

Curriculum Training

Technical Introduction

2007 Model Year XKR



E86263



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This manual is intended to introduce the technician to the new 2007 MY Supercharged XKR. The manual explains and illustrates the features that differentiate the XKR from the Normally Aspirated XK and, in some cases, from the outgoing XKR.

Please remember that our training literature has been prepared for 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 Technical Training to gain extensive knowledge of both theory and practice.

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Workshop safety

This page highlights the general observations expected whilst attending this training programme, and its continuation upon returning to your place of work.

General

Whilst working on all vehicles, the following items where available should always be used:

- Wing covers
- Seat covers
- Floor protection

Optional items:

- Steering wheel cover
- Park brake lever cover
- Door grab handle protection

Safety

All precautions must be taken and observed at all times, to prevent injury or damage to the following:

- Yourself
- Customer's property
- Workshop equipment
- Work place colleagues

Operating guidelines

Whilst using any piece of workshop equipment:

The manufacturer's guidelines and warning labels must be followed.

This will ensure correct use and application at all times.

Seek the necessary advice or training where equipment usage is unclear.

Chemicals, Oils and Solvents

Follow all manufacturer's warnings and labels, also take into account local disposal regulations when working with chemicals, oils or solvents.

Ensure that all risks are completely minimised.

Make sure that all protective items of clothing are worn where required e.g.

- Eye protection
- Gloves
- Overalls
- Footwear

System capping

Upon disconnecting components from a system, take all precautions necessary to prevent system contamination or environmental leakage.

Fit relevant plugs or caps i.e. to pipes, unions and component orifices etc.

Updates

Keep abreast of all relevant changes that effect your role within the dealership, by monitoring all factory issued documentation.

Driving

Operating vehicle features, such as ICE, mobile phones and CD player equipment etc., can cause a momentary distraction whilst driving.

Follow all road traffic regulations as written in the Highway Code, when operating vehicle systems or using diagnostic equipment whilst on the move.

Mobile diagnostic equipment operation, may require the use of an assistant.

ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this course book. The majority of them conform to SAE J1930 standards.

Acronym	Definition
ANSI	American National Standards Institute
CATS	Computer Active Technology Suspension
CFR	Code of Federal Regulations
DMTL	Diagnostic Monitoring Tank Leakage
DSC	Dynamic Stability Control
ECM	Engine Control Module
EGR	Exhaust Gas Recirculation
LH	Left-Hand
LHD	Left-Hand Drive
MAF	Mass Air Flow (Sensor)
N/A	Normally Aspirated
PAS	Power Assisted Steering
RH	Right-Hand
SAE	Society of Automotive Engineers
SC	Supercharged
ULEV	Ultra Low Emissions Vehicle
VIN	Vehicle Identification Number
VVT	Variable Valve Timing

OVERVIEW

The 2007 model year Jaguar XKR (the supercharged XK) builds on the success of the New XK (X150), launched in 2006, with the following features:

- Supercharged 4.2-liter AJ40 V8 engine
- Twin air intake system
- Active (vs. semi-active) exhaust system
- Enhanced CATS dampers
- ‘R’ performance brakes
- Alcon high performance brakes (future special edition models only)
- Standard adaptive front lighting system

The exterior of the 2007 XKR is distinguished from the XK by a number of design elements which give the car a more aggressive appearance:

- Aluminum-finish mesh upper and lower front grills
- Body-colored integrated fog light bezel and grill surround
- Body-colored Supercharger air intake louvers in the hood
- Aluminum-finish quarter-light trim (coupe)
- Chrome-finish waist finisher (convertible)
- Aluminum-finish power side vents w/integrated side marker
- Aluminum-finish trunk plinth
- Quad bright exhaust finishers

The interior includes a number of features unique to the XKR: new front seats with increased side bolster profiles to provide more support; ‘R’ branding on the headrests, tachometer, steering wheel and gear knob.

The 2007 XKR offers the following enhancements over the outgoing XKR:

- All-new aluminum structure provides a 5% reduction in overall weight
- New twin air intake system
- Introduction of variable valve timing
- Active exhaust system

IDENTIFICATION PLATES AND LABELS

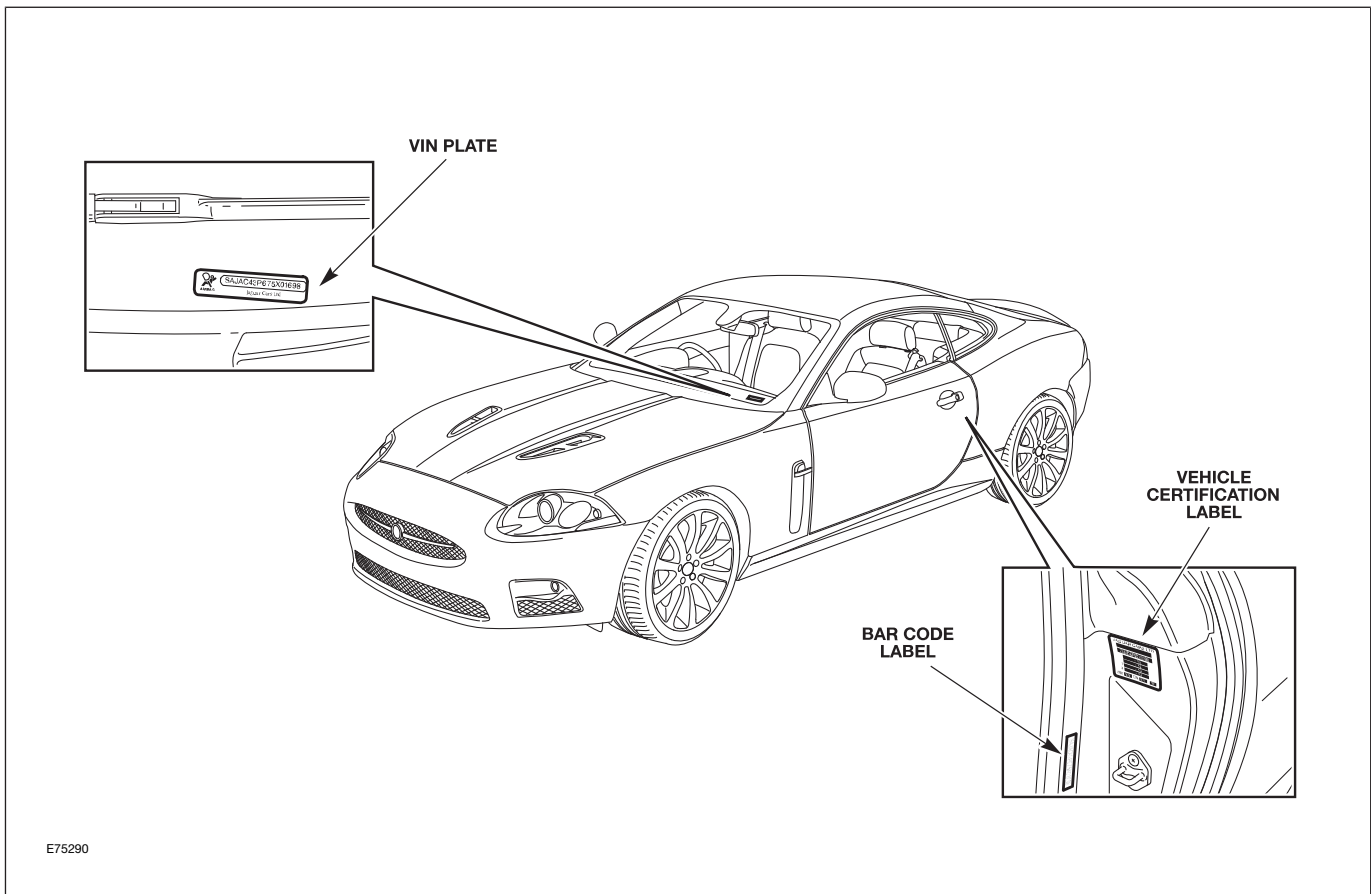
Vehicle Identification Number (VIN)

The 17-digit vehicle identification number (VIN) is stamped on a plate affixed to the dash panel, visible through the lower windshield on the LH side of the vehicle. The VIN can also be found on the vehicle certification label.

Starting VIN

The VIN range for the 2008 MY XKR begins at B10572.

VIN Locations



VIN Description

Typical VIN: SAJDA43B?85B12345

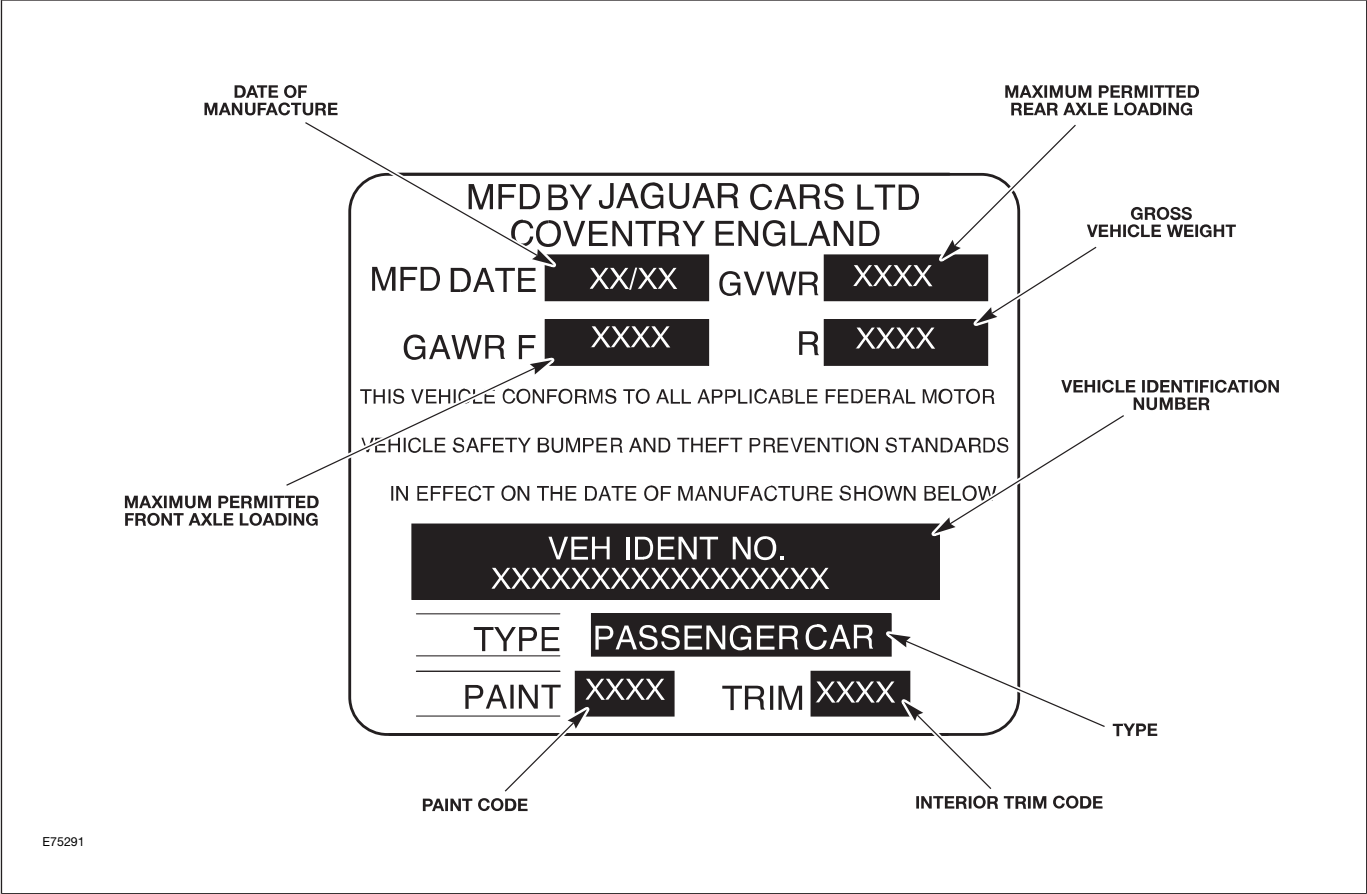
The following table explains the codes in each of the positions.

Position	Definition	Characters
1 – 3	World Manufacturer ID	SAJ = Jaguar Cars Limited; Passenger Car
4	Market Restraint System	D = USA; 4 airbags
		F = Canada; 4 airbags
5	Transmission / Steering	A = Automatic, LHD
6 – 7	Model Line / Body Type	43 = X150 2-door Coupe
		44 = X150 2-door Convertible
8	Emission Control System	B = 4.2L Naturally Aspirated ULEV II
		F = 4.2L Naturally Aspirated Stage 2
		K = 4.2L Naturally Aspirated Stage 3
		P = 4.2L Naturally Aspirated Stage 4
		U = 4.2L Naturally Aspirated Stage 2 (91 RON)
		X = 4.2L Naturally Aspirated Stage 2 (E22 RON)
9	Check Digit	0 – 9 or X; Calculated in accordance with ANSI CFR, part 565
10	Model Year	7 = 2007
		8 = 2008
11	Model Line / Assembly Plant	5 = 4.2L; Castle Bromwich
12	Model Line	B = XK
13 – 17	Serial Number	00001 – 99999

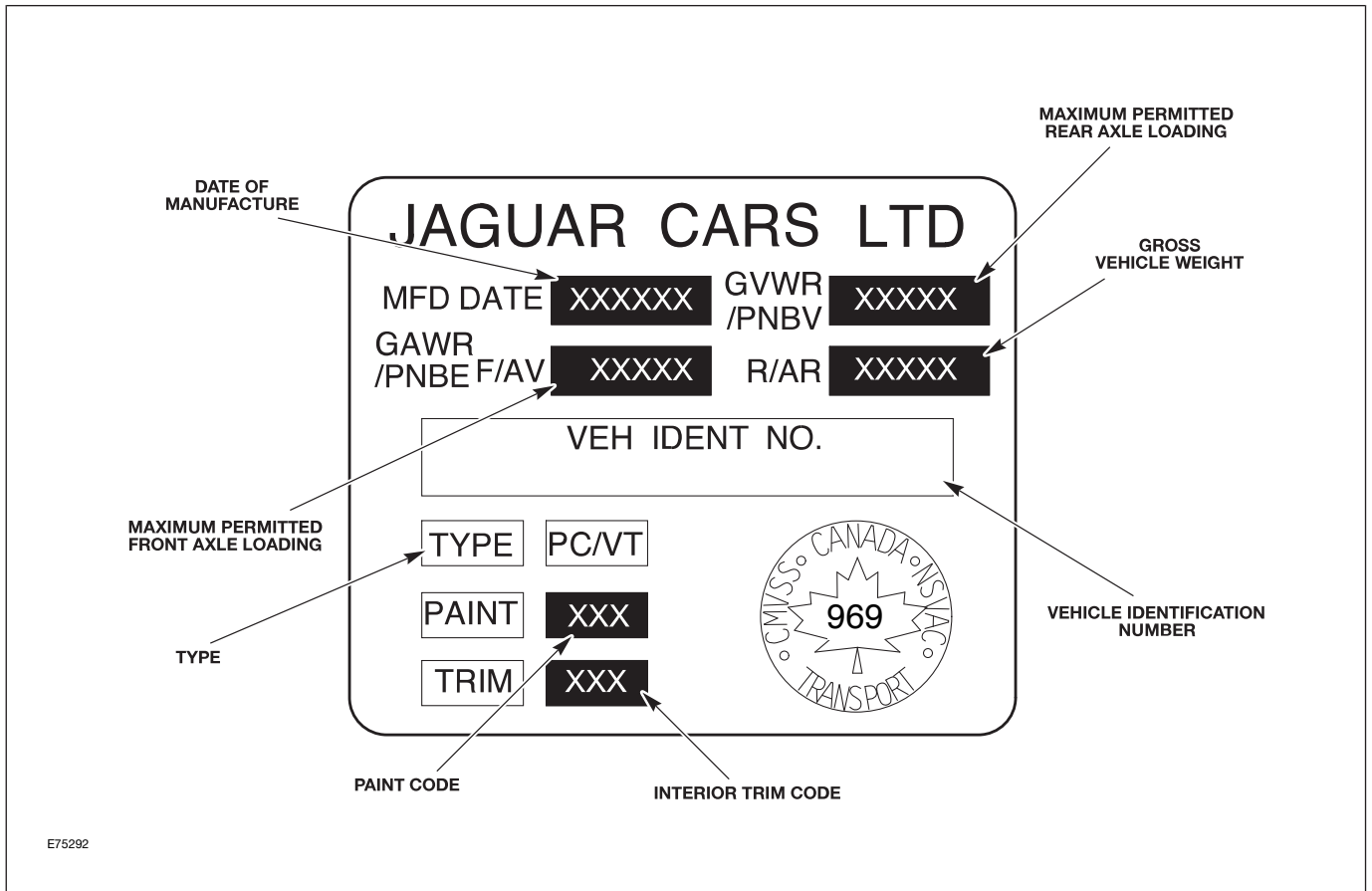
Vehicle Certification Label

The vehicle certification label is affixed to the LH ‘B’ post.

Vehicle Certification Label: United States

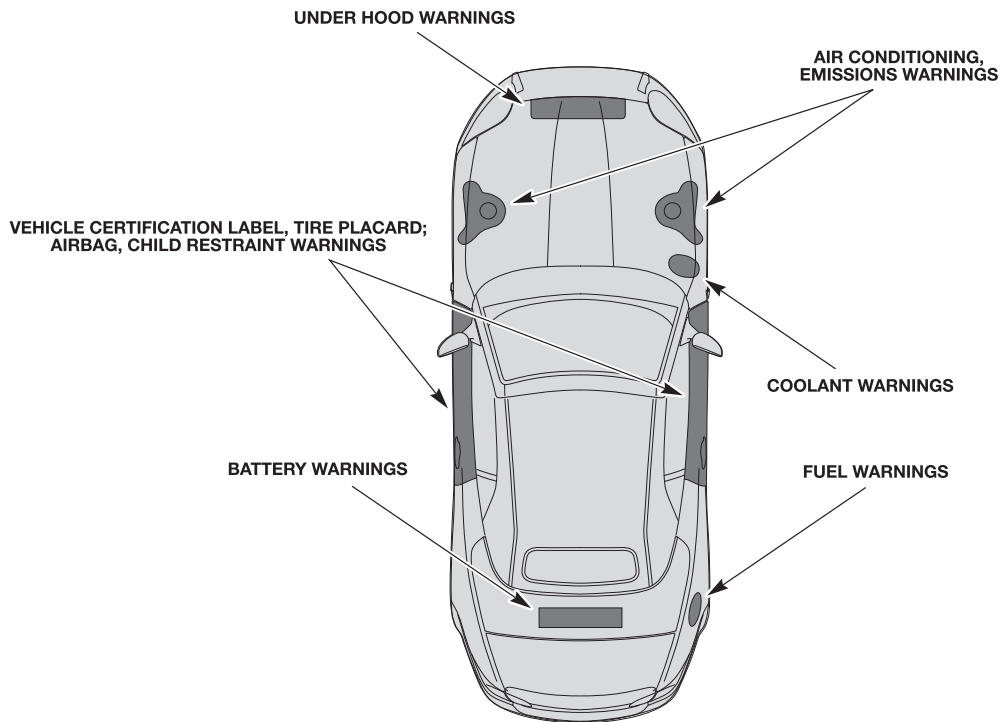


Vehicle Certification Label: Canada



Warning and Information Labels

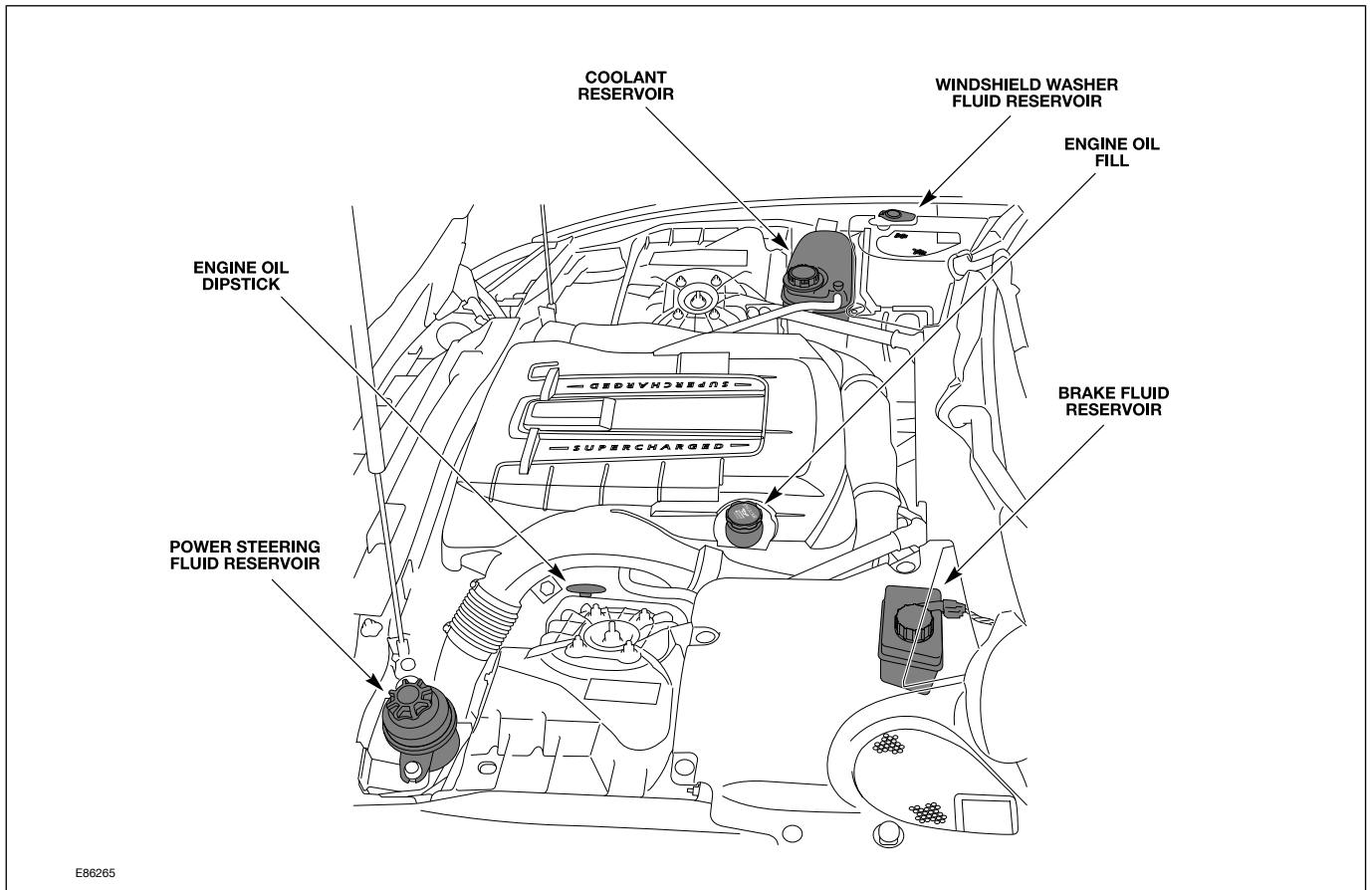
The following illustration shows the general locations for vehicle warning and information labels:



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MAINTENANCE

Reservoir and Dipstick Locations



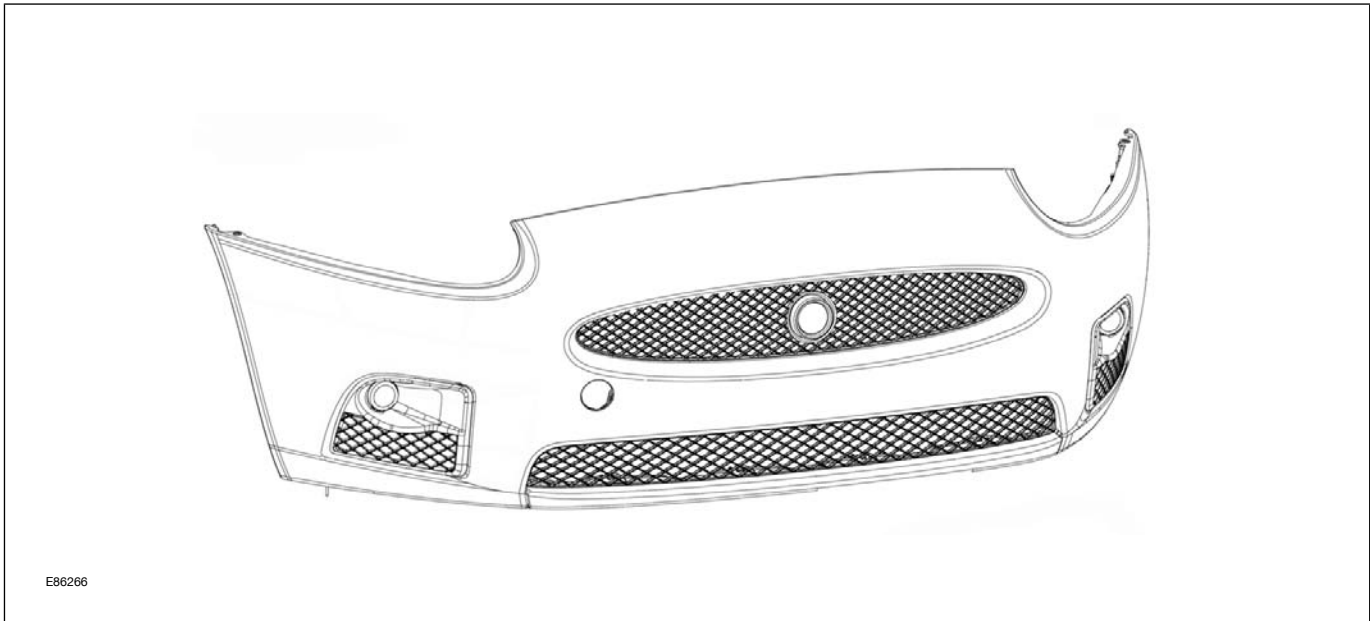
OVERVIEW

Most of the changes to the body for the XKR (vs. the XK) are external.

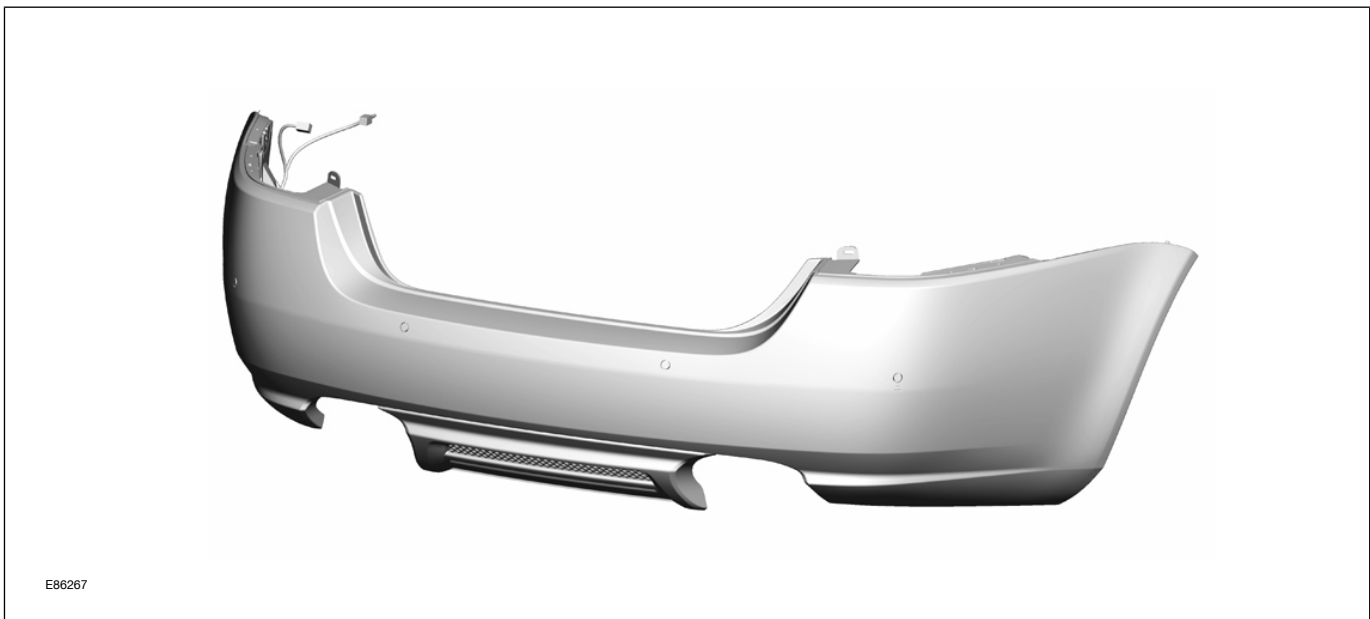
Front and Rear Bumpers

The bumpers have been redesigned to reinforce the high-performance appearance of the XKR. The front bumper incorporates body-colored integrated fog light bezels and grill surround. The rear bumper has been changed to accommodate the quad exhaust tailpipes.

Front Bumper



Rear Bumper



Hood

The hood has been redesigned to incorporate the supercharger air intake slots, similar to former XKR models.

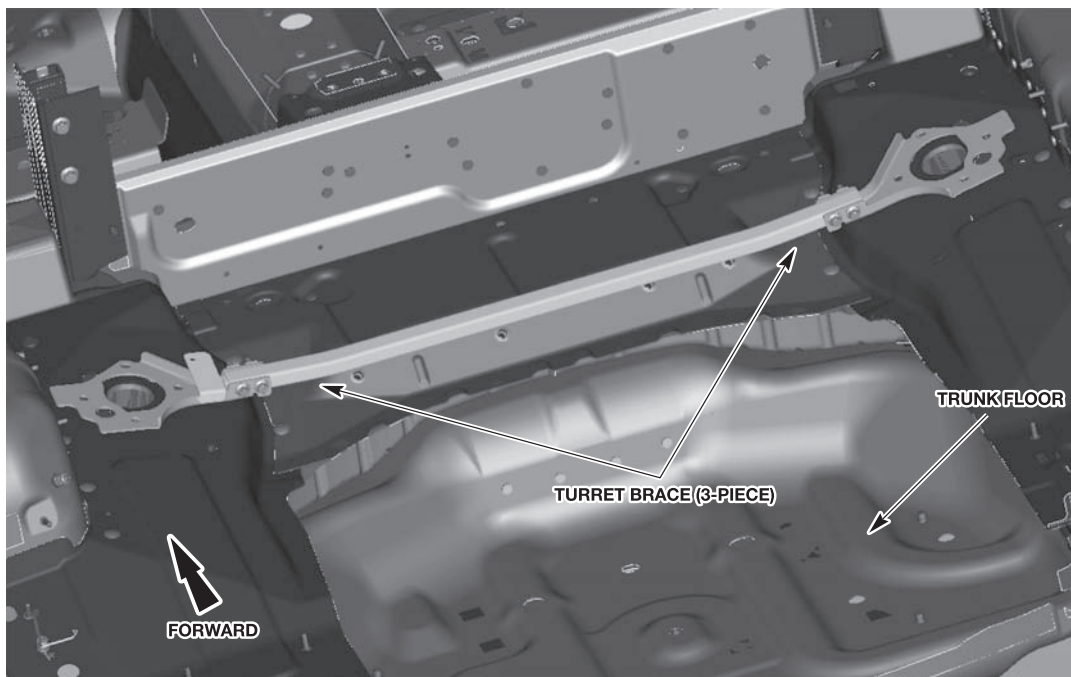
Exterior Hood Panel



Rear Suspension Turret Brace (Convertible Only)

The XKR convertible is fitted with a rear suspension turret brace to provide additional stiffness for the monocoque rear portion of the body.

Rear Suspension Turret Brace



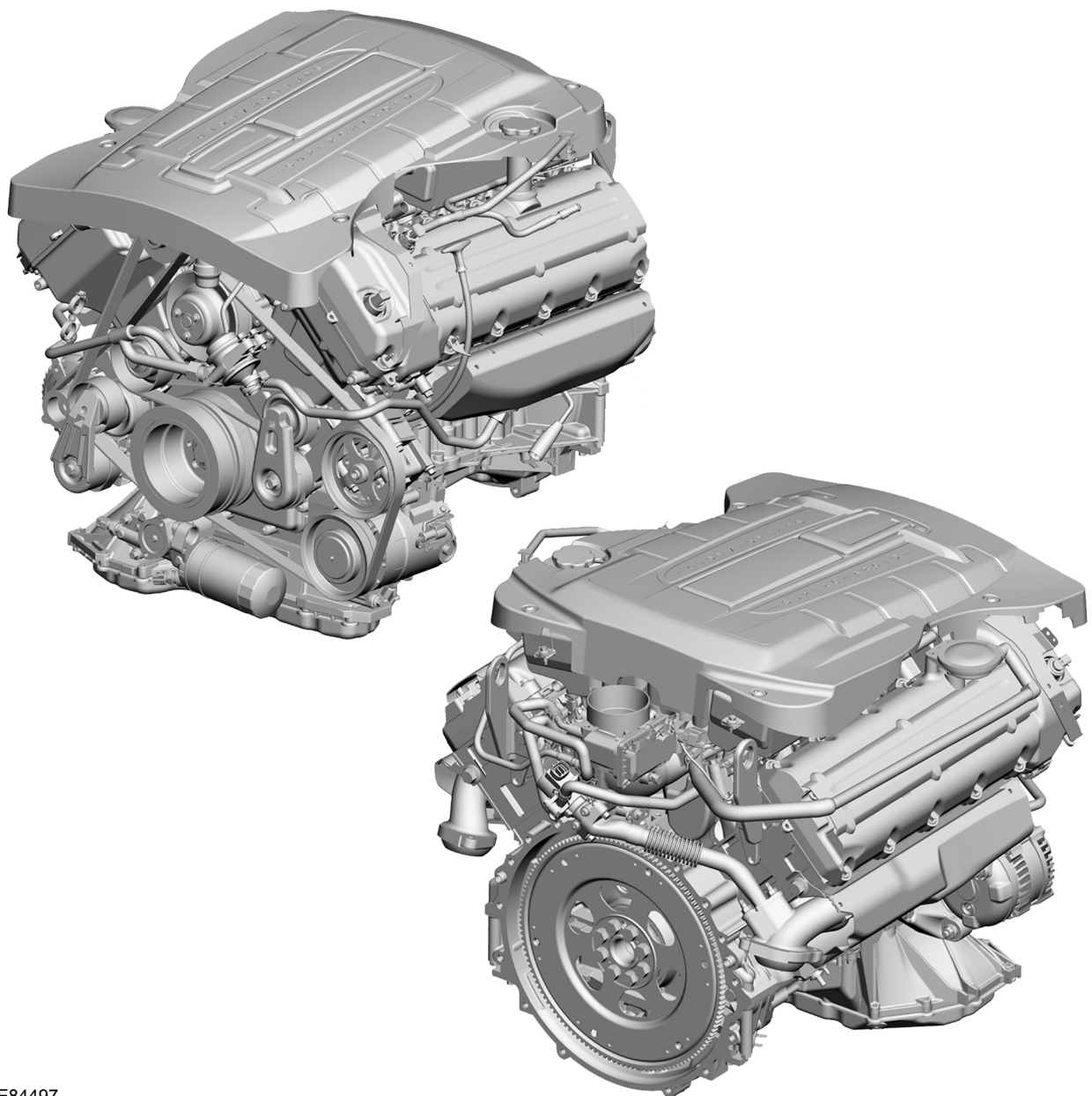
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ENGINE

Overview

The supercharged (SC) 4.2-liter V8 engine fitted in the new XKR is an upgrade of the 4.2L AJ34 V8 engine fitted to the outgoing XKR. The new engine, designated AJ40, includes minor changes such as intake and throttle

position and the addition of variable valve timing (VVT). Power and torque levels are increased over the AJ34; power increases from 390 to 420 bhp (SAE).



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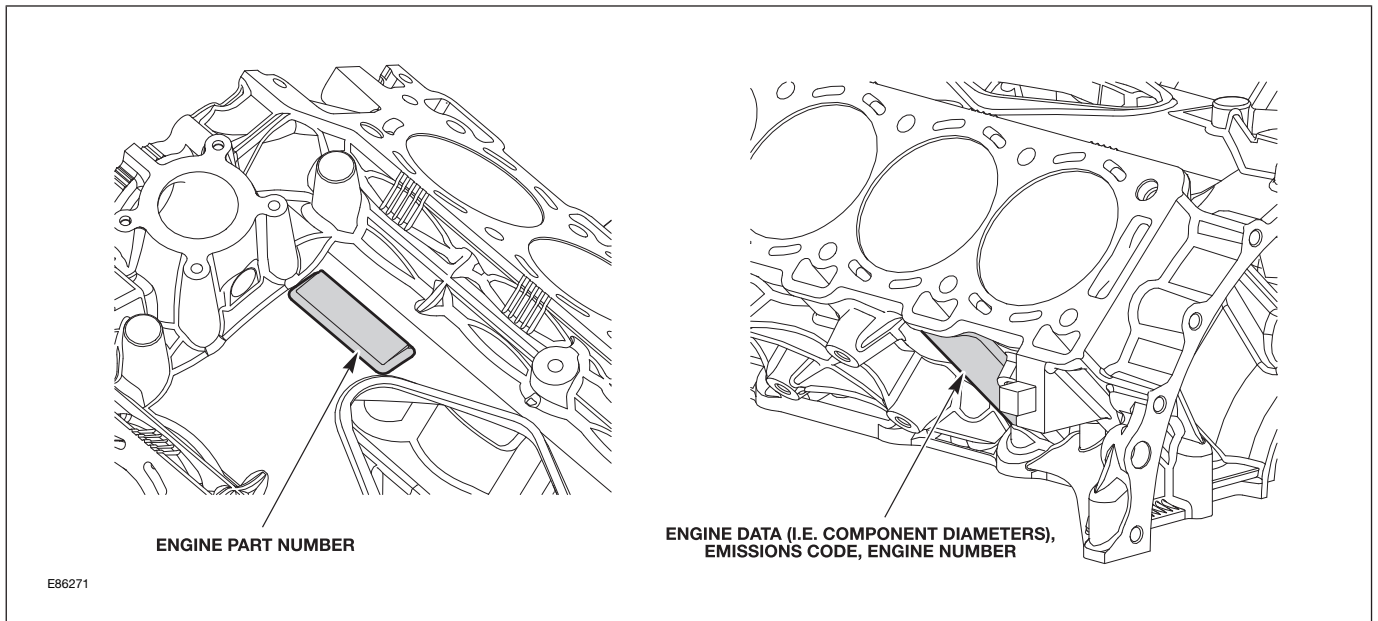
Engine Specifications

The table below compares the AJ40 SC engine to the Normally Aspirated (N/A) version.

	AJ40 4.2L N/A	AJ40 4.2L SC
Configuration	90° V8	90° V8
Cylinder Head	– Dual overhead camshafts – 4 valves per cylinder	– Dual overhead camshafts – 4 valves per cylinder
Valve Clearances (cold)	Intake: 0.18 – 0.22 mm (0.007 – 0.0085 in.) Exhaust: 0.23 – 0.27 mm (0.009 – 0.011 in.)	Intake: 0.18 – 0.22 mm (0.007 – 0.0085 in.) Exhaust: 0.23 – 0.27 mm (0.009 – 0.011 in.)
Bore	86 mm (3.386 in.)	86 mm (3.386 in.)
Stroke	90.3 mm (3.555 in.)	90.3 mm (3.555 in.)
Displacement	4.196 liters (256 in ³)	4.196 liters (256 in ³)
Compression Ratio	11.0 : 1	9.1 : 1 (± 0.5 : 1)
Maximum Power (SAE)	300 BHP at 6000 rpm	420 BHP at 6100 rpm
Maximum Torque (SAE)	310 lb. ft. at 4100 rpm	413 lb. ft. at 3500 rpm

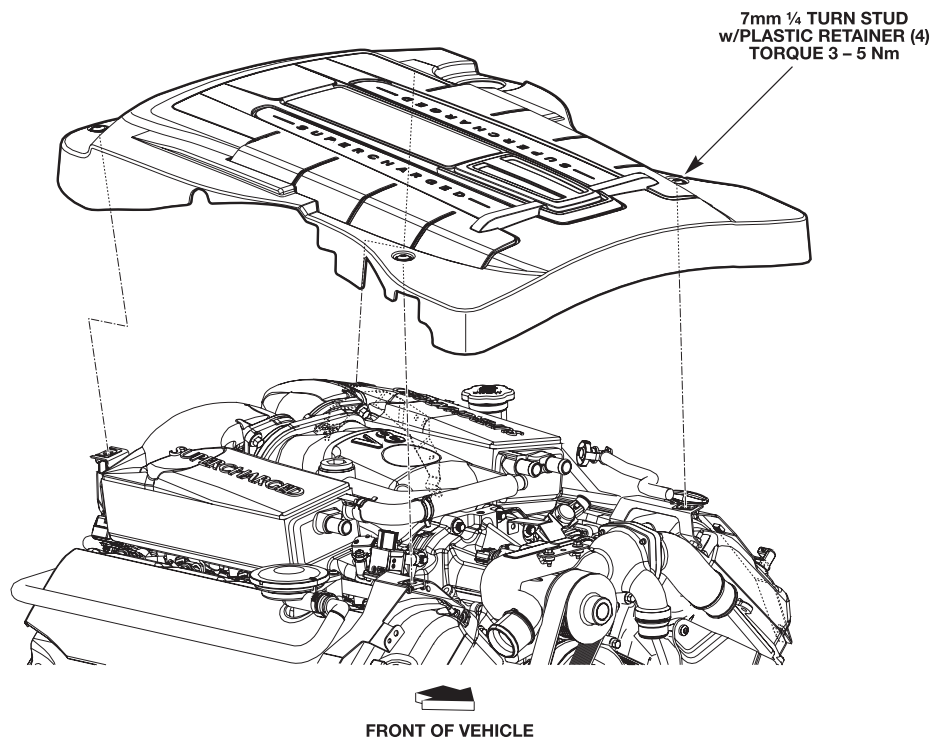
Engine Data Locations

Engine data is marked in three locations: two on the cylinder block (as shown in the illustration) and one on the engine front cover (which consists of a label displaying the engine number).



Engine Cover

The Supercharged AJ40 engine uses a new and unique engine cover, designed to accommodate the new air intake layout and to improve aesthetics.



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Variable Valve Timing

The continuously variable valve timing (VVT) system changes the phasing of the intake valves relative to the fixed timing of the exhaust valves to alter the mass of air flow into the cylinders, thereby improving the engine torque response and fuel economy and reducing emissions.

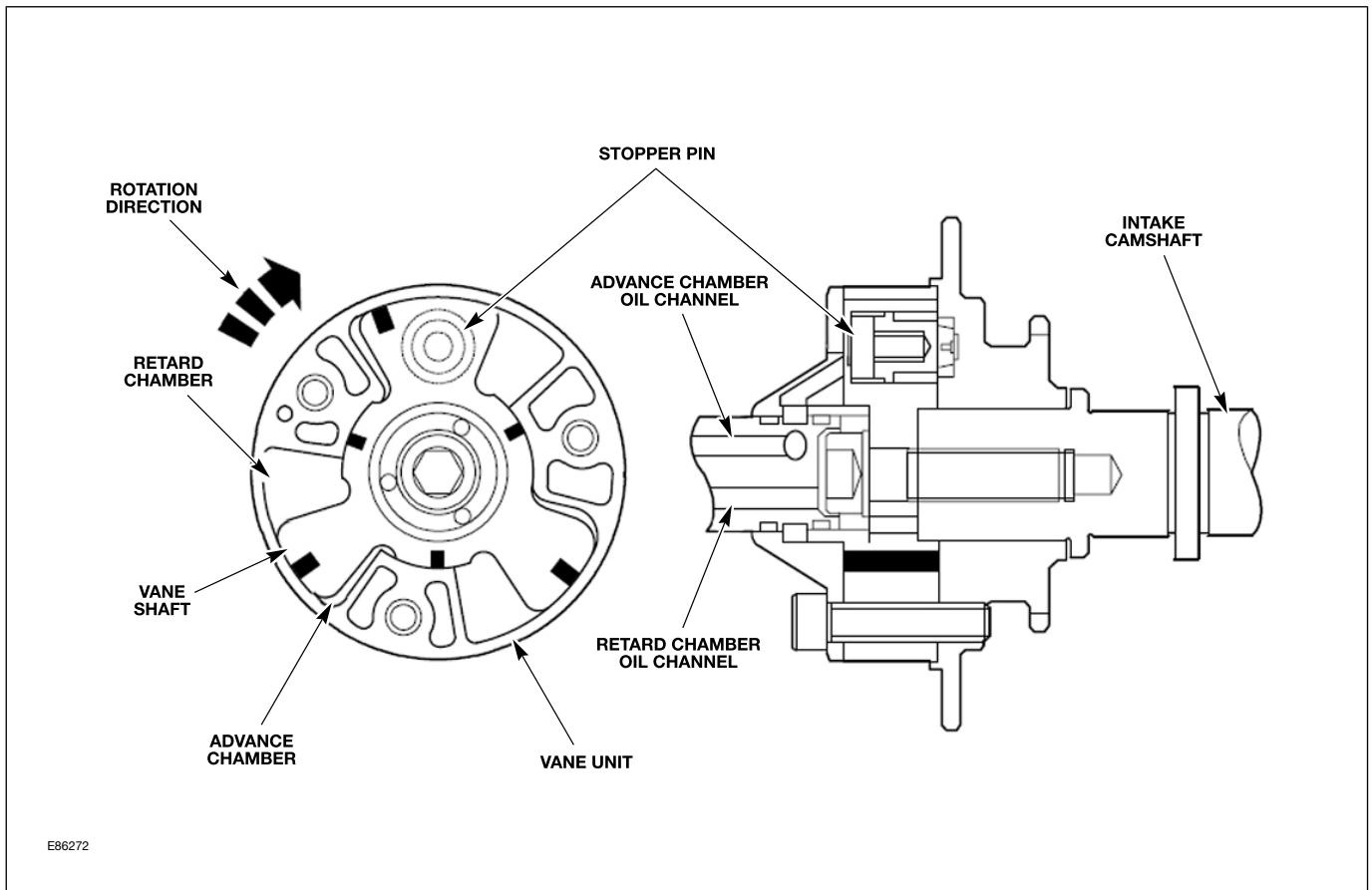
The VVT unit operates on oil pressure under control of the engine control module (ECM). The unit uses a vane device to control the intake camshaft angle in relation to the primary chain to advance and retard the timing. The system operates over a range of 48° and is advanced or retarded to the optimum angle within this range. The appropriate camshaft position is calculated by the ECM based on engine speed, load, and oil temperature signals.

The VVT system provides the following advantages:

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

The system has the added benefit of operating at a lower oil pressure and faster response time when compared to a non-VVT system.

VVT Unit



VVT Operation

The VVT unit is a hydraulic actuator mounted on the end of the intake camshaft, which advances or retards the intake camshaft timing and thereby alters the camshaft-to-crankshaft phasing. The oil control solenoid, controlled by the ECM, routes oil pressure to either the advance or retard chambers located either side of the 3 vanes interspersed within the machined housing of the unit.

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

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

Engine oil properties and temperature can affect the ability of the VVT mechanism to follow demand changes to the cam phase angle. At very low oil temperatures, movement of the VVT mechanism is sluggish due to increased viscosity, and at high oil temperatures the reduced viscosity may impair operation if oil pressure is too low. To maintain satisfactory VVT performance, an increased capacity oil pump is installed, plus an engine oil temperature sensor to enable monitoring by the ECM. The VVT system is normally under closed-loop control except in extreme temperature conditions, such as cold starts below 0°C. At extremely high oil temperatures, the ECM may limit the amount of VVT advance to prevent the engine from stalling when returning to idle speed.

The VVT system does not operate when engine oil pressure is below 1 bar (14.5 psi), as there is insufficient pressure to control the phasing. This usually occurs when the engine is shutting down and the VVT has returned to the retarded position. The stopper pin locks the camshaft to the VVT unit to ensure camshaft stability during the next engine start-up.

ENGINE MANAGEMENT

Overview

The XKR engine management system includes the following features:

- Twin air intake system
- New air filter boxes
- Two MAF sensors
- Vertical throttle elbow (carryover from AJ34)
- Revised fuel pump and fuel tank
- Fully active exhaust, controlled by the ECM

Twin Air Intake System

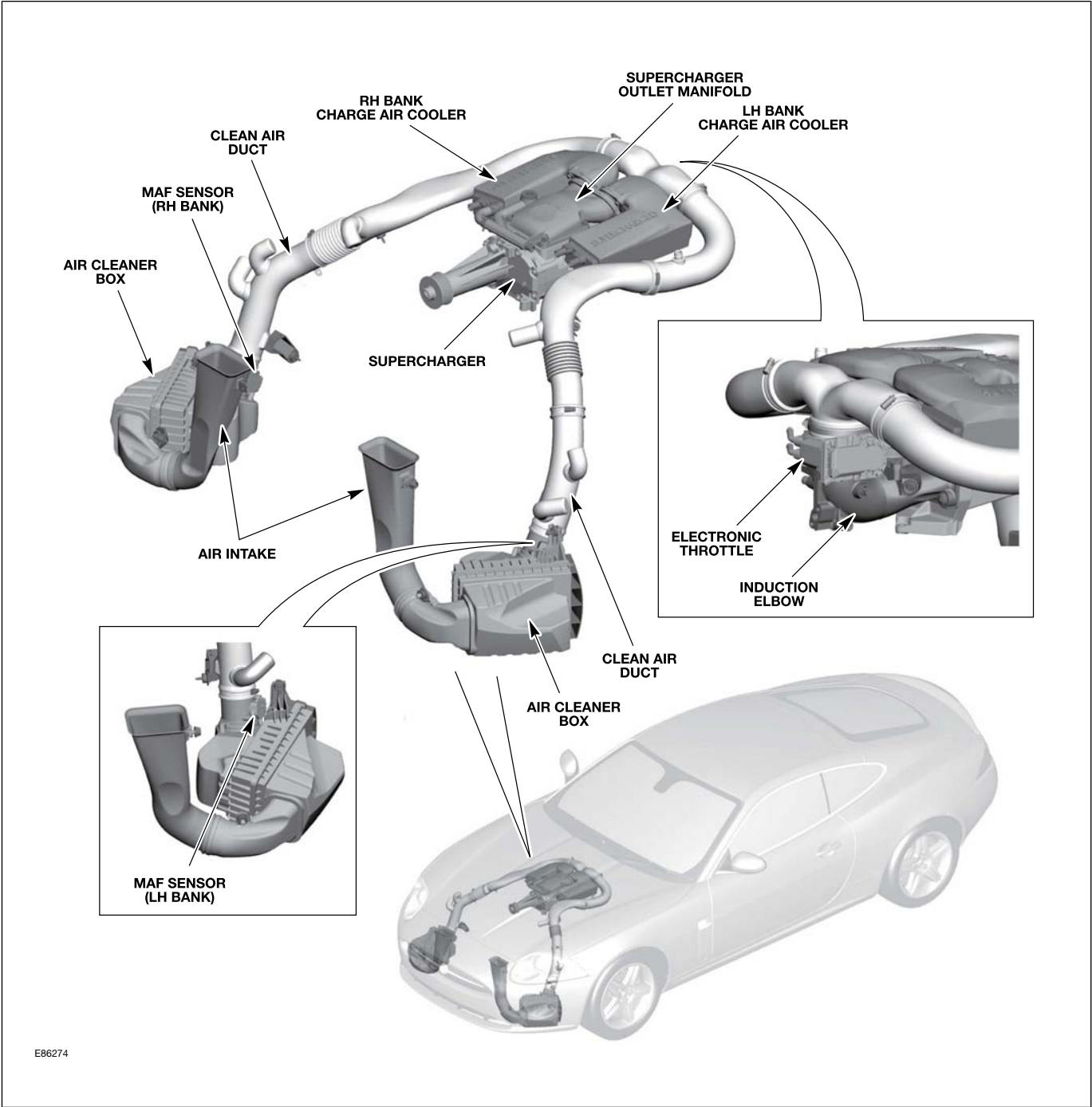
The AJ40 is the first Jaguar V8 SC engine to use two mass air flow (MAF) sensors to monitor air intake. The use of two sensors allows the engine to cope with the increase in engine air flow while maintaining the service intervals for the filter elements.

The engine air intake and distribution system comprises:

- Two air intakes
- Two air cleaner boxes
- Electronic throttle
- Supercharger
- Two MAF sensors
- Two supercharger charge air coolers

One MAF sensor is fitted at the outlet of each air cleaner box. The intake elbow directs the metered airflow from the throttle body outlet (underside of the throttle body) into the intake of the supercharger. Each sensor provides an input signal to the ECM. If one of the sensors should fail, the ECM will use a model in place of the missing signal. The system will continue to operate, with slightly degraded performance at full load.

Intake Air Distribution System

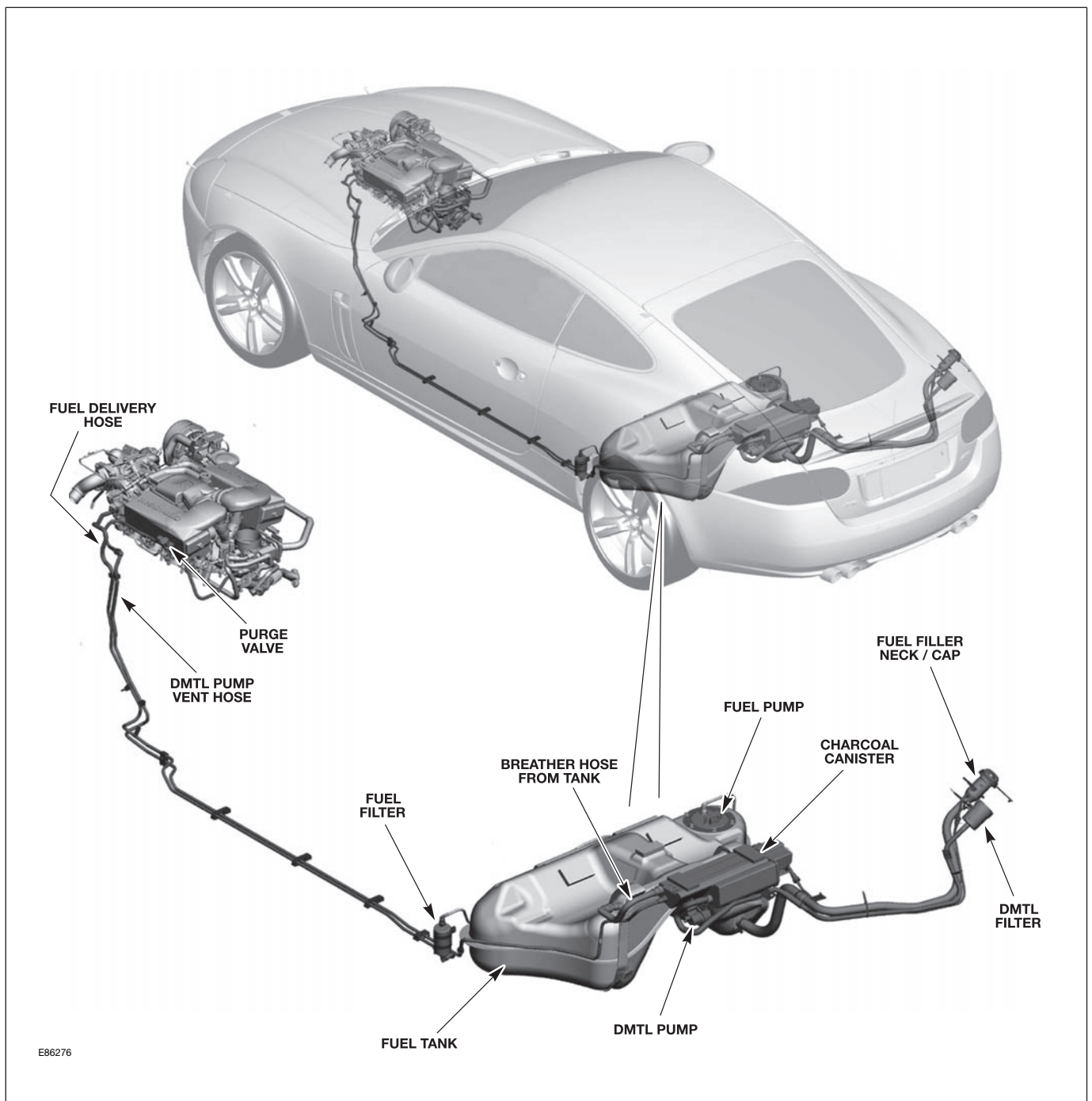


Fuel System

The fuel system on the XKR differs from the XK N/A on the following:

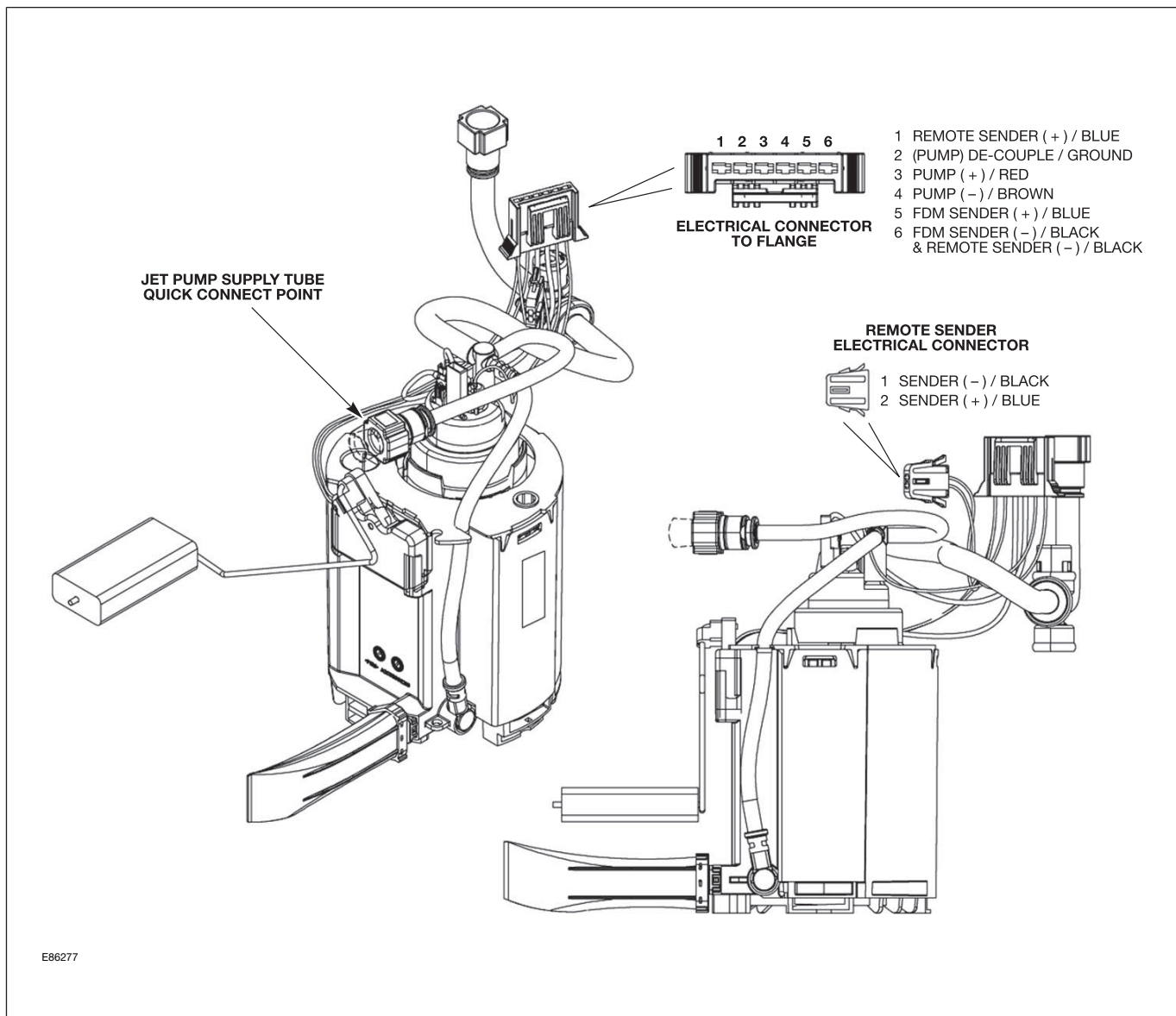
- Revised fuel pump
- Revised fuel tank

Fuel System Components



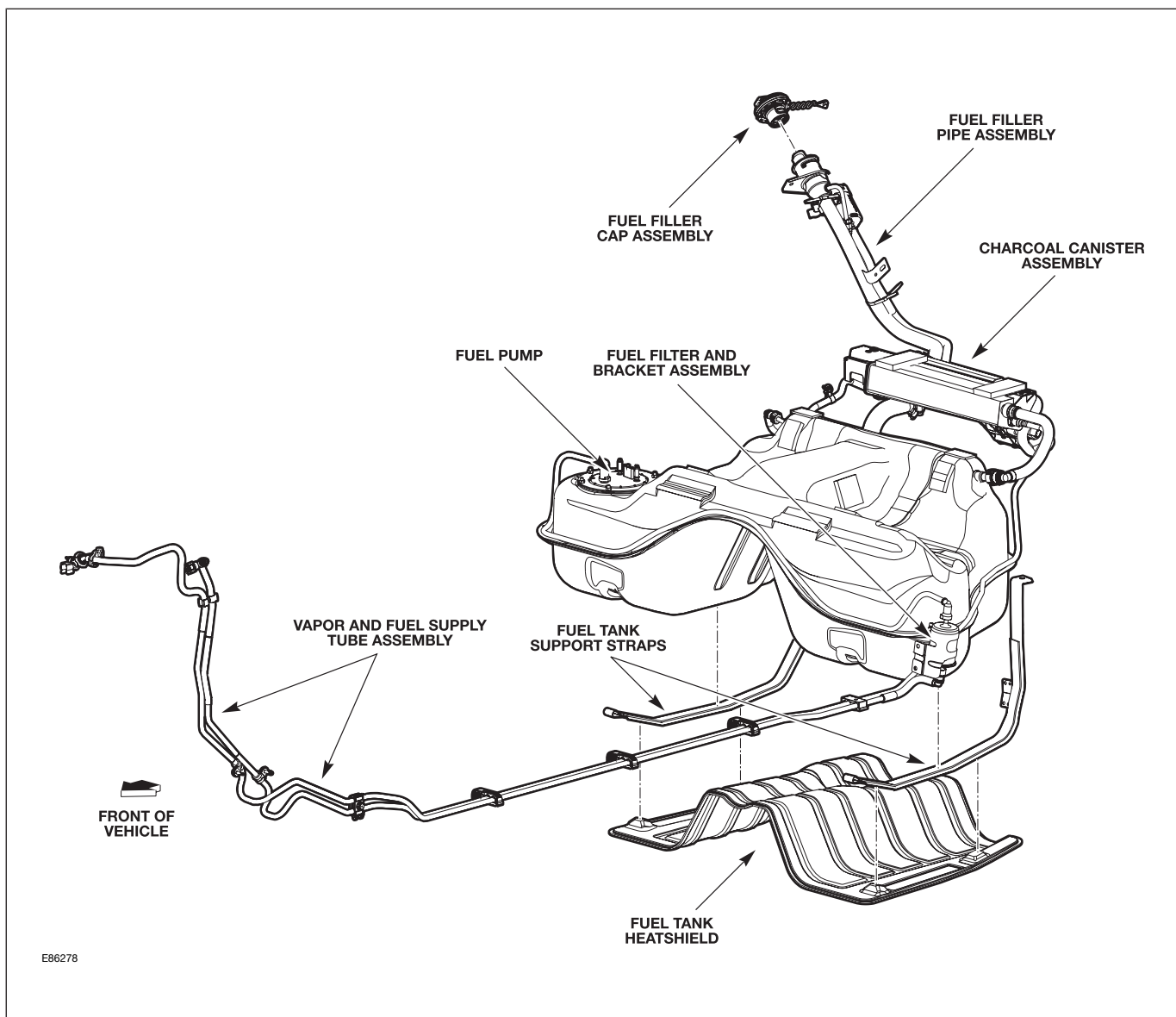
Fuel Pump

In order to meet the requirements of the supercharged engine, the XKR uses a unique and higher-rated fuel pump within the fuel tank assembly.



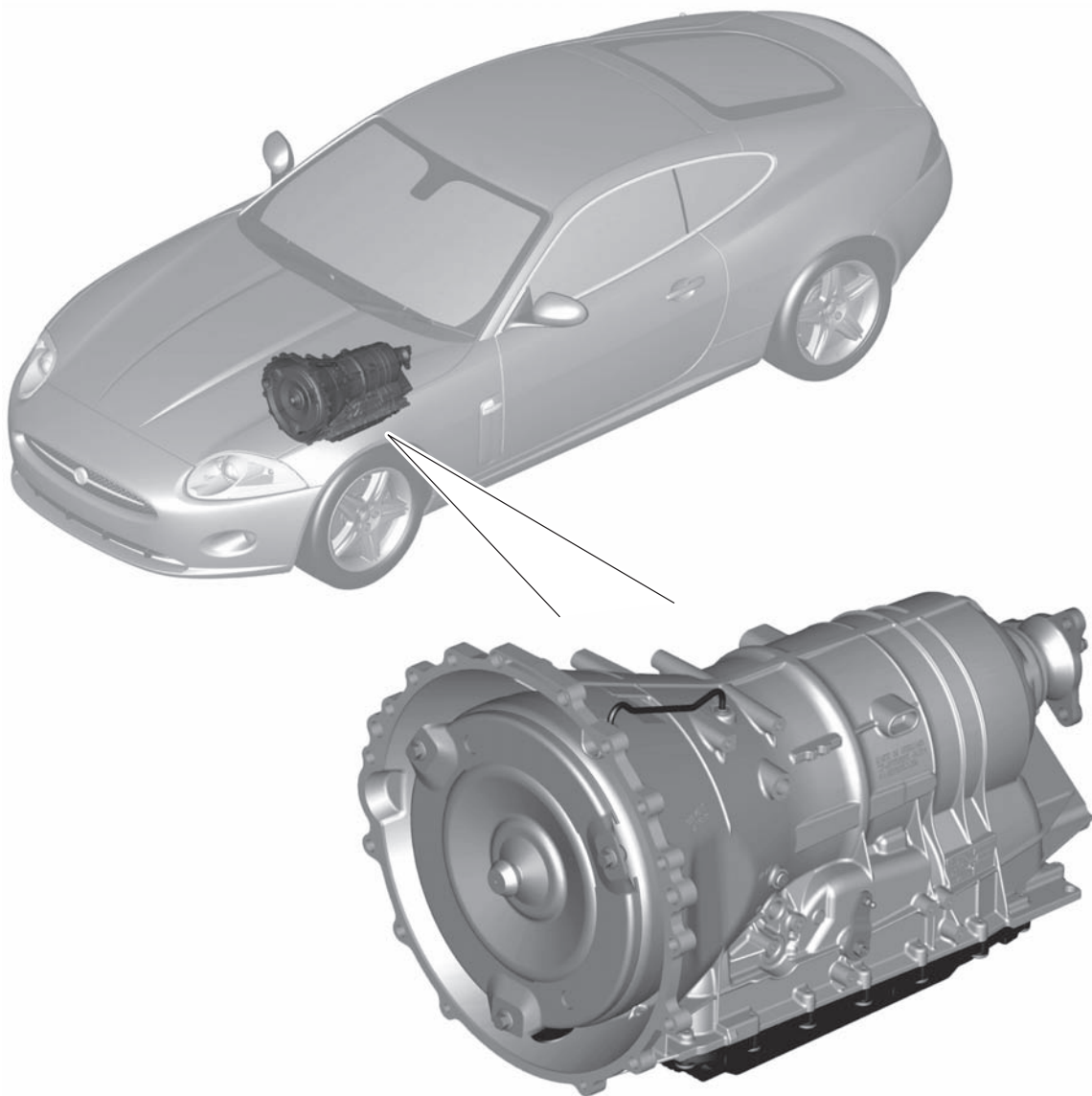
Fuel Tank

The fuel tank is revised to accommodate the new fuel pump.



AUTOMATIC TRANSMISSION

The XKR uses the ZF 6HP26 automatic transmission; the torque converter has a larger diameter and higher torque limit than that used in the XK N/A. In addition, a seventh E-clutch is added internally to accommodate the increased engine torque.



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EXHAUST SYSTEM

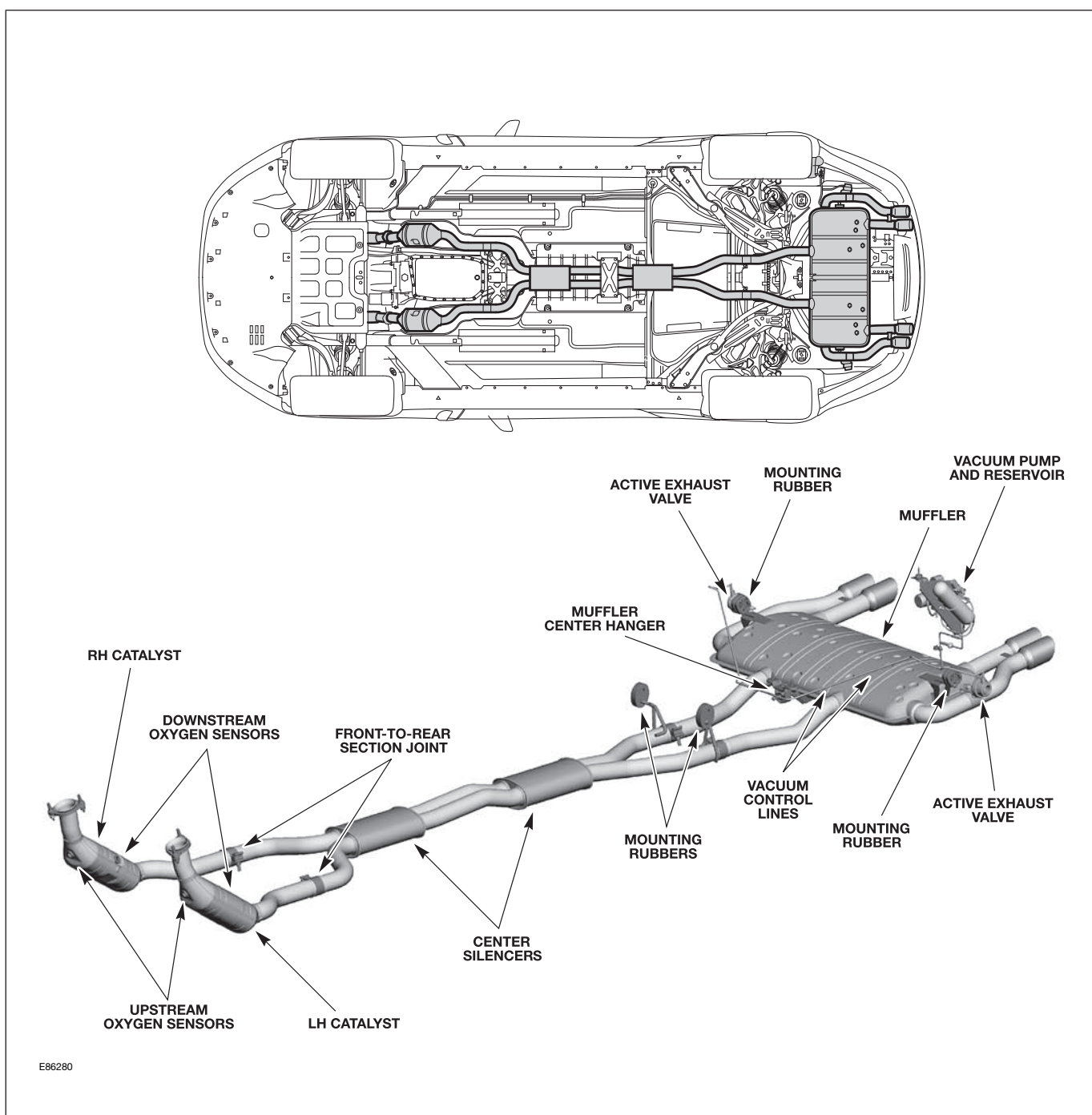
The exhaust system is fabricated from stainless steel and is supplied as four separate assemblies:

- LH front section incorporating a catalytic converter
- RH front section incorporating a catalytic converter

- Center section incorporating two silencers
- Rear section including the main muffler

Each section of the exhaust system is available as a service replacement.

Exhaust System Components



The exhaust system is attached to the underside of the body with five mounting rubbers – two on the center section and three on the rear muffler. The system is routed along the center of the chassis before splitting near the rear differential prior to entering the main muffler at the rear of the vehicle.

To reduce the carbon monoxide and hydrocarbon content of the exhaust gases, a catalytic converter is integrated into each of the front pipes of the exhaust system.

Active Exhaust System

The rear muffler unit incorporates an active exhaust system, designed to give a more sporty sound and to reduce the back-pressure in the exhaust system. The

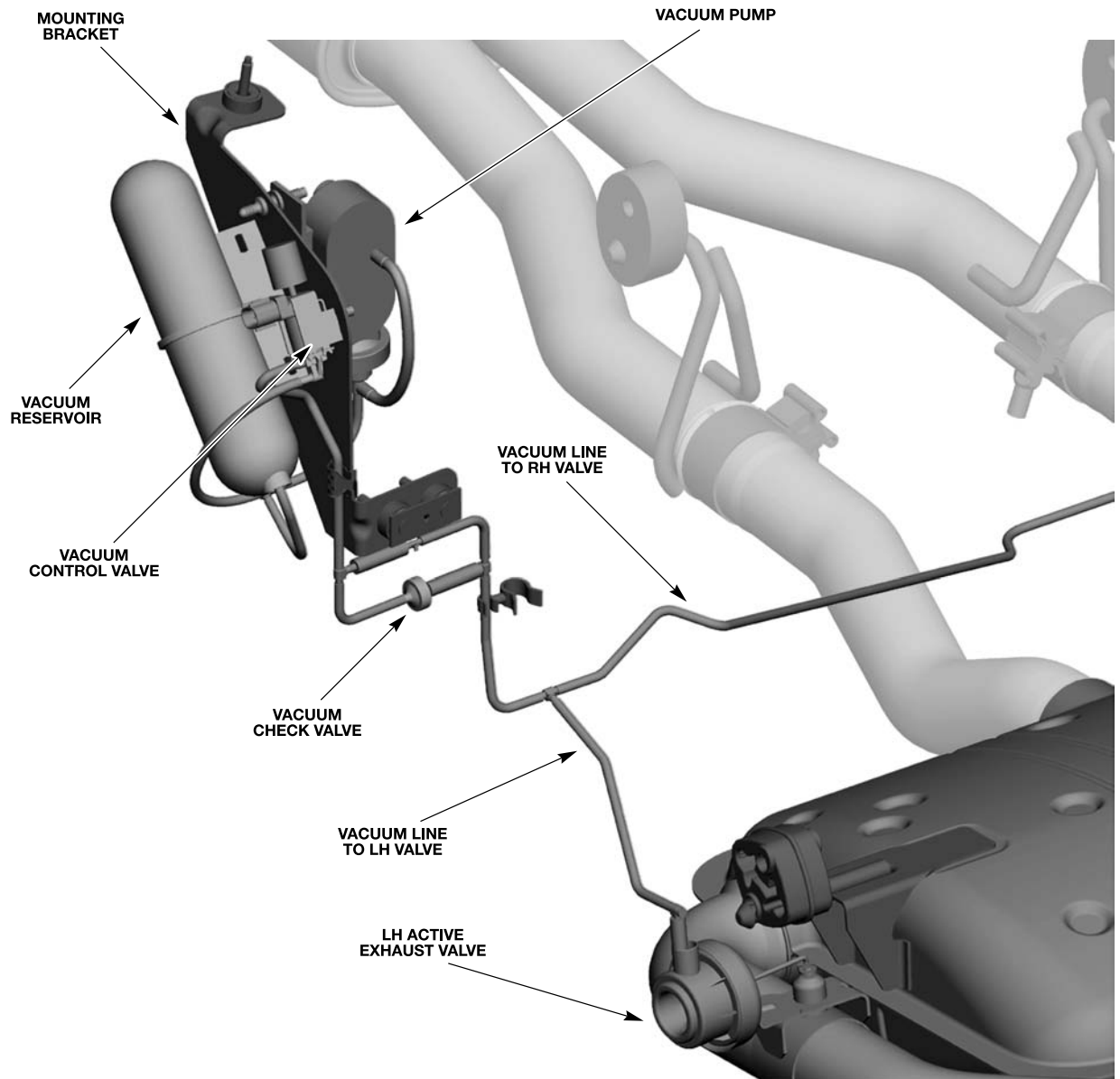
ECM operates a vacuum control valve, which applies or restricts vacuum to the active exhaust valves. The exhaust valves open to redirect exhaust pressure through the second exhaust outlet pipe.

The vacuum system comprises:

- Vacuum reservoir
- Vacuum pump
- Vacuum control solenoid
- Vacuum check/non-return valve
- Vacuum restrictor valve

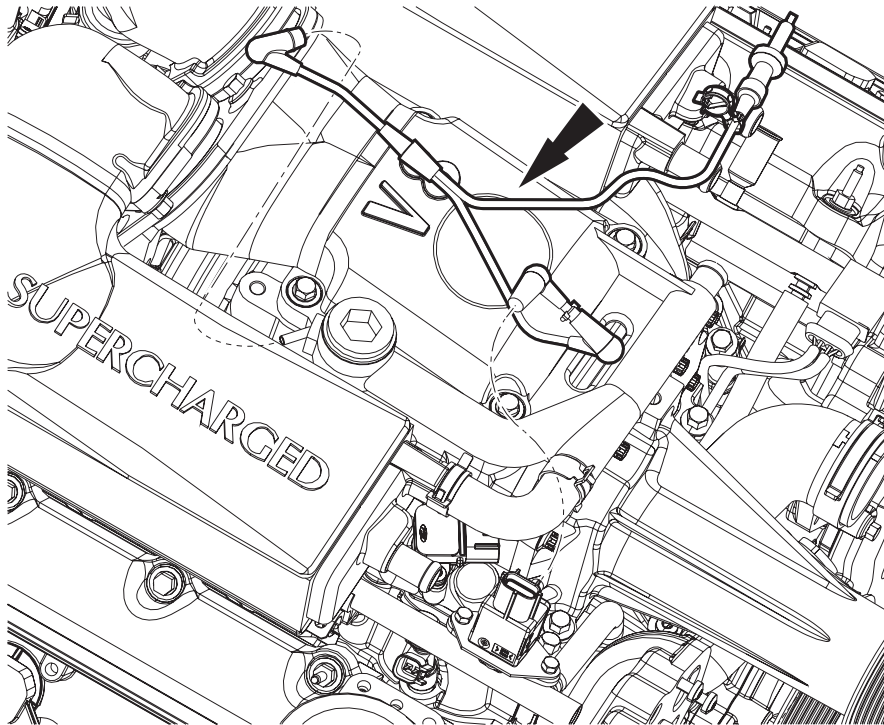
The vacuum restrictor valve, located in the vacuum line just above the check valve, allows air back into the vacuum lines to allow the active exhaust valves to open more slowly than they close.

Active Exhaust Vacuum Control System



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Vacuum Harness Assembly




FRONT OF
ENGINE

E86282

The active exhaust valves are operated in response to engine speed and throttle angle; the valves are normally open until a vacuum is applied. At startup, the valves are always opened to give an enhanced sound. The valves are open at idle, close at 1100 rpm, reopen at 3000 rpm and remain open until full throttle. At engine

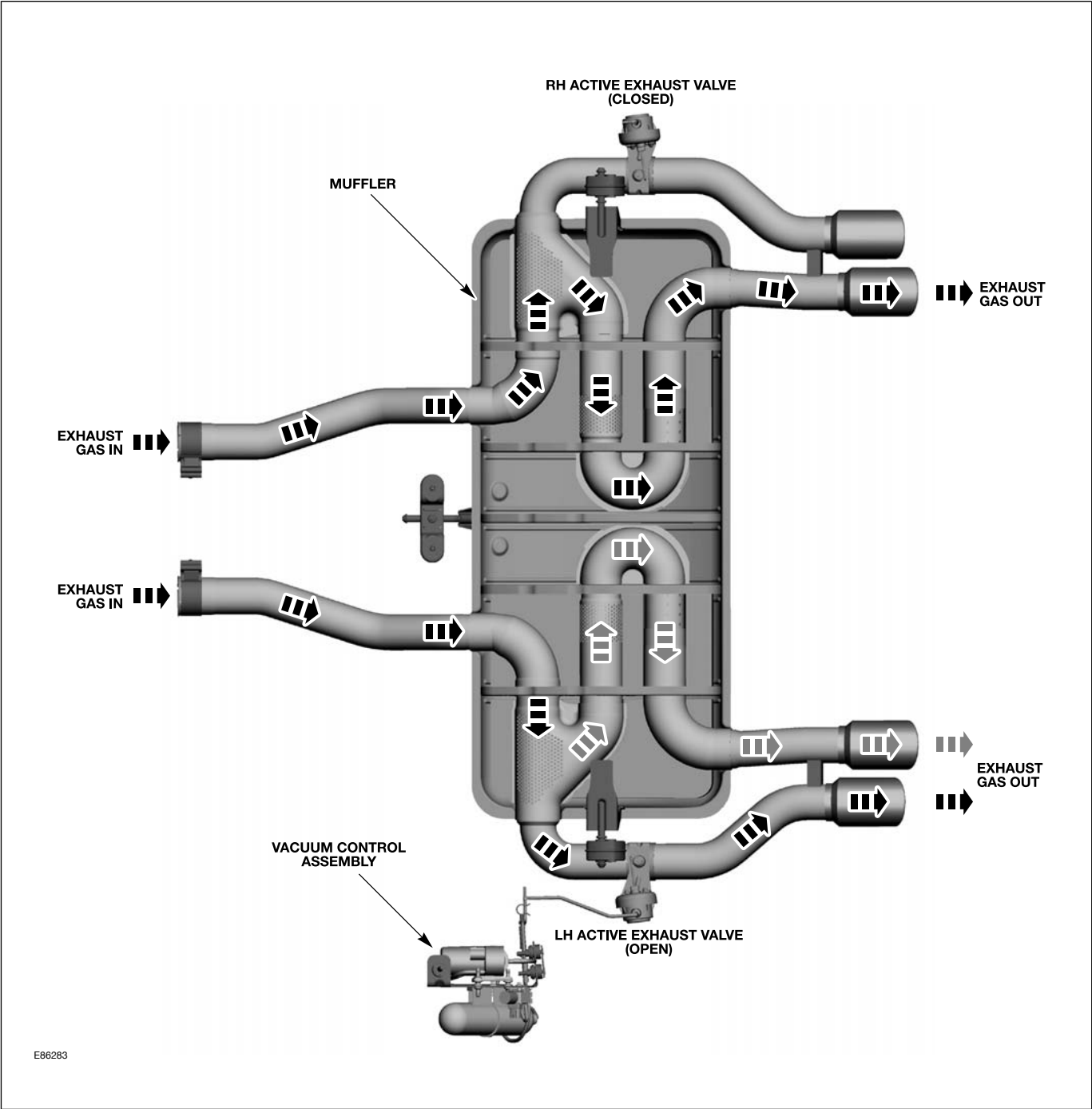
speeds above 4000 rpm, the valves are open independent of throttle angle. On deceleration, they will close. The following table details when the valves are open and when they are closed.

NOTE: The active exhaust valves are either fully open or fully closed; they do not partially open.

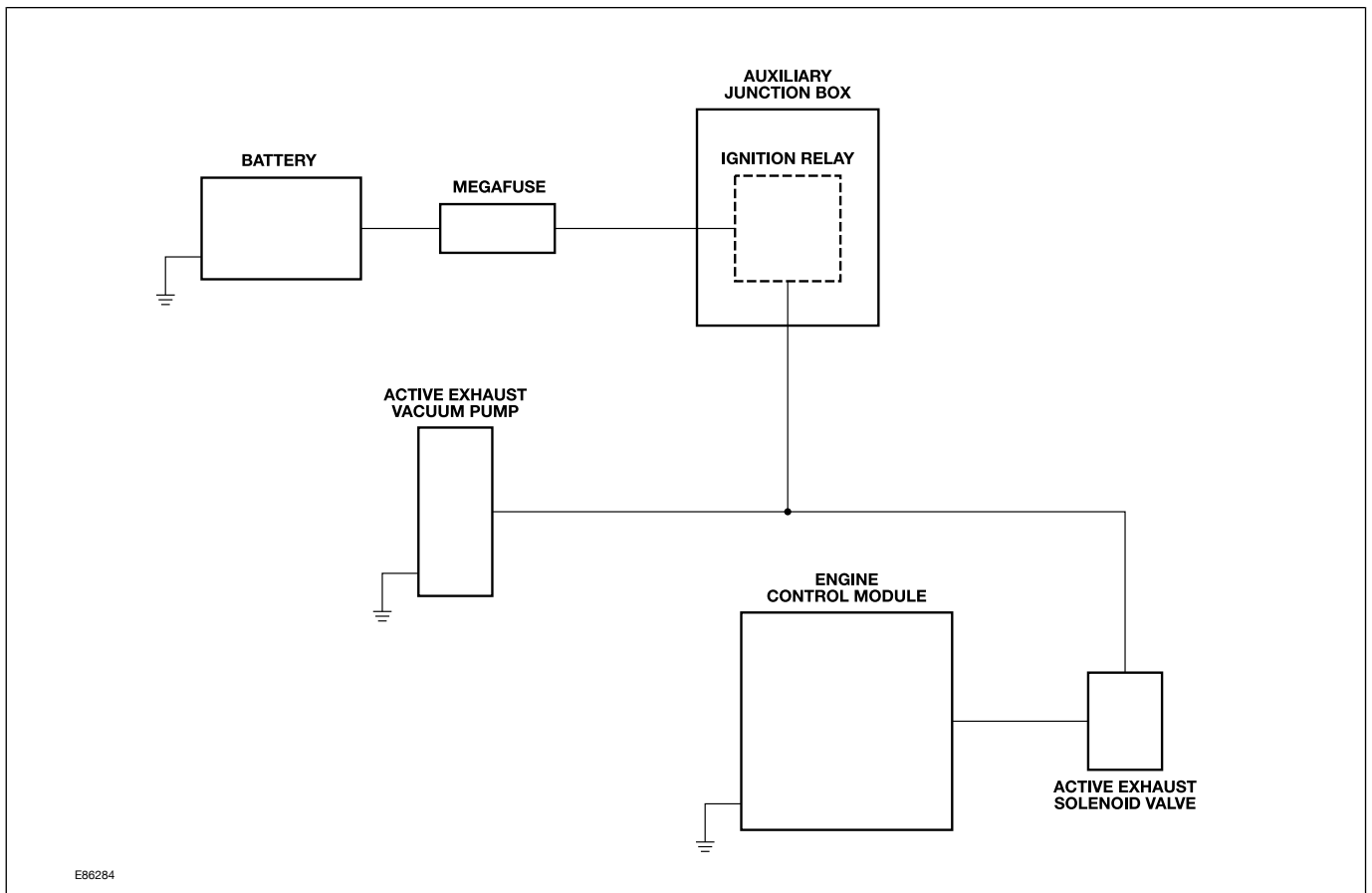
Active Exhaust Valve Opening Strategy

Throttle Angle (%)	Engine Speed (RPM)							
	500	1000	1500	2000	2500	3000	3500	>4000
0	Open	Closed	Closed	Closed	Closed	Closed	Closed	Open
10	Open	Closed	Closed	Closed	Closed	Closed	Closed	Open
20	Open	Closed	Closed	Closed	Closed	Closed	Closed	Open
30	Open	Closed	Closed	Closed	Closed	Closed	Closed	Open
40	Open	Closed	Closed	Closed	Closed	Closed	Closed	Open
50	Open	Closed	Closed	Closed	Closed	Closed	Open	Open
60	Open	Closed	Closed	Closed	Closed	Closed	Open	Open
70	Open	Closed	Closed	Closed	Closed	Closed	Open	Open
80	Open	Closed	Closed	Closed	Closed	Closed	Open	Open
90	Open	Closed	Closed	Closed	Closed	Open	Open	Open
100	Open	Closed	Closed	Closed	Closed	Open	Open	Open

Exhaust Gas Flow



Active Exhaust Valve Control



BRAKES

Mechanical Brake System

XKR models use Teves-supplied 'R' performance brakes with non cross-drilled rotors, as used on the 2007 XJR (X350) and S-TYPE R (X206) models. The cast iron 2-piston caliper is painted black and features the Jaguar 'R' logo. Front brake disc diameter is increased from 326 mm on non-'R' variants to 355 mm; front disc thickness increases from 30mm to 32mm. The ventilated brake disc is manufactured from cast iron.

NOTE: There is no wear indicator installed for the front brake pads.

'R' Performance Brake Caliper



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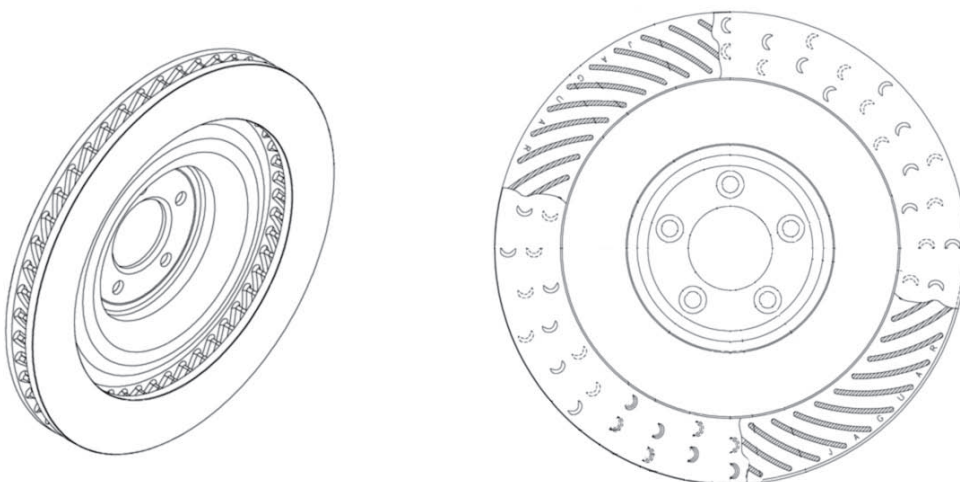
Alcon High-Performance Brake System (Special Edition models only)

A new high-performance brake system will be available on future special-edition XKR models. This brake system, manufactured by Alcon, is a racing-derived brake system featuring the following:

- Crescent-grooved brake discs
- 6-piston front calipers
- 4-piston rear calipers
- Standard 2007 MY XK (X150) rear knuckle
- Brembo parking brake caliper (as used on 2004 MY XJR and S-TYPE R)

Alcon Brake Discs

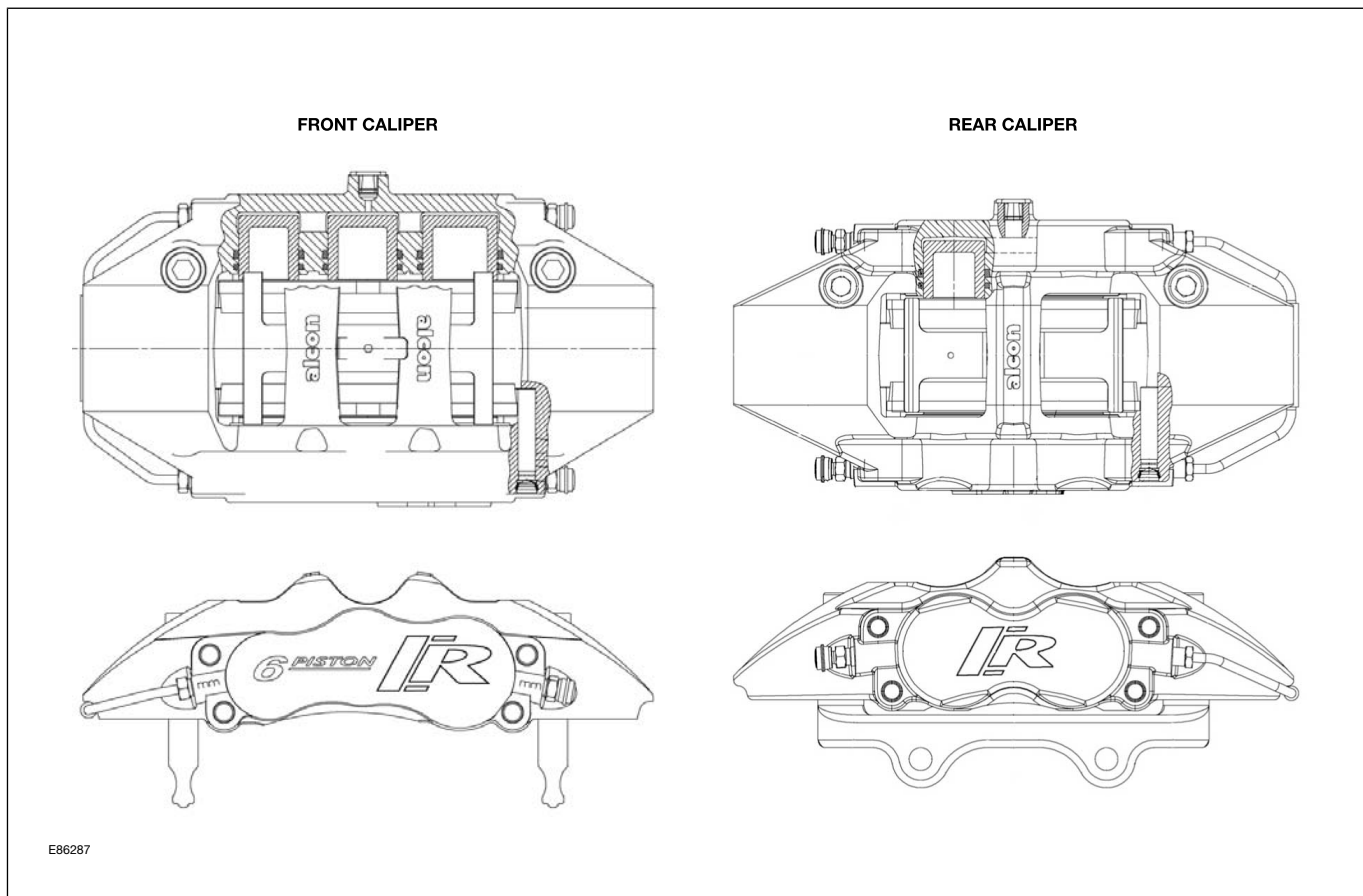
The Alcon brake discs are high-performance ventilated discs made of cast iron. These discs are 'handed' and cannot be swapped from side to side (left to right). The discs have a diameter of 350mm and a thickness of 45mm.



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Alcon Brake Calipers

The Alcon Monobloc calipers are non-handed except for the installation of the pipe assemblies, bleed nipples and dust caps. The front calipers have 6 pistons, while the rear calipers have 4. The calipers are painted red with the 'R' logo painted on the top surface.



Rear Brakes

The rear brakes on models fitted with the Alcon brake pack use the standard XK N/A knuckle, and are fitted with separate emergency brake calipers (as on 2003 – 2004 MY XJR and S-TYPE R models).

DSC SYSTEM

A running change has been introduced for the dynamic stability control (DSC) system; this change applies to both SC and N/A XK models. To turn the DSC system OFF, it is now necessary to press and hold the DSC switch for 10 seconds. The previous requirement was 5 seconds.

DSC Switch



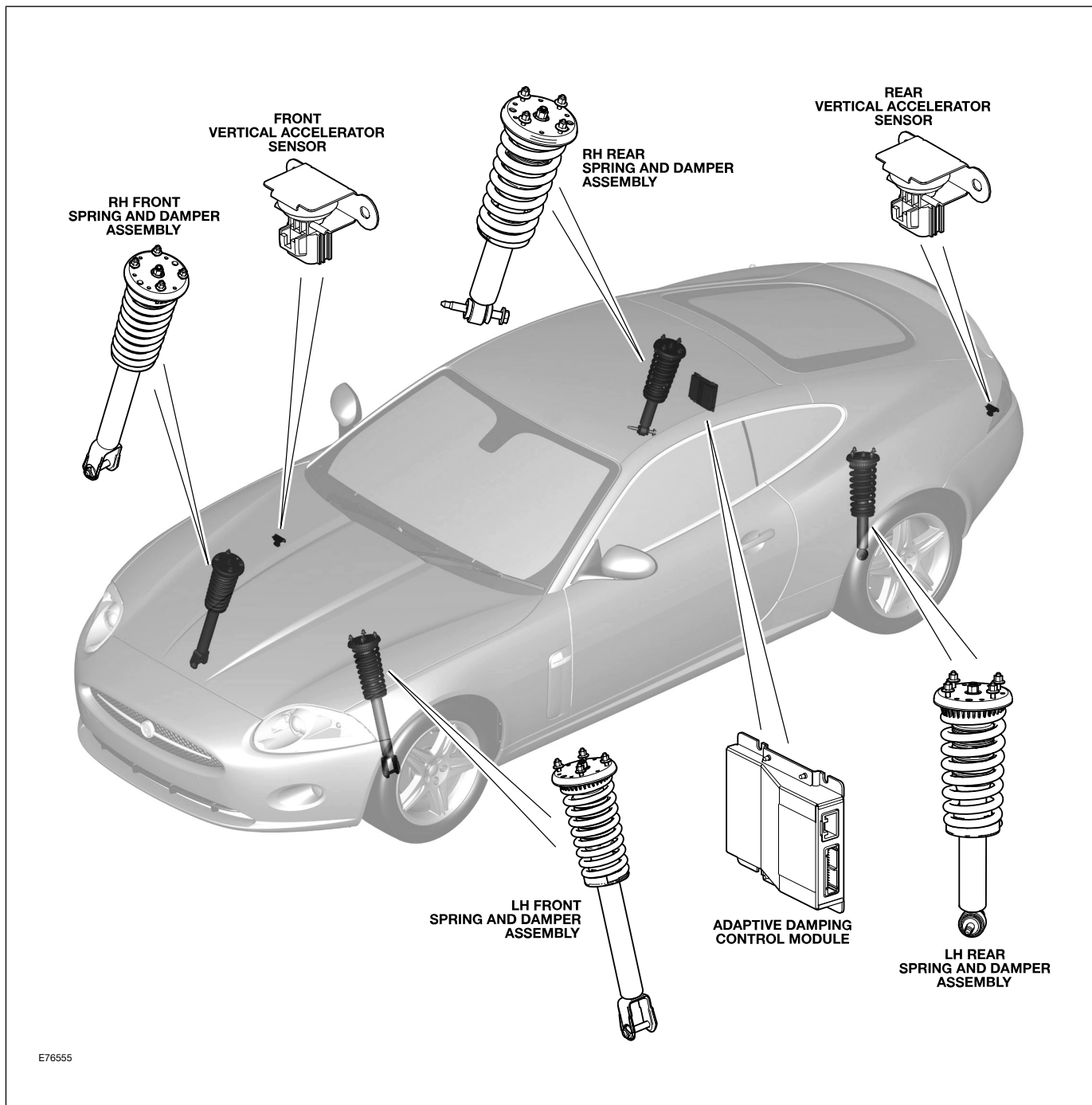
ADAPTIVE DAMPING SYSTEM

Computer Active Technology Suspension

The computer active technology suspension (CATS) system on the XKR differs only in the dampers used: they are tuned for a firmer ride, with extra shim stacking

within the damper unit to alter oil flow. CATS dampers are painted green for S/C models (vs. black for N/A models).

CATS Components



POWER ASSISTED STEERING SYSTEM

The power assisted steering (PAS) system on the XKR uses a unique PAS cooler and a unique PAS pump. The changes to the PAS pump are all internal.

PAS Cooler and Hoses

