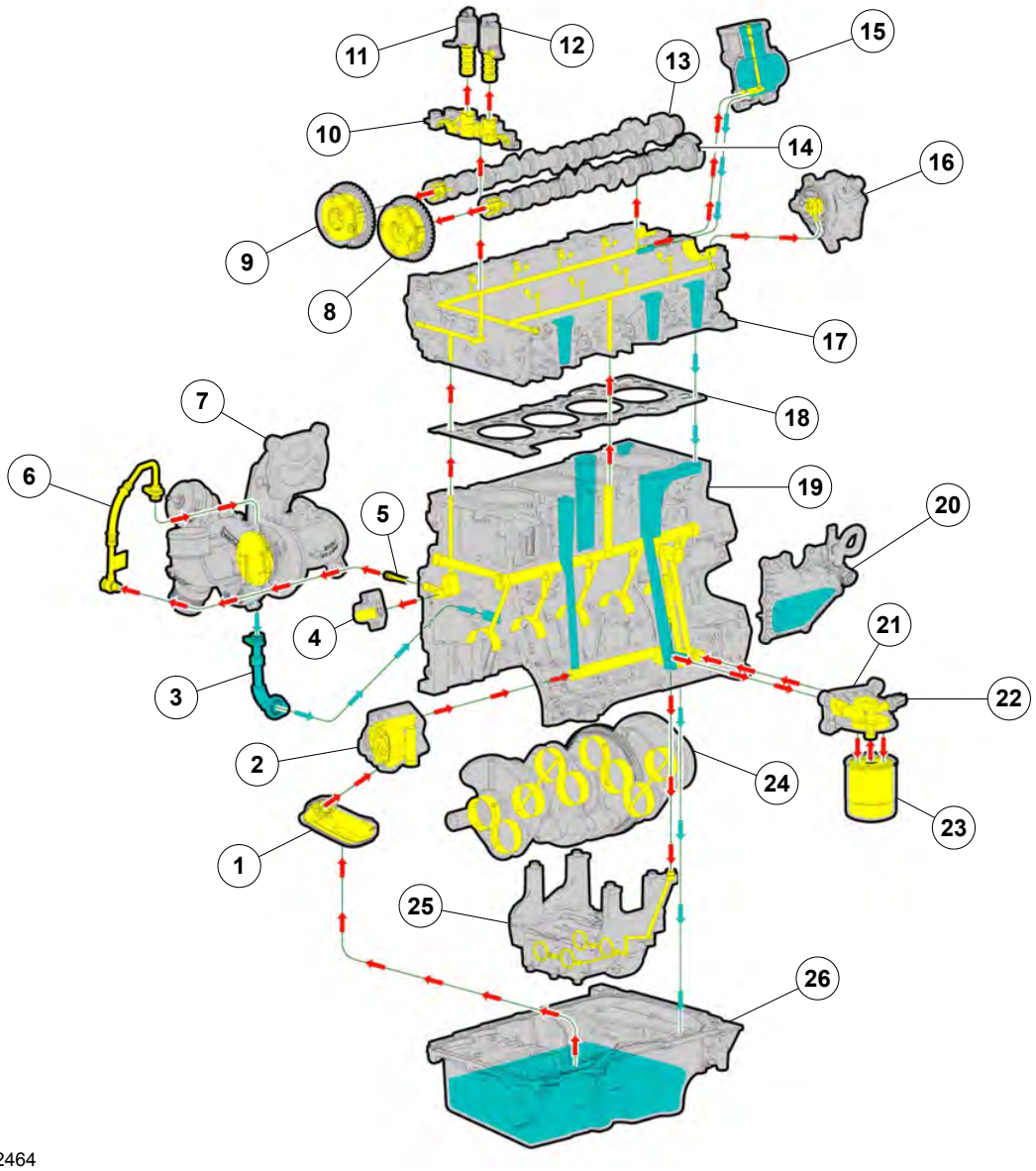
The valve are actuated using Direct Acting Mechanical Buckets (DAMB). The camshaft lobes are positioned directly above mechanical buckets which are on top of the valves.

Valve clearance adjustment is carried out by measuring the clearance of each valve base using a feeler gauge, with the lobe pointed away from the tappet. If a clearance is out of specification a new DAMB with the appropriate thickness will need to be installed.

Lubrication System



1 Oil pump screen and pickup tube
2 Oil pump
3 Turbocharger oil return tube
4 Timing chain tensioner
5 Turbocharger oil filter
6 Turbocharger oil supply tube
7 Turbocharger
8 Intake VCT (variable camshaft timing) unit
9 Exhaust VCT unit
10 Camshaft front bearing cap
11 Exhaust VCT oil control solenoid
12 Intake VCT oil control solenoid
13 Exhaust camshaft
14 Intake camshaft
15 Fuel pump housing
16 Vacuum pump
17 Cylinder head
18 Head gasket

19 Cylinder block
20 Crankcase vent oil separator
21 Oil Filter Adapter
22 Oil pressure switch
23 Oil filter
24 Crankshaft assembly
25 Balance shaft assembly
26 Oil pan

The engine lubrication system is of the force-feed type in which oil is supplied under full pressure to the crankshaft, connecting rod bearings, timing chain tensioners, camshaft bearing caps and VCT solenoids. The flow of oil to the valve tappets and valve train is controlled by a restricting orifice located in the cylinder head gasket.

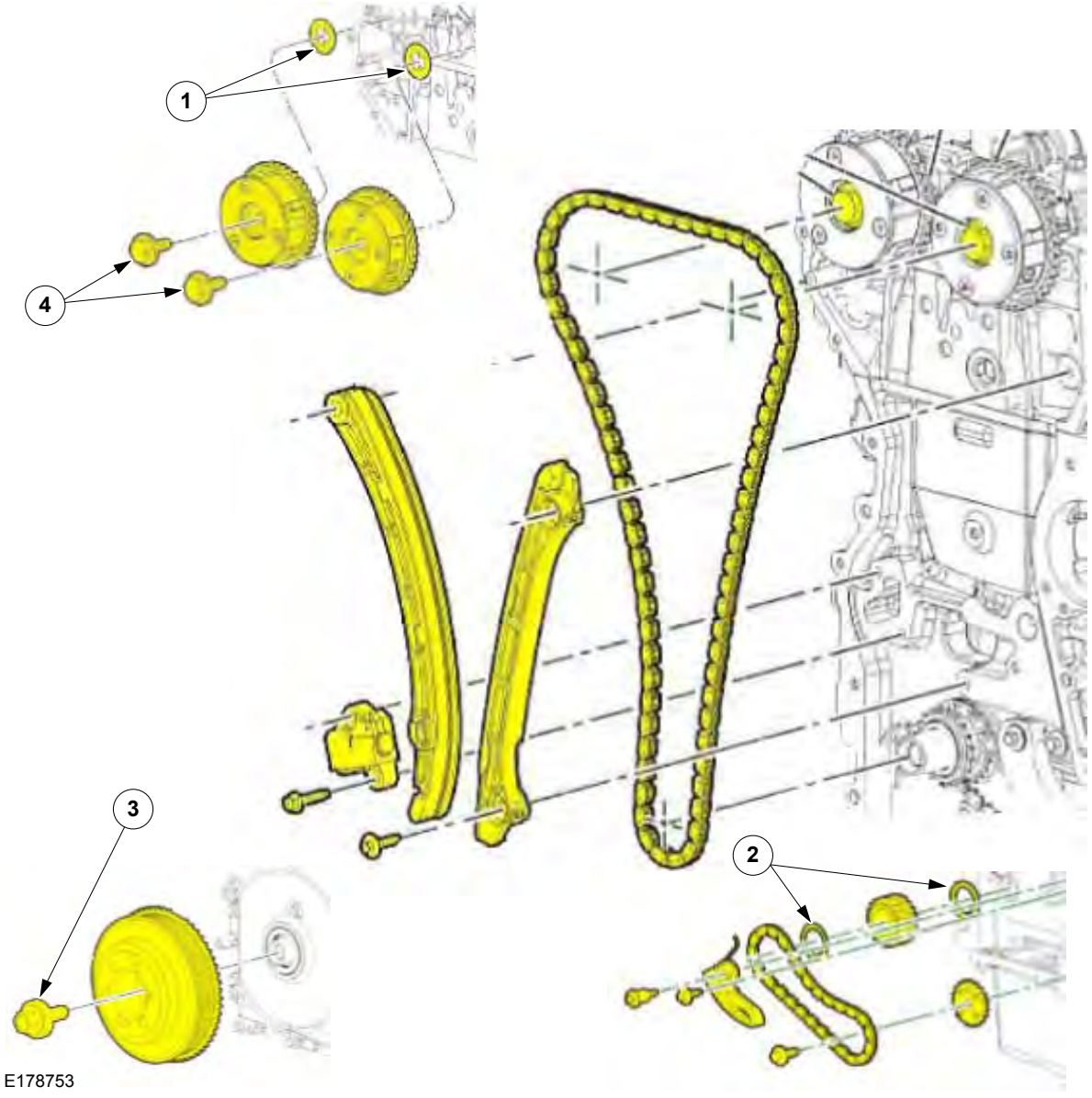
The lubrication system is designed to provide optimum oil flow to critical components of the engine through its entire operating range. The 2.3L RS engine uses a new synthetic oil for greater lubrication and improved durability.

The heart of the system is a positive displacement internal gear oil pump.

Generically, this design is known as a gear rotor pump, which operates as follows:

- The oil pump is chain driven off of the crankshaft
- System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil back to the inlet side of the oil pump
- Oil pump displacement has been selected to provide adequate volume to make sure of correct oil pressure both at hot idle and maximum speed
- The relief valve calibration protects the system from excessive pressure during high-viscosity conditions
- The relief valve is designed to provide adequate connecting rod bearing lubrication under high temperature and high-speed conditions

Twin Independent Variable Cam Timing (TI-VCT)



1 Friction washers
2 Friction washers
3 Crankshaft pulley bolt
4 Camshaft chain wheel bolts

The Ti-VCT system allows variable independent control of both the intake and exhaust camshafts by adjusting their rotational position. This alters the valves opening and closing timing with relation to the crankshaft position. Improved power from low to high engine speeds (broadening of the torque curve) is achieved by varying the valve overlap and camshaft timing to match all operating ranges and ambient conditions which also improves fuel economy, exhaust emissions, and engine performance.

The camshaft adjustment units are controlled via two VCT solenoids. The VCT solenoids for the intake and exhaust camshafts differ only in terms of the position of the fastening point by which they are fixed to the VCT bearing cap.

NOTE: The camshaft adjustment units can only be changed as a complete set during servicing. They cannot be repaired.

This system uses electro-hydraulically regulated camshaft adjustment. The timing of the intake and exhaust valves can be controlled independently of one another using a pressurized engine oil supply which is controlled by solenoids.

NOTE: When repairing parts of the timing gear which operate under engine oil pressure, extreme cleanliness is vital. Particles larger than 0.2 mm in diameter can cause the valve adjustment to fail.

Upon starting the engine and during idling, both camshafts are mechanically locked in their starting positions. The exhaust camshaft is in the advanced position and the intake camshaft is in the retarded position.

The camshaft adjuster on the exhaust side has a torsion spring which compensates the camshaft drive torque. This ensures, under all operating conditions and when the engine is turned off, that the assembly can return to the starting position.

Internal exhaust gas recirculation can be realized through continuous adjustment of the timings. The resulting de-throttling of the engine results in better fuel consumption and more favourable combustion temperatures at which fewer pollutants are generated. VCT can also optimise the camshaft timing to maximize engine performance at wide open throttle.

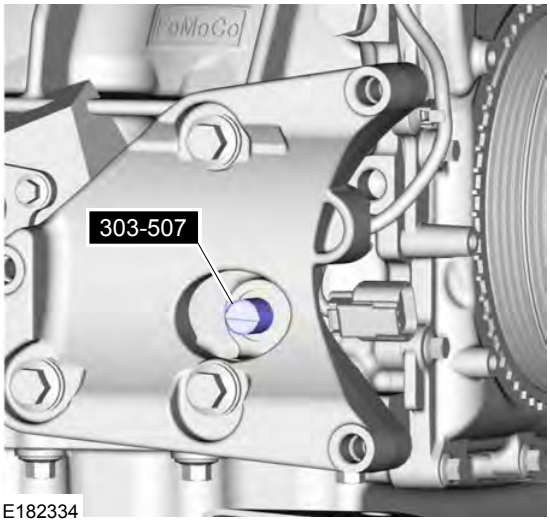
The camshaft timing must be performed whenever either the front camshaft bolts or the crankshaft pulley bolts have been loosened. This must be done as the camshafts and the crankshaft don't have keyways for chain wheel or pulley location. The friction washers must be replaced whenever a camshaft chain wheel or crankshaft pulley bolt has been loosened.

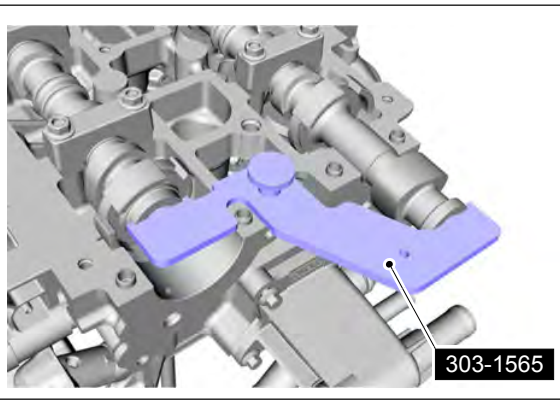
NOTE: If the crankshaft pulley or VCT unit bolts are loosened, the camshaft timing procedure needs to be performed.

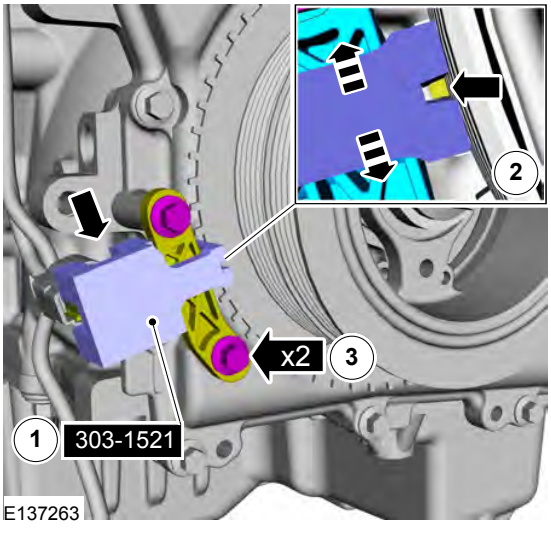
When replacing the timing chain there are a number of special tools which are required to ensure correct engine timing:

If the crankshaft pulley or VCT unit bolts are loosened, the camshaft timing procedure needs to be performed. When replacing the timing chain there are a number of special tools which are required to ensure correct camshaft timing:

- 303-507 Crankshaft locking tool
- 303-1565 Camshaft alignment tool
- 303-1521 CKP alignment tool



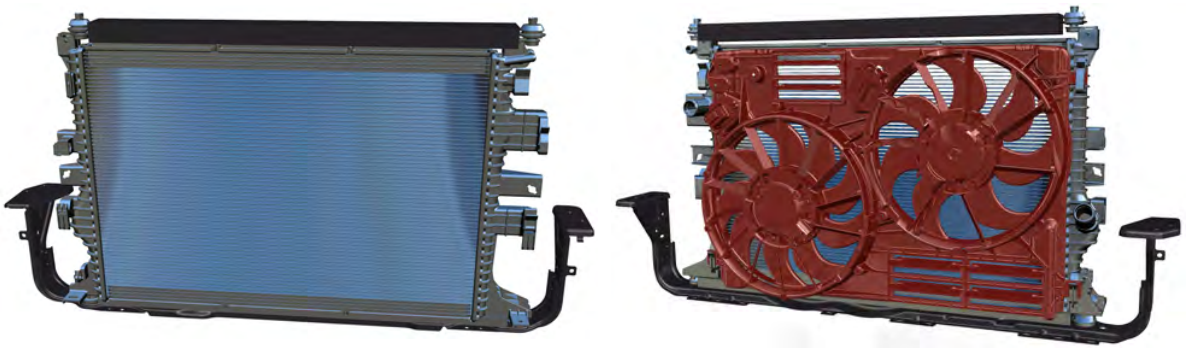




NOTE: For further information regarding camshaft timing procedures and tightening torques refer to the Workshop Manual.

Engine Cooling

Radiator



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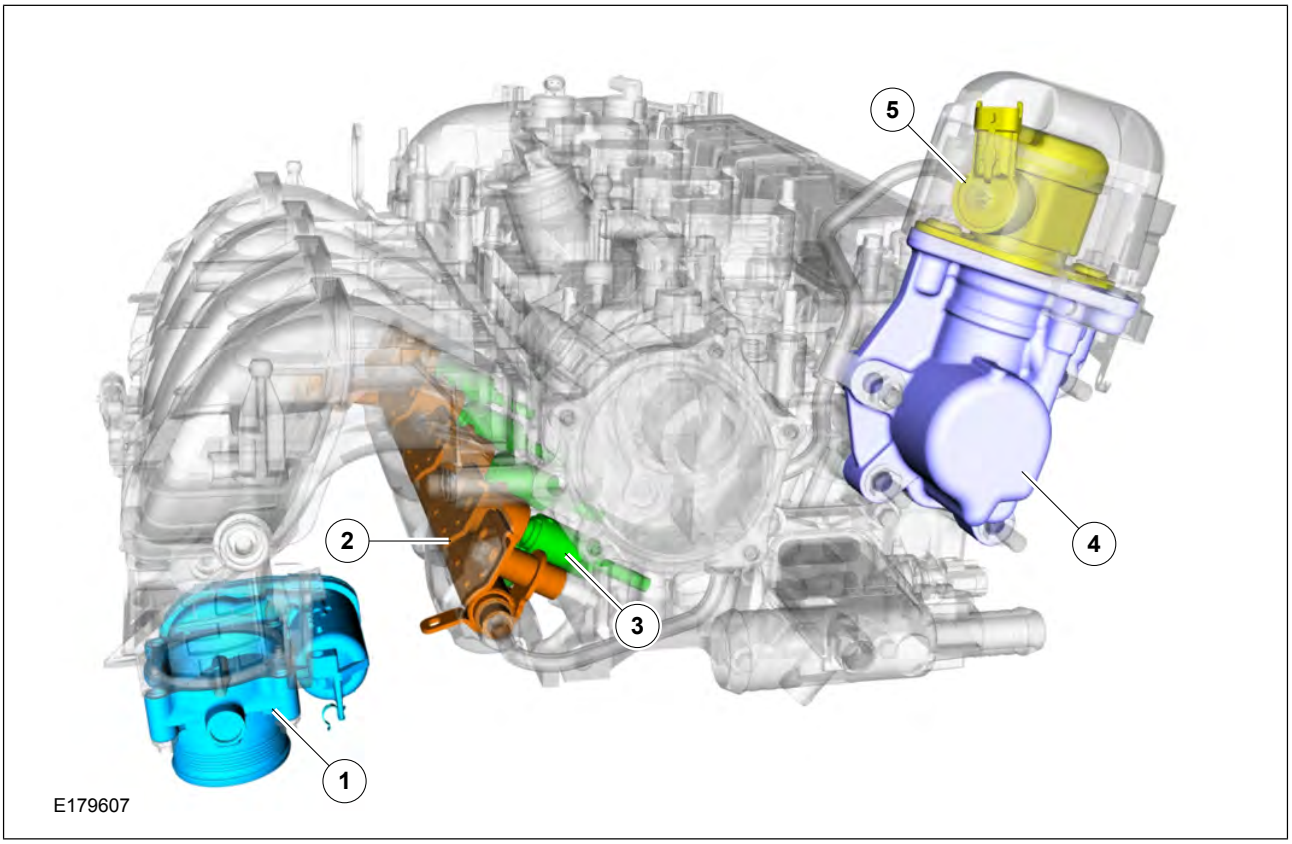
Engine cooling has been given the highest priority on the Focus RS, with engineers creating additional space within the front of the vehicle to house a significantly larger radiator pack, the biggest ever fitted to a Focus. The radiator was designed to provide the level of cooling demanded for hard circuit use.

Two cooling fans provide additional airflow through the radiator when the vehicle is at low speed, stationary or during high engine temperatures.

Fuel Charging and Controls

High-Pressure Fuel System



1 Throttle Body (TB)
2 Fuel rail
3 Fuel injector
4 High-pressure fuel pump drive unit
5 High-pressure fuel pump

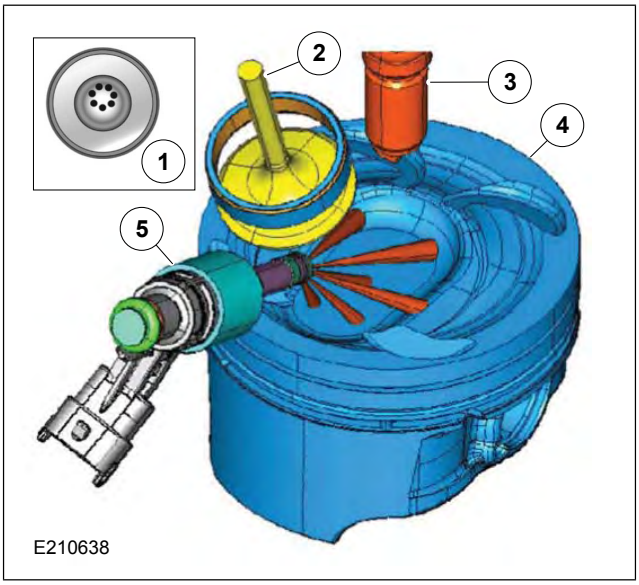
The high pressure fuel system consists of the following components:

- Mechanical high pressure fuel pump with incorporated fuel metering valve
- High pressure fuel line
- High pressure fuel rail
- FRP (fuel rail pressure) sensor

The high pressure fuel system receives low pressure fuel from the fuel pump assembly and delivers fuel at high pressure to the fuel injectors.

System Operation

Direct Fuel Injection System



1 Injector nozzle outlet
2 Inlet valve
3 Spark Plug
4 Piston
5 Fuel Injector

Direct petrol fuel injection systems feature a high-pressure fuel system which injects fuel directly into the combustion chamber. The fuel/air mixture is generated inside the combustion chamber.

Operating Modes

The direct fuel injection system fitted to 2.3L EcoBoost engines has two different operating modes:

- Homogeneous operating mode
- Heat catalytic converter operating mode

Homogeneous Operating Mode

When the engine is at operating temperature, mixture formation takes place exclusively in homogeneous operating mode. In this mode, the injected quantity of fuel is metered precisely to the fresh air at the stoichiometric air to fuel ratio for petrol of 14.7:1 (Lambda 1.00).

The fuel is injected during the intake stroke here so that enough time remains to homogenise the entire mixture. In homogenous operating mode, the fuel charging and combustion are similar to manifold injection.

Heat Catalytic Converter Operating Mode

The heat catalytic converter operating mode serves to quickly heat up the three-way catalytic converter when the engine is cold and is possible by means of twin injection.

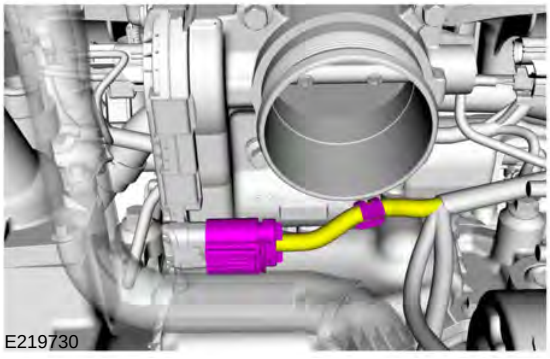
The first injection, as in homogeneous operating mode, is initiated during the intake stroke. The second injection takes place during the compression stroke, immediately after the intake valves close. This produces a rich core of fuel around the spark plug.

The ignition timing is retarded so that maximum combustion heat can enter the exhaust tract to heat the three-way catalytic converter.

NOTE: If the fuel rail pressure is too low on engine warm up then it will not be possible to initiate the heat catalytic converter operating mode. The injection will be in homogenous mode and a DTC code will be set.

Component Description

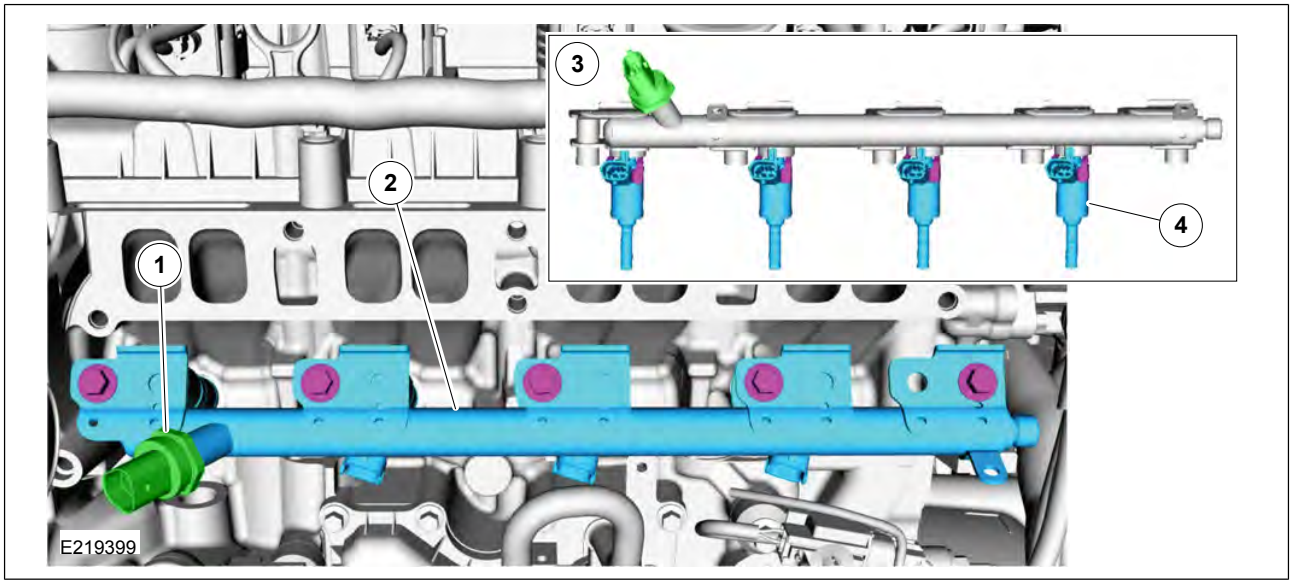
Throttle Body



The throttle body system meters air to the engine during idle, part throttle, and wide open throttle (WOT) conditions. The throttle body system consists of single bore with butterfly valve throttle plates and a throttle position (TP) sensor.

The major components of the throttle body assembly include the TP sensor and the throttle body housing assembly.

High Pressure Fuel Rail



1 FRP sensor
2 High pressure fuel rail
3 High pressure fuel rail removed
4 Fuel injector

The high pressure fuel pump supplies fuel to the fuel rail which distributes fuel to the fuel injectors. When the fuel injectors are opened by a signal from the PCM the fuel is injected into the cylinder.

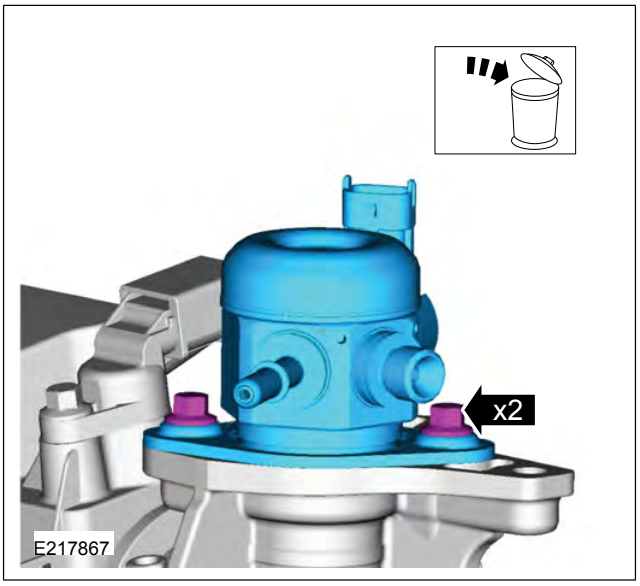
The FRP sensor is a diaphragm strain gauge device which measures the pressure difference between the fuel rail and atmospheric pressure.

The FRP sensor nominal output varies between 0.5 and 4.5 volts, with 0.5 volts. The sensor can read vacuum and may lower the output voltage to slightly below 0.5 volts.

This condition is normal and is usually the case after several hours of cold soak before the vehicle dome light is turned ON.

The FRP sensor is located on the fuel rail and provides a feedback signal to indicate the fuel rail pressure to the PCM. The PCM uses the FRP signal to command the correct injector timing and pulse width for correct fuel delivery at all speed and load conditions. The FRP sensor, along with the fuel volume regulator (part of the fuel injection pump), form a closed loop fuel pressure control system.

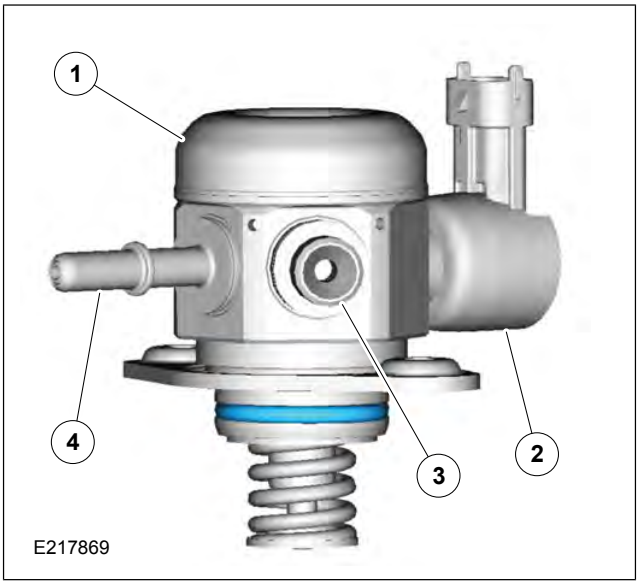
High Pressure Fuel Pump



The high pressure fuel pump is located at the rear of the engine and is driven by a four sided cam on the exhaust camshaft. The high pressure fuel pump increases fuel rail pressure to the desired level to support fuel injection requirements.

Unlike conventional gasoline port fuel injection systems, the desired fuel rail pressure for the direct injection system ranges widely over various engine operating conditions. The high pressure fuel pump receives fuel from the fuel pump assembly (in tank), and increases the fuel pressure delivering it to the fuel rail.

NOTE: When the high pressure fuel pump is removed the retaining bolts must discarded and a new bolts installed, refer to the WSM for more information.



1 High pressure fuel pump
2 Fuel volume control valve (integral to the high pressure fuel pump)
3 Fuel rail pipe connection (outlet)
4 Fuel line to fuel tank connection (inlet)

The fuel volume control valve is a solenoid valve permanently mounted to the pump assembly. The PCM commands the fuel volume control valve to meter in a specified fuel volume with each pump stroke. The PCM regulates the fuel volume into the rail to achieve the desired fuel rail pressure.

The fuel volume control valve is synchronised to the cam position on which the pump is mounted. The PCM takes into account that camshaft phasing which varies during engine operation.

The fuel pressure sensor is a 3 wire variable capacitance sensor located at the end of the fuel rail. The PCM supplies a 5 volt reference (VREF) signal which the FRP sensor uses to produce a linear analog voltage indicating fuel pressure.

The primary function of the FRP sensor is to provide fuel rail pressure feedback to the PCM. The PCM monitors FRP sensor as the engine is operating to control fuel pressure.

This is a closed loop function which means the PCM continuously monitors and adjusts for ideal fuel rail pressure determined by conditions such as engine load, speed and temperature. The fuel rail pressure can be monitored using IDS.

Fuel Injectors

The direct fuel injection fuel injector delivers fuel directly into the cylinder under high pressure. Each injector is controlled by 2 circuits from the PCM.

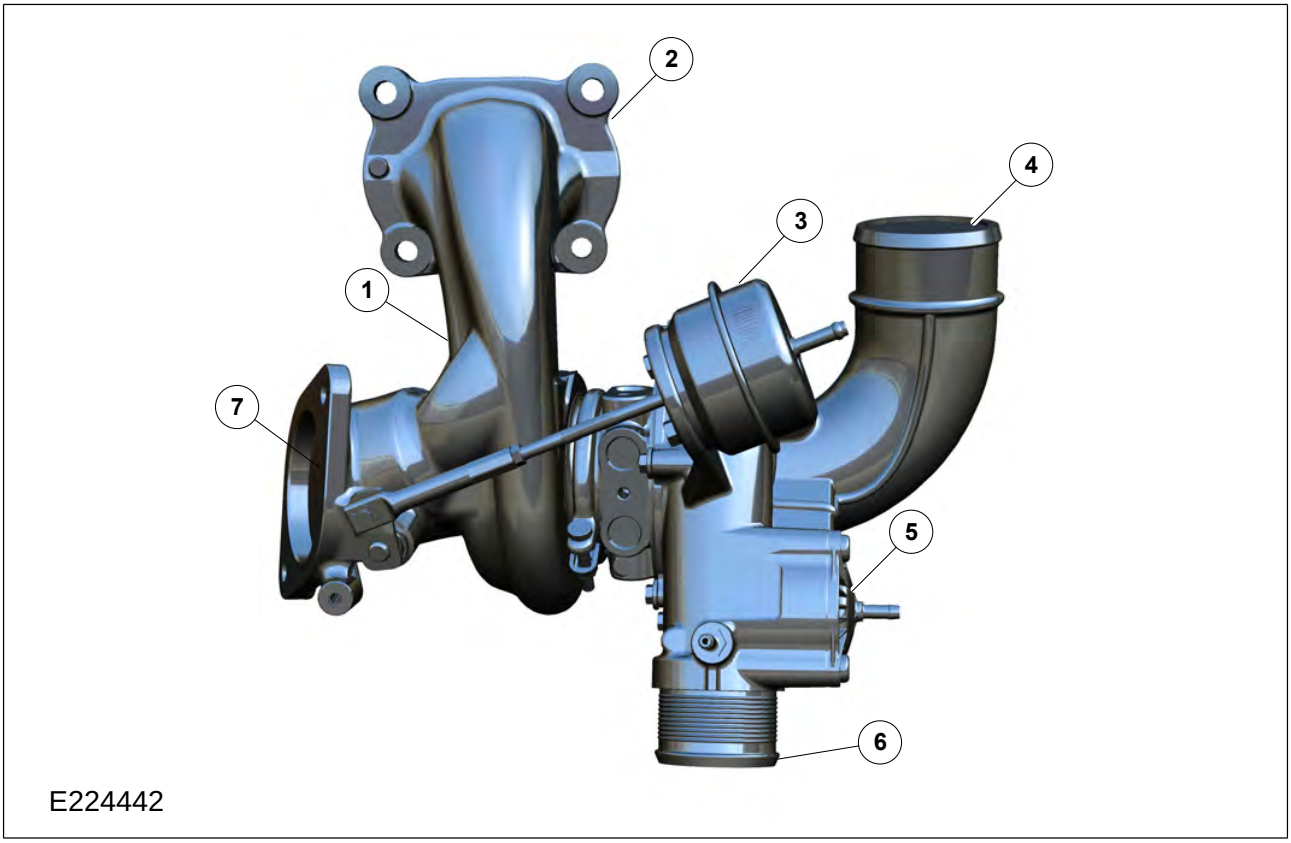
A boosted voltage supply, up to 65 volts, is generated in the PCM and used to initially open the injector. The injector driver controls three transistor switches that apply the boost voltage to open the injector and then modulates the current to hold the injector open.

The PCM contains a smart driver that monitors and compares high side and low side injector currents to diagnose numerous concerns. Each fuel injector high side circuit is paired inside the PCM with another fuel injector high side circuit.

NOTE: When replacing fuel injector(s) the fuel injector O-ring, injector support ring and lower fuel injector Teflon® seal must be removed and discarded and new components must be installed.

NOTE: When replacing fuel injector(s) the following special tools must be used, 310-205 Brush, 310-206 Remover, 310-207 Seal Installer, 303-1567 Teflon® Seal Sizer and 307-005 (T59L-100-B) or equivalent Slide Hammer.

Turbocharger



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1 Turbocharger assembly
2 Direct mount to cylinder head
3 Turbocharge wastegate actuator
4 Air inlet from air cleaner
5 Turbo charger by pass valve
6 Air outlet (CAC)
7 Exhaust system

⚠ **NOTICE: Whenever turbocharger air intake system components are removed, always cover open ports to protect from debris. It is important that no foreign material enter the system. The turbocharger compressor vanes are susceptible to damage from even small particles. All components should be inspected and cleaned, if necessary, prior to installation or reassembly.**

The Focus RS 2.3 Litre EcoBoost engine is fitted with a NEW twin-scroll turbocharger. The turbocharger incorporates an internal bypass valve.

The turbocharger is an exhaust-driven centrifugal air compressor. Its purpose is to increase power output by supplying compressed air to the engine. The internal components are cooled by engine oil, engine coolant and air. Engine oil and coolant are circulated through the center housing which acts as a heat barrier between the "hot" turbine and the "cold" compressor. Bearings are sleeve type and lubricated by engine oil. Oil is

circulated to the turbocharger center housing and returned to the sump through an oil drain in the center housing.

Expanding exhaust gases drive the turbine shaft assembly to speeds up to 200,000 rpm. Filtered air entering the compressor side of the turbocharger is compressed and delivered through a Charge Air Cooler (CAC). The very hot compressed air is cooled by the CAC, and then continues on to fill the intake manifold at a higher pressure than atmospheric pressure. Because considerably more air is forced into the intake manifold, the results are increased power, fuel efficiency and the ability to maintain power at higher altitudes.

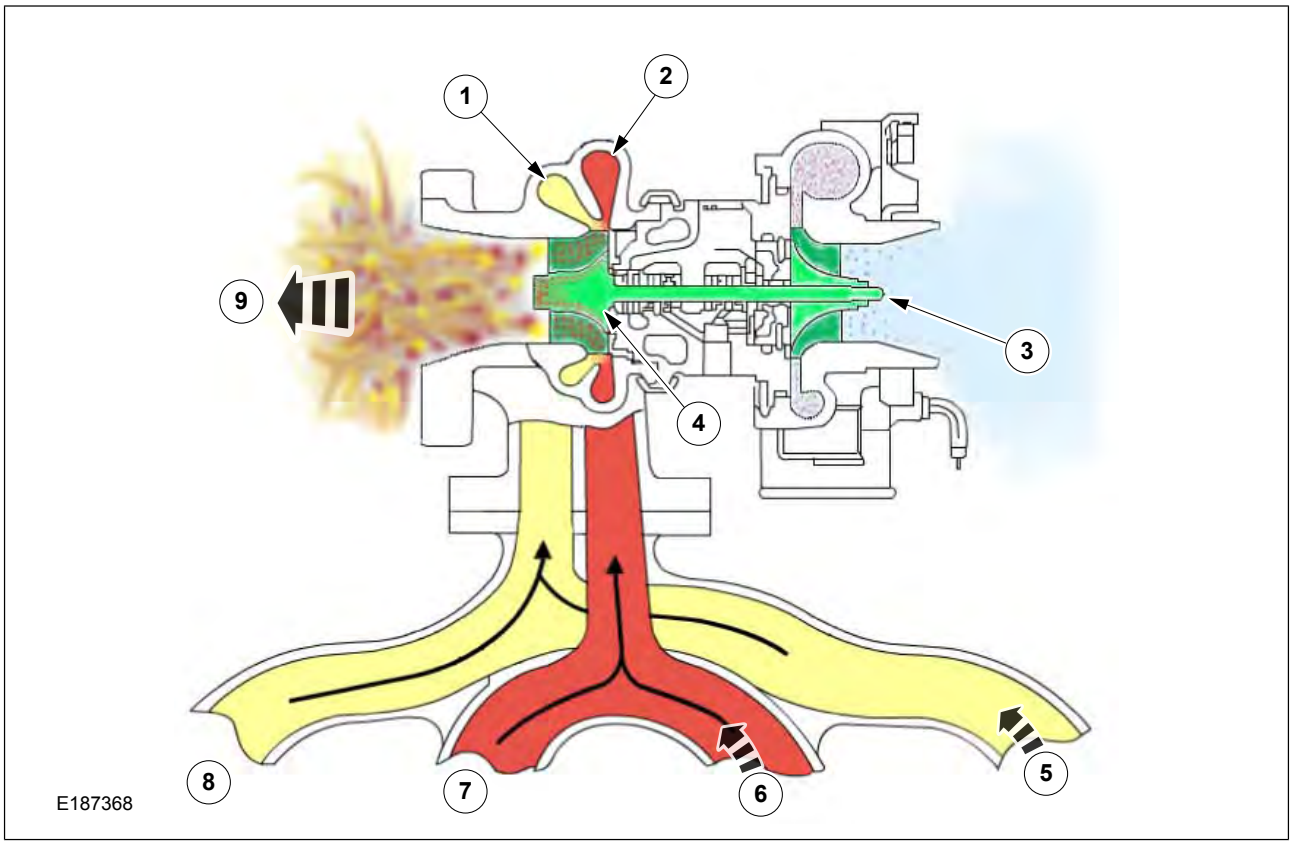
The turbocharger wastegate is designed to be in the closed position. The wastegate is normally closed at the onset of engine run.

The turbocharger is mounted to the cylinder head. This configuration improves engine responsiveness (turbo lag) due to the close proximity of the exhaust turbine to the cylinder head. This also leads to an improved turbocharger package and better utilization of heat energy from the compact cylinder head to turbocharger flange. The compact design of the system allows the catalysts to be located very close to the turbocharger outlet for improved emissions.

A bypass valve is fitted to the TC (turbocharger) outlet pipe. The bypass valve maintains impeller shaft speed when the throttle is closed quickly. The bypass valve is a pneumatic valve which is actuated by the PCM (powertrain control module).

System Operation

Twin-Scroll Turbocharger



1 Turbine housing volute, cylinders 1 and 4 combined

2 Turbine housing volute, cylinders 2 and 3 combined

3 Compressor wheel

4 Turbine wheel

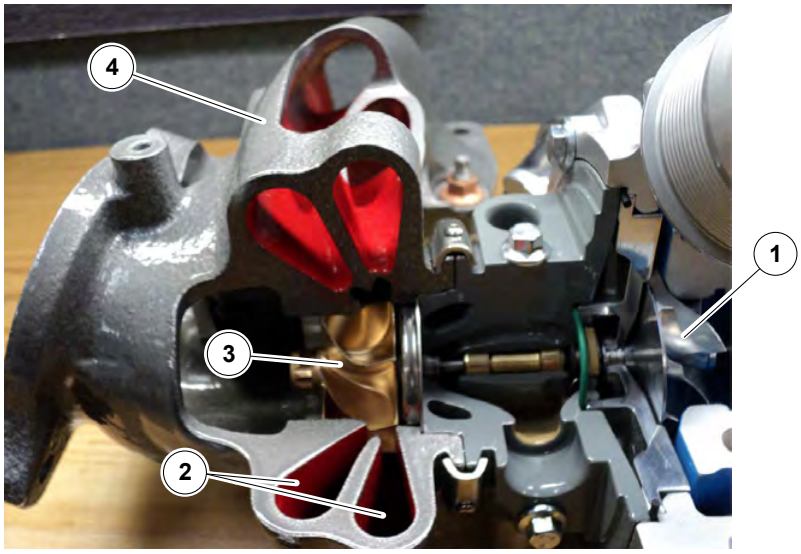
5 Exhaust cylinder 1

6 Exhaust cylinder 2
7 Exhaust cylinder 3
8 Exhaust cylinder 4
9 Turbine housing exhaust outlet

Unlike a traditional mono-scroll turbo, a twin-scroll turbo has two separate chambers in the turbo housing along with two separate exhaust runners that flow into the turbo, one runner for cylinders 1 and 4 and another runner for cylinders 2 and 3. Since the cylinders fire in sequence (not all at once), the exhaust exits the combustion chamber in irregular pulses.

Conventional mono-scroll turbochargers route those irregular pulses of exhaust into the turbine with a single runner (think of a 4-into-1 exhaust). This design causes the exhaust gases to collide and interfere with one another, reducing the strength of the flow.

In contrast, a twin-scroll turbocharger gathers exhaust from pairs of cylinders in alternating sequence. This design maximizes pulse energy to the turbine wheel. The result is a quicker torque delivery (reduced lag).



1 Compressor wheel
2 Twin scrolls
3 Turbine wheel
4 Housing

The Focus RS twin scroll turbocharger is equipped with a new turbine and larger compressor wheel (60 mm to 63 mm). This permits a higher boost pressure and ensures improved airflow.

The engine also has an overboost feature increasing boost above its normal max boost pressure to allow temporary torque delivery. This feature widens the RPM range of the peak torque curve, giving maximum performance while passing another vehicle or launching from a standing start.

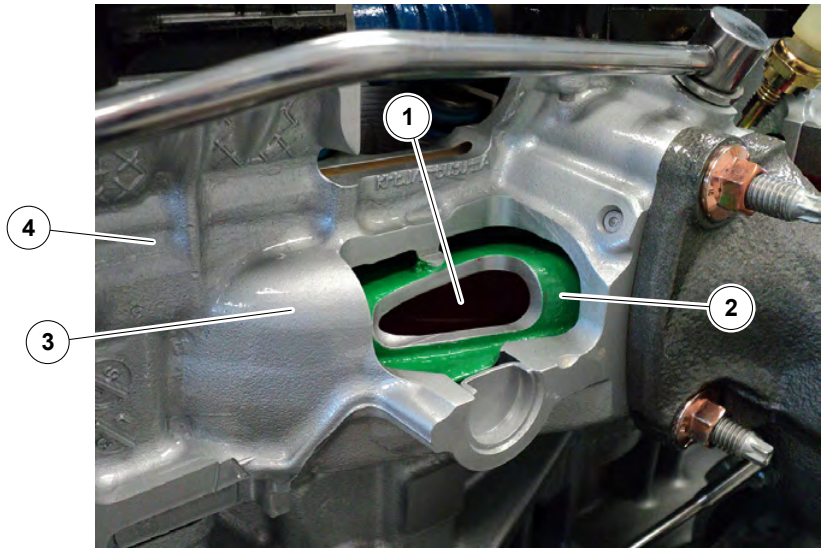
The system allows a maximum of 20 seconds of engine overboost. After 20 seconds the system automatically ramps down the turbo boost to a predetermined max limit.

Once the turbo boost drops below the predetermined limit the system resets and a further 20 seconds of engine overboost is permitted.

NOTE: The engine management system automatically controls overboost.

Component Description

Integrated Exhaust Manifold (IEM)

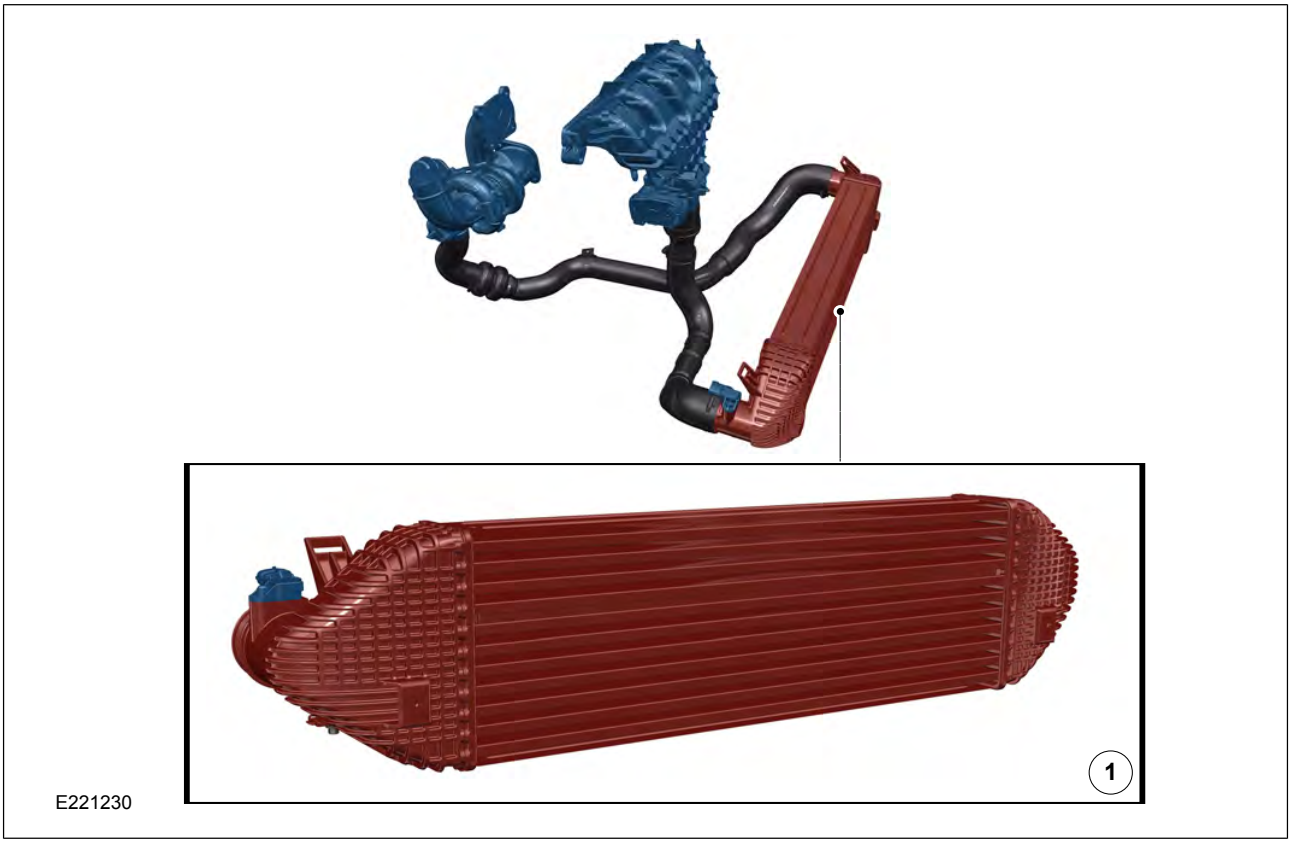


1 Exhaust passage
2 Coolant passage
3 Integrated Exhaust manifold (IEM)
4 Cylinder head

The turbocharger is mounted to an Integrated Exhaust Manifold (IEM) positioning it closer to the cylinder head exhaust ports for better response. The exhaust that flows from the inner and outer pairs of cylinders are kept separate as they flow into the two scrolls of the turbocharger. Separating the exhaust pulses until they reach the turbine wheel minimizes the backflow into the next pulse, which provides a more efficient delivery of exhaust gas energy to the turbine wheel.

The result is quicker response, improved efficiency and better scavenging through valve overlap. The IEM is cooled by engine coolant flowing throught it.

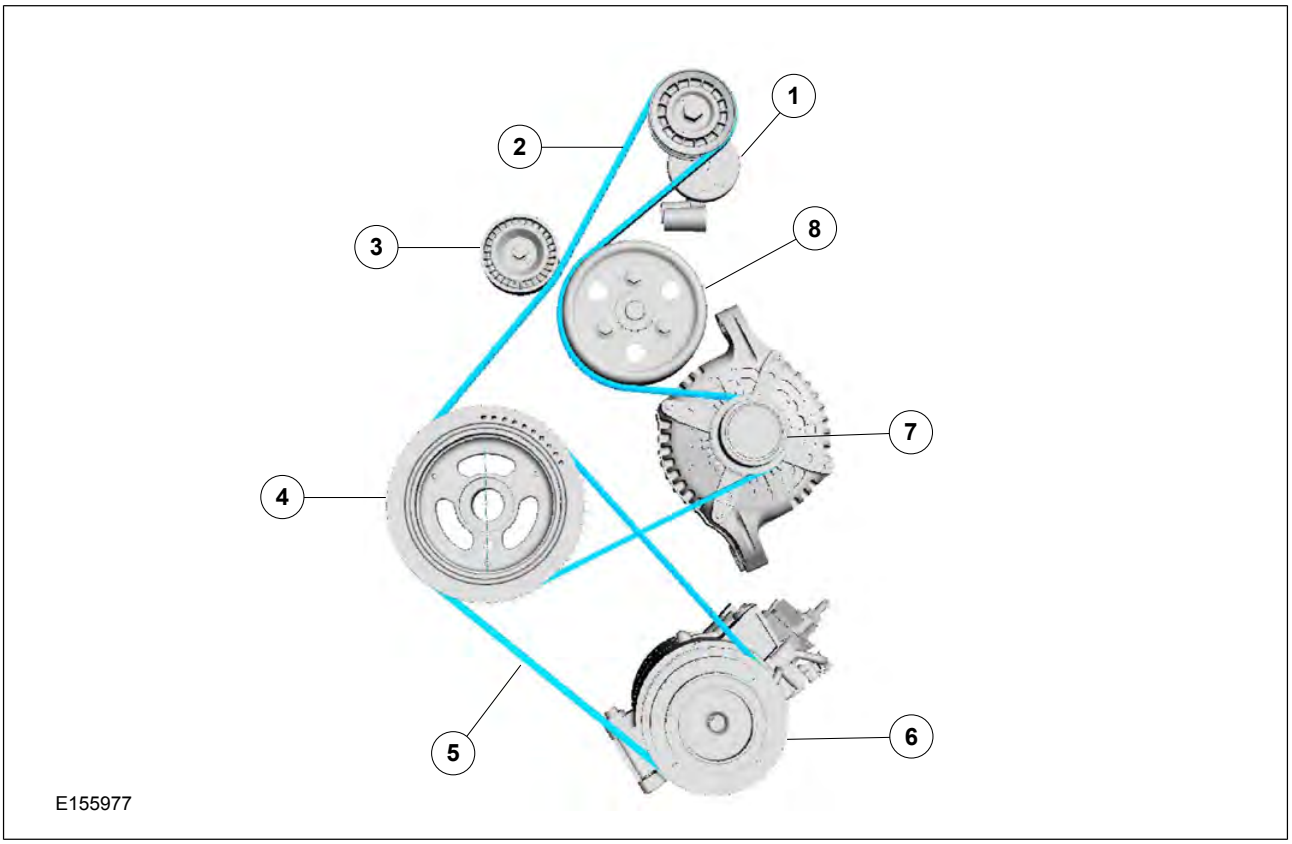
Charge Air Cooler (CAC)



1 Charge Air Cooler (CAC)

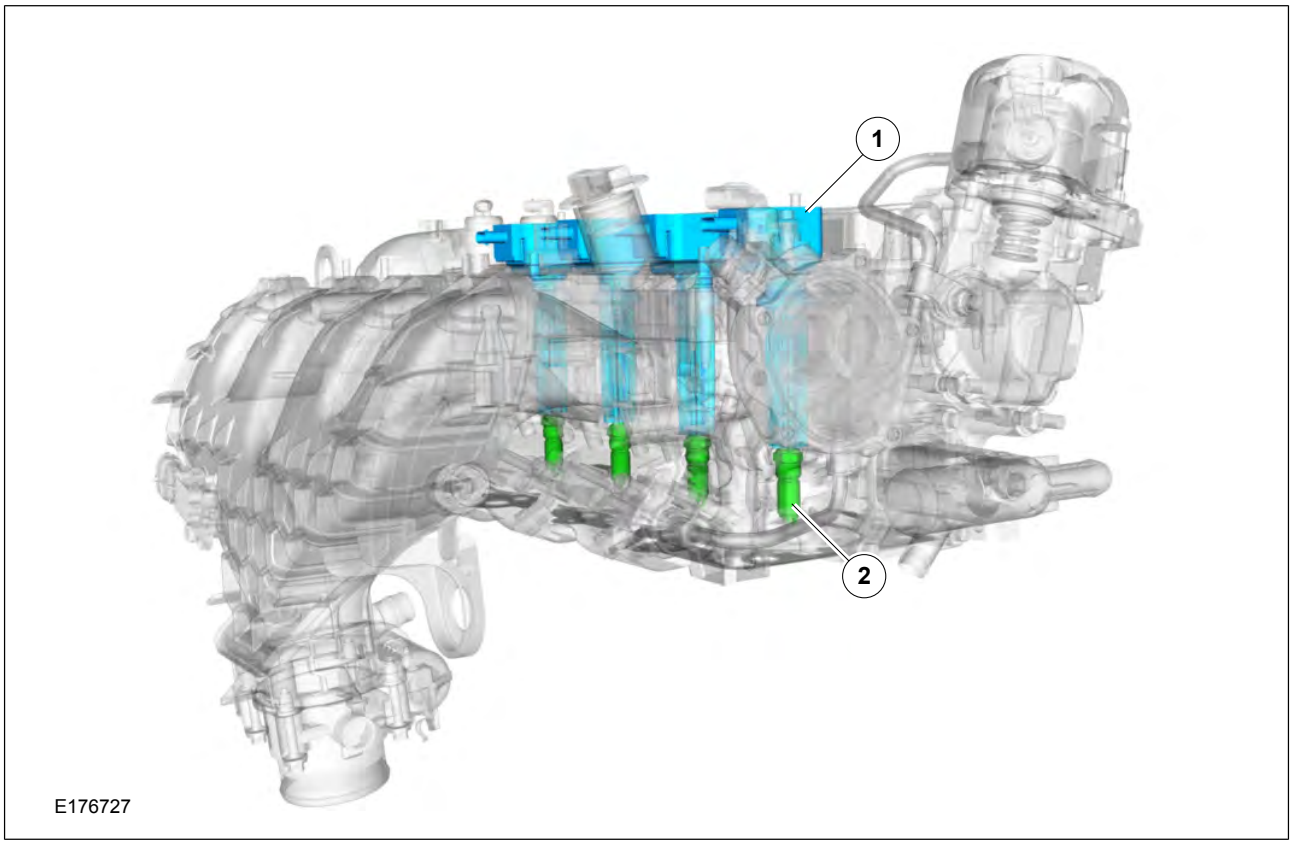
A larger charge air cooler is used in combination with the TC to increase the air density in the combustion chamber.

Accessory Drive



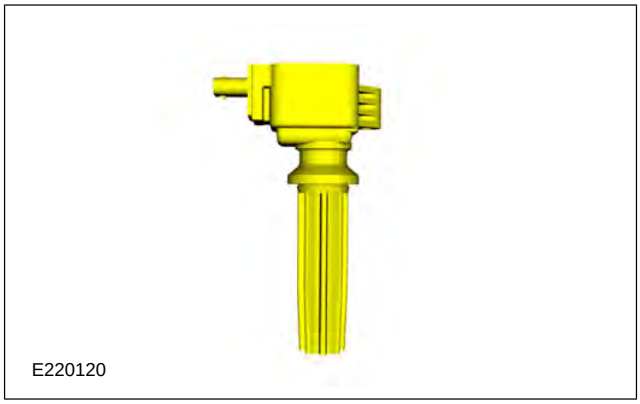
1 Accessory drive belt tensioner
2 Accessory drive belt
3 Drive belt idler pulley assembly
4 Crankshaft belt pulley
5 Belt - A/C compressor
6 Pulley - A/C compressor
7 Generator pulley
8 Coolant pump pulley

Engine Ignition



1 Ignition coil-on-plug(s)

2 Spark plug(s)



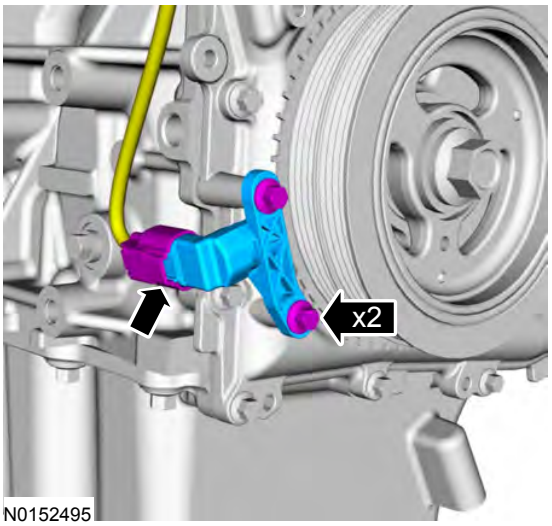
The ignition system ignites the compressed air and fuel mixture in the engine's combustion chamber using a high voltage spark delivered from an ignition coil. The ignition coil is controlled by the PCM.

The ignition system fitted to this engine is referred to a COP (coil on plug) type, where each spark plug has its own ignition coil. COP ignition coils eliminate the need for secondary spark plug wires which improves ignition spark reliability.

The ignition system uses a 3 wire COP type ignition coil. This means the coil driver is integrated in the COP assembly. This configuration eliminates the need for high current circuits from the PCM to the COP.

NOTE: Electronic ignition engine timing is controlled by the PCM and is not adjustable. Do not attempt to check base timing as a false reading will be obtained.

The integrated electronic ignition system consists of a Crankshaft Position (CKP) sensor, Camshaft Position (CMP) sensor, COP, connecting wiring, and PCM.



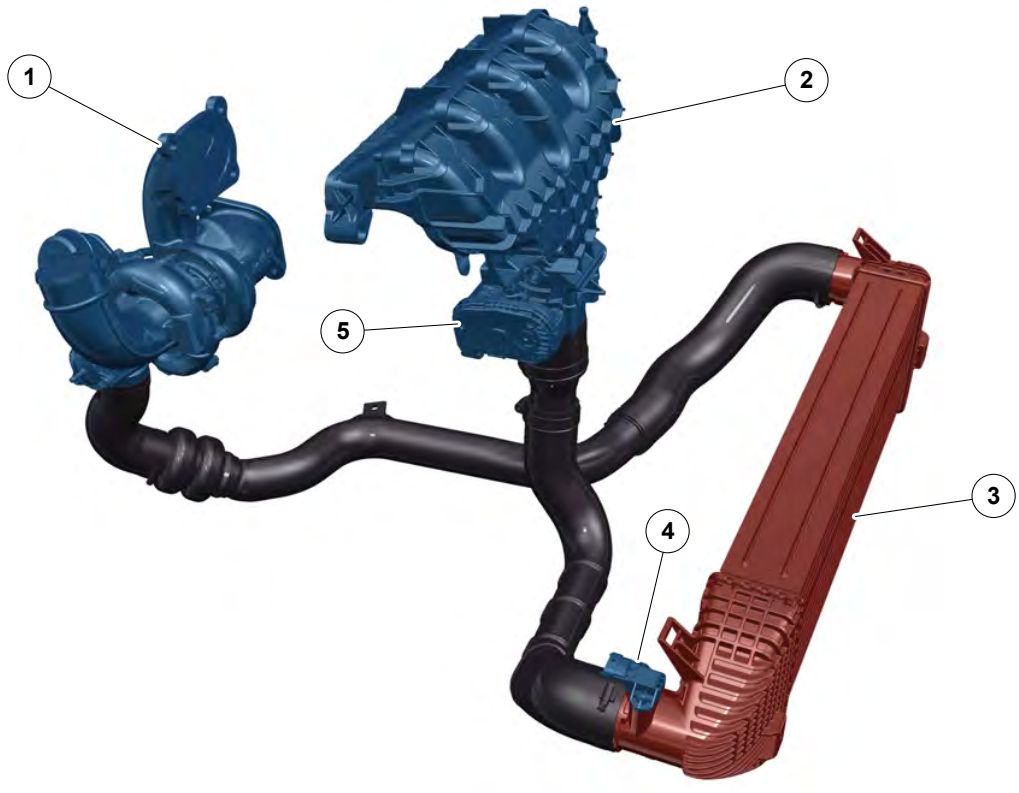
The PCM uses the CKP sensor signal to calculate a spark target and then fires the COP. The PCM uses the CMP sensor signal to identify the compression stroke of cylinder 1.

The PCM controls the ignition coils after it calculates the spark target. The COP coils fire the spark plug after receiving the fire signal from the PCM.

The current flow or dwell through the primary ignition coil is controlled by the COP electronics.

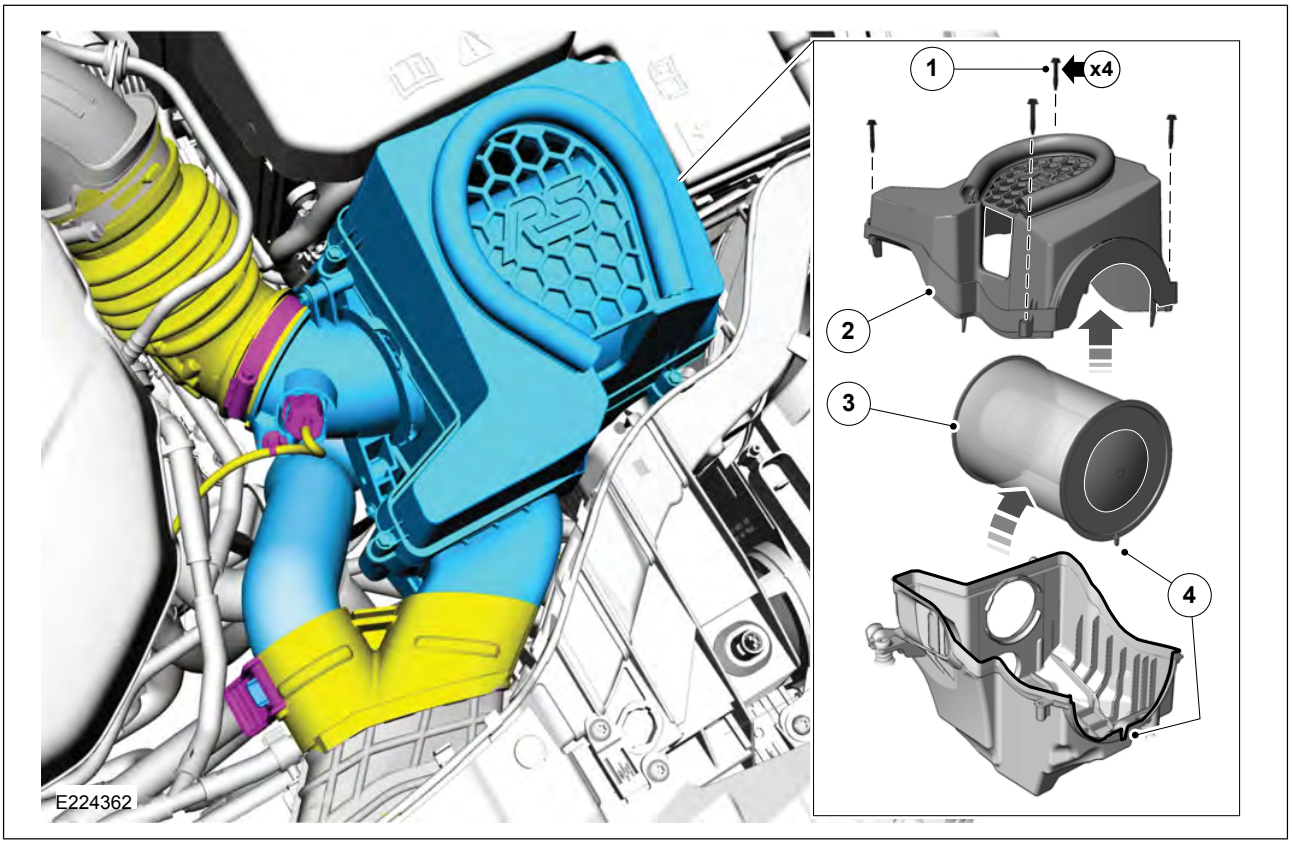
When the ignition coil driver is switched ON, current rapidly builds up to a maximum value, determined by the coil inductance and resistance. When the current is switched OFF, the magnetic field collapses which induces a secondary high voltage surge and the spark plug is fired.

Intake Air Distribution and Filtering



1 Turbocharger
2 Inlet manifold
3 CAC (charge air cooler)
4 Boost pressure sensor
5 Throttle body

Air Filter Element Replacement



1 Remove the screws that secure the air filter housing cover

2 Remove the air filter housing cover

3 Remove the air filter element from the air filter housing

Comments:

Wipe any dirt or debris from the air filter housing and cover to make sure no dirt gets in the engine and that you have a good seal

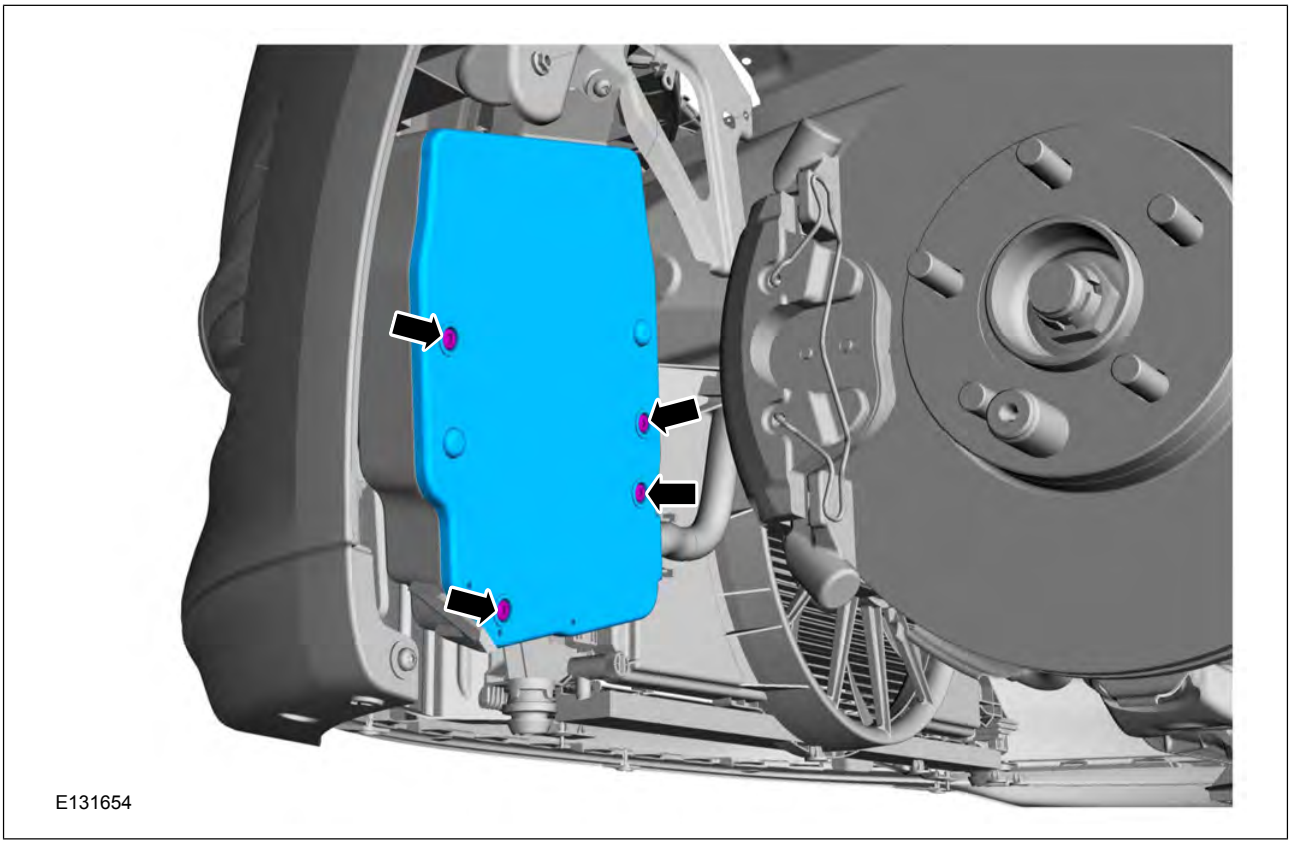
4 Install a new air filter element

5 Install the air filter housing cover

6 Install the screws to secure the air filter housing cover to the air filter housing

Electronic Engine Controls

2.3L EcoBoost Electronic Engine Controls



The EEC system provides optimum control of the engine through the enhanced capability of the powertrain control module (PCM). The EEC system also has an on board diagnostic (OBD) monitoring system with features and functions to meet federal regulations on exhaust emissions.

The EEC system has two major divisions: hardware and software. The hardware includes the PCM, sensors, switches, actuators, solenoids, and interconnecting terminals. The software in the PCM provides the strategy control for outputs (engine hardware) based on the values of the inputs to the PCM.

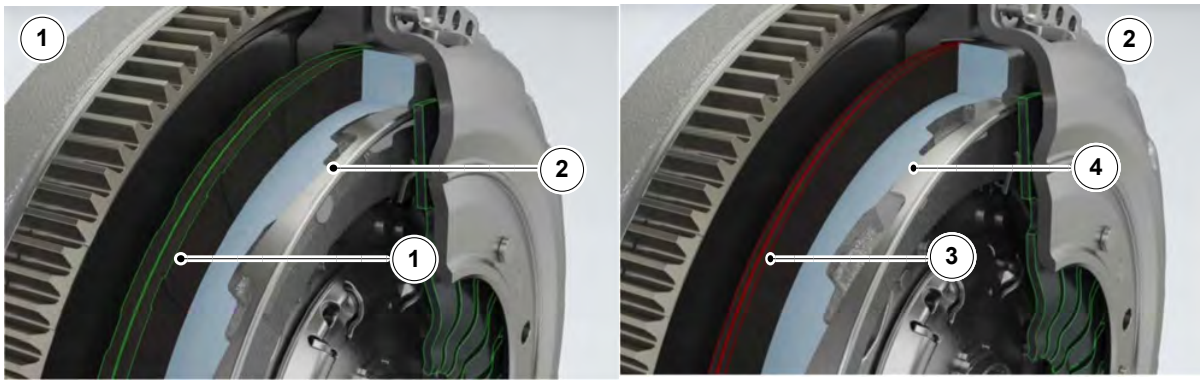
The PCM receives information from a variety of sensor and switch inputs. Based on the strategy and calibration stored within the PCM, the PCM generates the appropriate output. The system is designed to minimize emissions and optimize fuel economy and driveability.

The software strategy controls the basic operation of the engine, provides the OBD strategy, controls the malfunction indicator lamp (MIL), communicates to the scan tool over the data link connector (DLC), allows for flash electrically erasable programmable read only memory (EEPROM), provides idle air and fuel trim, and controls failure mode effects management (FMEM).

Clutch

The Focus RS is equipped with a modified PW10F clutch to handle the additional engine torque.

The clutch utilises a 'TAC' (Travel Adjusted Clutch) technology enabling higher overboost torques and is automatically adapted to the wear.



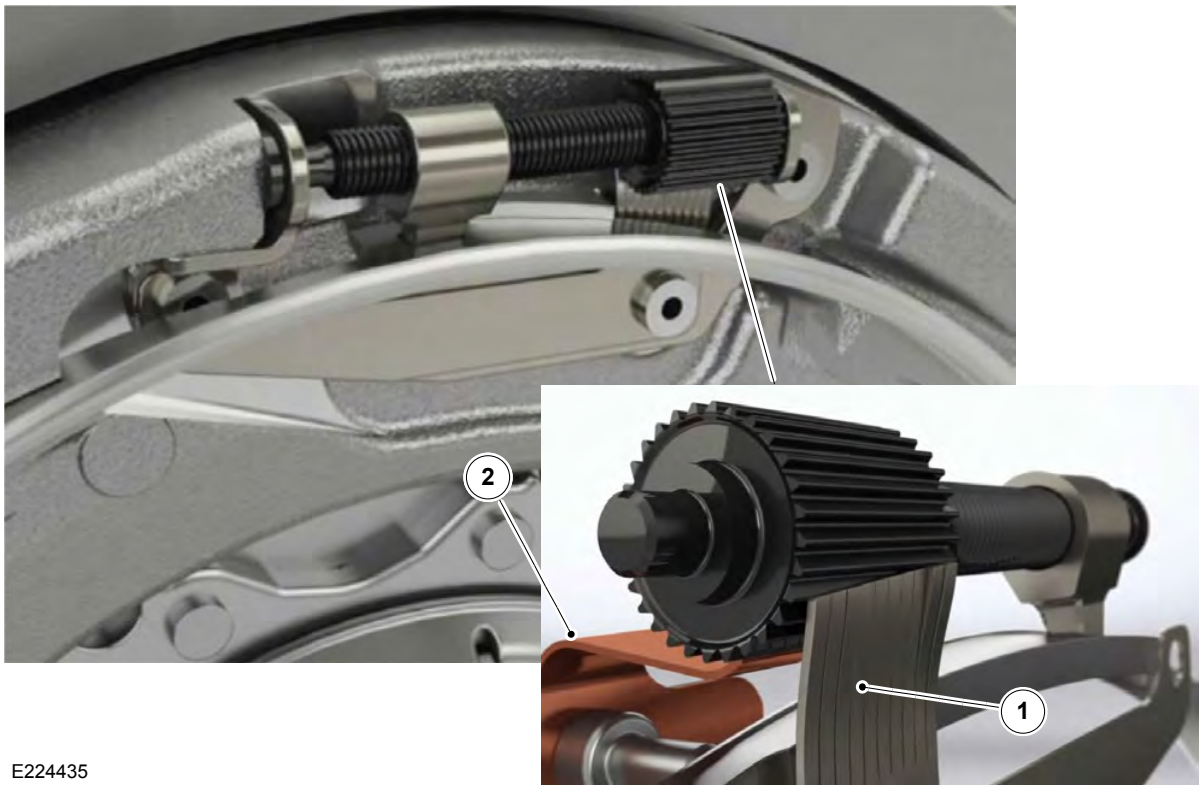
E224437

1 Clutch plate
2 Ramp ring
3 Clutch wear
4 Ramp ring movement

The system provides a way of compensating clutch lining wear. This is accomplished with the aid of a pinion/spindle drive and a ramp ring between the Belleville washer and pressure plate

The lining wear is compensated by turning the ramp ring. The installation position of the Belleville washer and the actuation forces remain constant.

The ramp ring is driven by the pinion/spindle drive via a positive connection. The pinion is not driven if there is no wear.



1 Pinion Spindle drive

2 Drive pawl

The drive pawl engages in the next tooth and drives the pinion, which compensates for wear. A mechanical freewheel locks the position of the pinion.

A redesigned dual-mass flywheel is also installed to minimize undesired noise, vibration and harshness.

Manual Transmission

MMT6 Manual Transmission with AWD (all-wheel drive)


E217553

The six-speed manual transmission has been optimised for the enthusiast driver with a shorter gear lever to deliver faster and more accurate shifts. Both the transmission and the clutch have been upgraded with stronger components to cope with the engine's increased torque output.

The Focus RS is equipped with a modified MMT6 manual transmission featuring carbon synchronizer rings, modified mounts at the halfshaft and a reinforced hub for greater load-carrying capacity.

The transmission bell housing has been adapted to suit the 2.3L EcoBoost RS engine. A neutral position sensor is installed for the Auto Start Stop functionality. This minimizes the fuel consumption and enables the CO^2 targets to be reached.

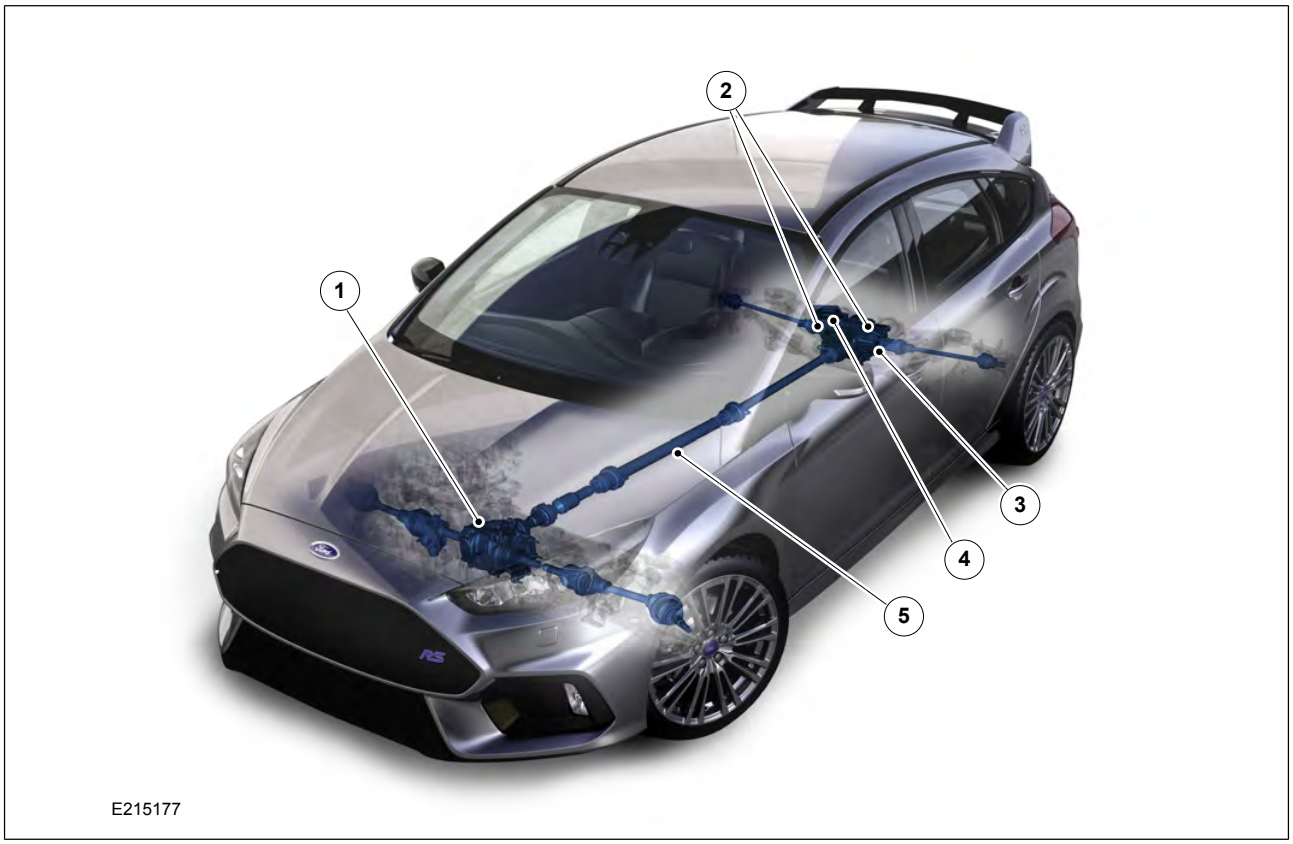
To meet the vehicle requirements, the torque of first gear has been increased to 350 Nm, the torque of second gear to 440 Nm, and the overall on demand torque to 470 Nm.

The sporty gearshift feel comes about through the shorter gearshift lever.

Ratios

2.3L EcoBoost 257Kw	Transmission Ratio	Final Drive Ratio	Overall Ratio
1st Gear.	3,231	4,063	13,128
2nd. Gear	1,952	4,063	7,931
3rd. Gear	1,321	4,063	5,367
4th. Gear	1,029	4,063	4,181
5th. Gear	1,129	2,955	3,336
6th. Gear	0,943	2,955	2,787
Reverse Gear	1,423	2,955	13,586

Four-Wheel Drive Systems



1 Transfer case (power transfer unit)
2 Hydraulically actuated clutches
3 TWINSTER® rear drive unit
4 AWD electronic control unit
5 3-piece drive shaft

AWD (all-wheel drive) with Dynamic Torque Vectoring

The Focus RS is offers a new level of handling capability and driver enjoyment with Dynamic Torque Vectoring, which combines outstanding traction and grip with exciting agility and cornering speed.

Dynamic torque vectoring use all four wheels to power the vehicle and independently control the torque to each wheel.

The system also has the ability to over speed the outside rear wheel while cornering, this increases traction and handling performance giving the vehicle handling capabilities that are superior to conventional two-wheel drive and four-wheel drive vehicles. The system is active all the time and requires no input from the driver.

The system comprises of two elements:

- **Torque vectoring control** - Automatically applies brake torque on the inner wheel in a curve to increase traction and decrease understeer
- **Cornering understeer control** - Automatically controls the traction response of the vehicle under braking and acceleration on high and low friction surfaces

Unlike electronic stability control, enhanced torque vectoring control does not slow the vehicle. The system limits excessive wheel slip giving greater cornering agility.

NOTE: The system does not disable enhanced torque vectoring control if the stability control system or traction control system are switched off.

The AWD system uses two electro-hydraulically controlled clutch packs on each side of the rear drive unit to apply torque to the rear wheels.

The clutch packs connect each rear halfshaft to the rear drive unit when engaged. The clutch packs manage the car's front/rear torque split and control the side-to-side torque distribution on the rear axle, delivering torque vectoring capability that has a dramatic impact on handling and cornering stability.

A maximum of 70% of the drive torque can be diverted to the rear axle, with up to 100% of available torque at the rear that can be sent to each rear wheel. This ensures optimum vehicle stability, counteracting 'Understeer' and initiating controlled 'oversteer'.

The rear drive unit does not require any normal scheduled maintenance. The system is electronically monitored and any required service messages appear in the information display.

The rear drive unit lubricants may require changing if the vehicle is subject to extended periods of high speed driving, for example race circuit use.

A wide range of sensor signals is processed at 100 times a second by the AWD system to adapt the torque distribution to the respective driving situation.

This includes the following data:

- Steering input
- Mixture control
- Engine power output/engine speed
- Yaw rate
- Lateral and longitudinal acceleration
- Brake system data
- Wheel speed
- Temperature

AWD System Messages

When a AWD system fault is present, a message appears in the information display and the system defaults to front-wheel drive. If a warning displays, the vehicle must be checked as soon as possible.

Messages	Action and Description
AWD OFF	Appears in the information display if the all-wheel drive system overheats and defaults to front-wheel drive. This may be caused by operating the vehicle with an incorrect wheel or tire installed or excessive wheel slip and the system is over-heating. The system resumes normal function and the message clears after the correct wheel or tire fitted or after the system has cooled. To resume normal all-wheel drive function as soon as possible, stop the vehicle in a safe location and switch the engine off for at least 10 minutes.
Check AWD	Appears in the information display along with the powertrain malfunction warning lamp when the system is not operating correctly. Have your vehicle checked as soon as possible.
Driveline Oil Minder	Appears in the information display when the power transfer unit or rear drive unit lubrication requires changing. The power transfer unit or rear drive unit lubricants may require changing if you use your vehicle for extended periods of high speed driving, for example race circuit use.

Operating With Mismatched Tires or Wheels

NOTE: Only use replacement tires and wheels that are of the same size, load index, speed rating.

NOTE: Using a tire or wheel that is not recommended could cause steering, suspension, axle, power transfer unit or rear drive unit failure.

The Focus RS does not have a spare tire. It is not recommend using a mismatched tire or spare wheel, however in an emergency, the system can tolerate a mismatched tire or spare wheel of a different size to the original for a short journey.

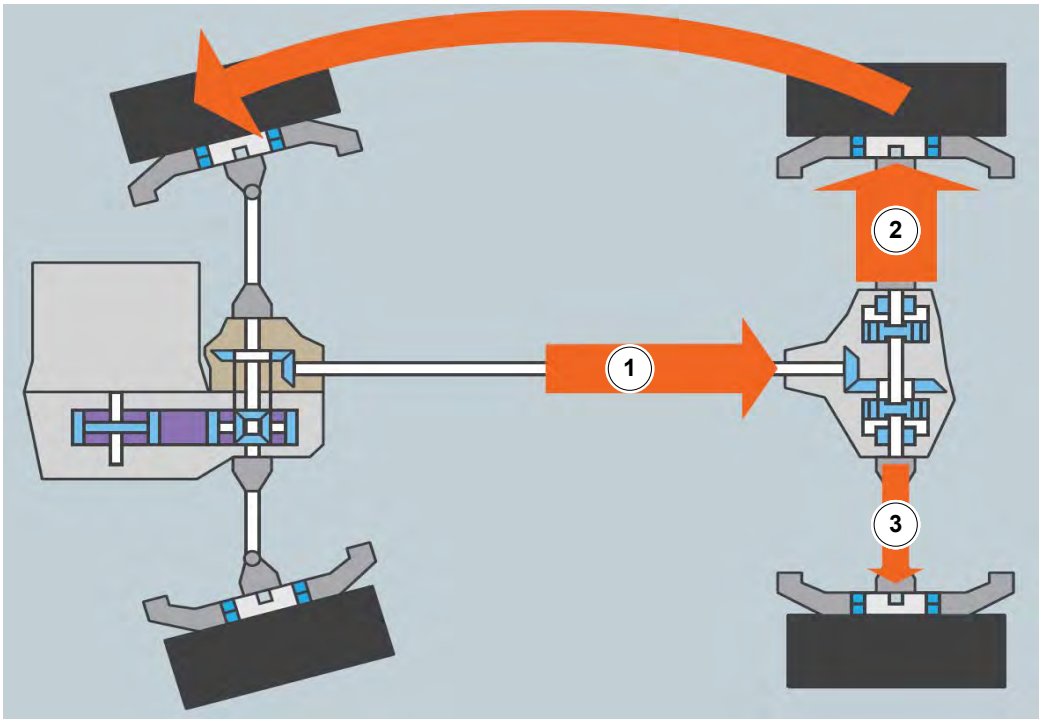
The system may automatically enter front-wheel drive only mode to protect driveline components if a mismatched tire or spare wheel is installed and a message displays in the information display. The message turns off after the correct wheel and is installed and the ignition is cycled.

Major mismatched tire or wheel sizes between the front and rear axles, for example 18 inch low profile tires on the front axle and 20 inch low profile tires on the rear axle causes the system to default to front-wheel drive only mode.

The system can tolerate any combination of new and worn tires of the same original tire size. For example, using 3 worn tires and 1 new tire.

System Operation

Dynamic Torque Vectoring



E220850

1 55% of the torque to the rear axle

2 90% of the rear-wheel torque to the outside wheel

3 10% of the rear-wheel torque to the inside wheel

Dynamic torque vectoring is used to actively influencing the yaw angle of vehicle. The AWD system can provide targeted steering assistance by distributing drive torque to an individual rear wheel.

The vehicle tires may loose grip with the road surface when cornering in the conditions listed below:

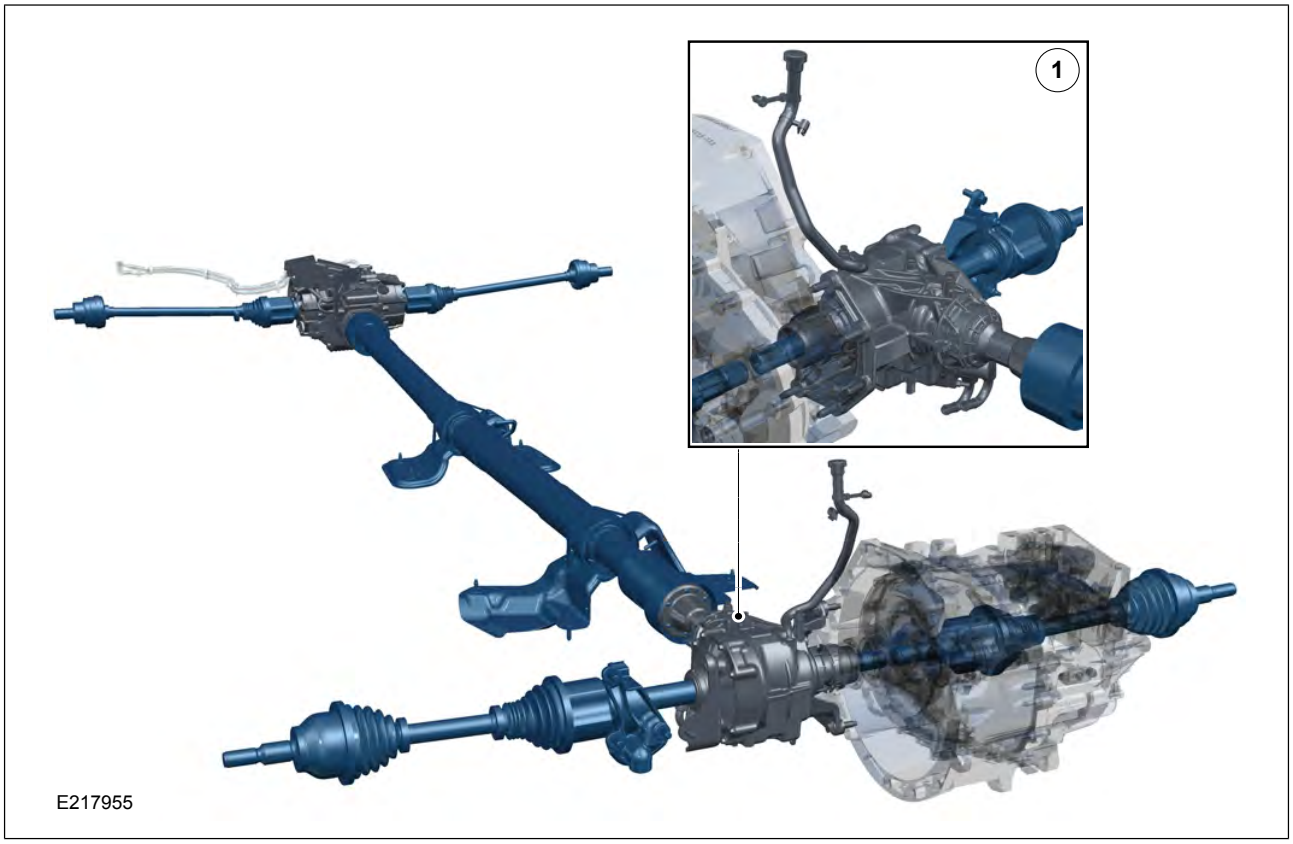
- High speed
- Wet road surface
- Uneven road surface
- Narrow curve radius

With the conventional traction control system, wheelspin on the inside wheel is prevented by reducing engine torque. Therefore the vehicle is only able to drive as fast as permitted by the traction on the inside wheel.

During cornering on vehicles with dynamic torque vectoring, the inside wheel is braked and the rear drive unit pre-emptively diverts torque to the outer rear wheel immediately, based on inputs from steering wheel angle, lateral acceleration, yaw and speed. The vehicle gains agility, has improved driving behaviour and increased steering precision.

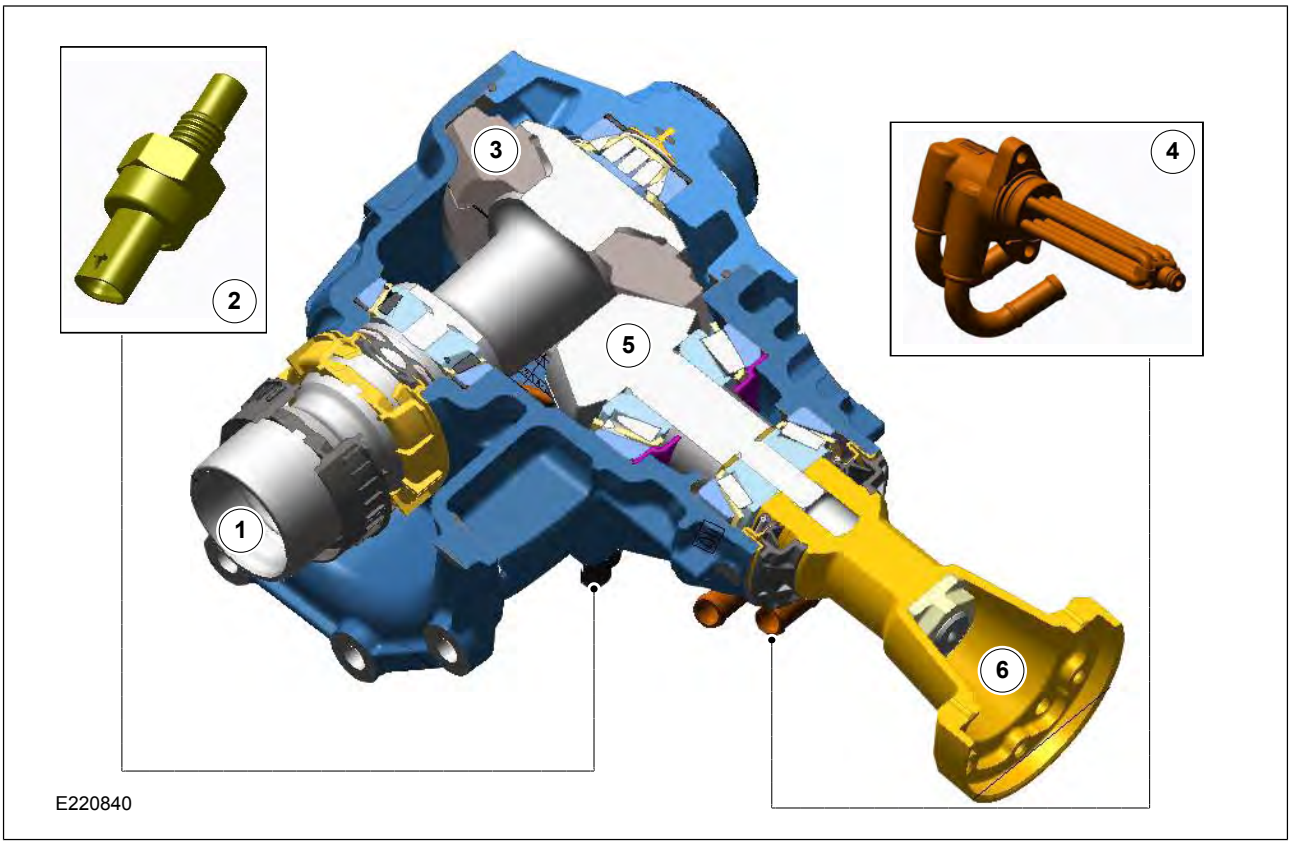
Component Description

Transfer Case



1 Transfer case (power transfer unit)

The main purpose of the transfer case is to transmit engine torque to the RH front halfshaft as well as to the TWINSTER® rear drive unit via the 3-piece drive shaft.



1 Input shaft
2 Temperature sensors
3 Ring gear
4 Water-cooled heat exchanger
5 Pinion
6 Output flange

To enable greater heat dissipation at the transfer case and support high torque input, a water-cooled heat exchanger and a temperature sensor have been installed into the transfer case.

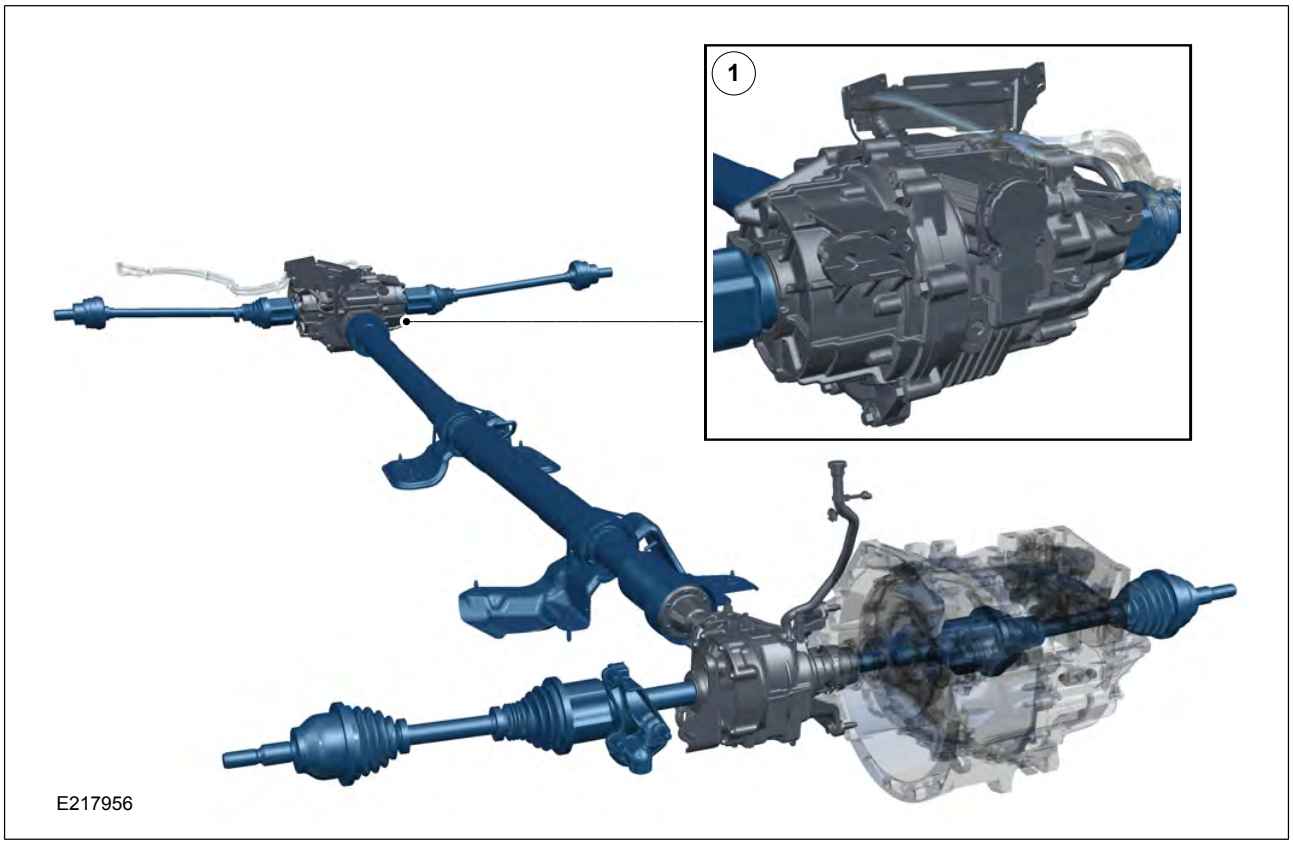
The AWD system monitors temperature sensor and when the temperature limits are exceeded the AWD functionality is deactivated.

The transfer case ring gear has been reinforced in order to withstand higher torques values of up to 1150 Nm.

The ring gear is welded onto the input shaft and drives the output pinion. The gear ratio is 2.58333 (31 ring gear teeth to 12 pinion teeth).

The capacity of the transfer case is 0.75 l (Motorcraft SAE 75W-140 synthetic oil – WSL-M2C192-A).

TWINSTER® Rear Drive Unit

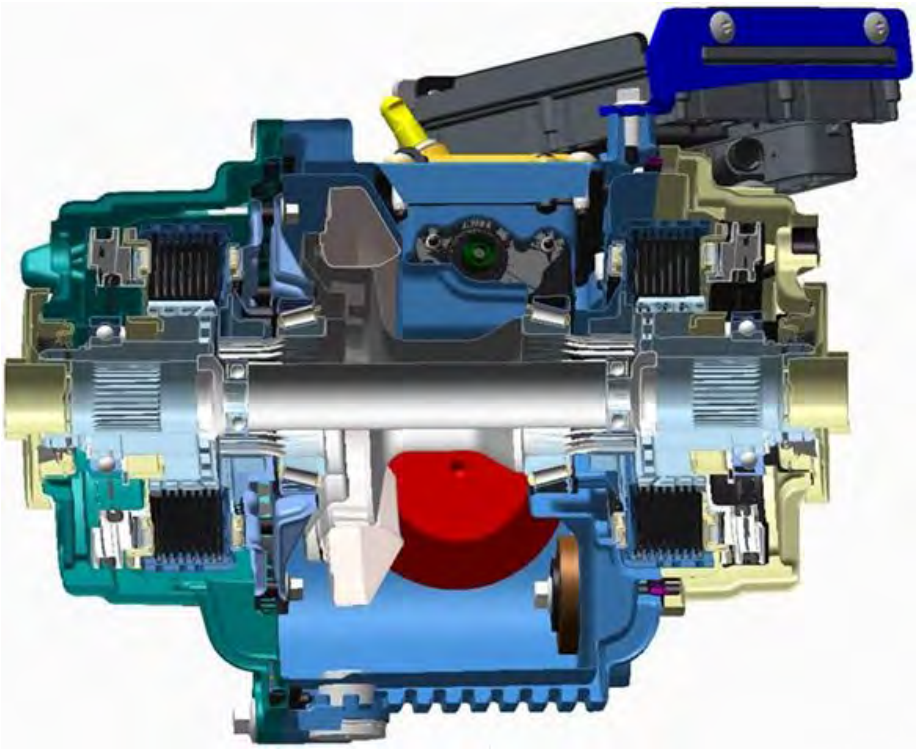


1 TWINSTER® rear drive unit

The TWINSTER® rear drive unit is a disconnect all-wheel drive system that disengages the rear wheels when it is not needed.

The rear drive unit contains two multi-plate clutches which are able to transmit engine torque to the rear wheels. The two clutches can be actuated on a wheel-specific basis using an electro-hydraulic servo drive and two control valves.

The independent rear drive unit continuously adapts the torque to each rear wheel depending on the driving situation.



E220578

The rear drive unit stores fluid in three separate chambers.

- Rear drive unit differential housing
- Left clutch pack housing
- Right clutch pack housing

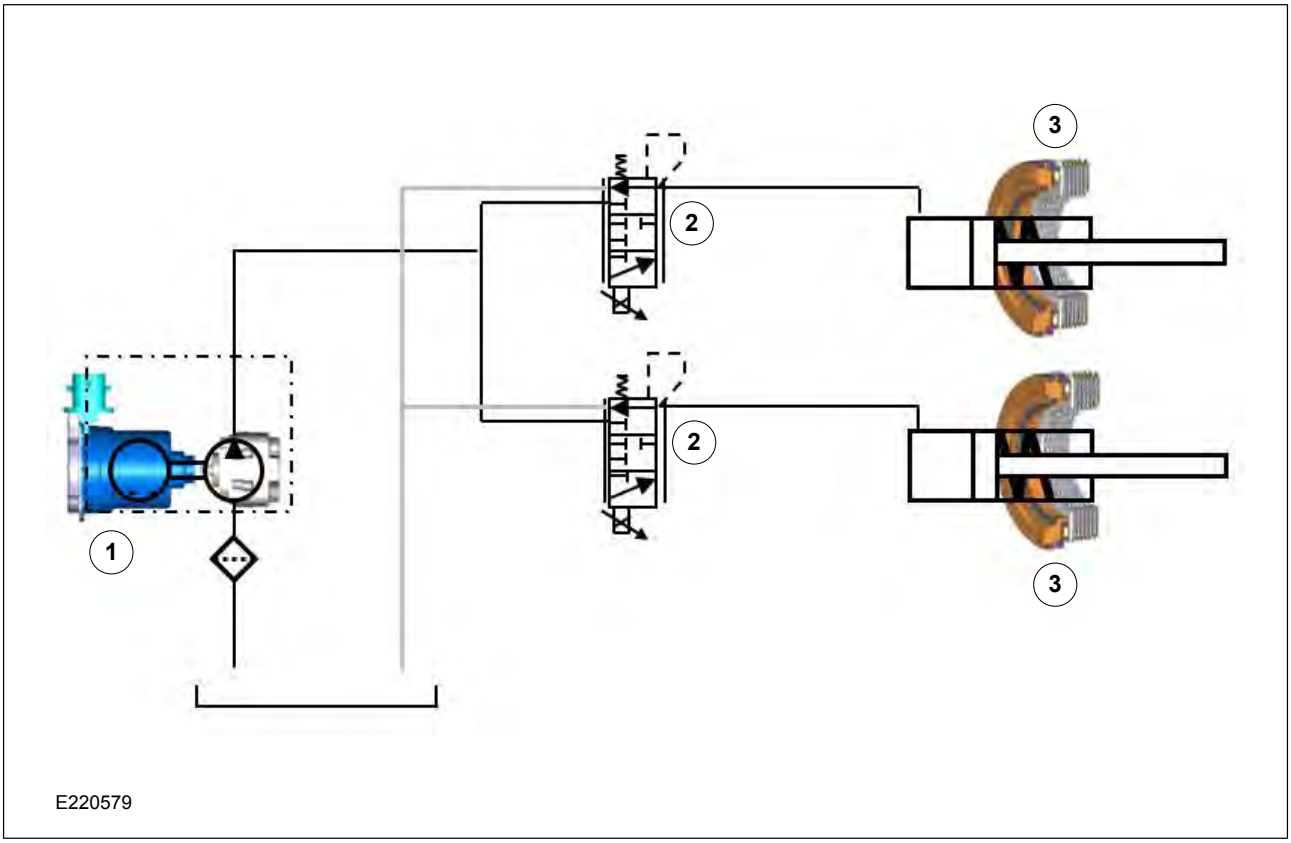
The rear drive unit differential housing is filled with Hypoid oil Ford 75W 85 plus 5% Lubrizol FM6179 to lubricate the differential and to actuate the multi plate clutch packs.

NOTE: The clutch pack hydraulic fluid can not be replaced.

The clutches are wet-running multi-plate clutches with a carbon lining and are immersed in Pentison CMF11S 275 ml hydraulic fluid. Carbon is used on the clutches as it has the best properties in terms of power density and NVH (noise, vibration and harshness) performance.

Modulation of the multi-plate clutch locking torque is performed by means of a hydraulic pressure that acts directly on the plate assembly via a piston.

Multi-Plate Clutch Actuation

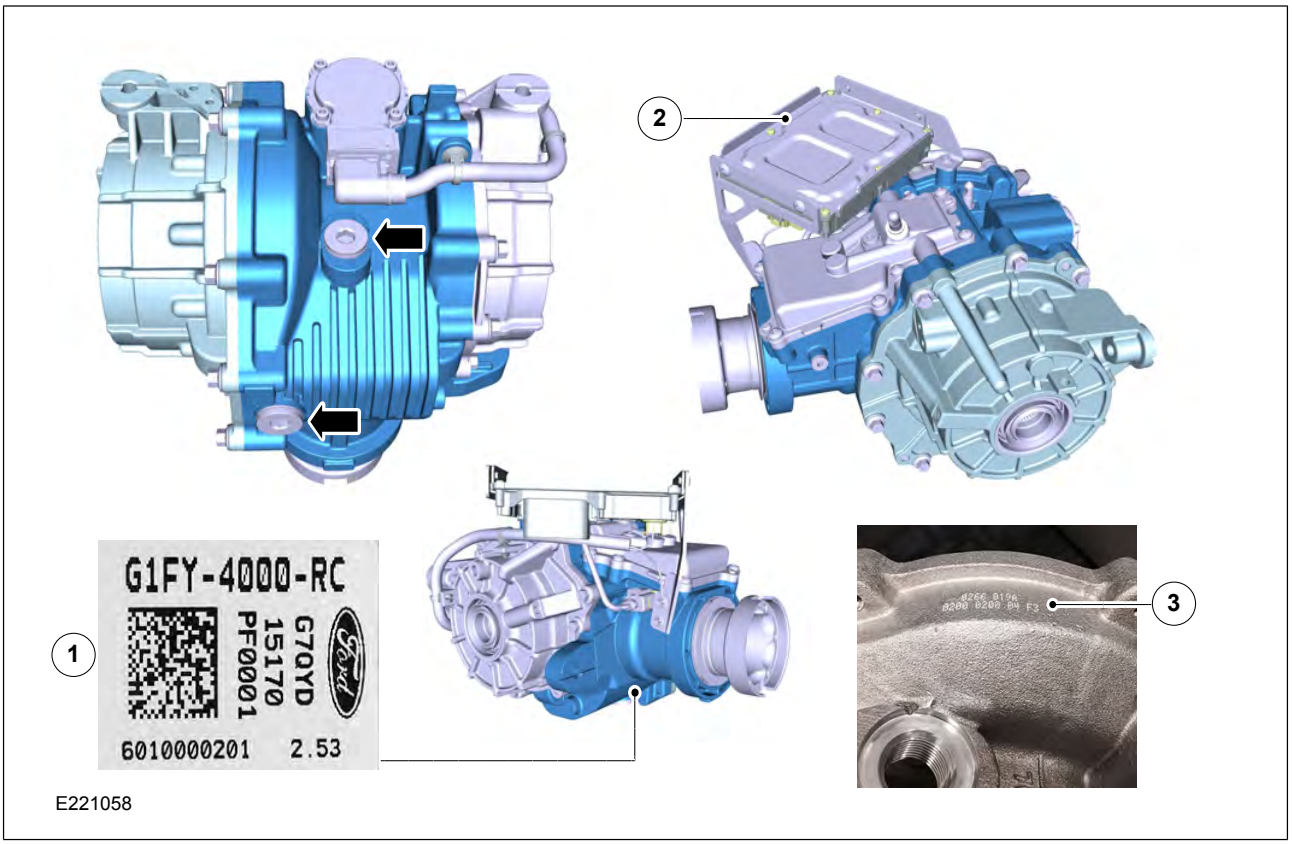


1 Electro-hydraulic servo drive
2 Control valves
3 Hydraulically actuated clutches

The hydraulic actuation system consists of an electronic control unit and an electro-hydraulic servo drive mounted on the rear drive unit.

The electro-hydraulic servo drive uses a 3-phase, brushless electronically controlled DC (direct current) motor. The motor is connected to a pump that provides the line pressure for two control valves.

The two control valves are used to pressurize the clutches and transmit engine torque to the rear wheels. The control valves are actuated using a PWM (pulse width modulation) signal voltage.



1 Label for clutch correction data

2 AWD electronic control unit

The AWD electronic control unit is mounted to rear drive unit. The AWD control unit specifications are listed below:

- Splash-proof
- Operating temperature range: -40 °C – 105 °C
- Operating voltage range: 9 – 16 V
- Nominal voltage at 13 V

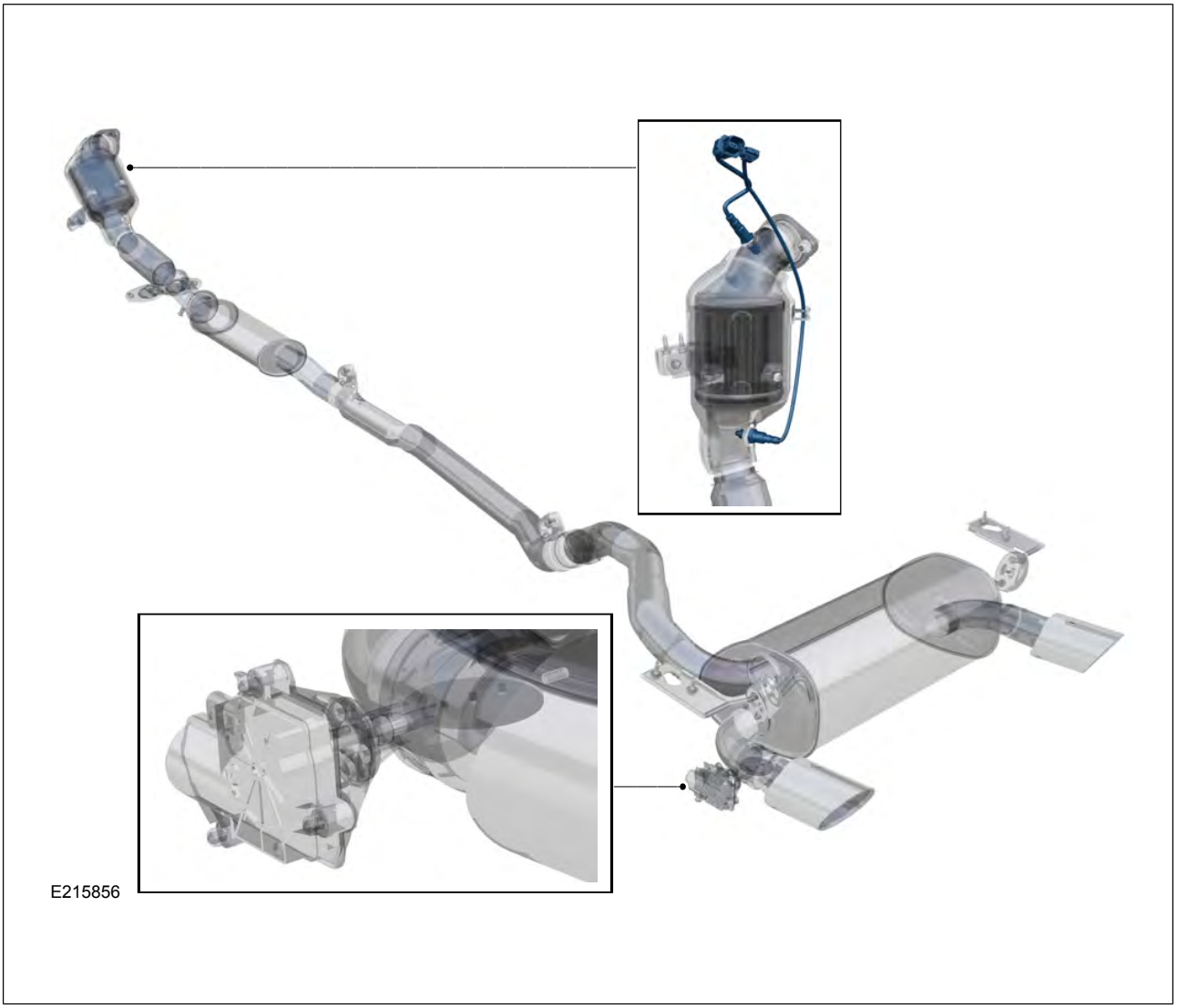
NOTE: The AWD electronic control unit can be replaced using the familiar inhale/exhale method.

NOTE: During normal operation the rear drive unit fluid will not need to be changed or checked.

The rear drive unit fill plug is located on the back of the rear drive unit (under the electro-hydraulic servo drive) and the drain plug is on the underside of the rear drive unit.

The capacity of the rear drive unit is 890 ml.

Exhaust System

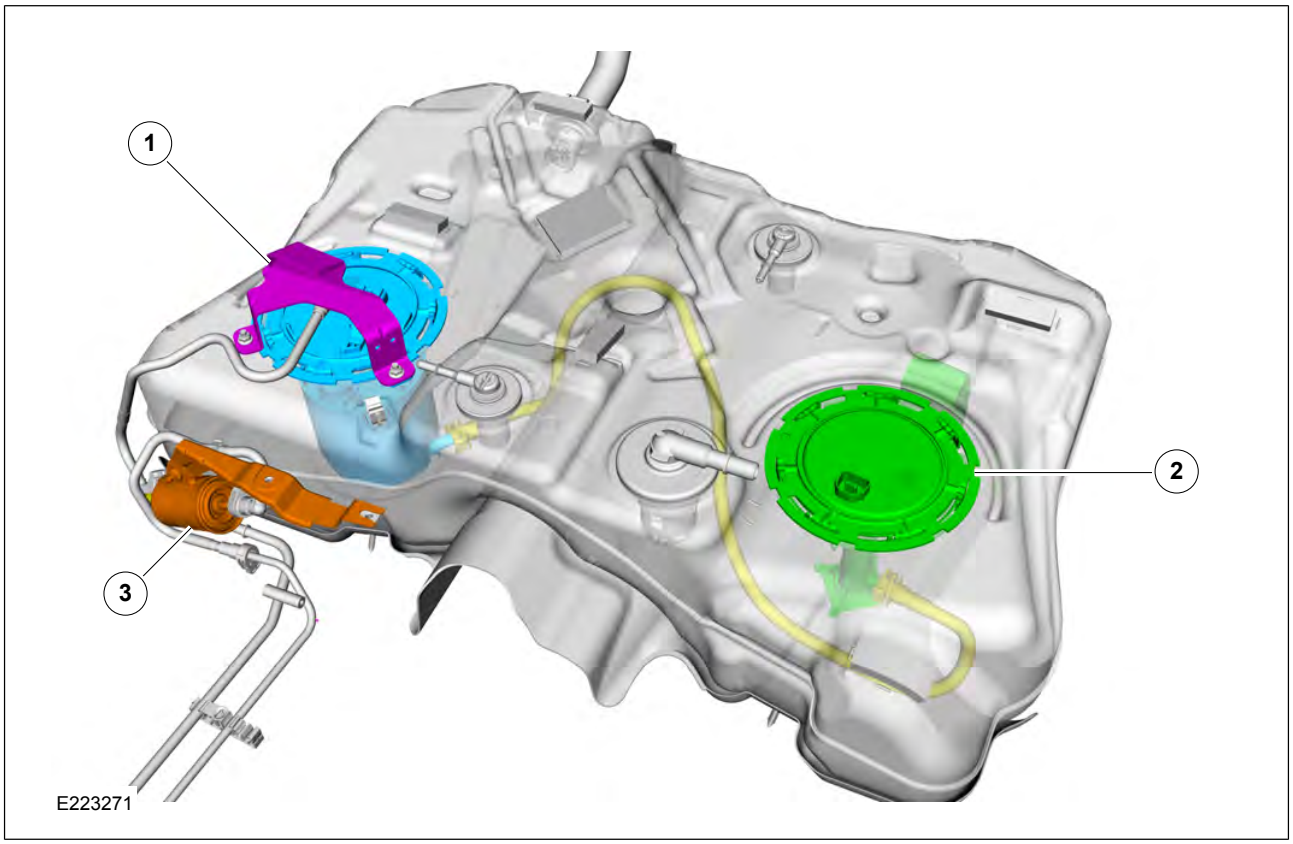


The Focus RS is fitted with a large-bore high performance exhaust system. The right tailpipe is equipped with an electronically controlled valve. The electronically controlled valve ensures a balance between sufficient back pressure and a sporty sound.

The electronically controlled valve enables:

- Minimal exhaust restriction and sporty sound during performance driving conditions - Valve open
- Sufficient back pressure and muffled exhaust noise during highway cruise or low speed/low load conditions - Valve closed

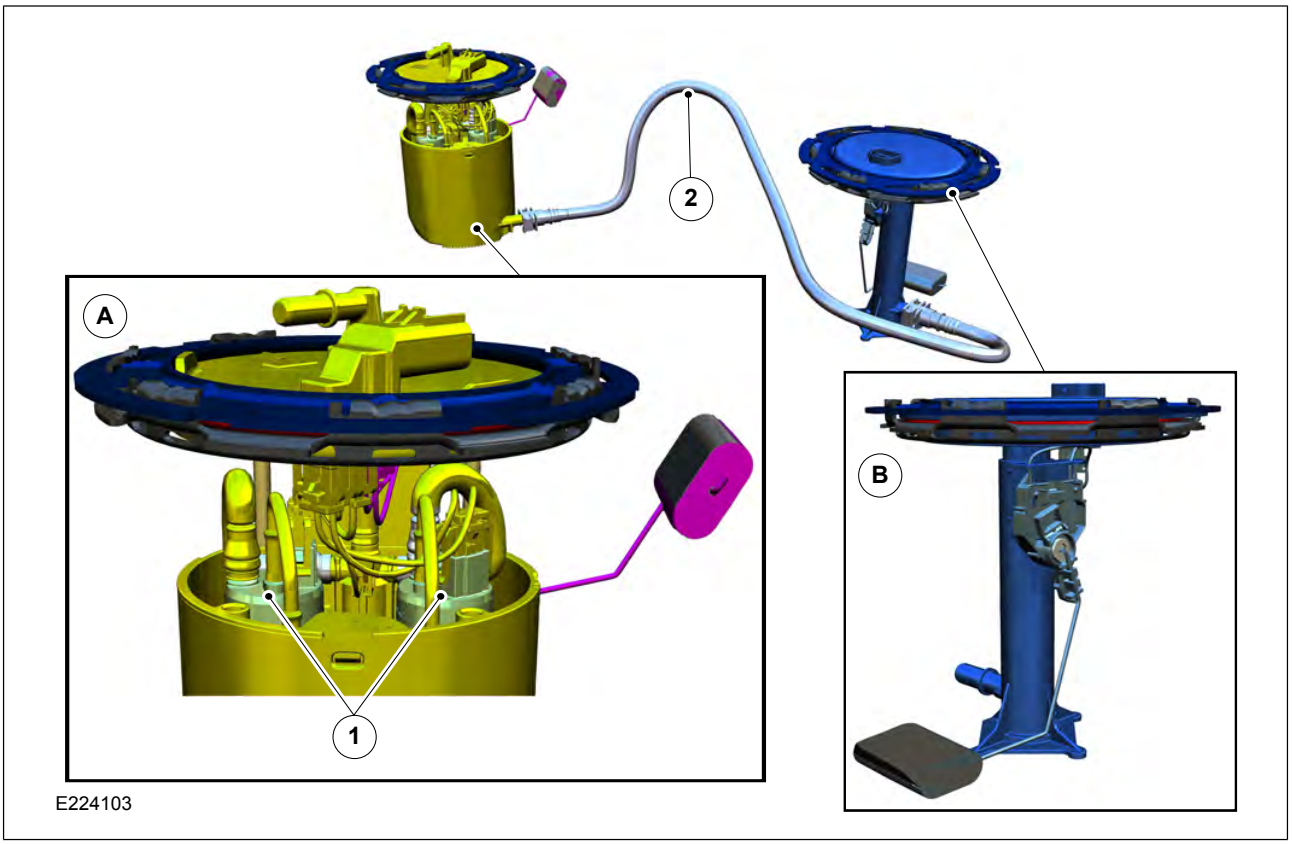
Fuel System



1 Fuel pump and sender unit
2 Fuel level sender
3 External fuel filter

Low Pressure Fuel System

The Focus RS is equipped with a saddle shaped fuel tank to accommodate the AWD systems 3-piece drive shaft and exhaust system. Due to the design of the tank fuel is stored in two separate chambers and therefore two fuel level sensors (one for each chamber) are required to measure the fuel level.



A Fuel pump and sender unit

B Fuel level sender unit

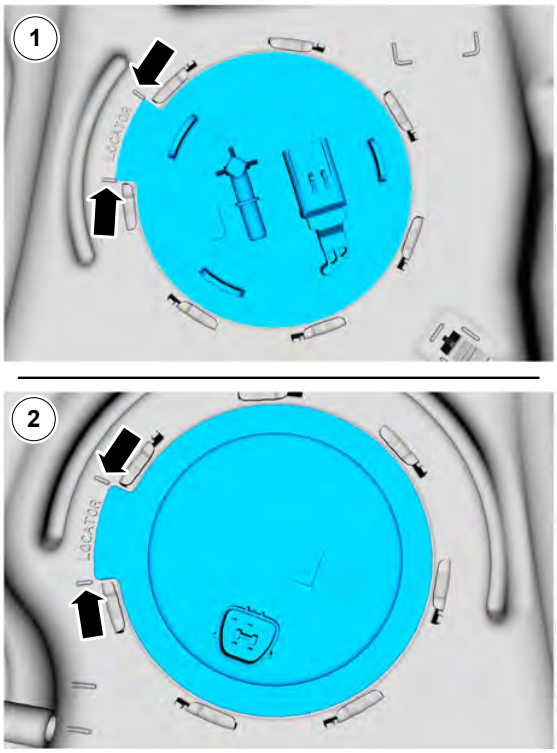
1 Two electric fuel pumps

2 Suction line

The Focus RS requires two electric fuel pumps to achieve its impressive performance. These pumps ensure a higher flow rate and pressure in the low pressure fuel system. The two Delfi electric pumps can supply 160 l/h of fuel to the direct injection fuel pump at pressures ranging between 3.5 and 5.2 bar.

The two electric pumps are located in the fuel pump and sender unit. A metal protective bracket is installed above the fuel pump and sender unit.

Fuel is pumped from the fuel pump and sender unit (one side of the tank) to the high pressure fuel system. Fuel from the other side of the tank is drawn into the fuel pump and sender unit using a suction jet pump. The suction jet pump is connected to the fuel level sender unit pickup using a suction line.



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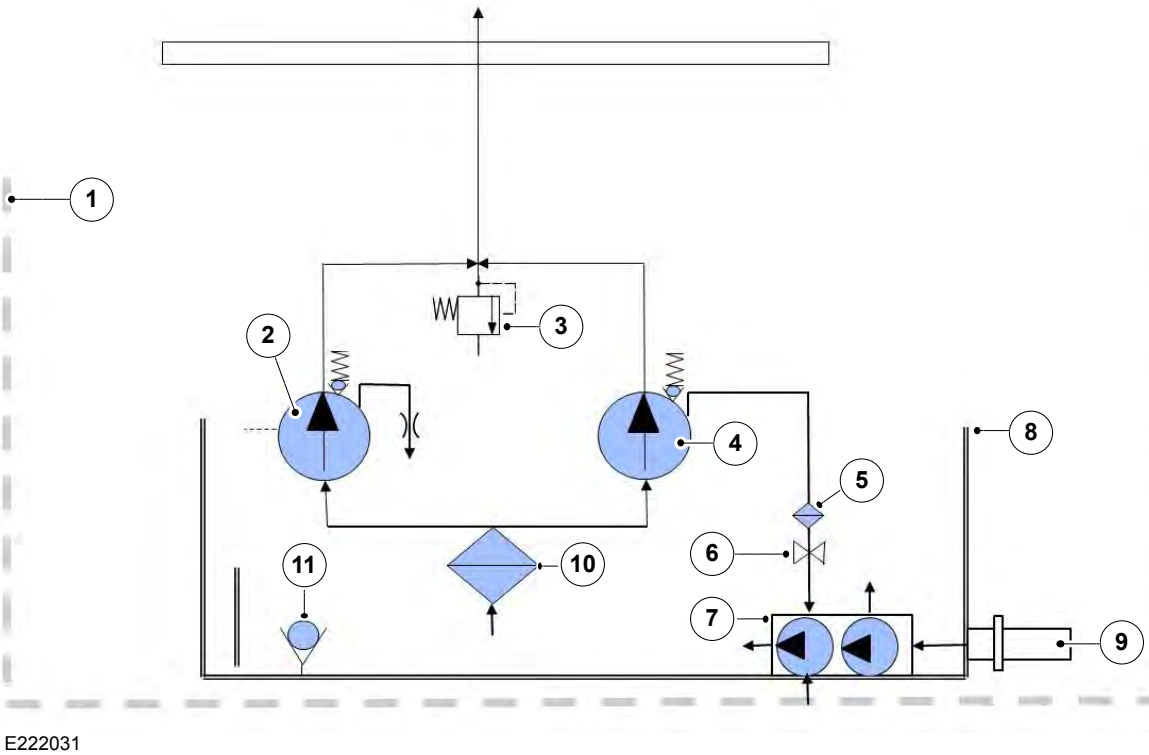
1 Fuel pump and sender unit

2 Fuel level sender unit

When replacing the fuel pump and sender unit or fuel level sender unit, care must be taken to align the units correctly to ensure the correct operation if the fuel level sensors and fuel delivery system. The tab on the units must be positioned next to the "locator" marking on the fuel tank.

Fuel Pump Operation



E222031

1 Fuel tank
2 Electric pump 1
3 Pressure control valve
4 Electric pump 2
5 Filter
6 One-way valve
7 Two suction jet pumps
8 Reservoir
9 Line connection to the passive side
10 Screen
11 Valve

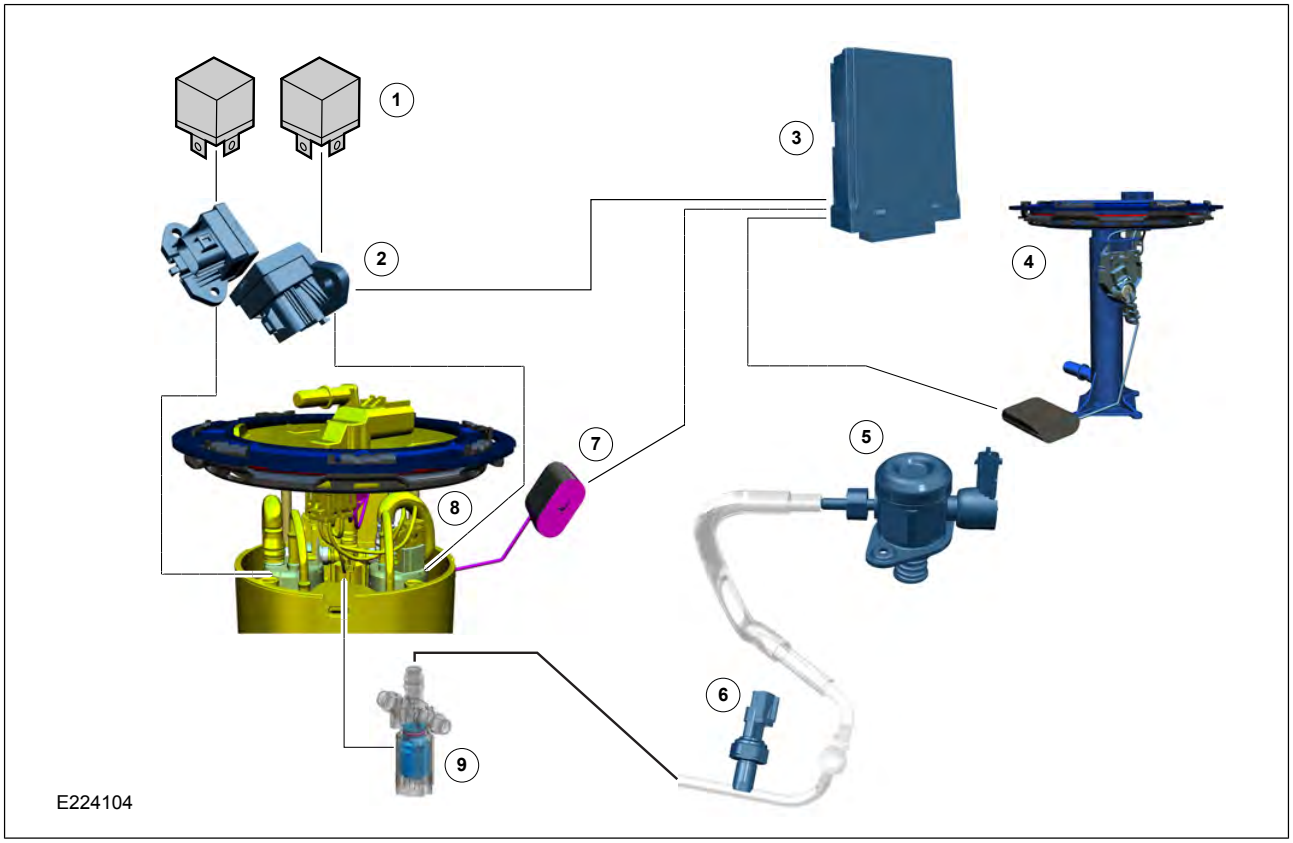
Electric pump 2 (primary pump) drives two suction jet pumps (passive). One of the suction jet pumps fills the reservoir with fuel from the fuel tank, which holds fuel to supply the electric fuel pumps.

The other suction jet pump draws in the fuel from the fuel level sender unit via a suction pipe. Electric pump 1 (secondary pump) has a cooling flow opening for a low fuel requirement.

The two electric pumps supply the required fuel to the high-pressure pump via a pressure control valve. There is a pre-filter in the reservoir and a main filter outside the fuel tank.

The pre-filter is not subject to change intervals. The valve on the underside of the reservoir ensures sufficient filling of the reservoir.

The valve opens when it is surrounded by sufficient fuel in the fuel tank. It closes if there is just a residual amount of fuel in the tank. This means that no air can form in the reservoir and the lines remain filled.



1 Fuel pump relays
2 FPDM (fuel pump driver module)
3 PCM
4 Fuel level sensor 2 (fuel level sender unit)
5 High-pressure fuel pump
6 Low-pressure fuel system sensor
7 Fuel level sensor 1 (fuel pump and sender unit)

8 Electric fuel pumps

9 Pressure control valve

Instrument Panel Cluster (IPC)

The Focus RS has unique instrument cluster graphics incorporating the 'RS' logo as a welcome animation in the message center.

To achieve maximum acceleration through the gears, a small 'RS' indicator illuminates in the IPC when the powertrain reaches the optimum upshift point. The 'RS' indicator flashes when the engine is close to reaching the RPM limiter and when 6900 RPM is exceeded.

Auxiliary Gauges

1 Oil temperature gauge
2 Turbo boost gauge
3 Oil pressure gauge

The Focus RS has also has three auxiliary gauges located on top of the instrument panel to display additional engine information:

- **Oil temperature gauge** - Displays engine temperature
- **Turbo boost gauge** - Displays the added intake system pressure provided by the turbocharger
- **Oil pressure gauge** - Displays engine oil pressure
  - If the needle enters the red section a warning lamp illuminates and a message appears in the information display

Drive Modes

1 Drive mode switch

2 Drive mode information in information display

The Focus RS has four drive modes that can deliver driving experiences through a suite of sophisticated electronic systems. Each mode has preset vehicle management settings to optimize:

- Steering
- All Wheel Drive (AWD)
- Torque vectoring
- Powertrain response
- Suspension and.
- Traction and electronic stability control

There is a drive mode switch located beside the gearshift lever, which is used to select the desired drive mode. Pressing the button repeatedly will enable the driver to scroll through all available modes which are displayed in the message center.

When the desired mode appears in the message center, pressing the OK button on the steering wheel selects it. The four drive modes and their features are listed below:

- **Normal** - Default setting each time the vehicle is started. Vehicle response tuned for street driving, where the Electronic Stability Control and Traction Control systems are fully enabled
- **Sport** - Vehicle response tuned for performance street driving, where the Traction Control system is disabled while the Electronic Stability Control system remains fully enabled
- **NOTE:** This mode is for track use only.

  Track - For aggressive driving while at race circuits, where the system allows greater wheel spin and limited drift limits. Electronic Stability Control and Traction Control systems are disabled
- **NOTE:** This mode is for track use only.

Drift - For spirited and aggressive driving, where the system allows controlled oversteer drifts. Electronic Stability Control and Traction Control systems are reduced while the system disables engine stability control intervention, allowing more vehicle drift

Drive Mode	Normal	Sport	Track	Drift
Engine controls	Normal	Sport	Sport	Sport
Exhaust sound	Normal	Sport	Sport	Sport
Twinster controls	Normal	Sport	Sport	Drift
Damper controls	Normal	Sport	Sport	Normal
Brake controls	Normal	Normal	Sport	Sport
Steering controls	Normal	Sport	Sport	Normal

Launch Control

The launch control feature configures the chassis and powertrain systems to deliver the fastest possible acceleration when launching from a standing start. The following must be carried out to switch the feature on:

NOTE: The vehicle must be completely stationary.

1. Fully depress the clutch pedal and shift the gearshift lever to first gear
2. **NOTE:** When the feature is switched on, it is only active for one launch. The feature must be switched on each time it is required.

   Access the following menu using the information display control "Settings/Driver Assist/Launch Control" and check the box to switch the feature on
3. Within a few seconds, fully depress the accelerator pedal
4. Release the clutch pedal when ready to launch

NOTE: The system does not operate in any of the following conditions:

- Transmission is in reverse gear
- Engine has not reached normal operating temperature

Exterior Lighting

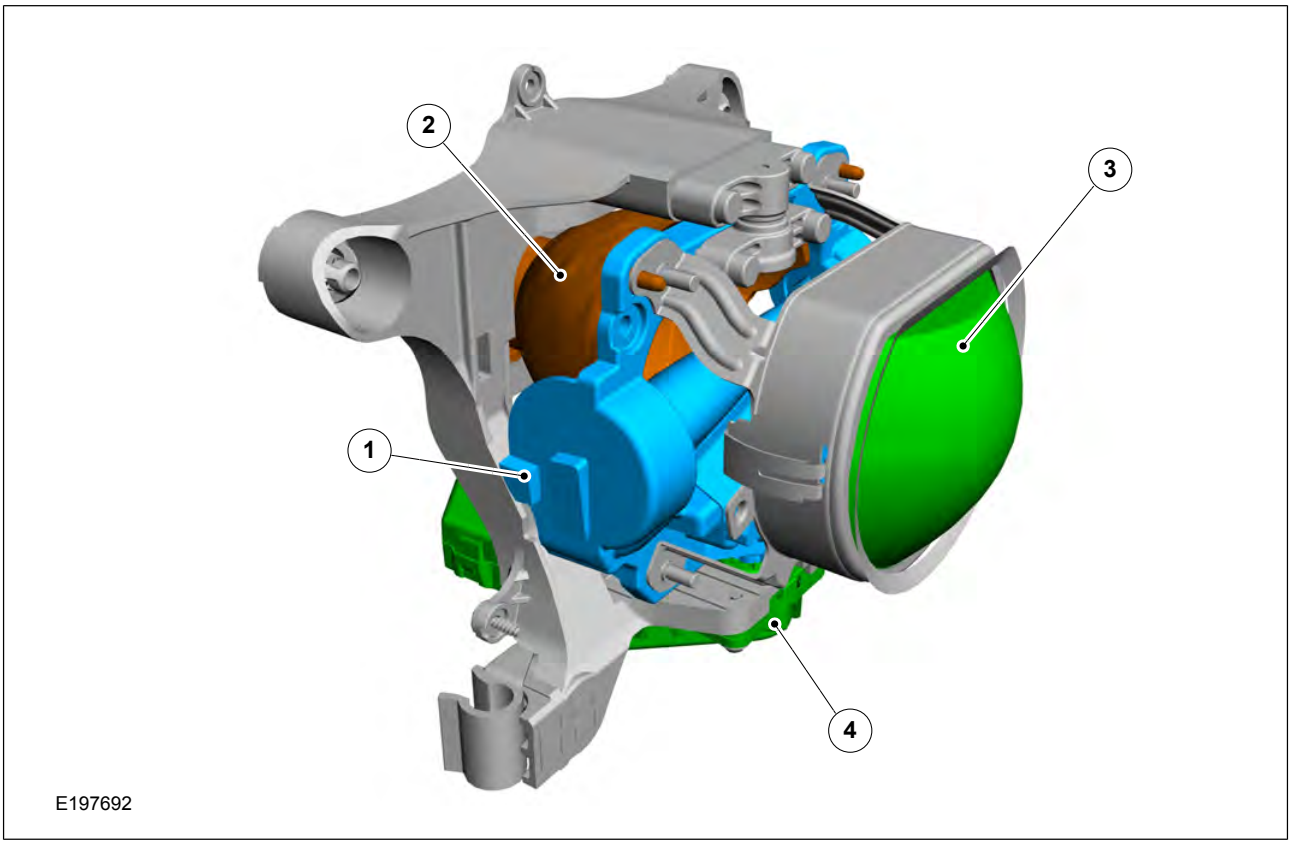
The Focus RS is equipped with Bi-Xenon HID headlamps and Adaptive Front Lighting. The adaptive front lighting system adjusts the intensity and angle of the headlamp beams according to vehicle speed, steering angle and distance to objects, for optimal illumination.

The Focus RS also has unique vertical front fog lamps located in the flanks of the front bumper.

The rear lamps have been carried over from the Focus MCA.

The vehicle is fitted with a unique rear fog lamp which contains 6 LEDs (light emitting diodes). The LED fog lamp has an approximate current consumption of 0.2 amps/2.4 watts.

Adaptive Front Lighting



1 Multifunction unit incorporating:
Comments:
Free-form drum
Deflection mechanism
Stepper motor for multifunction unit

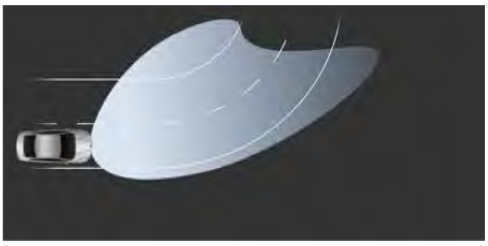
2 Reflector

3 Lens

4 Stepper motor for adaptive front light

The Bi-Xenon HID headlamp assembly has an integrated solenoid activated shutter which changes the headlamp beam pattern when activated. The solenoid and shutter are not serviceable separately from the headlamp assembly. The headlamp assembly is provided power on independent circuits for the low beams and the high beams.

The Bi-Xenon HID headlamp also contains LEDs that are signature lights when used as DRL (daytime running lamps) and are illuminated at their highest intensity or parking lamps and are illuminated at a reduced intensity when the parking lamps or headlamps are activated.



E197679

NOTE: Adaptive front lighting is only activated when the headlamp switch is in the AUTOLAMPS position.

Adaptive front lighting uses a HCM (headlamp control module) to command the left/right aiming of the headlamps through the LIN (local interconnect network) to the headlamp assemblies.

The headlamp assemblies contain a module that receives the messages through the LIN from the HCM.

Depending on the inputs received (steering wheel angle and vehicle speed for example), the HCM can command the angle at which the headlamps are aimed (left or right) to improve nighttime visibility around curves.

Additional functions have been added to the existing adaptive front lighting system enabling it to adapt the light beam to the respective driving situation.

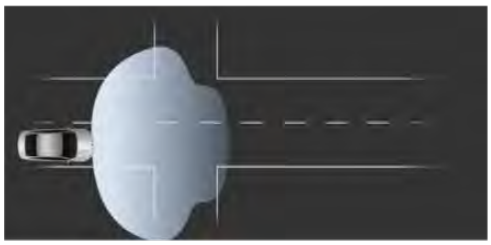
Different light distributions e.g. for city or country roads, adverse weather or freeway light, can be generated using the free-form drum based on internal vehicle data. A projection module with a rotating free-form drum between the light source and lens is required for this.

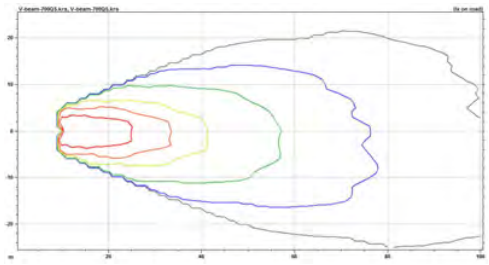
The drum has different contours and can swivel around its own longitudinal axis. The drum is swivelled into the required position within milliseconds using a stepper motor and in this way adapts the cut-off line to the respective light mode.

The following light modes are used depending on the vehicle speed and lighting conditions.

NOTE: The indicated speeds are approximate values. The loop must include hysteresis in order to avoid control oscillations due to constant fluctuations above and below the speed limits resulting in continuous cycling between the light modes. The result is that the higher light mode in each case is maintained.

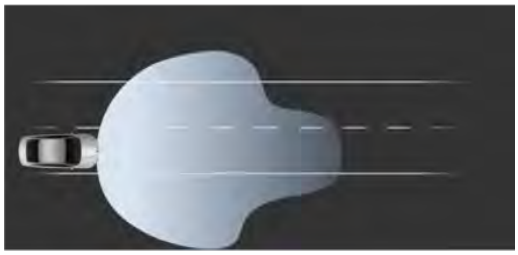
Pedestrian Area Light Mode

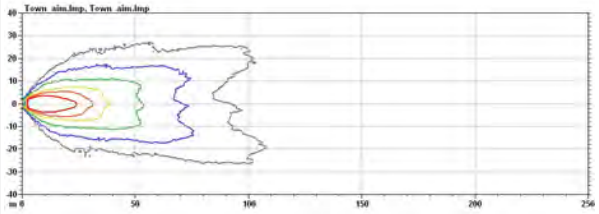




E197661

Town Light Mode



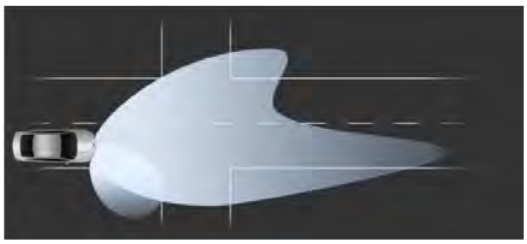


E197662

This light mode is used at speeds <30 km/h.

This light mode is used at speeds from 31 to 50 km/h.

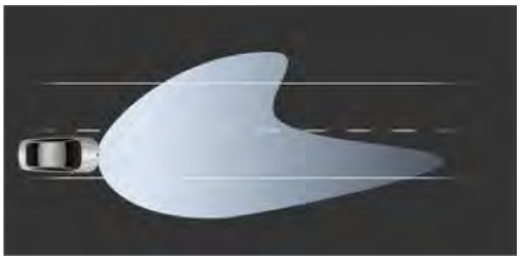
Cornering Light Mode

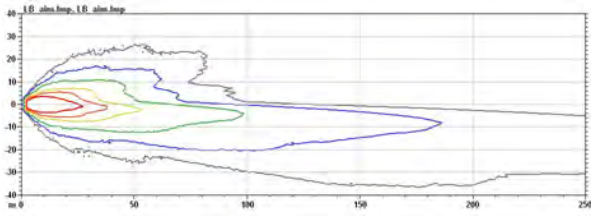


E197678

This light is used to illuminate tight bends, intersections or entryways at low speed.

Driving Light Mode



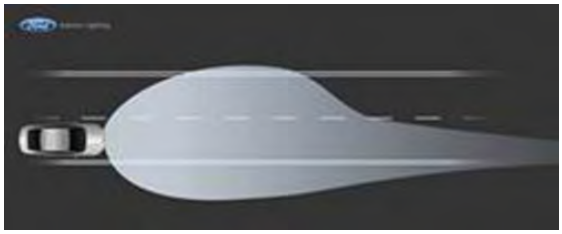


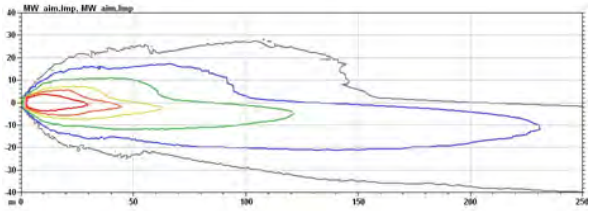
E197663

NOTE: The light distribution for mode is the same as for the conventional driving light.

This light mode is used at speeds from 51 to 100 km/h.

Freeway Light Mode





E197664

This light mode is used at speeds >110 km/h until top speed is reached.

It is activated when speeds of 110 km/h are exceeded for more than 30 seconds.

The auto high bean feature activates the main (high) beam using lighting information from the IPMA (image processing module A) (front camera).

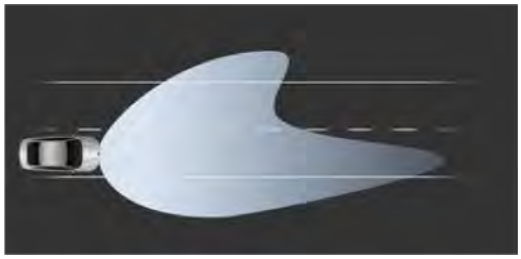
The system is able to detect oncoming traffic in combination with the IPMA and adapts the high beam if any are detected.

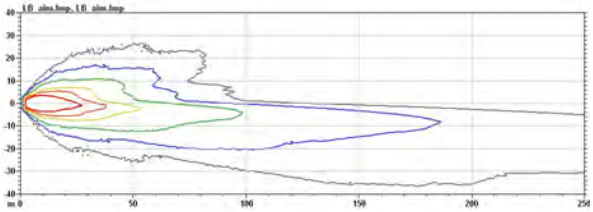
Adverse Weather Light Mode

E197954

This light mode is used at speeds from 0 to 50 km/h if the wipers have been on for more than two minutes and the front fog lamps are not switched on.

Failsafe Light Mode





E197663

Failsafe mode is automatically activated if the HCM diagnoses a fault in the system during the self-test. The light distribution is the same in this case as for driving light mode.

Communications Network

There are a total of Six data bus systems used on the communication network:

- HS-CAN (controller area network) bus
- HS-CAN multimedia bus
- Private HS-CAN bus
- MS-CAN bus
- LIN (local interconnect network) bus
- ISO bus

The private HS-CAN is used for rapid, interference-free data exchange.

The HS-CAN bus, the HS-CAN multimedia bus and the private HS-CAN bus have a speed of 500 kBit/s.

The MS-CAN bus and the private MS-CAN bus have a speed of 125 kBit/s.

The keyless vehicle module is connected with the radio frequency receiver over an ISO bus.

A total of 8 terminating resistors are installed.

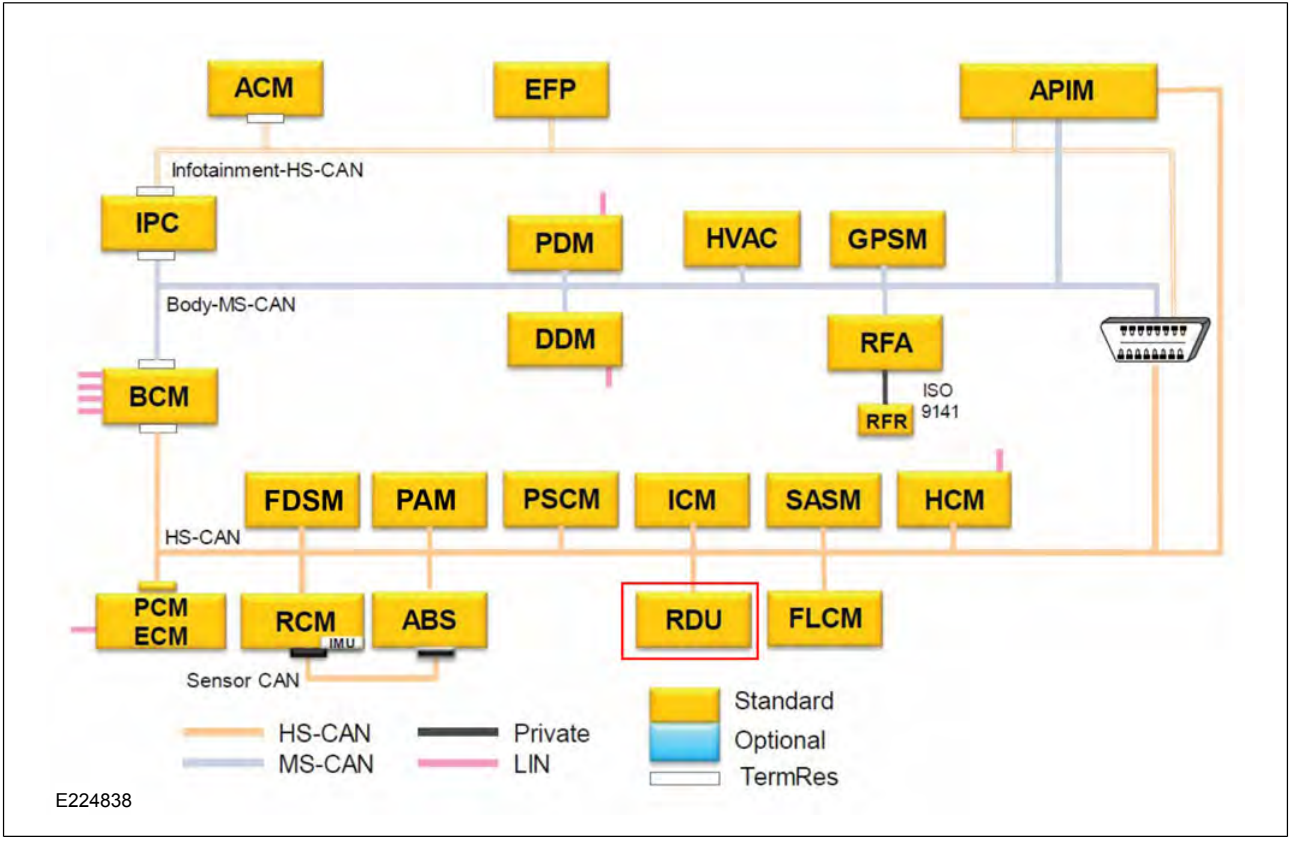
The two terminating resistors of the HS-CAN data bus, 120 ohms each, are integrated into the PCM (powertrain control module) and the BCM (body control module). Since both 120 ohm resistors are connected in parallel, the total resistance is 60 ohms (measured at the DLC (data link connector)). If a control unit is disconnected from the network, 120 ohms must be present between pin 6 and 14 at the DLC.

The terminating resistors of the HS-CAN multimedia system are located in the IPC (instrument panel cluster) and in the ACM (audio front control module).

The HS-CAN multimedia bus signals can be picked off via pins 1 and 8

The RCM (restraints control module) is connected to the CAN module via a private HS-ABS (anti-lock brake system) bus. Two separate termination resistors are installed here.

The MS CAN bus terminating resistors are located in the IPC and the BCM. The total resistance can be measured at the DLC between pins 3 and 11 and should be 60 ohms.



Two modules are designed as gateways:

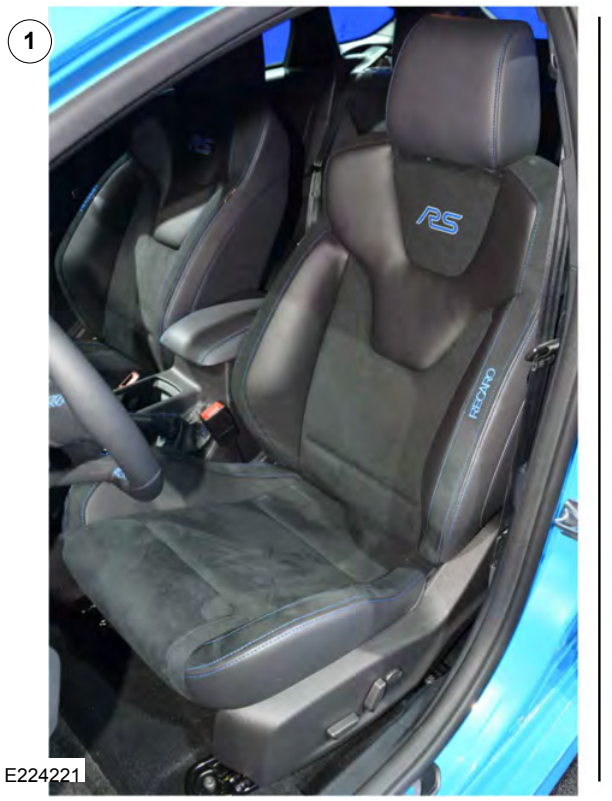
- The BCM between the HS-CAN and MS-CAN
- The IPC between the MS-CAN and HS-CAN multimedia

Module acronyms:

- ACM (audio front control module)
- DSP (audio digital signal processing module)
- EFP (electronic (finisher panel)
- APIM (SYNC module)
- IPC (instrument panel cluster)
- PDM (passenger door module)
- DDM (driver door module)
- HVAC (heating, ventilation and air conditioning)
- GPSM (global positioning system module)
- RFA (remote function actuator)
- RFR - RF receiver (radio receiver for keyless locking system)
- BCM (body control module
- FDSM (front distance sensing module)
- PAM (parking assist control module)
- PSCM (power steering control module)
- ICM (information center module)
- SASM (steering angle sensor module)
- HCM (headlamp control module)
- PCM (powertrain control module
- RCM (restraints control module)

- ABS (anti lock braking system) module
- FLCM (fuel level control module)
- RDU (rear drive unit)

Front Seats



1 Partial-leather Recaro sports seat

2 Signature RS Recaro shell seats (manually adjusted)

The high-performance character of the RS is reflected inside the car with heavily-bolstered partial-leather Recaro sports seats as the centrepiece of the cockpit.

Signature RS Recaro shell seats, with authentic motorsport microfibre fabric panels, are an optional on Focus RS.

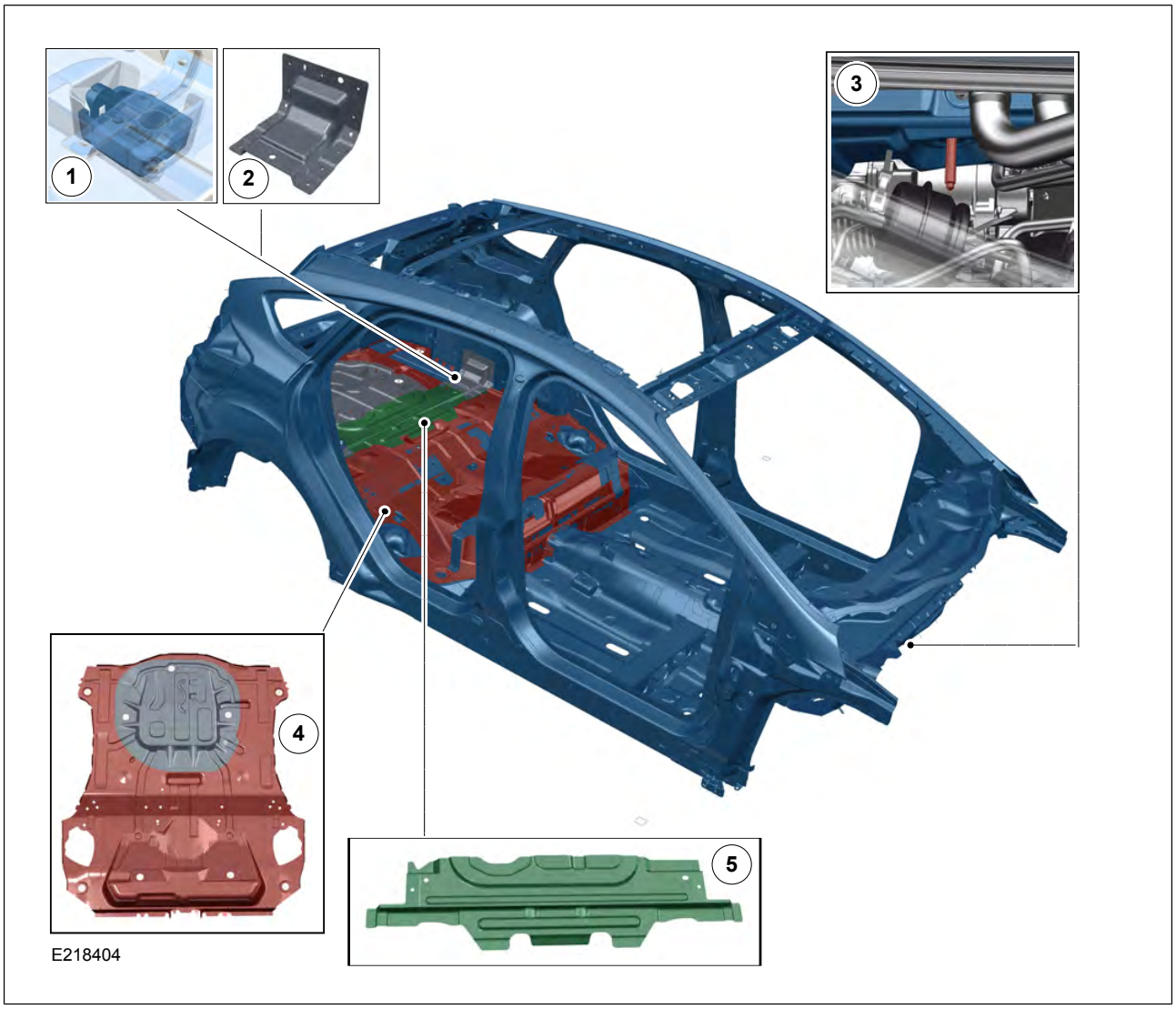
Instrument Panel

The Focus RS is equipped with SYNC II entertainment system with an 8-inch touchscreen, DATC (dual automatic temperature control) climate control system, sports steering wheel, aluminum pedals and Recaro part leather front seats.

The RS logo is displayed in the IPC (instrument panel cluster), stitched into the seat backrests, steering wheel and on the scuff plate molding trims.

The RS drive mode selection switch and start stop switch is located beside the gear shift lever.

Vehicle Specific Body Construction



1 Structural foam
2 Sidewall reinforcement ('lion's foot')
3 Shortened bolt at the bulkhead
4 No spare wheel well in the luggage compartment floor
5 Reinforced luggage compartment floor

The Focus RS body has been reinforced in several places to accommodate the powertrain changes. The spare wheel well has been sacrificed to cater for the sports exhaust and the AWD (all-wheel drive) system.

Certain bolts which extrude from the engine compartment bulkhead had to be shortened so they would not foul with the TC (turbocharger).

ABS	anti-lock brake system
ACM	audio front control module
APIM	SYNC module
AWD	all-wheel drive
BCM	body control module
CAC	charge air cooler
DDM	driver door module
DRL	daytime running lamps
DSP	audio digital signal processing module
FDSM	front distance sensing module
FRP	fuel rail pressure
GPSM	global positioning system module
HCM	headlamp control module
HVAC	heating, ventilation and air conditioning
ICM	information center module
IPC	instrument panel cluster
LIN	local interconnect network
PAM	parking assist control module
PCM	powertrain control module
PCV	positive crankcase ventilation
PDM	passenger door module
PSCM	power steering control module
RCM	restraints control module
RFA	remote function actuator
SASM	steering angle sensor module
TC	turbocharger
VCT	variable camshaft timing