Self-Study Program 920113

The 6.3L W12 FSI Engine

Audi Academy

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Always check Technical Bulletins and the latest electronic service repair literature for information that may supersede any information included in this booklet.

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The Self-Study Program provides introductory information regarding the design and function of new models, automotive components, or technologies.

The Self-Study Program is not a Repair Manual!
All values given are intended as a guideline only.

For maintenance and repair work, always refer to current technical literature.

Reference

Note

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A 12-cylinder engine is the pinnacle of engine design and a hallmark of luxury class vehicles. Twelve-cylinder engines have been used in the Audi A8 model line since 2001.

Over time, Audi's engineers have thoroughly revised the W12, increasing its displacement to 6.3 liters and equipping it with direct fuel injection for greater power and efficiency.

The 6.3L W12 FSI engine gives the 2011 A8L sports car performance: zero to 60 in just under 4.9 seconds and an electronically limited top speed of 155 mph (250 km/h).

The engine is exceptionally smooth running, and only at high engine loads and speeds do the car's occupants sense any of this supreme power at work.

The high fuel economy of the 6.3L W12 FSI engine, when compared with its competitors, is mainly the result of technologies from Audi's modular efficiency platform, which is used throughout the A8 model line.

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6.3L W12 FSI Engine

Overview

- 12-cylinder gasoline engine with four rows of three cylinders arranged in a W configuration
- More compact dimensions than a comparable V8 engine
  - Length: 19.6 in (500 mm)
  - Width: 27.5 in (700 mm)
  - Height: 27.5 in (700 mm)
- Two cylinder heads with four valves per cylinder and two camshafts per bank with hydraulic camshaft adjusters
- Engine is controlled by a multi-element chain drive (optimized for low friction)
- FSI direct injection with twin high-pressure fuel pumps, twin fuel rails and six-port high pressure injectors
- Recuperation system for energy recovery during deceleration phases

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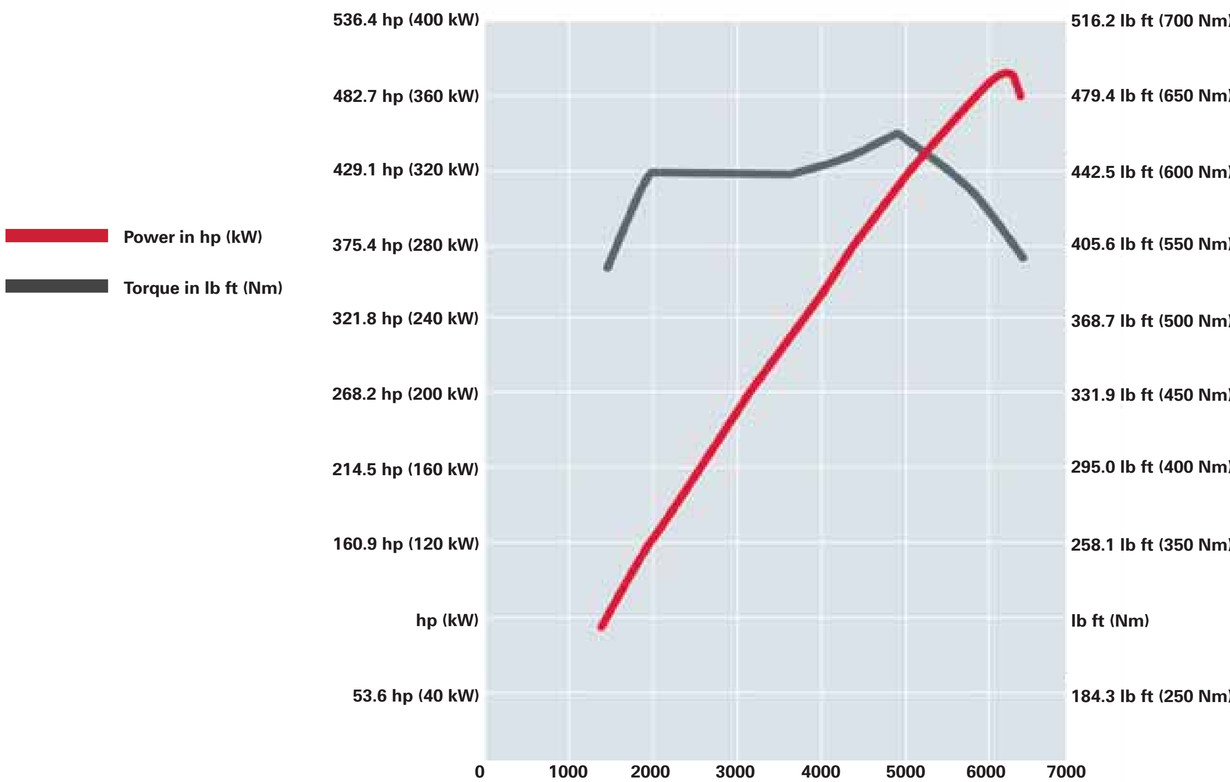
Reference

For further information about W12 engine design, refer to Self-Study Program 921403, *6.0L W12 Engine in the Audi A8L.*

Specifications



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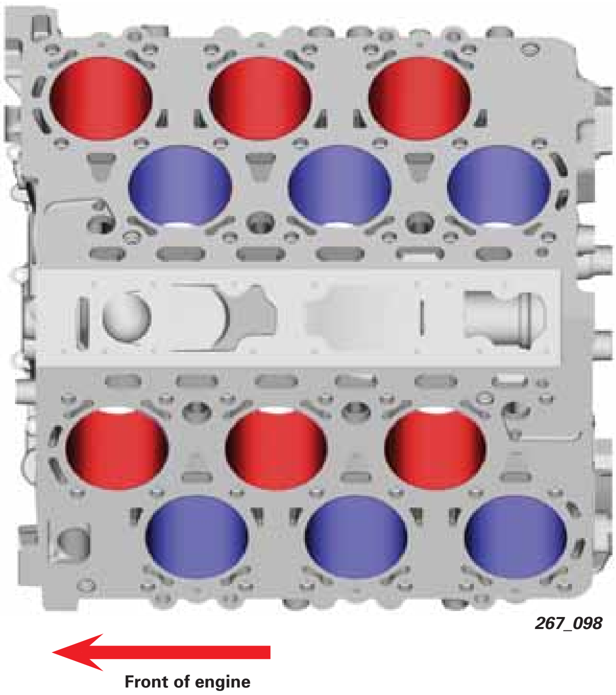
Engine Code	CEJA
Engine type	12-cylinder W type engine with a V angle of 15° and a bank angle of 72°
Displacement	384.3 cu in (6299 cc)
Maximum power	493.4 hp (368 kW) @ 6200 rpm
Maximum torque	460.9 lb ft (625 Nm) @ 4750 rpm
Valves per cylinder	4
Bore	3.38 in (86.0 mm)
Stroke	3.55 in (90.4 mm)
Compression ratio	11.8 : 1
Firing order	1-7-5-11-3-9-6-12-2-8-4-10
Engine weight	544.5 lb (247 kg)
Engine management	Bosch MED 17.1.6
Fuel grade	91 AKI
Exhaust emission standard	ULEV II
Exhaust gas aftertreatment	Four air-gap insulated manifold CAT modules, each with a close-coupled ceramic catalytic converter and twin oxygen sensors

Components

Cylinder Block

Compared with the 6.0L W12 engine, cylinder bore has been enlarged from 3.30 in (84.0 mm) to 3.38 in (86.0 mm).

The cylinder block is cast from a lightweight, high strength aluminum-silicon alloy. The bottom section has a cast iron crossmember with embedded main bearing pedestals.



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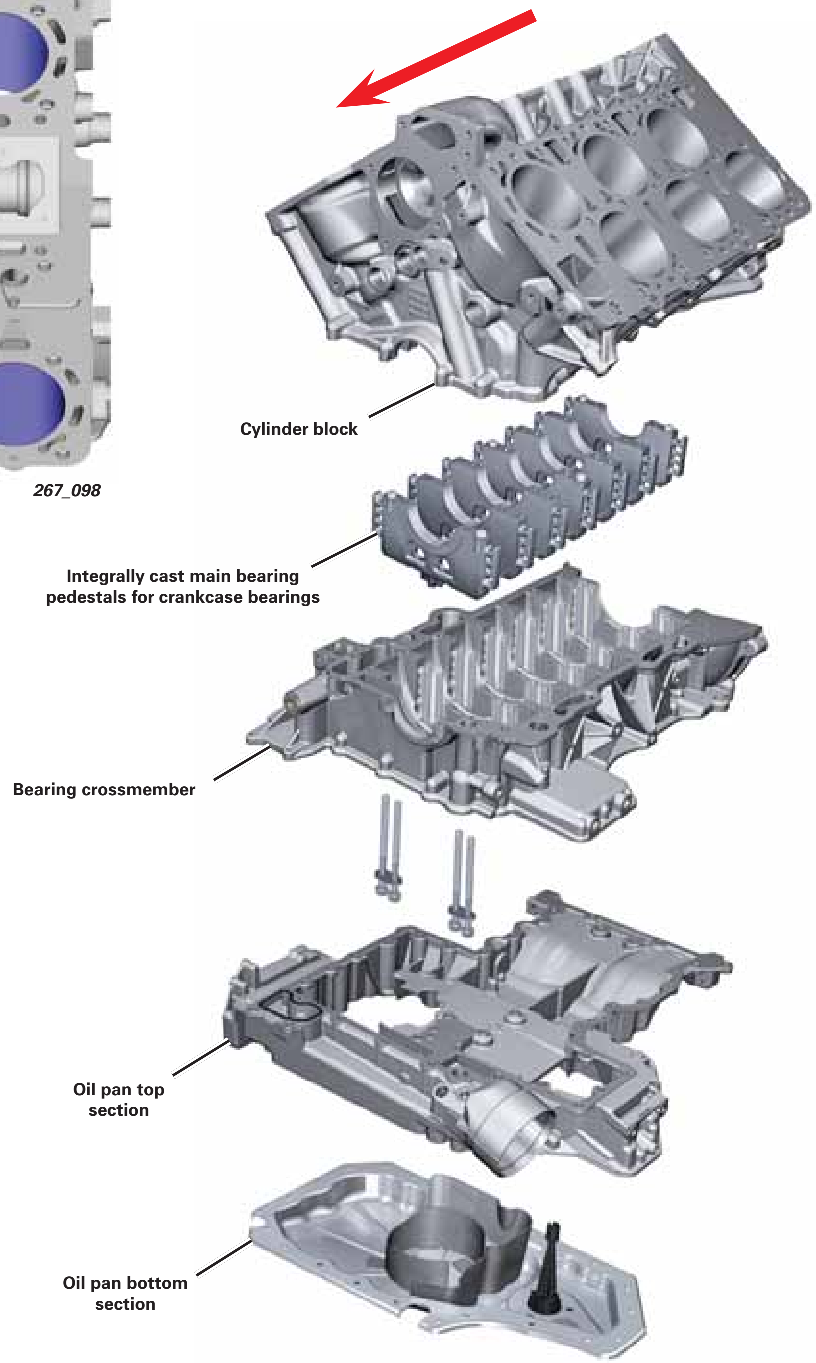

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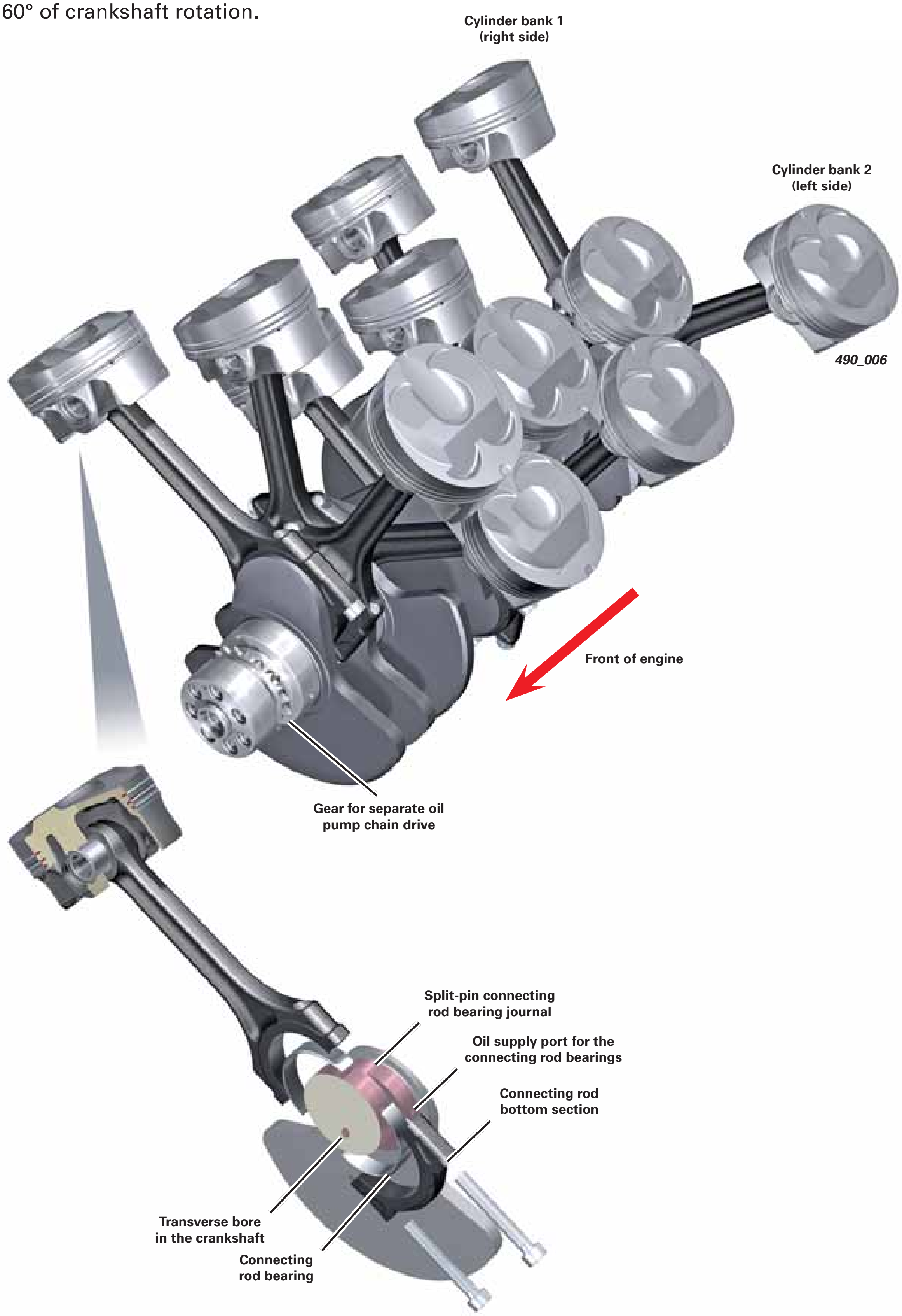
Crankshaft

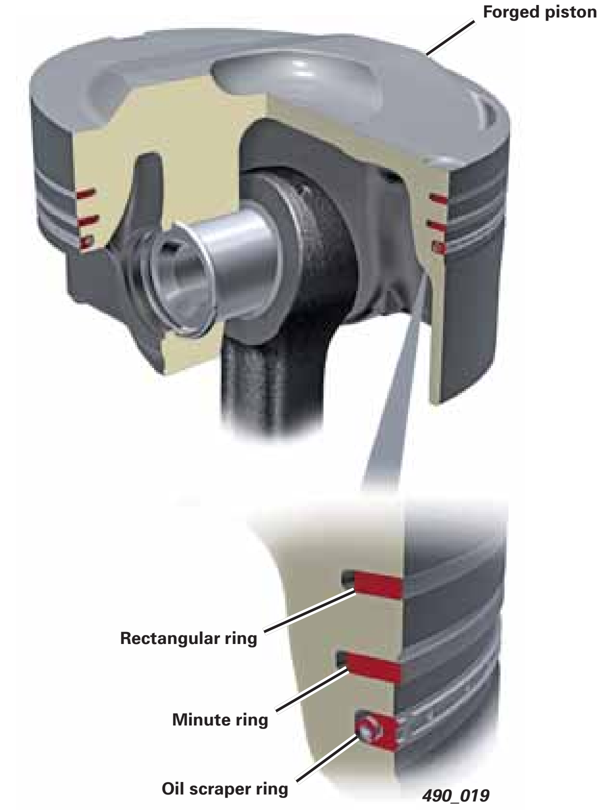
The forged crankshaft has a 12° crankpin offset angle. This allows the fuel mixture of each cylinder to be ignited at the ideal interval of every 60° of crankshaft rotation.



Pistons and Connecting Rods

The pistons are forged from high strength light alloy and have angled crowns to compensate for the cylinder bank angle. The shape of the piston crowns have been designed especially for the FSI engine.

The design of the W12 engine necessitated the use of high pressure injectors with different placement angles in the cylinder head. For this reason, the "outer" cylinders (1, 3, 5, 8, 10 and 12) have different pistons than the "inner" cylinders (2, 4, 6, 7, 9 and 11).



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Pistons of cylinders 2, 4, 6, 7, 9 and 11 (inner cylinders)

490_007

Pistons of cylinders 1, 3, 5, 8, 10 and 12 (outer cylinders)

490_008

490_009

Chain Drive

The timing gears and chain drive are located on the transmission side of the engine. The chain drive is divided into primary and secondary drives.

All components of the chain drive are designed to last the lifetime of the engine, and cannot be adjusted by service personnel.

Primary Drive

The primary drive is driven by a sprocket on the crankshaft. A simplex roller chain drives an intermediate gear, which provides speed reduction and drives the secondary drives.

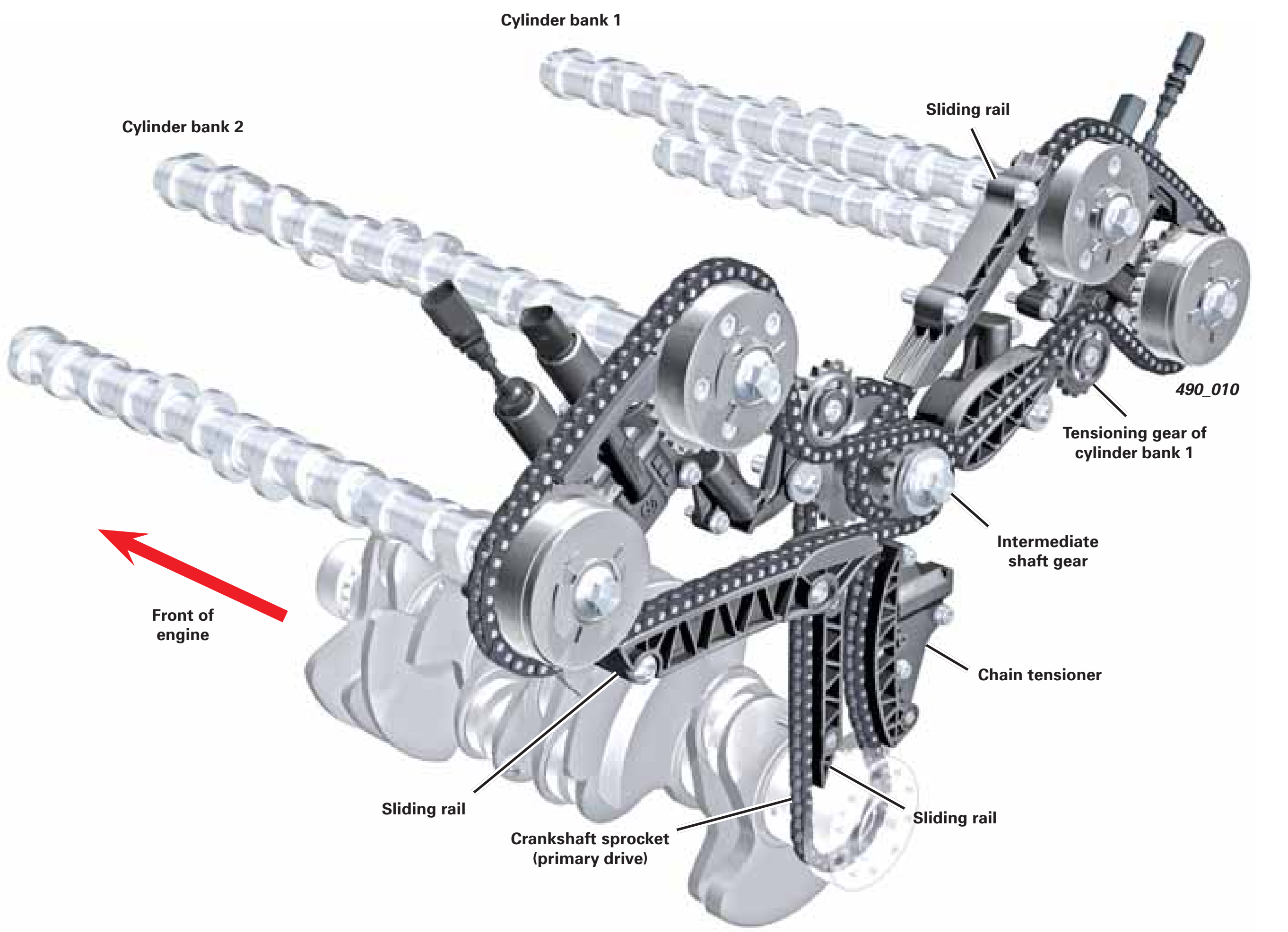
The chain is guided by a sliding rail. Chain tensioning is provided by a spring-loaded chain tensioner, which is assisted and damped by engine oil from the oil supply circuit.

Secondary Drives

The two secondary drives are driven by the intermediate gear. The two camshafts are driven by a single chain per cylinder bank. Chains are guided by sliding rails.

The chain tensioners work on the same principle as in the primary drive. However, the tensioning force of the chain tensioner does not act on the tensioning rail, but rather on a mounted tensioning lever.

At the end of the tensioning lever, a sprocket running on ball bearings engages the secondary chain. The chains of the secondary drives must be removed to take off the cylinder heads.



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Crankcase Breather

Blow-by gases are introduced directly into the cylinder heads via vent lines connected directly to the cylinder head covers on the belt side of the engine. These blow-by gases flow into the oil separator module of the crankcase breather, which is located on top of the engine between the two intake modules.

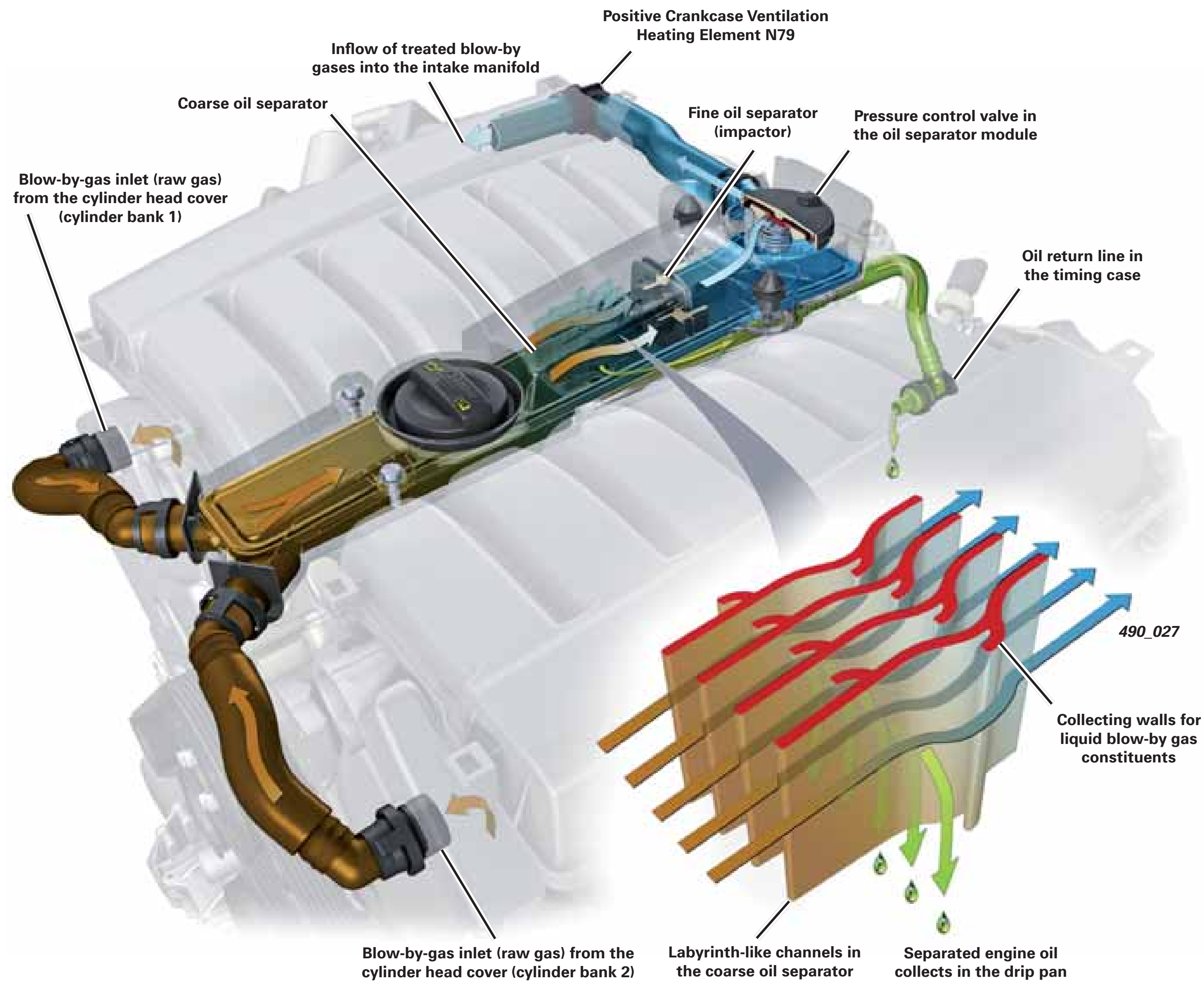
The engine oil filler cap is located on the separator module. When filling, oil flows through the vent lines into the engine.

Blow-by gases are channelled through the coarse oil separator in the oil separator module. The coarse oil separator has multiple labyrinth-like channels with collecting walls which retain most of the oil droplets due to their inertia.

The separated engine oil drips from the channel walls and is collected in a pan in the oil separator module. From here, the oil runs along a return line and drains into the timing case at the back of the engine.

Pre-treated blow-by gases then flow through a fine oil separator, continuing through the pressure control valve.

Blow-by gases are introduced directly into the intake manifold of cylinder bank 1 through a plastic pipe connected to the intake manifold of cylinder bank 1. If the vacuum inside the intake manifold is too high, the pressure control valve in the oil separator module closes. This prevents an excessively high vacuum from building up inside the crankcase, which can damage the crankshaft oil seals.



Fine Oil Separation

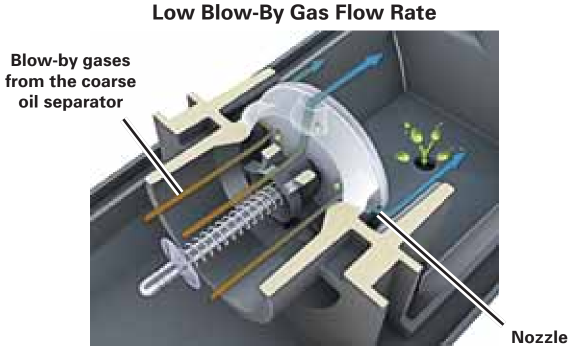
After the blow-by gases have passed the coarse oil separator, they flow through a fine oil separator.

The W12 engine method for separating liquid from a gas-fluid mixture is called an impactor type system. The gases are channelled so that their direction of flow changes sharply several times. Due to their inertia, the liquid components collide with the walls and drip down into a collection chamber.

Oil Return

Internal crankcase pressure must never be transferred into the oil separator module via the oil return line. This is prevented by a syphon downstream of a port in the timing case cover. Because the oil return inlet is always below the oil level in the oil collection chamber, there is no exchange of gases.

Low Blow-By Gas Flow Rate



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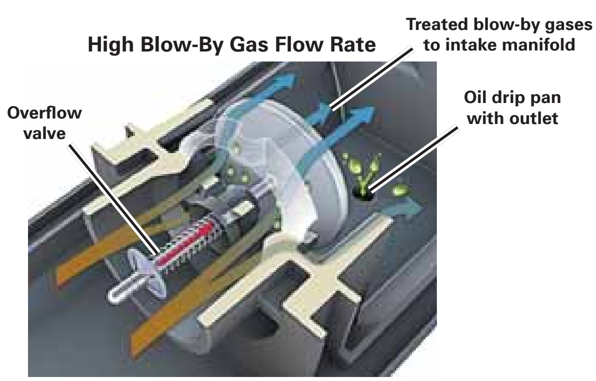
High Blow-By Gas Flow Rate



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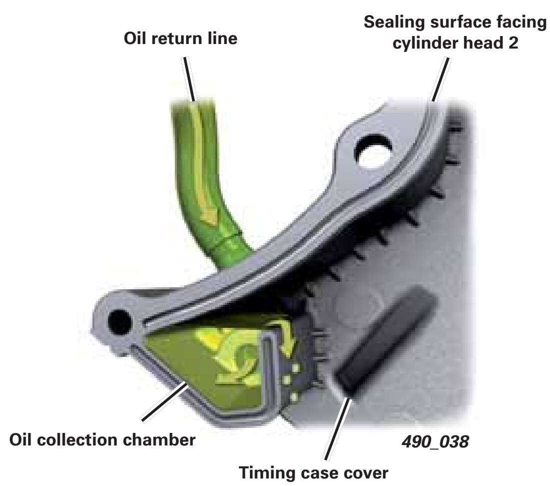
Function

As with an inertia separator, blow-by gas flow is sharply deflected, whereby oil droplets cannot follow the air flow due to their higher mass inertia. They collide with the housing wall and, as a result, are separated. This effect is intensified in the impactor, where mass flow is directed through nozzles.

The flow is accelerated inside the nozzle and deflected 90° straight after leaving the nozzle. Even very small oil droplets (< 1 µm) have little chance of following the air flow and collide with the wall.

A valve opens a gap and acts as a bypass to the nozzles at high blow-by gas flow rates. This allows the nozzles to be designed for lower volumetric flow rates, which in turn results in higher separation efficiency.

The opening gap on the overflow valve acts like a nozzle, speeding up gas flow. A constant, high level of separation efficiency is maintained even when the overflow valve is open.



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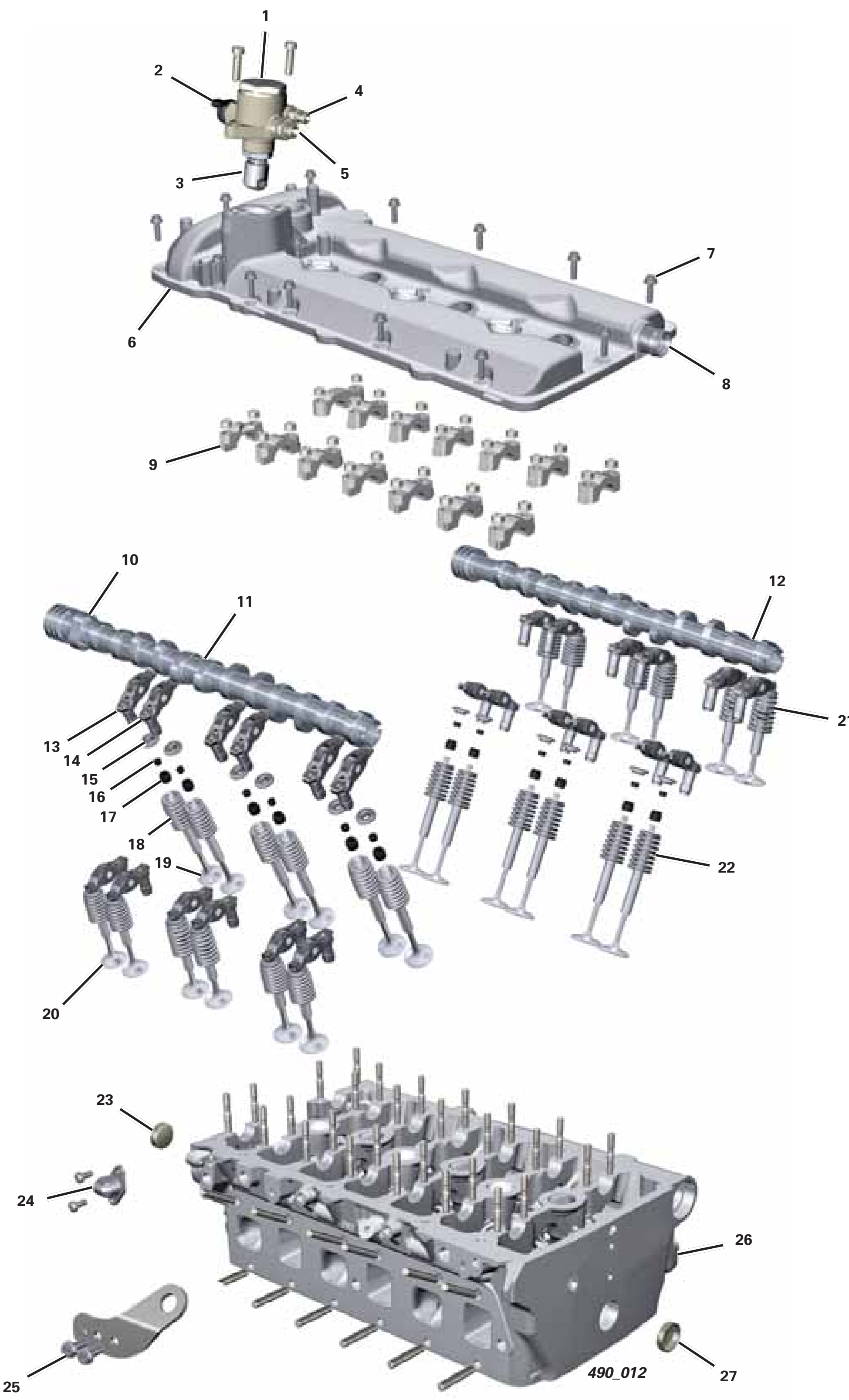
Heating

To prevent the crankcase breather from freezing up in cold weather conditions, an electrical heater at the inlet to the intake manifold is activated.

Engine Control Module 2 J624 activates Positive Crankcase Ventilation Heating Element N79 when the ambient temperature is below 32°F (0°C). It is deactivated when a temperature of 37.4°F (3°C) is exceeded. The ECM receives its temperature signal from Instrument Cluster Control Module J285.

Cylinder Head

Overview (using cylinder bank 1 as an example)

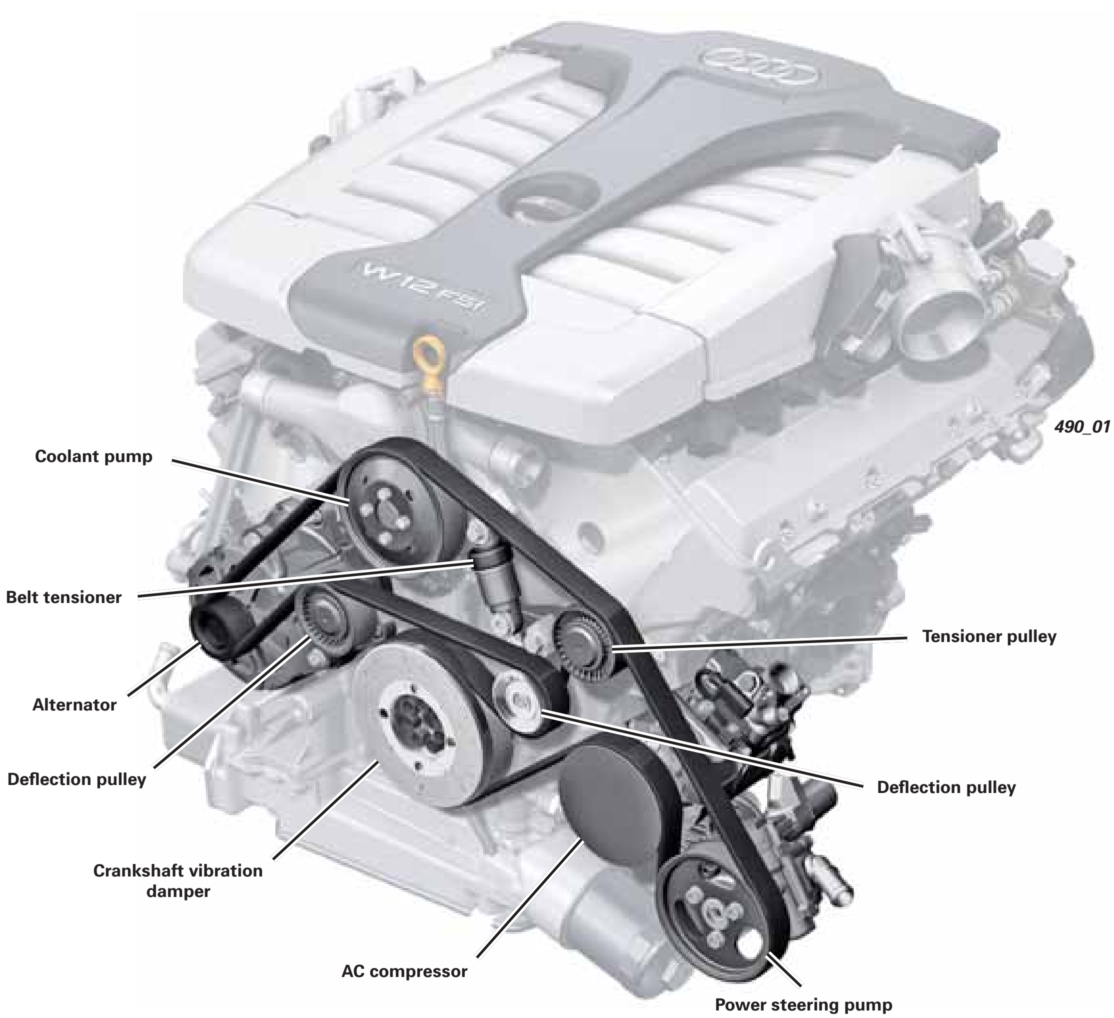


Legend for illustration on facing page:

1 High pressure fuel pump
2 Fuel Metering Valve N290
3 Roller tappet
4 Low pressure connection (supply)
5 High pressure connection
6 Cylinder head cover
7 Cylinder head cover bolts
8 Crankcase breather connecting port
9 Camshaft bearing caps
10 Drive cam for high pressure fuel pump
11 Exhaust camshaft
12 Intake camshaft
13 Roller cam follower (exhaust)
14 Support element (exhaust)
15 Valve spring plate (exhaust)
16 Valve keepers (exhaust)
17 Valve stem seal (exhaust)
18 Valve spring (exhaust)
19 Exhaust valve (long)
20 Exhaust valve assembly (short)
21 Intake valve assembly (short)
22 Intake valve assembly (long)
23 Freeze plug
24 Secondary air inlet
25 Suspension eye
26 Oil Pressure Switch F1
27 Freeze plug

Belt Drive

Auxiliary units are driven by a one-piece belt drive on the front end of the 6.3L W12 FSI engine. Key differences compared to the 6.0L W12 engine are belt routing and how the alternator and AC compressor are connected directly to the cylinder block.

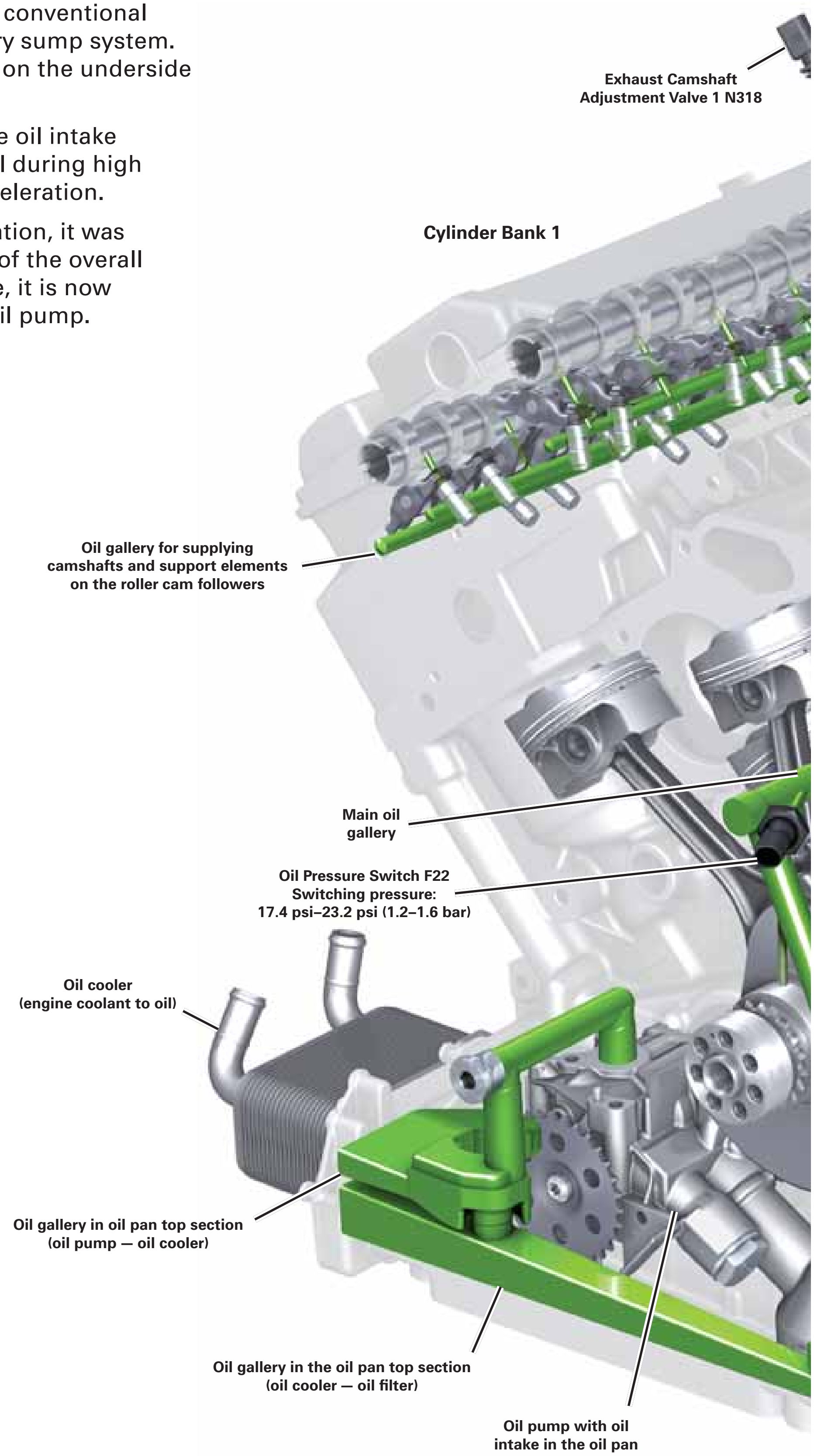


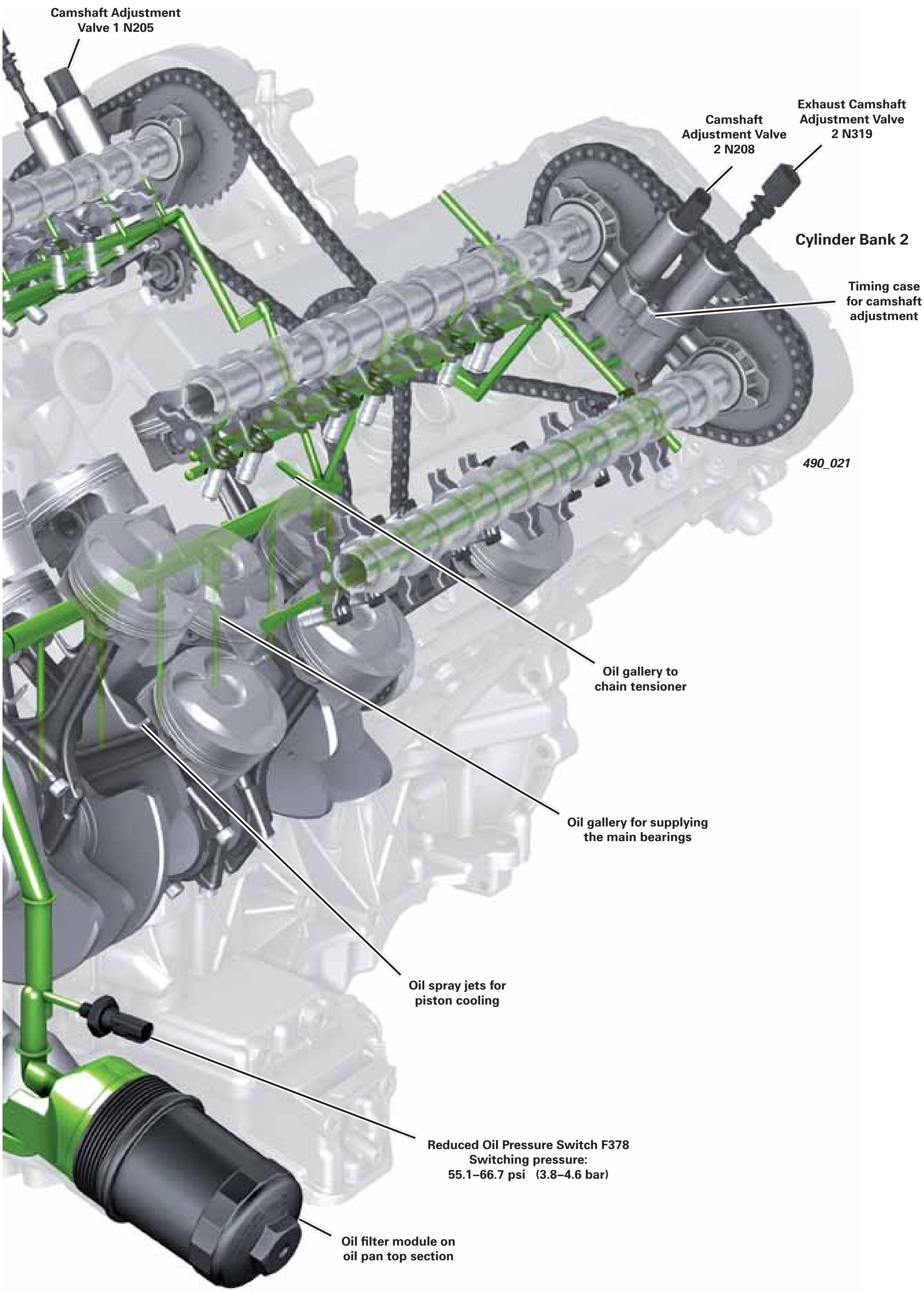
Oil Supply

The 6.3L W12 FSI engine uses a conventional lubrication system. It is not a dry sump system. An aluminum oil pan is located on the underside of the engine.

Baffle plates are installed on the oil intake to ensure a reliable supply of oil during high transverse and longitudinal acceleration.

By eliminating dry sump lubrication, it was possible to simplify the design of the overall lubrication system. For example, it is now possible to use a single stage oil pump.



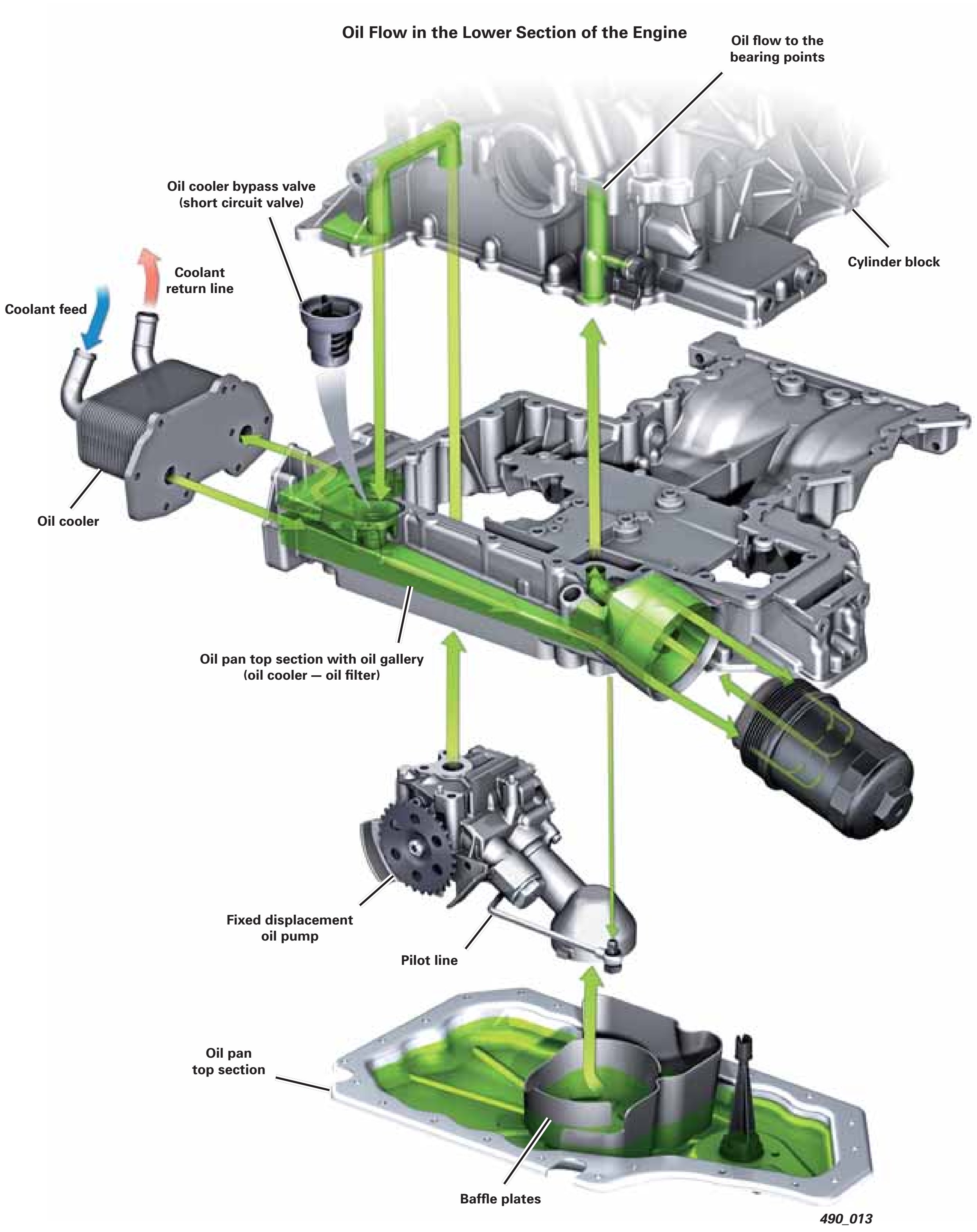


Camshaft Adjustment Valve 1 N205
Camshaft Adjustment Valve 2 N208
Exhaust Camshaft Adjustment Valve 2 N319
Cylinder Bank 2
Timing case for camshaft adjustment
490_021
Oil gallery to chain tensioner
Oil gallery for supplying the main bearings
Oil spray jets for piston cooling
Reduced Oil Pressure Switch F378
Switching pressure:
55.1–66.7 psi (3.8–4.6 bar)
Oil filter module on oil pan top section

Oil Circuit

Oil pressure produced by the oil pump initially passes through the oil cooler and then the oil filter module. An oil cooler bypass valve ensures a reliable flow of oil if the oil cooler becomes clogged.

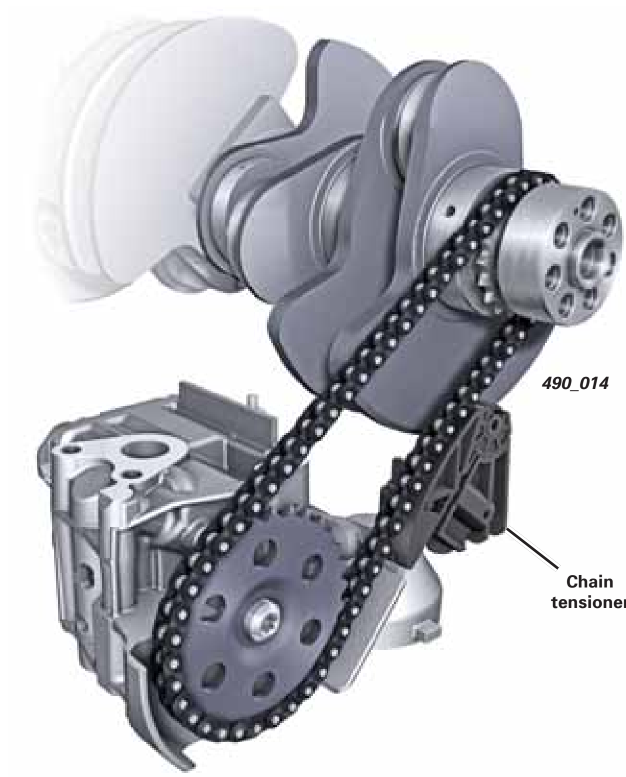
Oil flows from the oil cooler through ports in the oil pan top section to the oil filter. Clean oil then flows through corresponding oil galleries in the cylinder block and cylinder heads to lubrication points.



Oil Pump

The oil pump is a fixed displacement pump that draws oil directly from the oil pan.

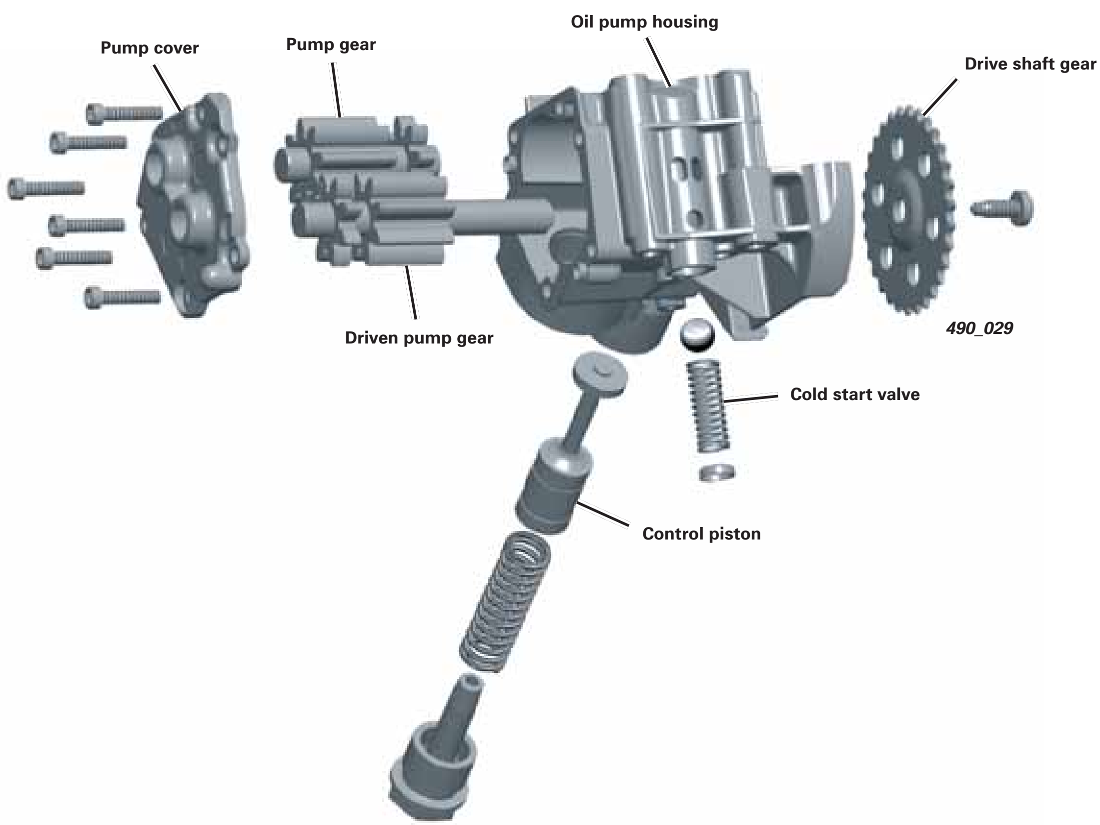
It is driven by a separate chain connected directly to a gear on the crankshaft. This chain drive is located at the front of the engine and has its own chain tensioner. The gear ratio of the pump rotates more slowly than the crankshaft (0.633:1).



Pressure Control

A control piston inside the oil pump controls oil pressure and diverts surplus oil. Oil pressure is present in a pilot line running from the oil gallery in the oil pan top section to the control piston in the oil pump. This control piston diverts surplus oil to the suction side.

During pump operation, oil pressure is kept constant at approximately 72.5 psi (5 bar) at any engine speed above idle. A pressure relief valve (cold start valve) opens at approximately 145.0 psi (10 bar). This can occur at very low engine oil temperatures.



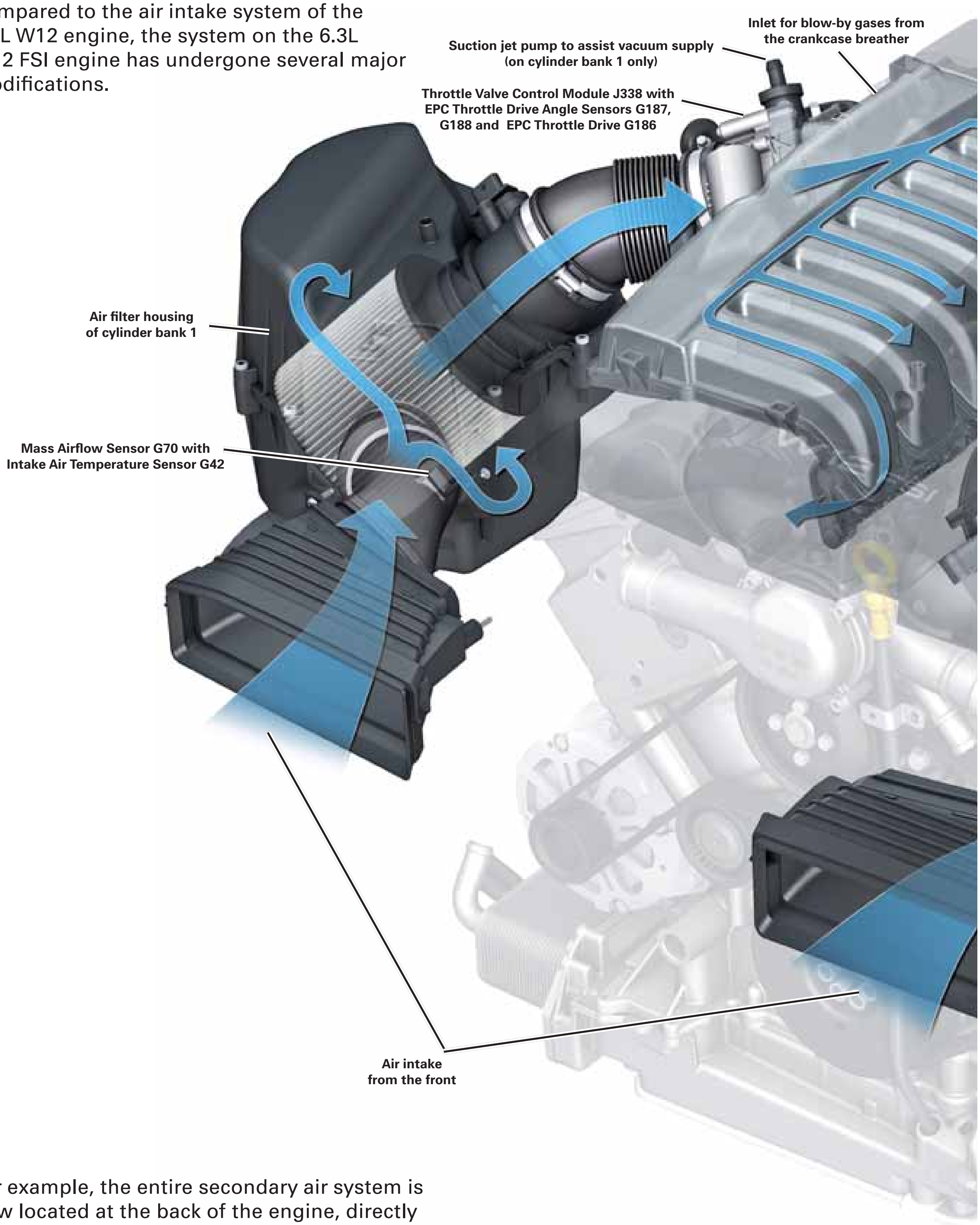
Reference

For additional information about the the design and function of the fixed displacement oil pump, refer to Self-Study Program 990713, *Audi TT RS with the 2.5L TFSI Engine.*

Air Supply

Intake Air Flow System

Compared to the air intake system of the 6.0L W12 engine, the system on the 6.3L W12 FSI engine has undergone several major modifications.



For example, the entire secondary air system is now located at the back of the engine, directly on the transmission.

A suction jet pump located on Throttle Valve Control Module J338 of cylinder bank 1 is used to produce the vacuum required for braking and actuating the exhaust flaps.

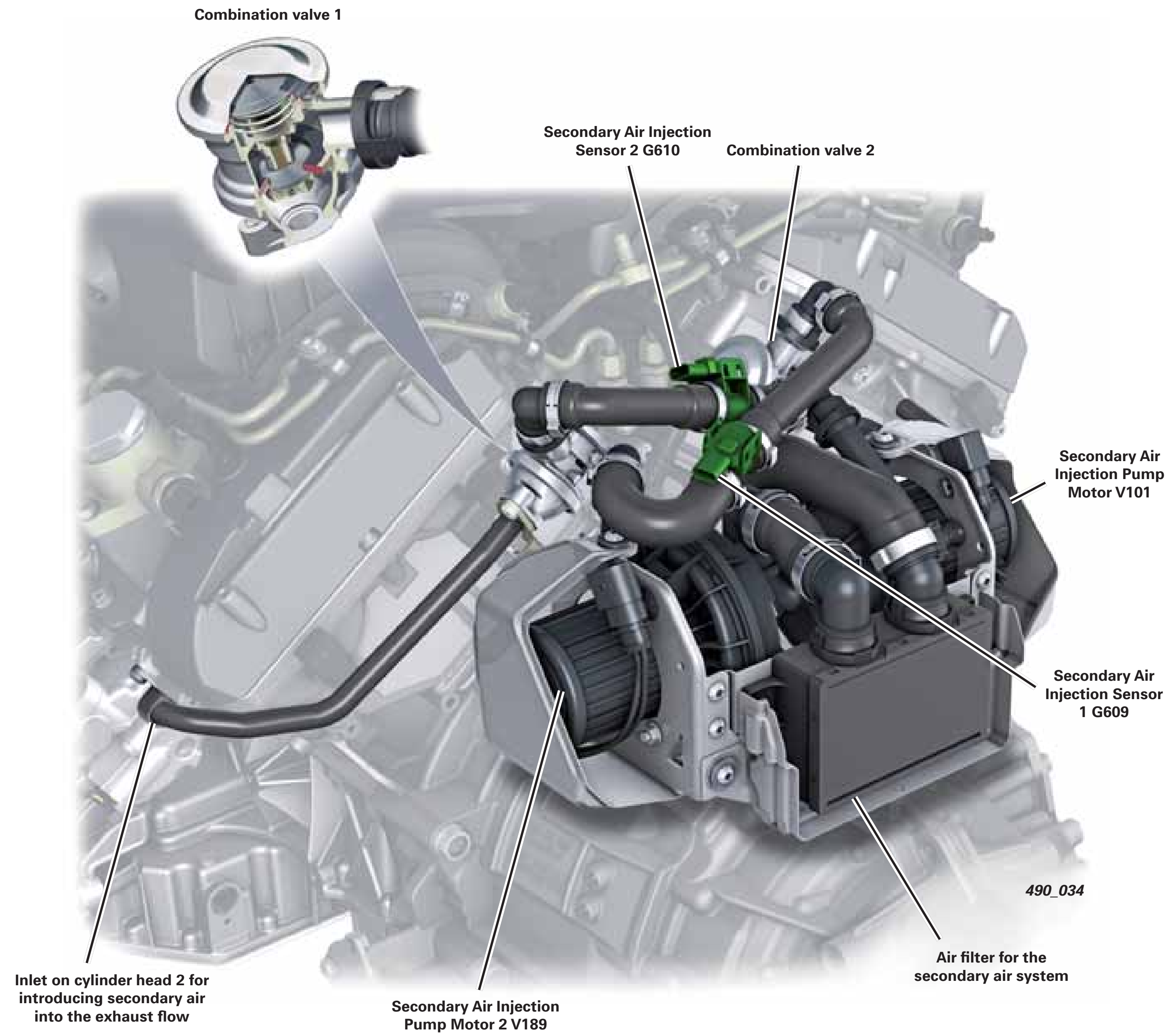
The air ducting system has also been modified compared to the 6.0L W12 engine. The air for the right cylinder bank is drawn in by the right air duct, while the air for the left cylinder bank is drawn in by the left air duct.


Cylinder Bank 1
Intake manifold 1
Intake manifold 2
Cylinder Bank 2
Throttle Valve Control Module 2 J544
with Throttle Drive 2 Angle Sensors
G297, 298 and Throttle Drive 2 G296
Mass Airflow Sensor 2 G246 with
Intake Air Temperature Sensor 2 G299
Air filter housing
of cylinder bank 2
Rubber buffer to support
the air filter element
490_033

Secondary Air System

The secondary air system ensures that the catalytic converters heat up more quickly and are available sooner after a cold start. Unlike the 6.0L W12 engine, secondary air pumps are no longer connected to the air filter housings.

The secondary air system is installed at the back of the engine, on the transmission. It has its own separate air filter.



Function

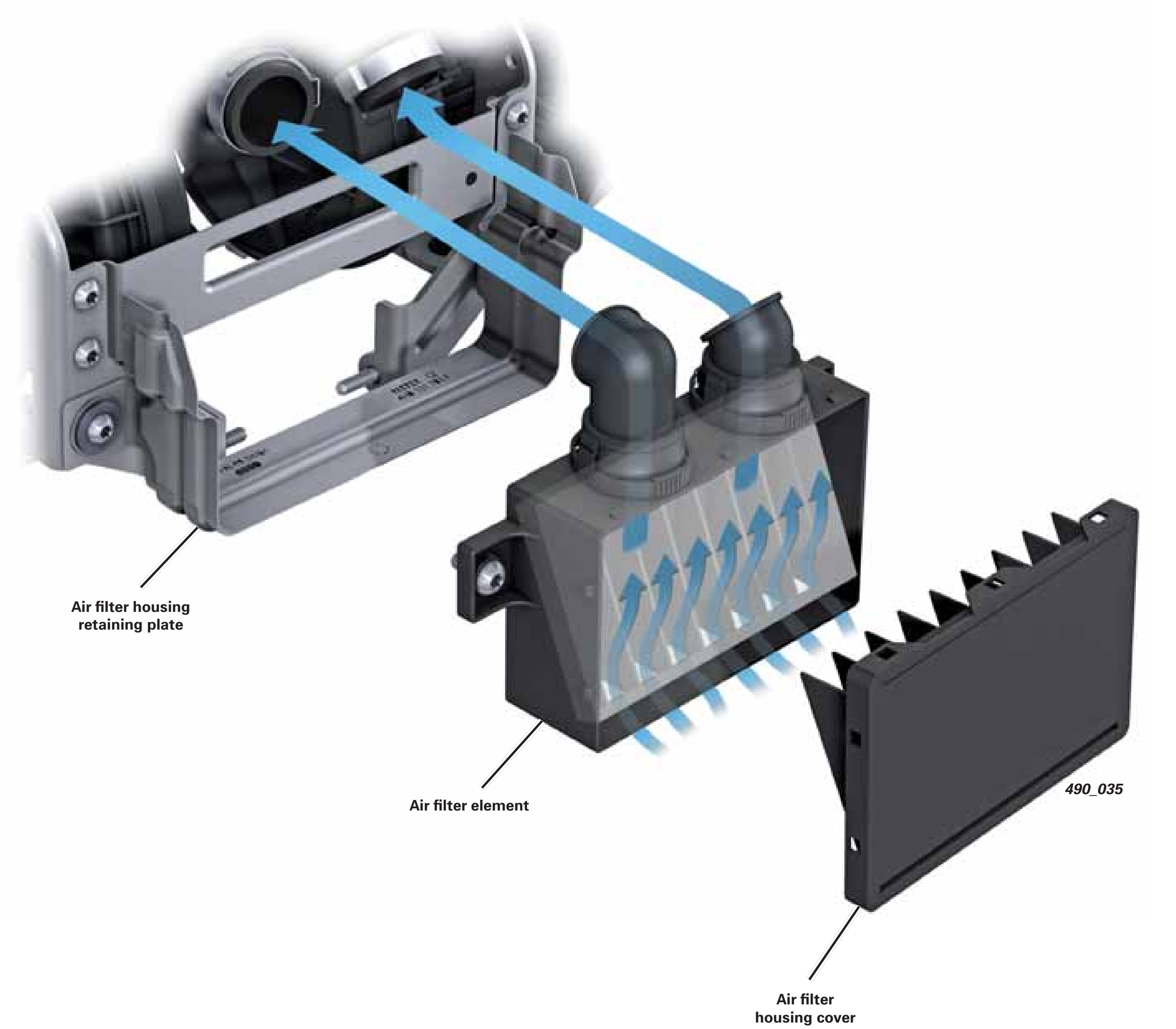
Fresh air is drawn in by Secondary Air Injection Pump Motors V101 and V189. They are activated via Secondary Air Injection Pump Relays 1 and 2 (J299 and J545) after receiving signals from Engine Control Modules 1 and 2 (J623 and J624).

Air flows through combination valves 1 and 2 (self-opening) to both cylinder heads, where it is mixed with the exhaust gas flow. Secondary air pumps distribute crossover air. Secondary Air Injection Pump Motor 2 V189 is connected to combination valve 1, while Secondary Air Injection Pump Motor V101 is connected to combination valve 2.

Secondary Air Injection Filter

Both secondary air pumps draw in air through a common air filter. No replacement interval is specified for the air filter element.

Air flow to the secondary air pumps



Vacuum Supply

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Suction Jet Pump

The conventional method of supplying vacuum to the brake booster and other engine components is problematic with gasoline engines, particularly on vehicles with automatic transmissions.

Installing a conventional vacuum line after the throttle valve would not produce sufficient vacuum for the 6.3L W12 FSI engine's various subsystems.

In the 6.3L W12 FSI engine, required vacuum is produced by a suction jet pump. This pump is connected in parallel with Throttle Valve Control Module 1 J338 before and after the throttle valve. Diverted airflow passes through the pump to produce vacuum, using the Venturi principle.

Brake System Vacuum Pump V192

If required, Brake System Vacuum Pump V192 is activated to assist with vacuum delivery.

This can occur under various operating conditions, for example, when the catalytic converter is heating up, or the throttle valve is wide open. In these cases, the suction jet pump alone is not sufficient to evacuate the brake booster.

Brake Booster Pressure Sensor G294 is connected to the line for the brake booster, sending its readings to Engine Control Module J623.

V192 is activated via characteristic map control by Engine Control Module J623 until the requisite vacuum is generated.

490_032

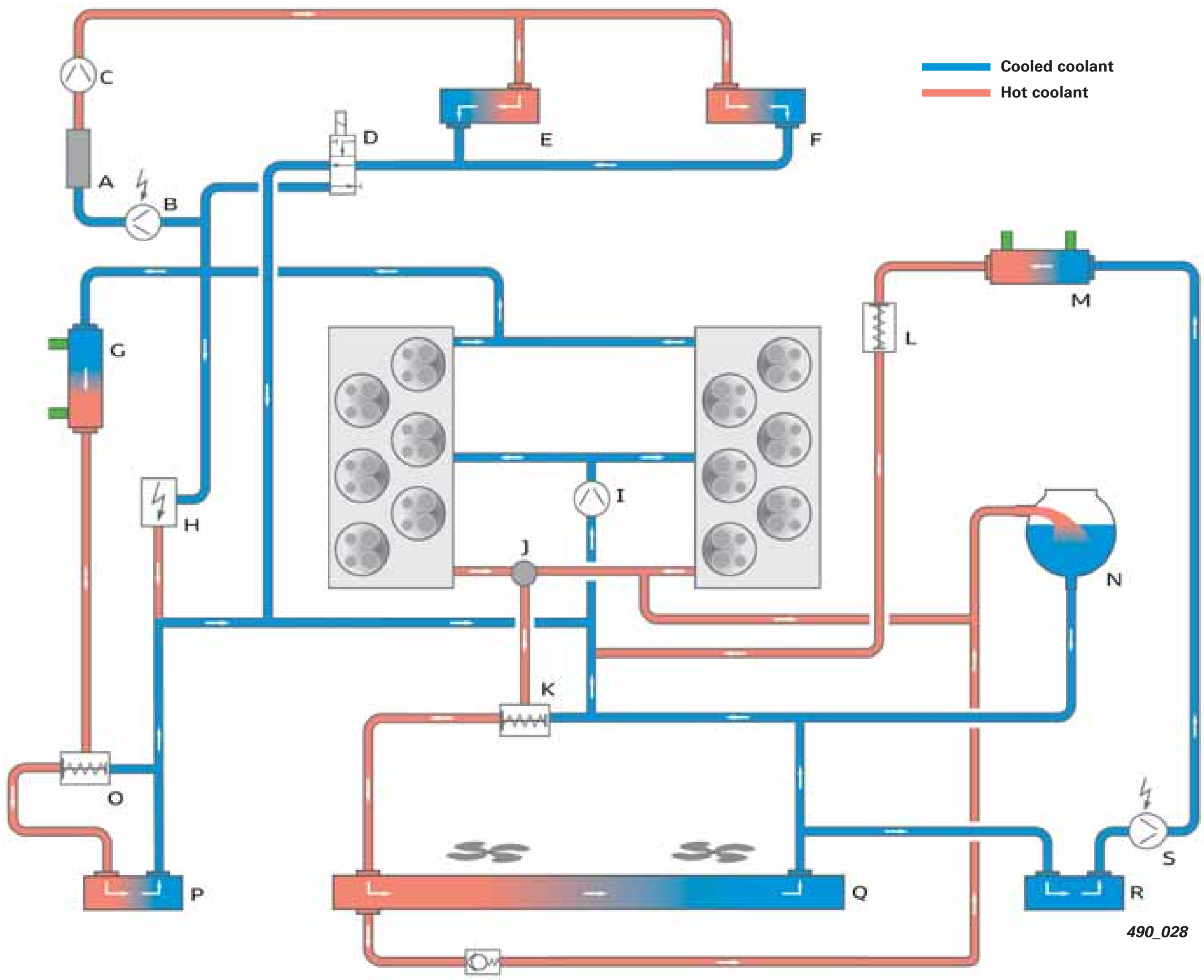
Legend for illustration on facing page:

- **A Brake System Vacuum Pump V192**
- **B Brake booster**
- **C Brake Booster Pressure Sensor G294**
- **D Left secondary air combination valve**
- **E Secondary Air Injection Sensor 1 G609**
- **F Secondary Air Injection Pump Motor 2 V189**
- **G Right secondary air combination valve**
- **H Secondary Air Injection Sensor 2 G610**
- **I Secondary Air Injection Pump Motor V101**
- **J Air filter of the secondary air system**
- **K Non-return valve**
- **L T-piece with flow restrictor**
- **M EVAP Canister Purge Regulator Valve 1 N80**
- **N Activated charcoal canister**
- **O Vacuum reservoir**
- **P Exhaust Door Valve 2 N322**
- **Q Left exhaust flap**
- **R Vacuum reservoir**
- **S Exhaust Door Valve 1 N321**
- **T Right exhaust flap**
- **U Suction jet pump**

Cooling System

Overview

This illustration includes an auxiliary heater and additional radiator that are not available in the North American market.



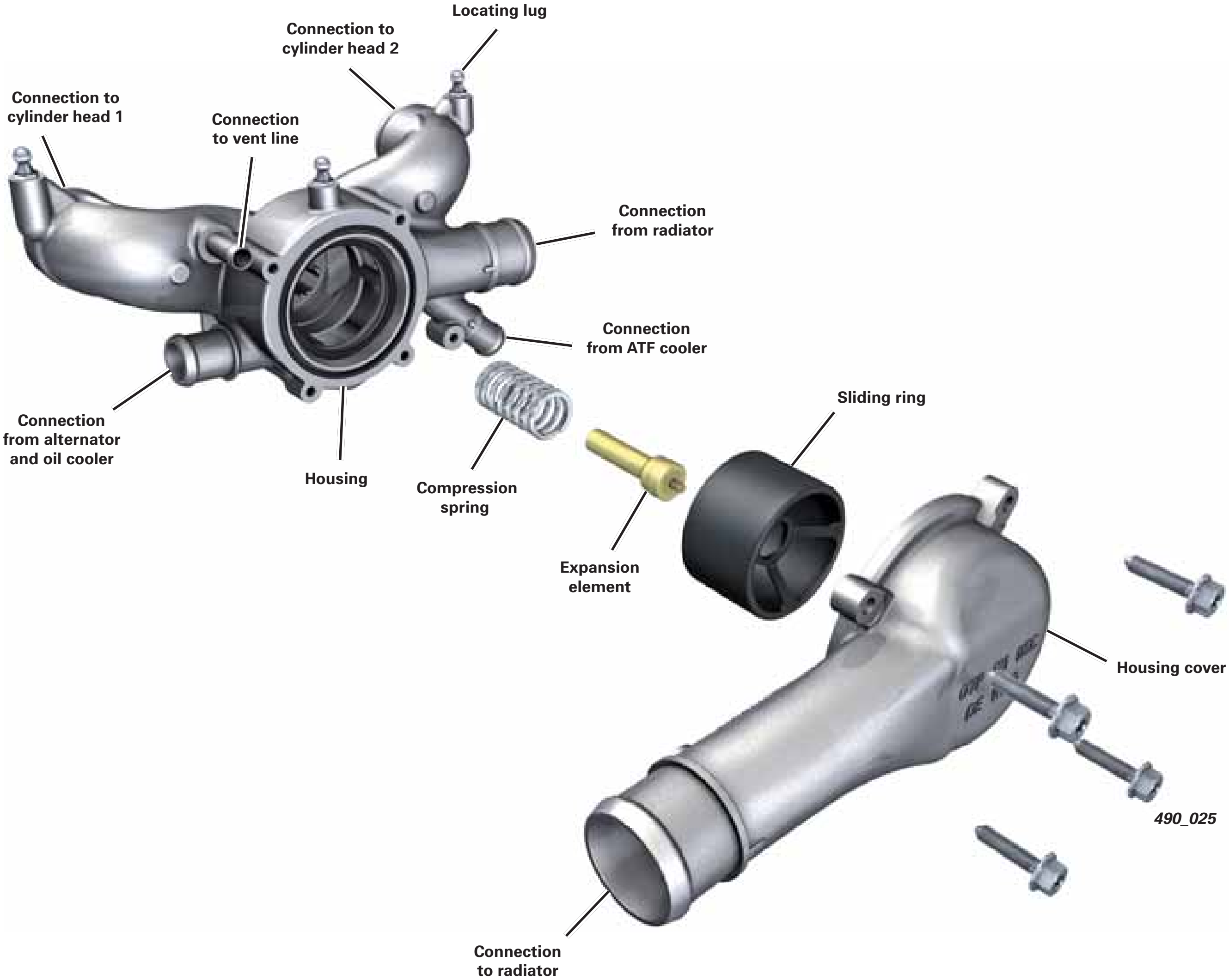
Legend:

- **A** Auxiliary heater (not for the North American market)
- **B** Recirculation Pump V55
- **C** Coolant Circulation Pump V50
- **D** Heater Coolant Shut-Off Valve N279
- **E** Front heater heat exchanger
- **F** Rear heater heat exchanger
- **G** Engine oil cooler
- **H** Alternator
- **I** Coolant pump
- **J** Engine Coolant Temperature Sensor G62
- **K** Coolant thermostat [initial opening temp: 206°F (97°C)]
- **L** Coolant circuit thermostat for ATF cooling [initial opening temp: 167°F (75°C)]
- **M** ATF cooler
- **N** Coolant expansion reservoir
- **O** Coolant thermostat for right side additional radiator (not for the North American market)
- **P** Right side additional radiator (not for the North American market)
- **Q** Coolant radiator
- **R** Left side additional radiator
- **S** After-Run Coolant Pump V51

Coolant Thermostat

The coolant thermostat is located at the front end of the engine. Coolant flows to both cylinder heads, converging inside the coolant thermostat housing. The coolant thermostat for the primary cooling circuit opens at a temperature of 206°F (97°C).

The plunger of the expansion element rests on the housing cover. The sliding ring moves with the expansion element and, depending on its position, disconnects the secondary cooling circuit from the primary cooling circuit. The coolant thermostat housing has three locating lugs into which the engine cover clips.



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Note

The cooling system may only be refilled using cooling system charge unit VAS 6096.

Fuel System

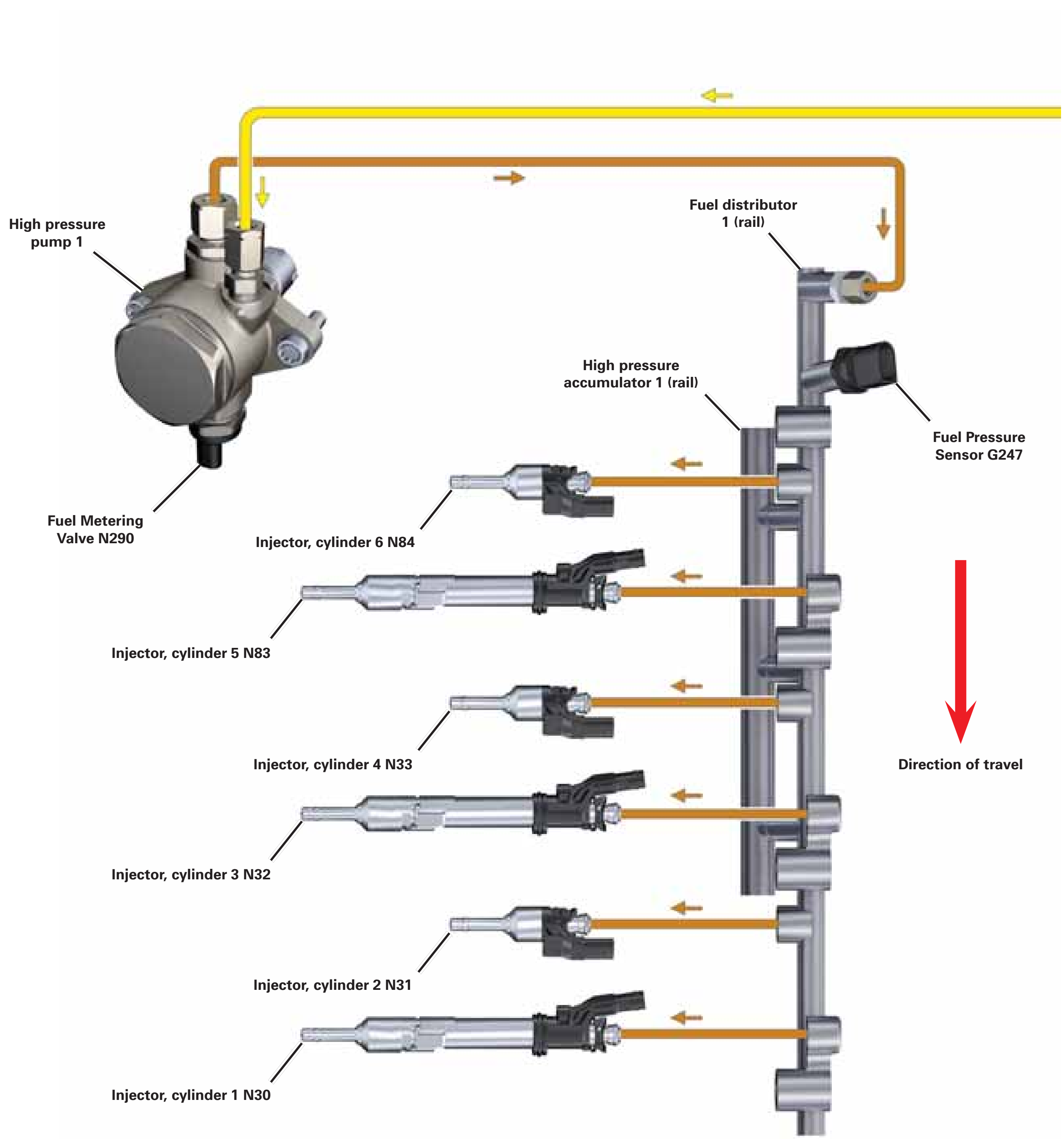
Overview

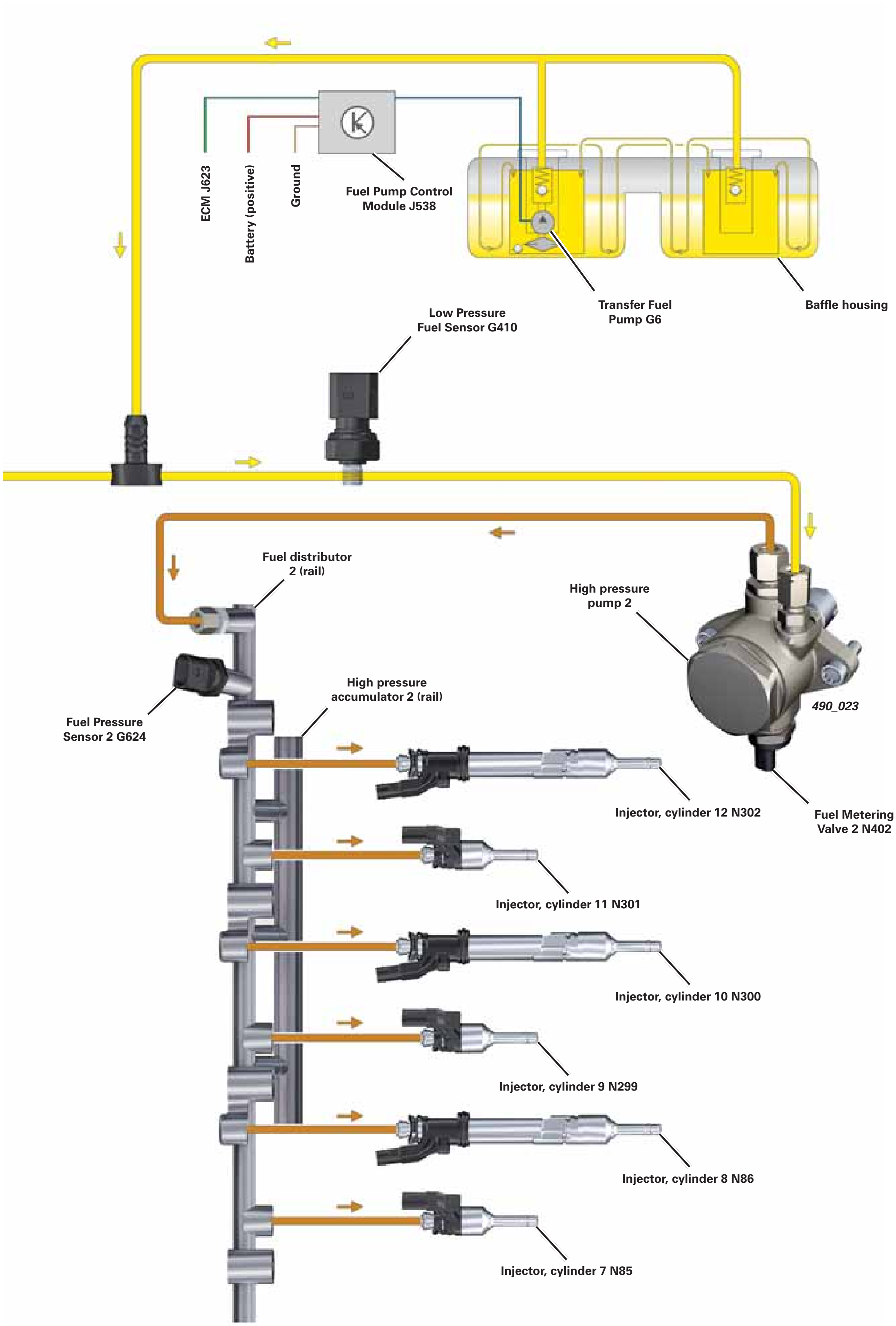
As in all FSI engines, the fuel system is divided into low pressure and high pressure fuel systems.

Both the high and low pressure sides of the fuel system operate on demand. Neither system has a fuel return line.

Low Pressure System

The low pressure system is a closed-loop design in which system pressure is monitored by Low Pressure Fuel Sensor G410. Depending on requirements, pressure is regulated to between 50.7–87.0 psi (3.5–6.0 bar).





ECM J623
Battery (positive)
Ground
Fuel Pump Control Module J538
Transfer Fuel Pump G6
Baffle housing
Low Pressure Fuel Sensor G410
Fuel distributor 2 (rail)
High pressure pump 2
Fuel Pressure Sensor 2 G624
High pressure accumulator 2 (rail)
490_023
Injector, cylinder 12 N302
Fuel Metering Valve 2 N402
Injector, cylinder 11 N301
Injector, cylinder 10 N300
Injector, cylinder 9 N299
Injector, cylinder 8 N86
Injector, cylinder 7 N85

Fuel Rails

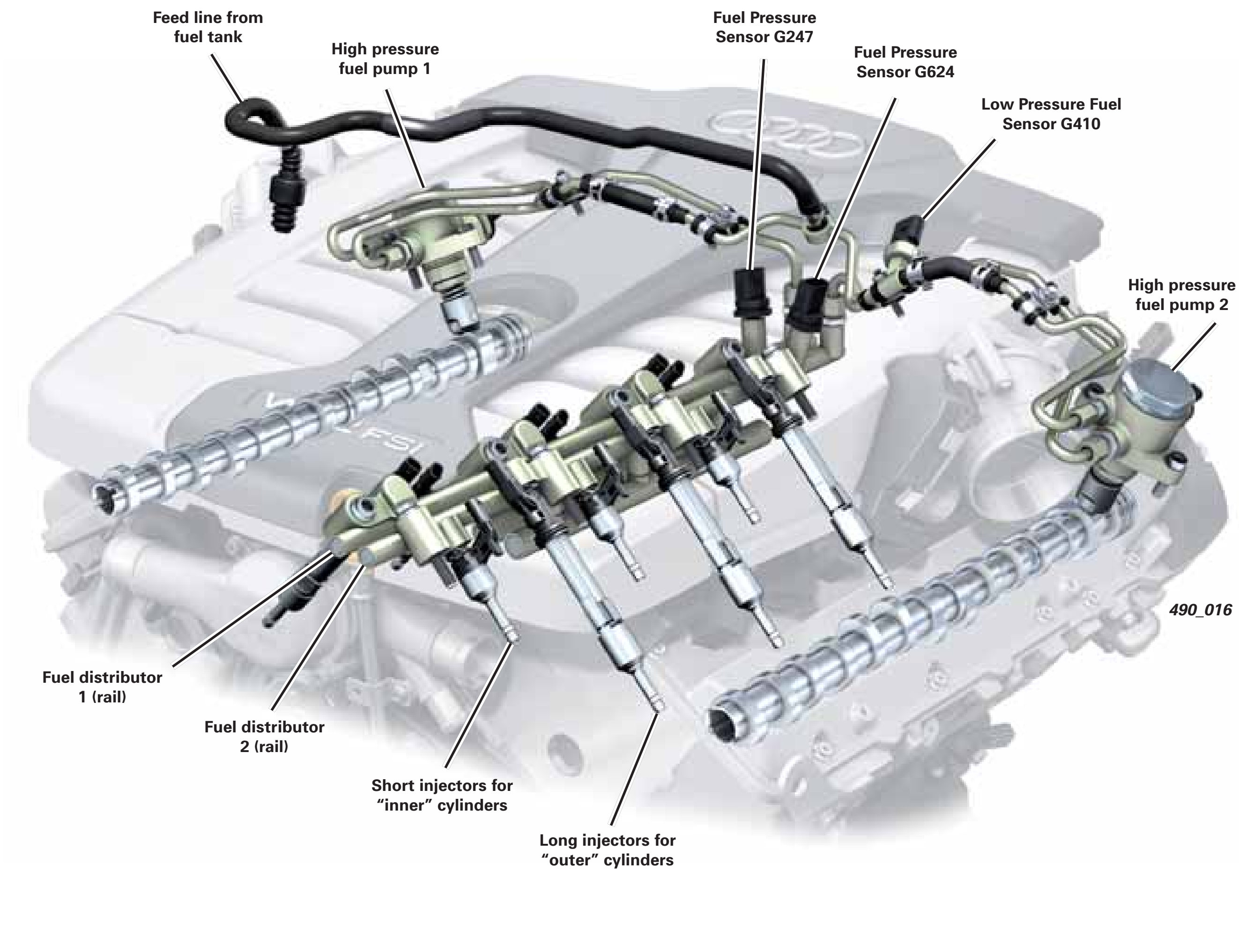
High Pressure System

Due to the engine's design, high fuel pressure is distributed to high pressure injectors via twin fuel rails.

Each cylinder bank is supplied fuel by its own high pressure fuel pump. Engine Control Module J623 (master) controls cylinder bank 1 and Engine Control Module 2 J624 (slave) controls cylinder bank 2. Low Pressure Fuel Sensor G410 is read by Engine Control Module J623.

Both high pressure sides are hydraulically independent of each other. For this reason, a separate fuel pressure sender is required for each cylinder bank.

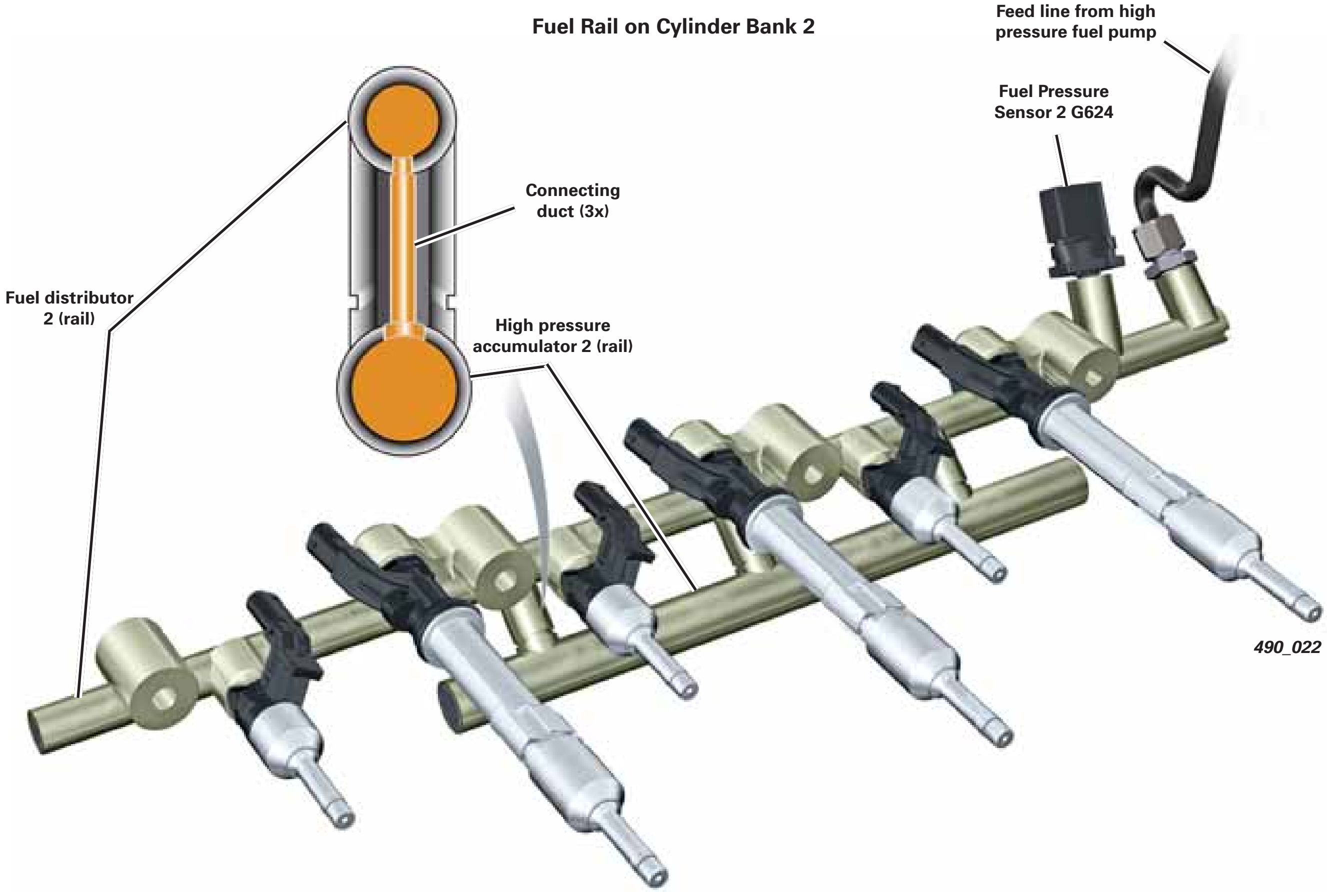
The high pressure pumps are integrated in the cylinder head covers and are driven by a three-lobe cam on the exhaust camshafts. The high pressure pumps operate at pressures between 580.1–1740.4 psi (40–120 bar).



Additional Volume on the Fuel Rails

Both fuel rails hold additional volume via a high pressure accumulator rail. This additional volume is required to compensate for pressure peaks and fluctuation. The greater the volume, the lesser the effect of the pressure drop due to loss of volume during injection.

The diameters of the rails could have been made slightly larger, but this was not possible due to space constraints. The additional volume solution was chosen for this reason.



> **Warning**
> Be very careful when working on the fuel system. It operates a extremely high pressures. To open the high pressure side, always follow the instructions given in current technical literature.

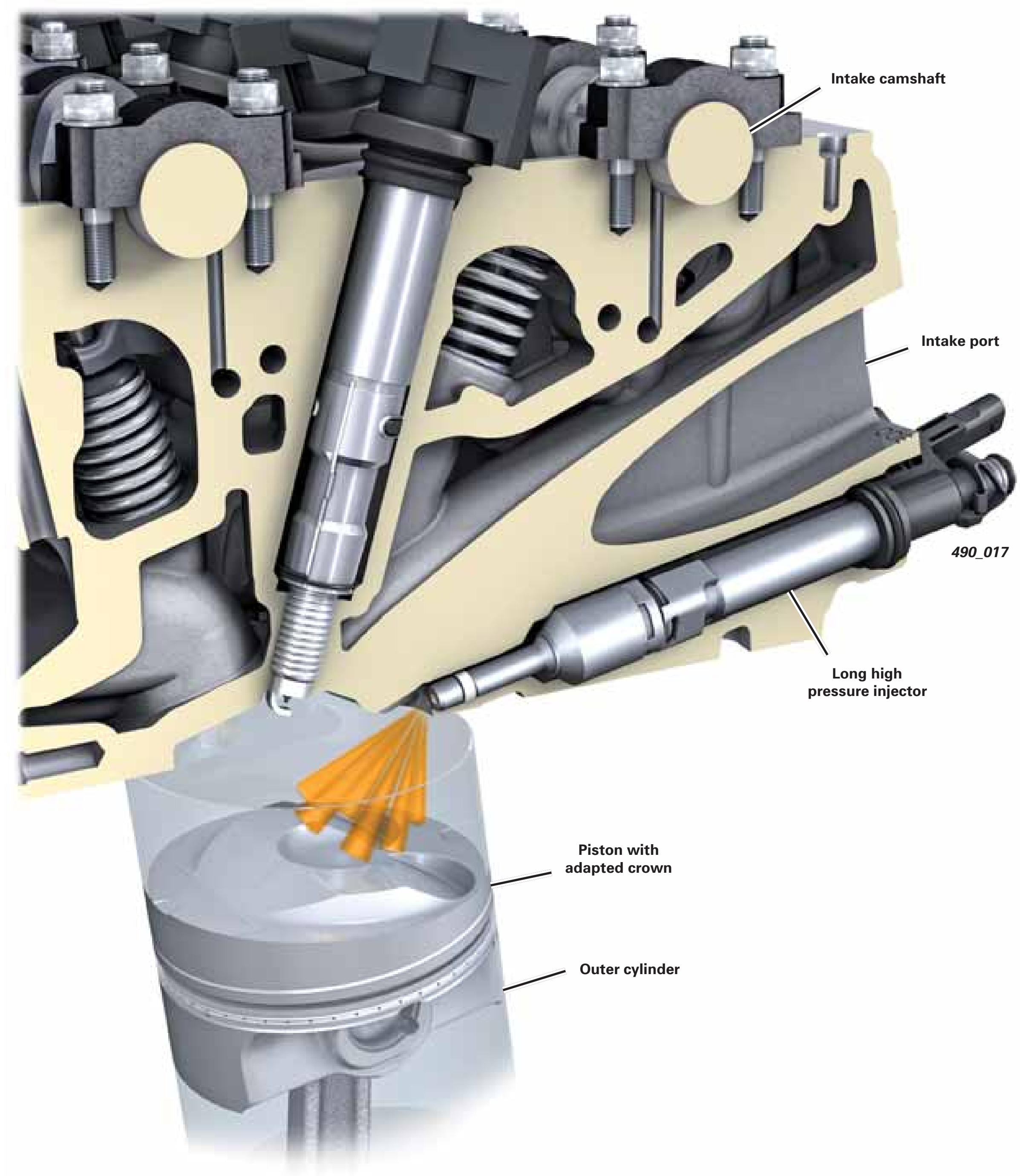
High Pressure Injectors

Fuel is injected into the combustion chambers at pressures up to 1740.4 psi (120 bar). This task is performed by two different types of injectors, with the six individual jets of each injector arranged to provide optimal spatial alignment.

Different pistons with correspondingly shaped crowns are used due to the different installation angles of injectors.

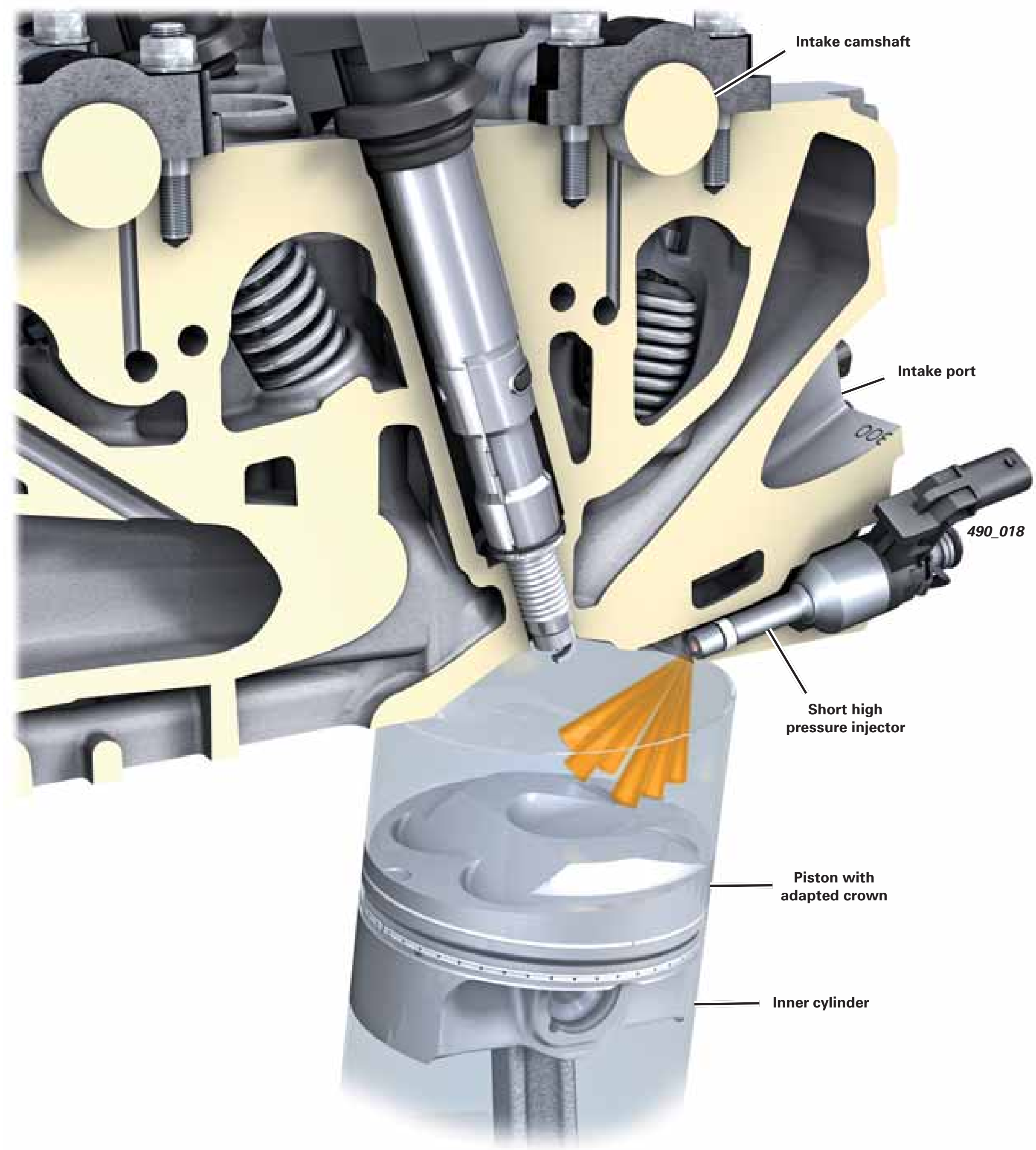
Cylinders 1, 3, 5, 8, 10, 12 Long High Pressure Injectors

In "outer" cylinders 1, 3, 5, 8, 10, and 12, longer injectors are used to deliver fuel from each of the fuel rails between the cylinder heads to the cylinders.



Cylinders 2, 4, 6, 7, 9, 11
Short High Pressure Injectors

The high pressure injectors of “inner” cylinders 2, 4, 6, 7, 9, and 11 are very similar in design to those of other Audi FSI and TFSI engines.



Engine Management

System Overview

Sensors

Low Pressure Fuel Sensor G410

Engine Coolant Temperature Sensor G62

Secondary Air Injection Sensor G609

Mass Airflow Sensor G70
Intake Air Temperature Sensor G42

Accelerator Pedal Position Sensor G79
Accelerator Pedal Position Sensor 2 G185

Engine Speed Sensor G28

Knock Sensors 1&2 G61, G66

Fuel Pressure Sensor G247

Camshaft Position Sensor G40
Camshaft Position Sensor 3 G300

Throttle Valve Control Module J338
EPC Throttle Drive Angle Sensors
1&2 G187, G188

Reduced Oil Pressure Switch F378

Oil Level Thermal Sensor G266

Brake Light Switch F

Heated Oxygen Sensors 1&2 G39, G108
Oxygen Sensor 1&2 After Three Way
Catalytic Converter G130, G131

Auxiliary signals:
– Cruise Control Switch E45
– Comfort System Central Control Module
  J393 (wake-up door contact)
– Brake Booster Vacuum Sensor G483

Fuel Pressure Sensor 2 G624

Camshaft Position Sensor 2 G163
Camshaft Position Sensor 4 G301

Throttle Valve Control Module 2 J544
Throttle Drive 2 Angle Sensors 1&2
G297, G298

Knock Sensors 3&4 G198, G199

Heated Oxygen Sensors 3&4 G285, G286
Oxygen Sensors After Catalytic
Converter 3&4 G287, G288

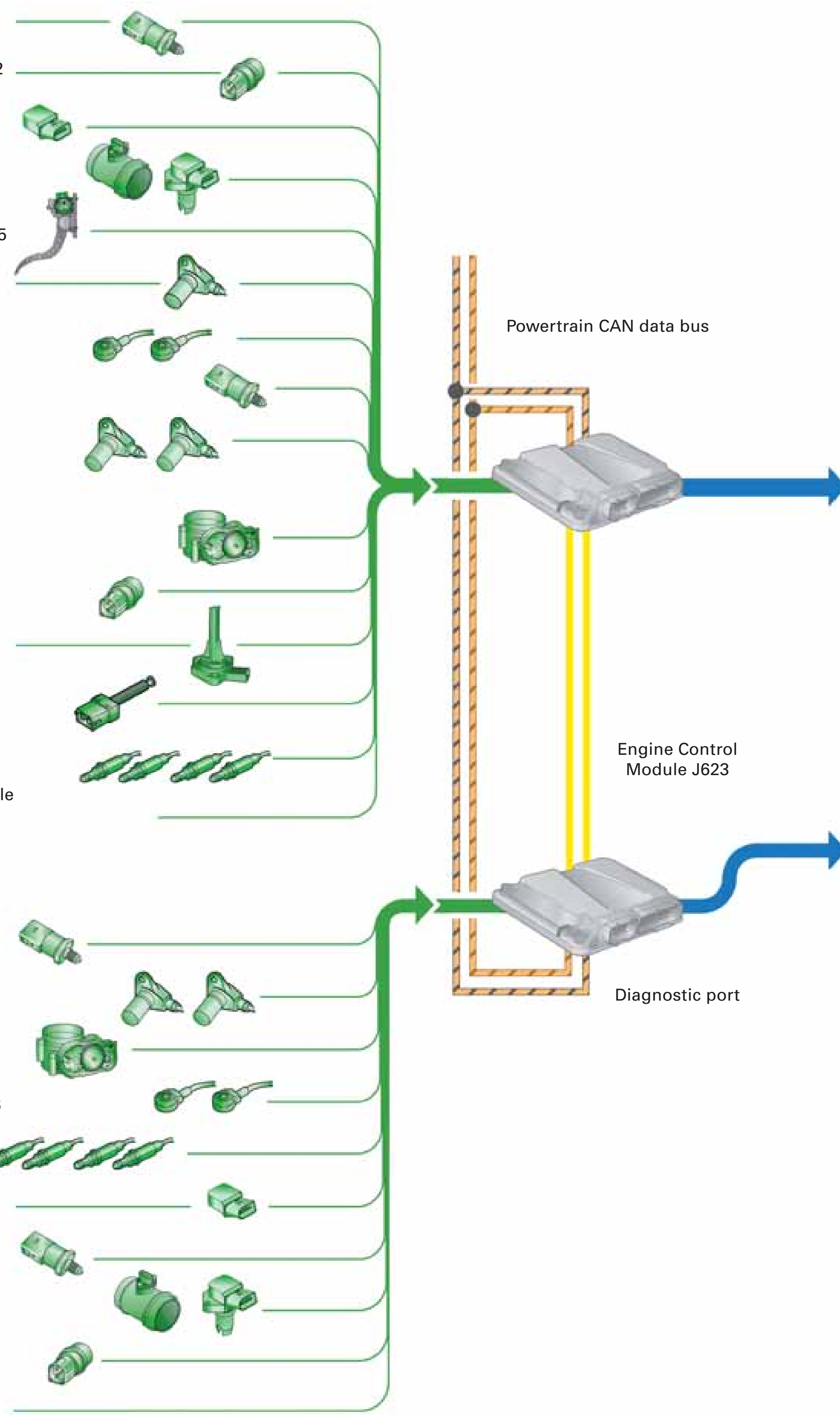
Secondary Air Injection Sensor 2 G610

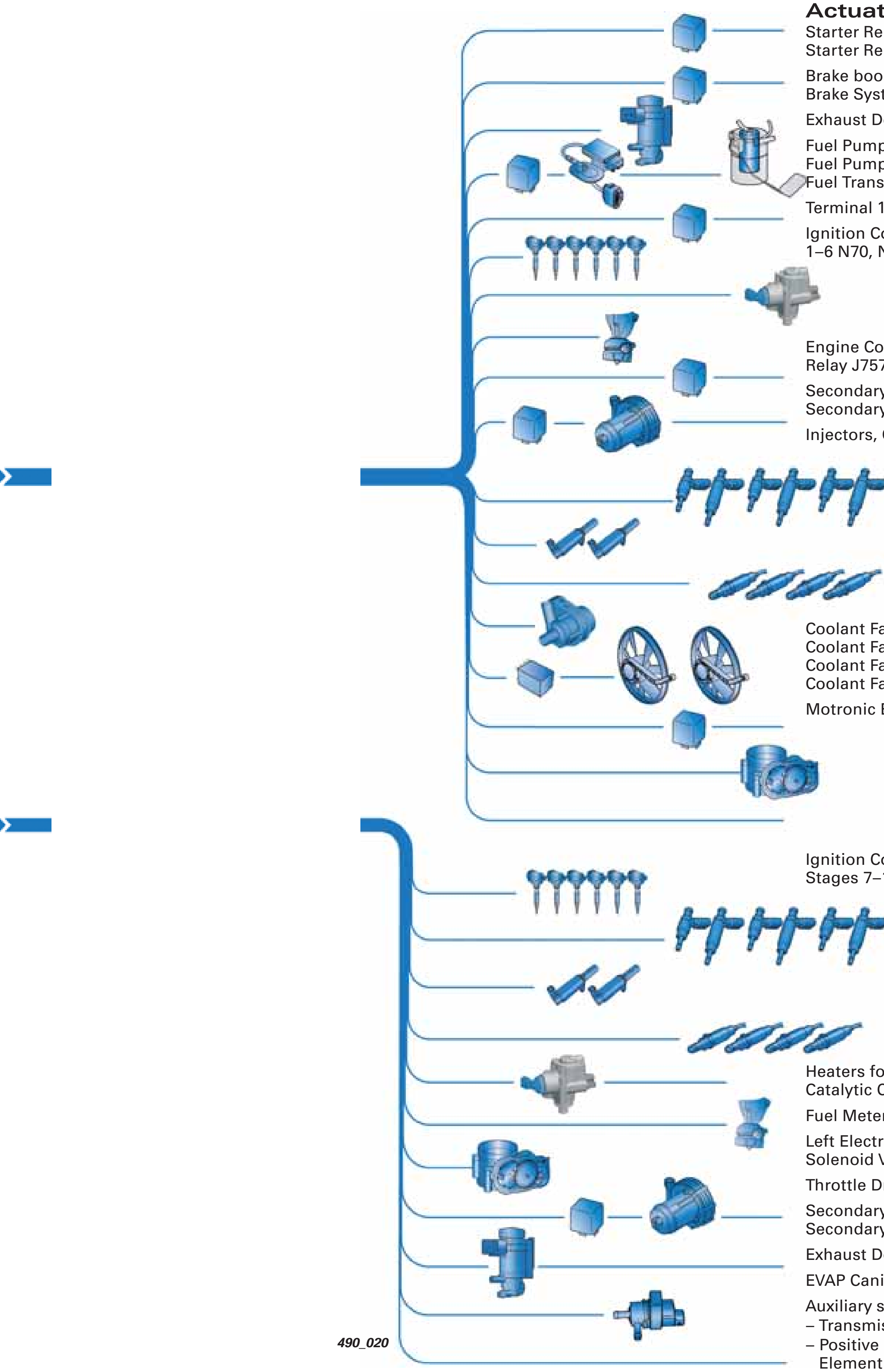
Fuel Tank Pressure Sensor G400

Mass Airflow Sensor G245
Intake Air Temperature Sensor 2 G299

Oil Pressure Switch F22

Auxiliary signals:
– Transmission Control Module J217





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Actuators

Starter Relay J53
Starter Relay 2 J695

Brake booster Relay J569
Brake System Vacuum Pump V192

Exhaust Door Valve 1 N321

Fuel Pump Relay J17
Fuel Pump Control Module J538
Fuel Transfer Pump G6

Terminal 15 Power Supply Relay J329

Ignition Coils with Power Output Stages 1–6 N70, N127, N291, N292, N323, N324

Fuel Metering Valve N290

Right Electrohydraulic Engine Mount Solenoid Valve N145

Engine Component Power Supply Relay J757

Secondary Air Injection Pump Relay J29
Secondary Air Injection Pump Motor V101

Injectors, Cylinders 1–6 N30–N33, N83, N84

Camshaft Adjustment Valve N205
Exhaust Camshaft Adjustment Valve N318

Oxygen Sensor Heaters Z19, Z28
Heaters for Oxygen Sensors 1&2 After Catalytic Converter

Coolant Circulation Pump V50

Coolant Fan Control Module J293
Coolant Fan V7
Coolant Fan Control Module 2 J671
Coolant Fan 2 V177

Motronic ECM Power Supply Relay J271

EPC Throttle Drive G186
After-Run Coolant Pump Relay V51

Auxiliary signals:
– Transmission Mount Valve 1 N262

Ignition Coils with Power Output Stages 7–12 N325–N330

Injectors, Cylinders 7–12 N85, N86, N299–N302

Camshaft Adjustment Valve 2 N208
Exhaust Camshaft Adjustment Valve 2 N319

Oxygen Sensor Heaters 3&4 Z62, Z63

Heaters for Oxygen Sensors 3&4 After Catalytic Converter Z64, Z65

Fuel Metering Valve 2 N402

Left Electrohydraulic Engine Mount Solenoid Valve N144

Throttle Drive 2 G296

Secondary Air Injection Pump Relay 2 J545
Secondary Air Injection Pump Motor 2 V189

Exhaust Door Valve 2 N322

EVAP Canister Purge Regulator Valve 1 N80

Auxiliary signals:
– Transmission Mount Valve 2 N263
– Positive Crankcase Ventilation Heating Element N79
– Fuel Tank Leak Detection Control Module J909

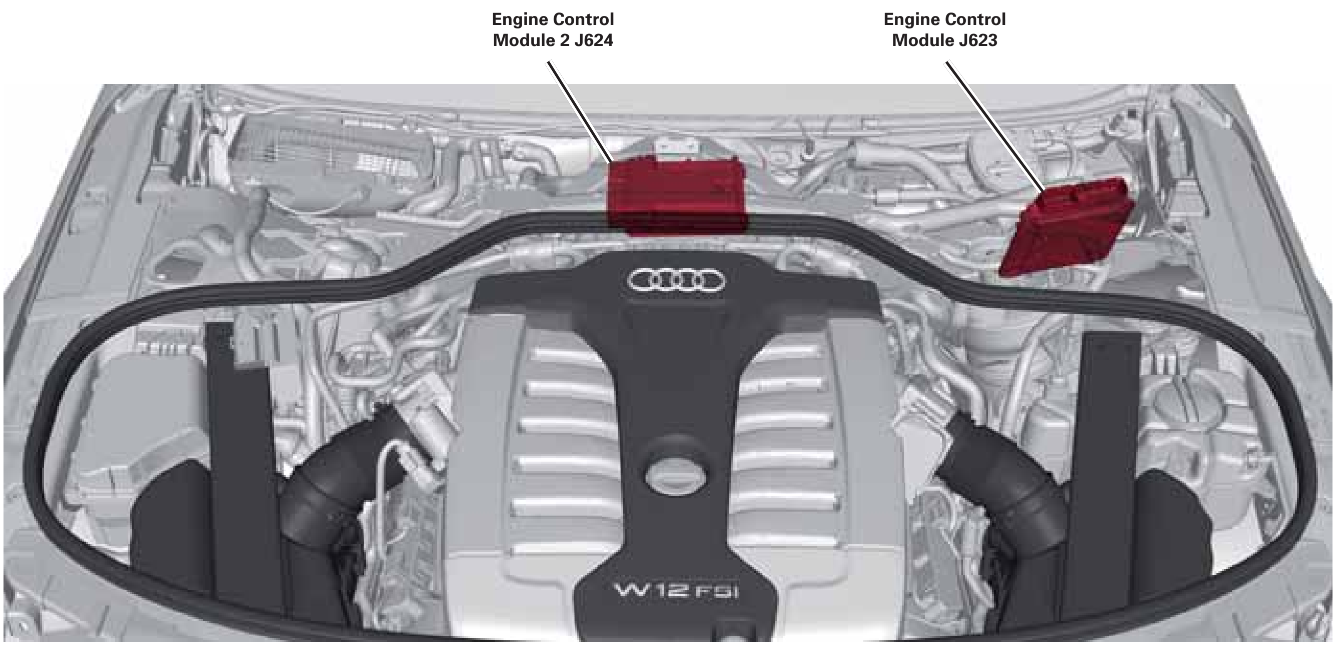
ECM J623 and ECM 2 J624

The engine control modules of the Bosch MED 17.1.6 engine management system operate in tandem.

Both ECMs are located in the plenum chamber and are identical in design. They are assigned to the cylinder banks by PIN (terminal) coding in the wiring harness.

The two ECMs must be treated separately during diagnosis, but share the following features:

– Same software version
– Same CCS and ACC adaptation
– Same coding



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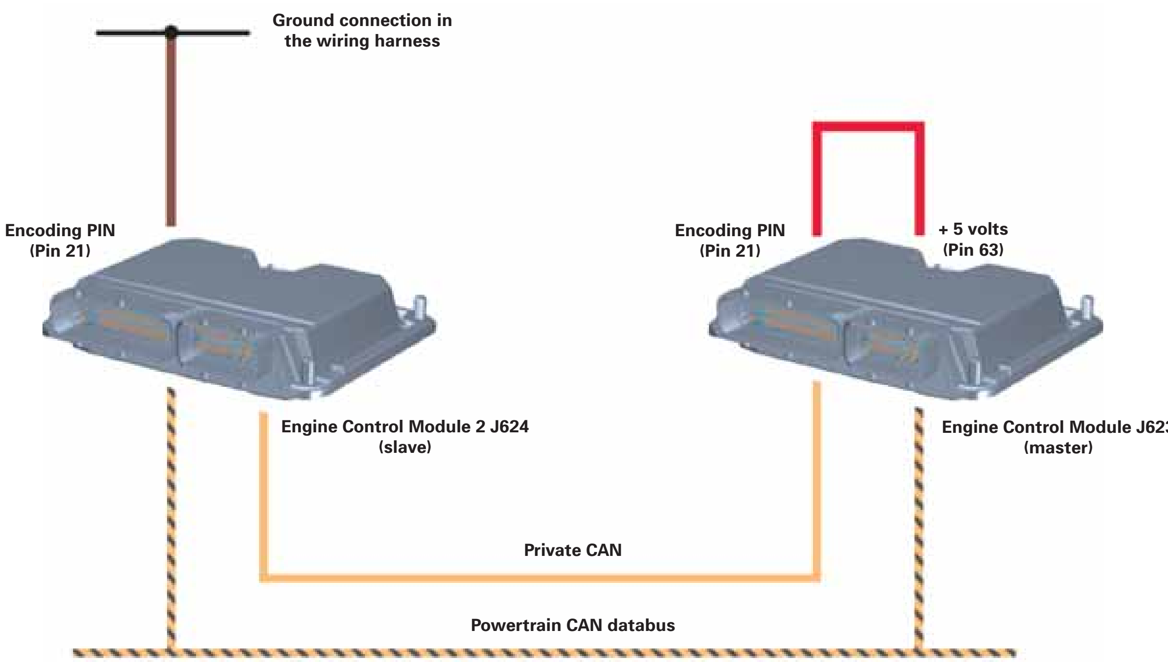
Control Module Communication

Both ECMs are on the Powertrain CAN data bus. They have an internal private CAN data bus for communicating with one another, which primarily facilitates the exchange of engine-specific data. This private CAN works in the same way as the Powertrain CAN data bus.

PIN (terminal) Coding

Each engine control module is assigned to a cylinder bank by PIN coding within the wiring harness.



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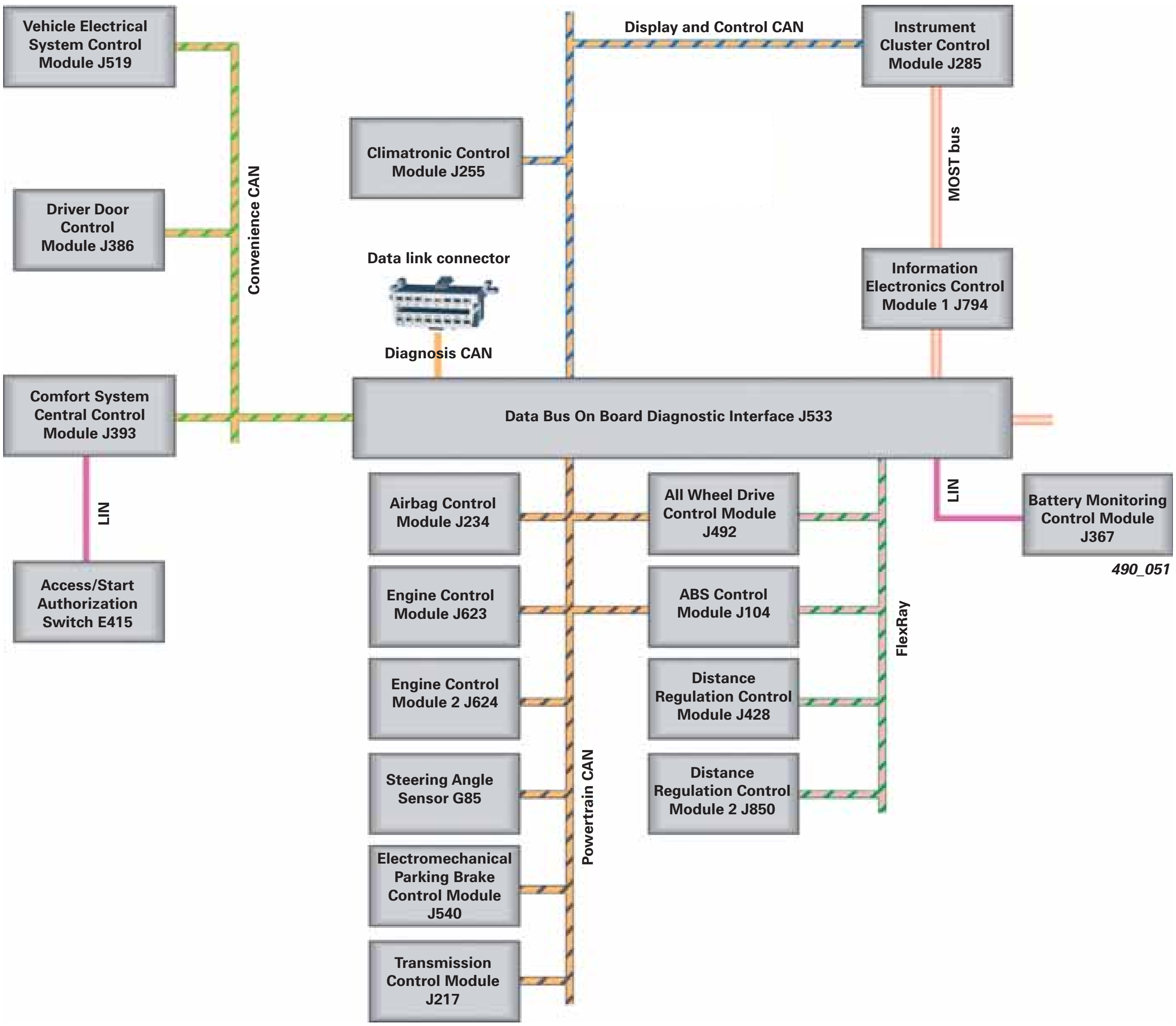
Important ECM Messages

- Distance Regulation Control Modules J428 / J850
  - System states
  - Torque requests
- Airbag Control Module J234
  - Crash intensity
  - Safety belt status, driver side
- Battery Monitoring Control Module J367
  - Alternator output
  - Radiator fan request
- Transmission Control Module J217
  - All relevant signals for engine torque adaptation
- Electromechanical Parking Brake Control Module J540
  - Deceleration request
  - Status of the EPB actuators
- ABS Control Module J104
  - All signals relevant to the ESP
- Access/Start Authorization Switch E415
  - Stop enable
  - Start request
- Climatronic Control Module J255
  - Engine speed increase requested before compressor activation
  - Rear window defroster
  - Windscreen defroster
  - Air conditioning system ON/OFF
- Instrument Cluster Control Module J285
  - Inoperative time
  - Fuel tank filling status
  - Ambient temperature
  - Vehicle speed
- Steering Column Electronics Control Module J527
  - Information from CCS and ACC switches
  - Steer angle

Signals Transmitted by ECM J623

- Engine torque
- Kick down
- Fault memory
- Cylinder cutout
- Transmission status
- Accelerator pedal values
- Engine speed
- ESP signals
- Oil level, minimum oil pressure warning
- Oil temperature
- Fuel consumption
- Radiator fan activation
- Vacuum
- On board diagnosis
- Recuperation enable signal
- AC adjustment
- Status of Audi drive select
- Radiator fan activation
- Information on replacement interval
- Activation of MILs
- Intake air temperature, intake manifold pressure
- Coolant temperature
- Altitude information
- System states of the engine (for example, overrun)
- Electromechanical Parking Brake Control Module J540
- Shut down cylinders

Other Control Modules that Communicate with the ECMs



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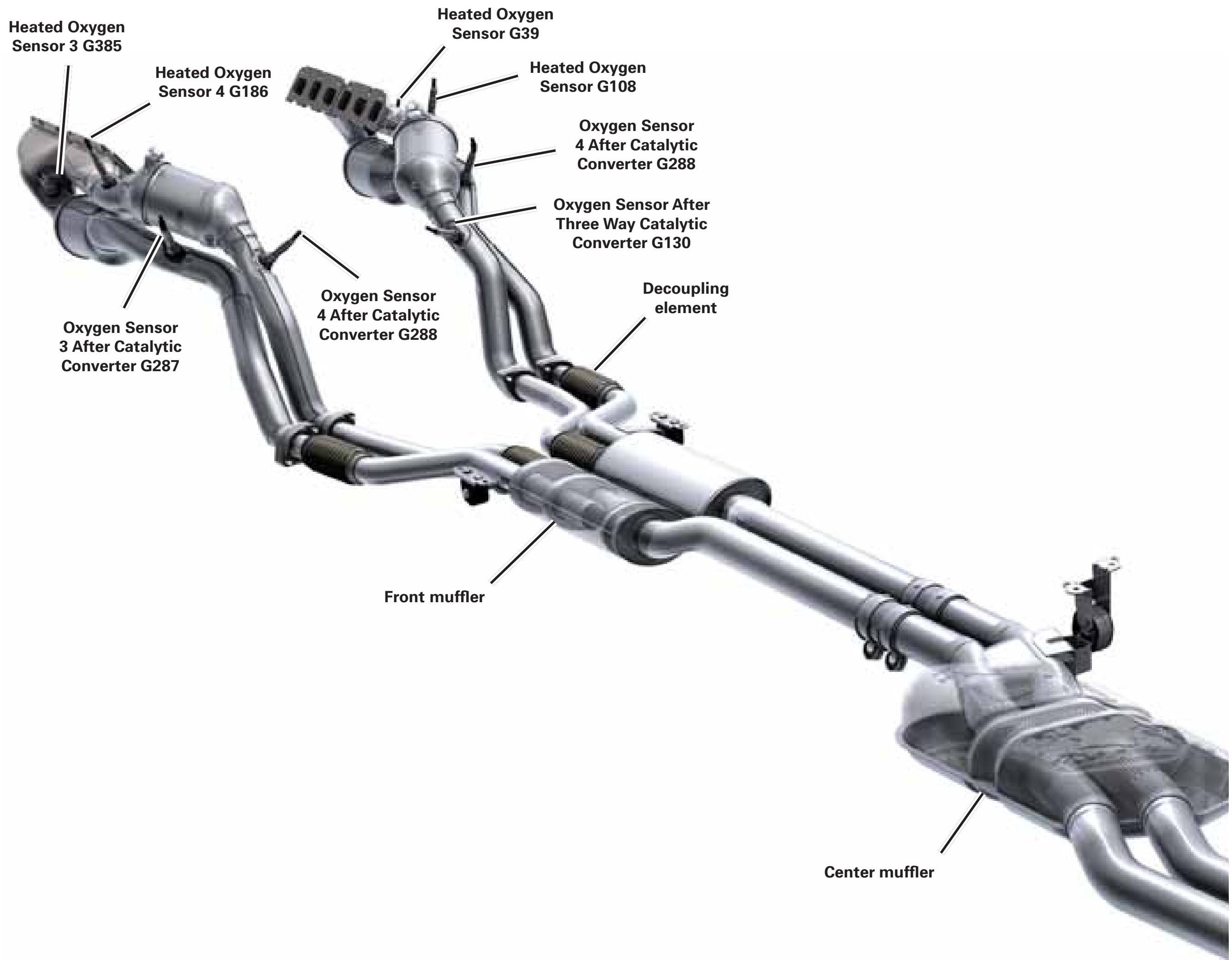
Reference

For further information about the networking system of the 2011 Audi A8, refer to Self-Study Program 970103, *The 2011 Audi A8 Convenience Electronics and Networking Systems.*

Exhaust System

Overview



Exhaust Flaps

An exhaust flap is located on each of the rear silencers attached to the two tailpipes. These exhaust flaps are designed to give the engine a more throaty and sporty sound.

As a result, low frequency noise at low engine speeds is negated. At high engine speeds and high exhaust gas flow rates, flow noise and exhaust back pressure are reduced by opening the additional cross section. The exhaust gas flaps are closed at idle, low engine load, and low engine speeds.

Function

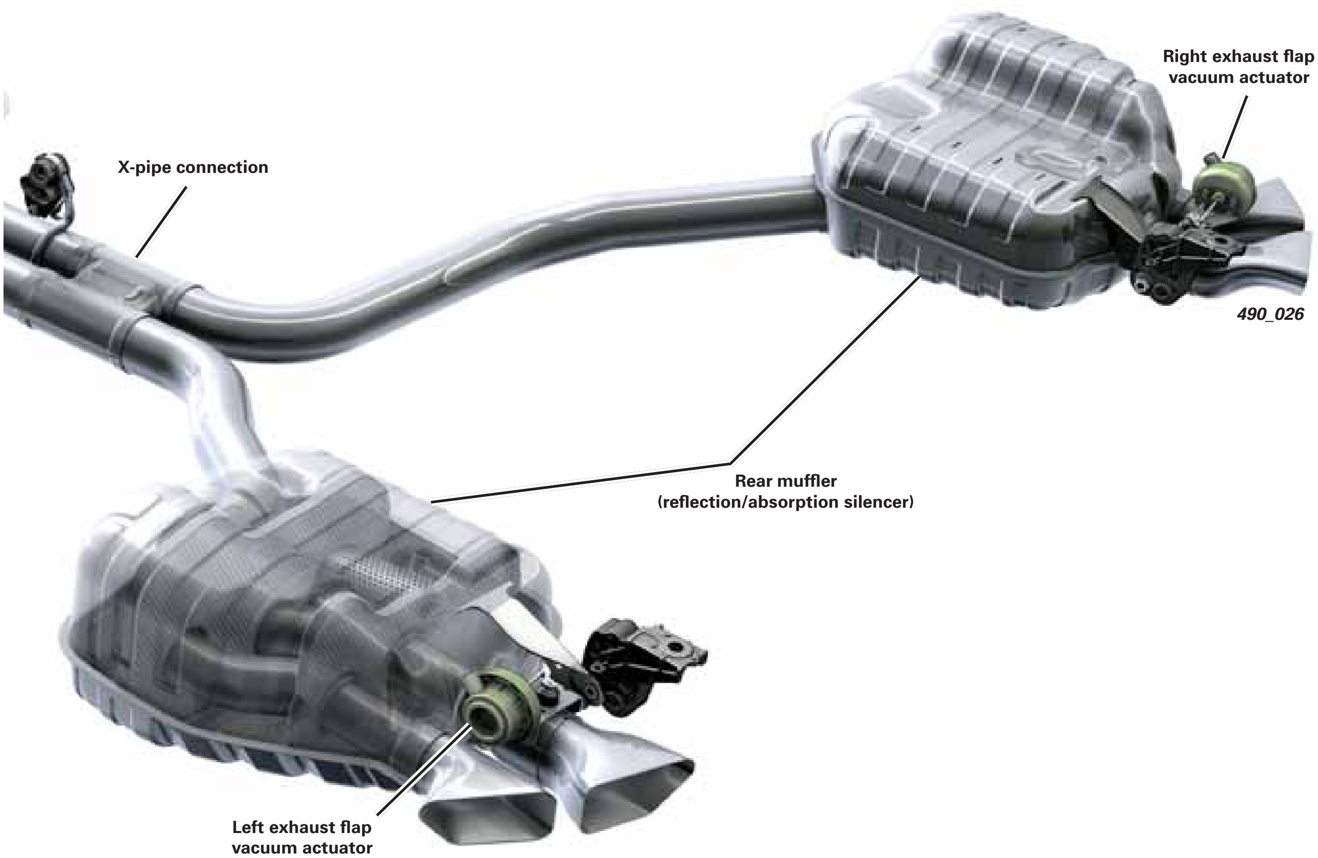
The exhaust flaps are switched by a vacuum actuator. To ensure rapid switching of these flaps, each vacuum actuator has an additional vacuum reservoir (see overview of vacuum supply on page 20).

Both vacuum units are switched by an electrically activated solenoid valve:

- Left: exhaust flap valve 1 N321
- Right: exhaust flap valve 2 N322

The exhaust flaps are switched according to a characteristic map. The engine control modules respond to the following to plot the characteristic map:

- Engine load
- Engine speed
- Selected gear



Special Tools

Assembly tool T40251

490_045

For assembling the crankshaft oil seal on the pulley side

Oil seal extractor T40249

490_046

For disassembling the crankshaft oil seal on the pulley side

Thrust piece T40250

490_047

For assembling the cylinder head cover oil seal

Thrust piece T10122/4

490_048

For assembling the PTFE crankshaft oil seal on the power output side

Engine and gearbox mounting VAS 6095/01-12

490_049

An on-line Knowledge Assessment (exam) is available for this Self-Study Program.

The Knowledge Assessment is required for Certification.

You can find this Knowledge Assessment at:

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Thank you for reading this Self-Study Program and taking the assessment.

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