



Technical Guide



XJ and XK Series 2000 Model Year Update



BY APPOINTMENT TO
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MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY



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Technical Guide

XJ and XK Series 2000 Model Year Update

This Technical Guide describes the changes introduced at 2000 Model Year to the XJ sedan and XK sports car ranges. It is intended to give Jaguar Dealer workshop personnel an overview of these changes and is for information purposes only. The contents of this Technical Guide must not be used as a reference source for servicing procedures; all servicing must be carried out in accordance with the appropriate workshop manual on the JTIS CD-ROM.

This Technical Guide will not be updated. While every effort is made to ensure accuracy, changes may occur between going to press and the vehicle being introduced to the market. Once the vehicle is in service, details of changes can be obtained from Service Bulletins and revisions to the workshop manual.

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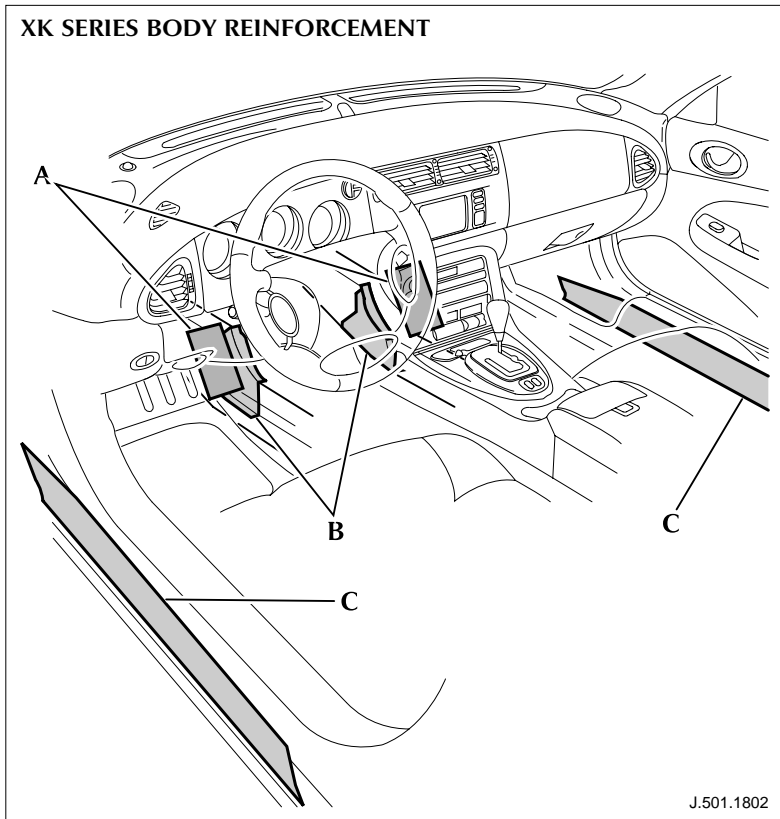
The following abbreviations are used in this document:

Abbreviation	Description
AAI	air assisted injection
ABS	anti-lock braking system
APP	accelerator pedal position (sensor)
A/C	air conditioning
AFR	air/fuel ratio
BPM	body processor module
CAC	charge air cooler
CAN	controller area network
CKP	crankshaft position (sensor)
CMP	camshaft position (sensor)
DSP	digital signal processing
DTC	diagnostic trouble code
DVD	digital versatile disc
ECM	engine control module
ECT	engine coolant temperature (sensor)
EEPROM	electrically erasable programmable read only memory
EGR	exhaust gas recirculation
EMS	engine management system
EOT	engine oil temperature (sensor)
EVAP	evaporative emissions (valve)
GPS	global positioning system
HO2	heated oxygen sensors
IAT	intake air temperature (sensor)
JTIS	Jaguar Technical Information System
KS	knock sensor
LCD	liquid crystal display
LED	light emitting diode
MAF	mass air flow (sensor)
MAP	manifold air pressure (sensor)
N/A	normally aspirated
NAS	North American specification
OBD II	on-board diagnostics
ORVR	on-board refuelling vapour recovery
PDU	portable diagnostic unit
PWM	pulse width modulation
RSCM	rain sensing control module
RAM	random access memory
SC	supercharged
TCM	transmission control module
TP	throttle position (sensor)
VVT	variable valve timing

Changes introduced at 2000MY for the XJ sedan and XK sports cars ranges provide improvements in exhaust and evaporative emissions, active and passive safety systems, driver assistance and entertainment:

- the supercharged (SC) engine receives similar modifications to the 1999MY normally aspirated (N/A) engine and is therefore designated AJ27
- the XKR sports with AJ27 SC engine is introduced into North America
- on-board refuelling vapour recovery (ORVR) is fitted to all SC vehicles for North America
- body modifications to comply with new impact requirements (XK models)
- enhanced braking performance with the ABS Plus system
- new wheels
- integrated navigation systems with different displays and facilities for the sedan and sports cars
- new upgraded standard and premium audio systems
- electrically fired seat belt pretensioners for XK sports cars
- automatic wiper system which detects rain on the front windshield

Body Reinforcement

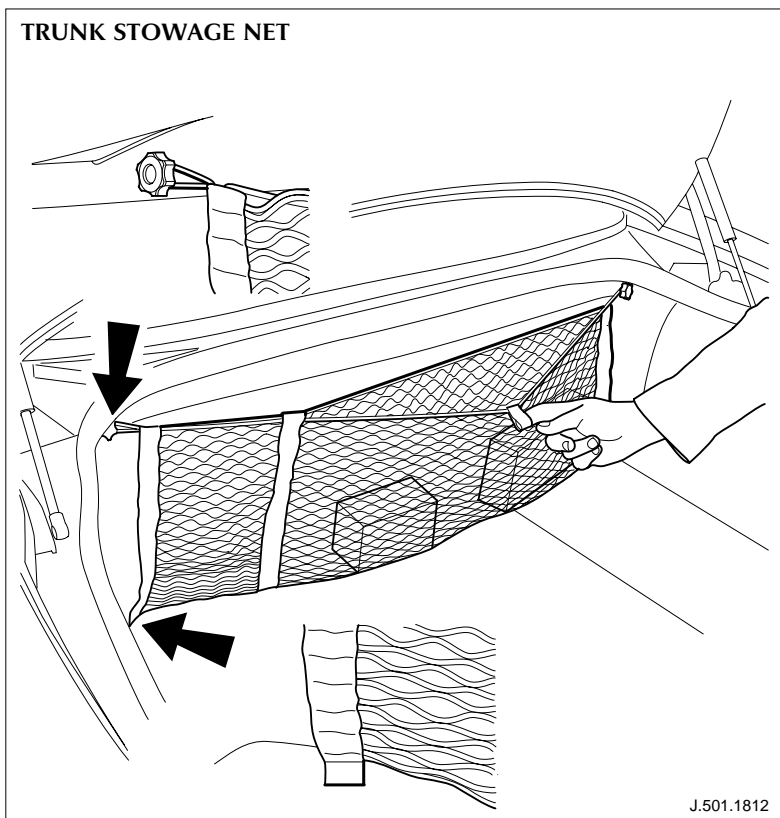


Changes are made to the XK Series to meet European impact requirements for front offset body deformation. On the coupe and convertible models, reinforcement panels (A) extend the driver and passenger toeboards to the transmission tunnel and internal stiffening is added to the adjacent part of the side members. Additional plates (B) are also welded to the exterior of the side members, on the coupe only, to further reinforce the toeboard region.

On the coupe, a stiffener panel (C) is welded to the inside of each outer sill to form a reinforced longitudinal assembly.

Mountings and Fixings

On both the XJ and XK Series vehicles, minor body changes introduced for new or modified sub-assemblies are described in the relevant sections.



Trunk Stowage Net

A removable trunk stowage net is fitted as standard to all XK Series vehicles to prevent the movement of small items inside the trunk. The net is fixed across the rear bulkhead by two loops at the top and by Velcro strips at the bottom. The net fixing loops are attached to new brackets which are screwed to the underside of the rear decking on the coupe and to the fuel tank closing panel upper mountings on the convertible.

Normally Aspirated Engine

The N/A engine was updated to AJ27 level at 1999MY and the basic engine and engine management system (EMS) are unchanged. Some changes are made to the cooling system and accessory drives in common with the SC engine and are detailed below.

AJ27 Supercharged Engine

The introduction of the AJ27 engine to the 1999MY N/A range included mechanical changes to the bottom end and cylinder head together with major changes to engine management components and software. Most of these mechanical changes to the basic engine were also incorporated in the SC AJ26 engine for that year to commonize production and are described in the 1999MY Technical Guide. Further revisions are now introduced at 2000MY to the SC engine but the major change is the adoption of the N/A engine management system which enables the more stringent emission requirements to be met. Note that the SC engine does not have variable valve timing (VVT) or air assisted (fuel) injection (AAI).

Specification

The specification for the N/A and SC engines is as given in previous Technical Guides with the exception of the following changes to spark plugs and engine oil.

Spark Plugs

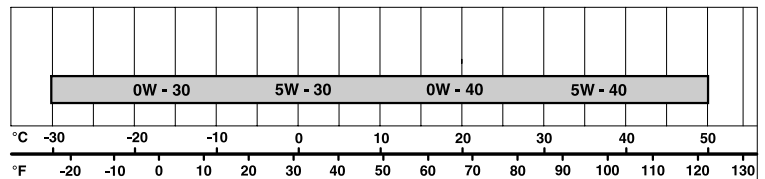
All N/A and SC engines using unleaded fuel must be fitted with NGK type PFR5G-11E spark plugs.

Oil Specification

Engine oil for all NAS markets must be to specification API S/EC and ILSAC GF-2.

The recommended SAE viscosity grades for the ambient temperature range are shown in the table.

SAE/TEMPERATURE TABLE



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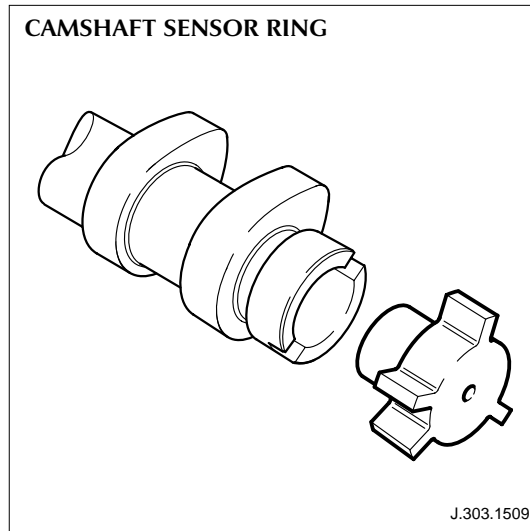
Basic Engine

Camshaft Sensor Rings

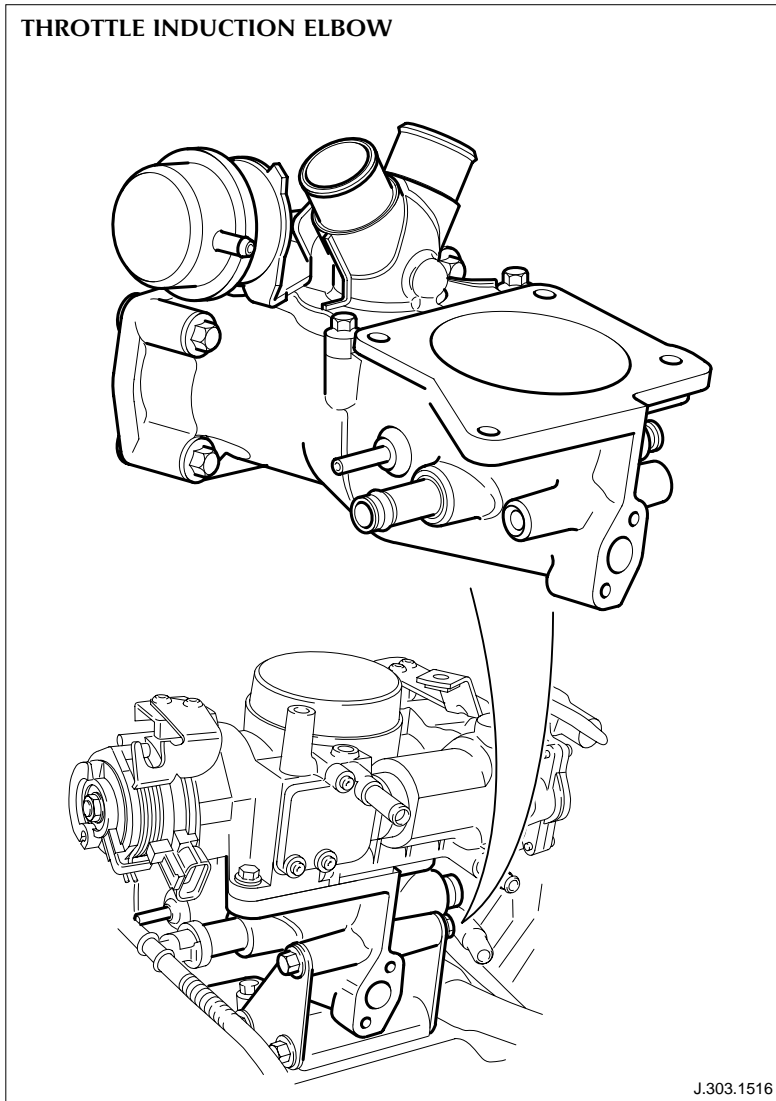
The inlet camshafts on both SC engine banks are fitted with the same four tooth cam position sensor rings as used on the N/A engine.

Transmission Drive Plate

The transmission drive plate/sensor ring assembly introduced on the 1999MY AJ27 N/A engine, is now fitted to the SC engine.



THROTTLE INDUCTION ELBOW



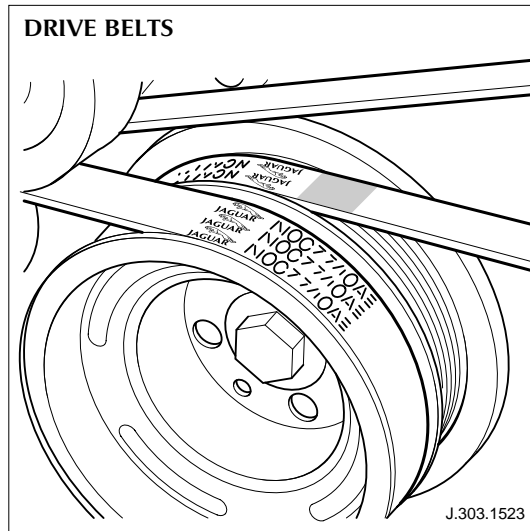
Air Induction System

The introduction of a new throttle body to the SC engine (see Page 10) has required a new induction elbow with a revised throttle mounting flange. The air induction tube is also slightly modified to fit the throttle body.

Front End Accessory Drive

A new belt with revised material composition was introduced at 1999MY for the XKR accessories drive but not the supercharger drive. For 2000MY drive belts on all XK and XJ Series vehicles are now made of the new material and are identified by larger white part numbers and Jaguar logos (the base drive belt also has a red band).

The plastic idler and tensioner pulleys on the accessories drive are replaced by steel pulleys. Note that the new type belts must not be used with the plastic pulleys.



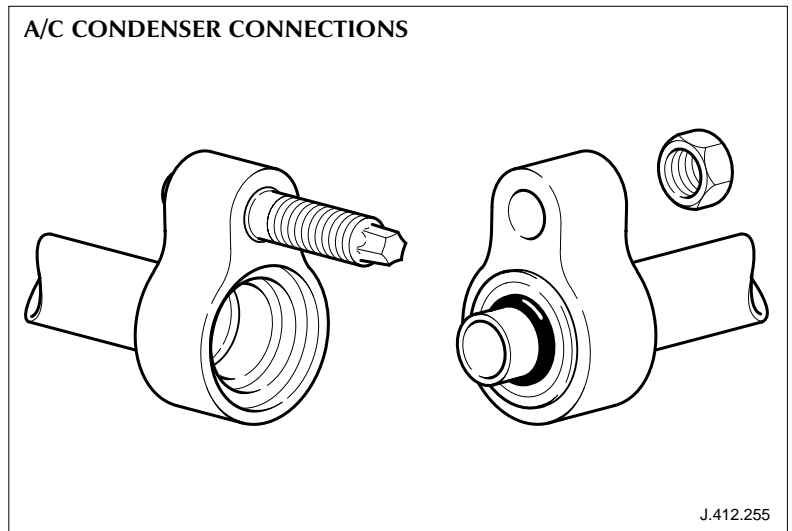
Cooling System

The following changes are made to the cooling system:

- at 2000MY a common condenser is used on all N/A and SC vehicles: the new parts are similar to those fitted to the previous SC vehicle but have modified inlet and outlet connectors (see figure)
- modified coolant hoses are fitted to the new throttle body and EGR valve on SC models
- WSS M97B44–D coloured orange, Extended Life Coolant first introduced in the S-TYPE cooling system, is now used in all XJ and XK Series vehicles. The recommended coolant change is every five years or 150,000 miles (250,000 km).

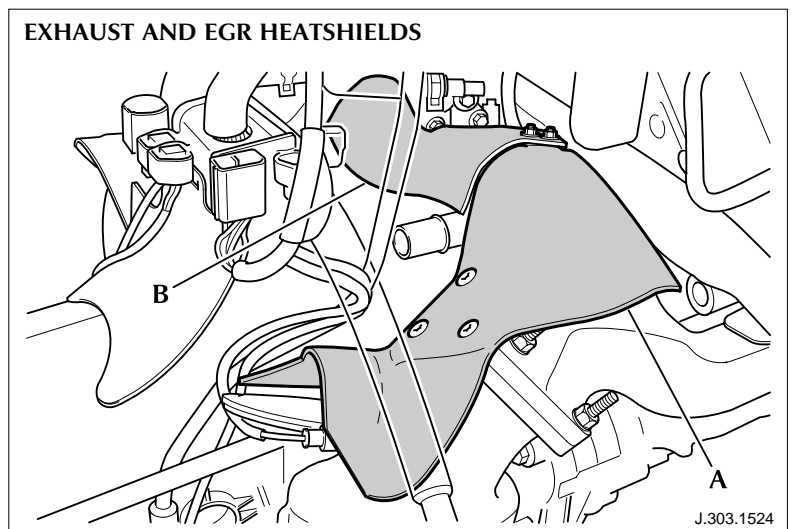
Caution:

Current coolants and the new long life coolant are incompatible and must not be mixed. Vehicle coolants must always be replaced with the original type.



Exhaust System

XKR engines have a new heatshield (A) fitted to the RH exhaust manifold with an extension shield (B) for the EGR feed pipe. The heatshields may also be fitted as an accessory item (part of tow kit) to the XJ Series cars but without the EGR shield on the N/A models.



Introduction

The SC engine adopts the engine management hardware and EMS strategies introduced on the AJ27 N/A engine but without the VVT and AAI features. The EMS software is also modified to take account of the slightly different operating conditions between the SC and N/A powertrains.

Engine Management and Emission Control

Engine management strategies for the SC engine are similar to the AJ27 N/A system with the main objectives being reduced emissions and improved starting. The common features for both types of engine are briefly reviewed here:

- faster first time firing on start up
- programmed extra ignition retard and throttle control during cold starts achieve faster catalyst 'light off'
- new HO2 sensors give improved AFR closed loop control
- more effective catalysts further reduce emissions
- improved ignition and knock control reduce misfires
- full authority electronic throttle with mechanical cable operation for driver demand
- cruise control is a function of EMS software and throttle system (no pneumatics)
- on-board refuelling vapour recovery (ORVR) fitted to all NAS vehicles
- 'flight recorder' function in the event of a vehicle impact (see **Diagnostics** on Page 18).

Engine Control Module

SC vehicles now have the same ECM as is fitted to the N/A models but with minor programming changes to suit the SC features.

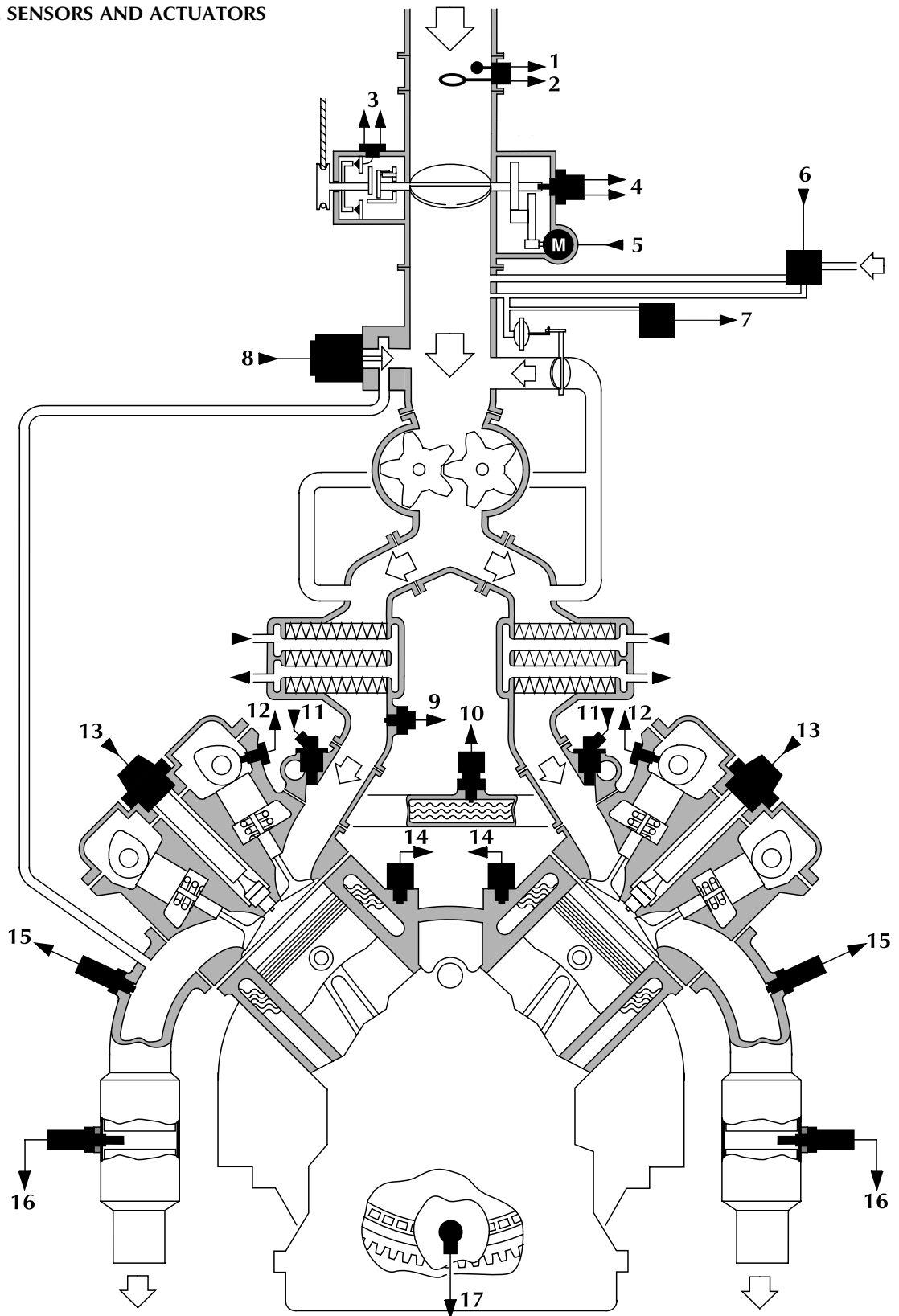
EMS Sensors and Actuators

The SC engine sensors and actuators are summarized in the schematic diagram. Note that an oil temperature sensor is fitted to the SC engine for production commonality with the N/A engine but, unlike the N/A sensor, is NOT a functional component within the EMS and is therefore not shown.

Key to schematic

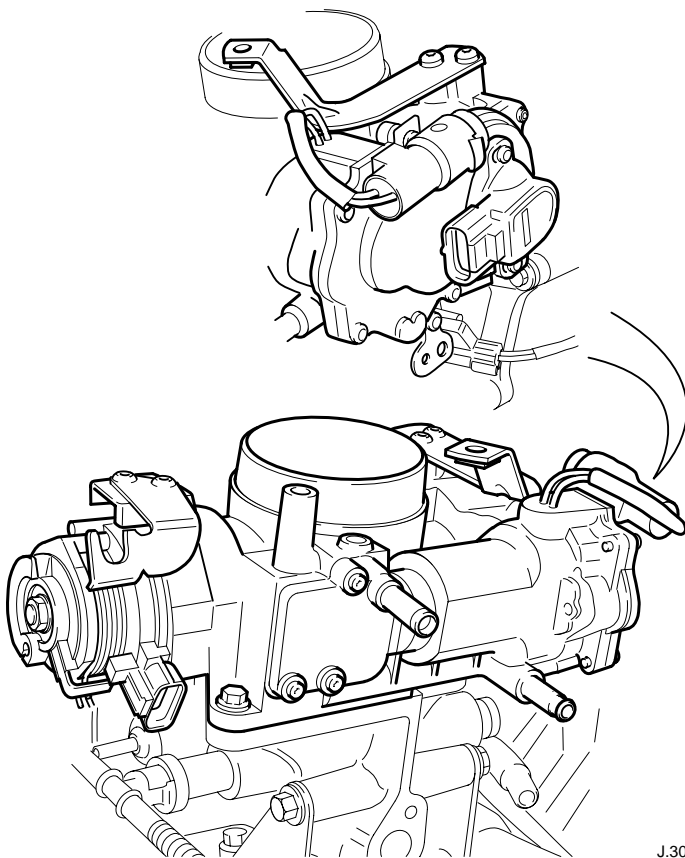
1. Intake air temperature (IAT) sensor
2. Mass air flow (MAF) sensor
3. Accelerator pedal position (APP) sensor
4. Throttle position (TP) sensor
5. Throttle motor
6. EVAP purge valve
7. Manifold air pressure (MAP) sensor
8. Exhaust gas recirculation (EGR) valve
9. Second air temperature (IAT 2) sensor
10. Engine coolant temperature (ECT) sensor
11. Fuel injectors
12. Camshaft position (CMP) sensors
13. Coil-on-plug ignition modules
14. Knock (KS) sensors
15. Upstream linear heated oxygen (HO2) sensors
16. Downstream stoichiometric heated oxygen (HO2) sensors
17. Crankshaft (CKP) sensor

SC ENGINE SENSORS AND ACTUATORS



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ELECTRONIC THROTTLE



Electronic Throttle

The new electronic throttle fitted to the SC engine is similar to the N/A variant. Since air assisted (fuel) injection (AAI) is not used on the SC vehicles, there is no provision on the throttle body for the AAI control valve to be fitted and no internal airway from the throttle bore. The throttle specification is otherwise identical to the N/A model. As on the N/A engine, the adoption of this throttle system allows full electronic cruise control to be implemented with no requirement for the previous pneumatic control components which are now deleted.

Engine Speed and Position

Engine starting and misfire detection are improved by changes to crankshaft and camshaft position detection. The four tooth sensor rings and inductive CMP sensors used on the N/A engine are fitted to the inlet camshafts on both engine banks on the SC engine. The transmission drive plate/sensor ring assembly and the crankshaft (CKP) sensor used on the N/A are also fitted to the SC engines.

Air Intake Sensors

A new integrated MAF/IAT sensor unit, similar to the N/A sensor, is fitted to the SC engine. However, due to the greater airflow required by the SC engine, the MAF sensing resistor has a different value, providing a higher airflow/volt output to the ECM. The ECM software is modified to interpret this signal.

The second intake air temperature sensor (IAT 2), mounted on the RH charge air cooler (CAC), is unchanged.

Ignition System

The coil-on-plug units and annular type knock sensors used on the N/A engine are fitted to the SC engine. The incorporation of an integral control module in each coil-on-plug unit allows the previous two separate drive modules to be eliminated (as on the N/A system). The features and operation of the new ignition system are as described in the 1999MY Technical Guide.

Exhaust Gas Recirculation System

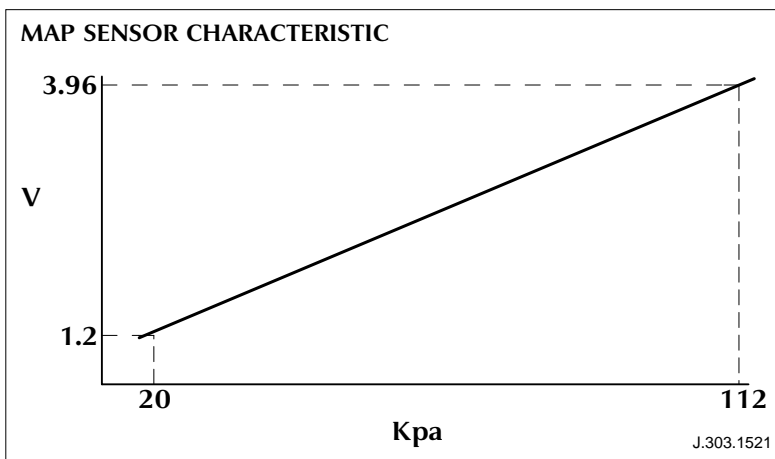
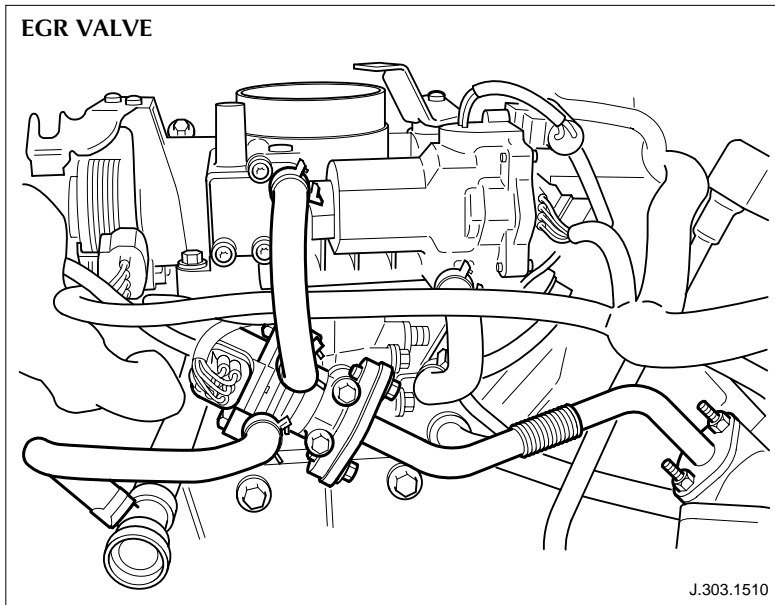
EGR Valve

A new EGR valve is fitted to all SC engines together with a modified gas feed pipe and reshaped coolant pipes. An increased amount of exhaust gas is recirculated to further reduce emissions but operation is otherwise as before.

Manifold Air Pressure Sensor

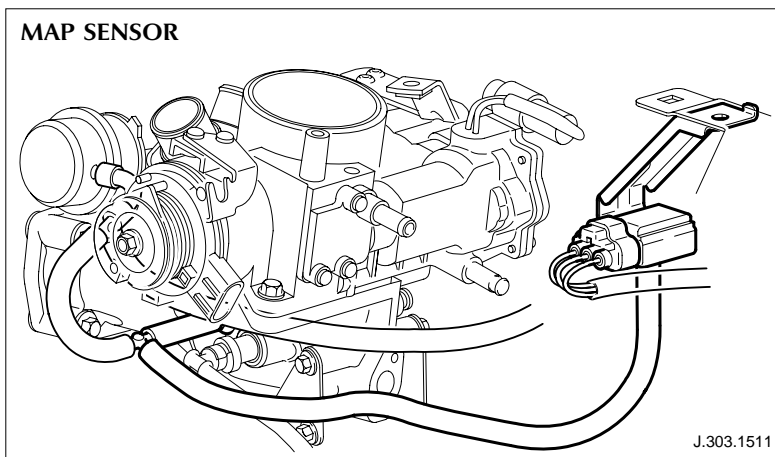
The inlet manifold air pressure (MAP) sensor is a new EMS component which monitors the operation of the EGR valve and is fitted to NAS SC vehicles only to comply with OBDII requirements. The MAP sensor measures air pressure at the induction elbow and sends an analogue voltage, directly proportional to the air pressure, to the ECM. This value is then used by the ECM to calculate the difference in manifold airflow due to the opening and closing of the EGR valve, so as to monitor EGR operation. The sensor is supplied at 5V dc from the ECM and produces a linear dc output voltage as shown.

The sensor circuit is monitored by the ECM for open and short circuit faults, sensor range and performance. New fault codes (DTC) are allocated.



MAP Sensor Fixing

The sensor is mounted on a bracket fixed to the engine bay bulkhead and connects to the common vacuum port on the induction elbow via flexible pipes.



Catalytic Converters and Sensors

Catalytic Converters

The catalytic converters on all SC engines are changed. Slimmer shaped converters are necessary on SC vehicles because of the gearbox dimensions (wider than the N/A gearbox). This reduced converter cross-sectional area has previously required the use of thin wall steel honeycomb substrates to achieve low gas back pressures. New thin wall ceramic substrates are now used which provide similar back pressure levels to the metallic type while retaining the same overall assembly shape and dimensions as before. The active catalyst coating is denser than on the previous metal substrate, causing a greater reduction in exhaust pollutants. Each converter contains two equal sized ceramic substrate elements with spacing between the elements for the downstream oxygen sensor location.

Oxygen Sensors

Operation of AFR closed loop control and catalyst efficiency monitoring is similar to the system in use on N/A engines as described in the 1999MY Technical Guide for the XJ and XK Series. The AJ27 SC engine now uses the same oxygen sensors as the N/A models, that is, a linear HO₂ sensor in the upstream position and a stoichiometric HO₂ sensor in the downstream position. This combination provides very accurate AFR control and the mid-positioned lower sensor also monitors catalyst deterioration.

On-board Diagnostics

The ECM records the last 10 seconds of operation for a number of parameters in rolling memory in the battery backed RAM. In the event of the inertia switch being operated, the last 8 seconds of RAM data plus data recorded up to 2 seconds after inertia switch operation is copied into non-volatile EEPROM.

Evaporative Emissions Control

On-board refuelling vapor recovery (ORVR) is now used on all SC vehicles, bringing these engines into line with the N/A engine to meet the 2000MY legislative requirements.

The variant fuel tanks for the SC vehicles are new assemblies which combine the upper part of the N/A tanks and ORVR components with the lower part of the existing SC tanks housing the twin fuel pumps. The tank ORVR components, carbon canisters, canister close valve and evaporative emission (EVAP) valve are as fitted to the N/A vehicles and system operation is unchanged.

Transmission Control

Transmission Control Module

A new transmission control module (TCM) incorporating software changes is fitted to SC vehicles. The software is modified to match the transmission operation to the AJ27 engine management changes so as to maintain the performance features of the SC powertrain. Some additional diagnostics are also added with new codes (DTC).

There are no changes to the N/A vehicle TCM.

J-Gate Selector Module

All SC models have a revised dual-linear switch fitted to the J-Gate gear selector module. To meet the requirements of the AJ27 ECM, the new switch provides a logic low signal (connector pin 11) to the ECM (EM081/12) when park or neutral are selected. The previous dual linear switch produced a logic high park/neutral signal (connector pin 5) and this output is retained but not connected on the new switch assembly, enabling the switch to be retro-fitted to AJ26 SC vehicles.

Braking System

Changes to the braking system include pre-2000MY running changes to brake hardware and, for 2000MY, the introduction of a more advanced anti-lock braking (ABS) system.

Running Changes

XK Front Discs

The XK8 now has the 325mm front brake discs as fitted to the XKR and SC sedan models.

Brake Booster and Pedal Assembly

On XK and XJ Series vehicles running changes have been made to the foot brake pedal assembly and brake booster unit to improve brake feel and effort and reduce pedal travel. A shorter pedal arm is used and the new booster unit produces a greater jump in boost pressure (approximately double the previous pressure) in response to initial pedal movement. The booster unit is now fixed via four studs to the pedal box.

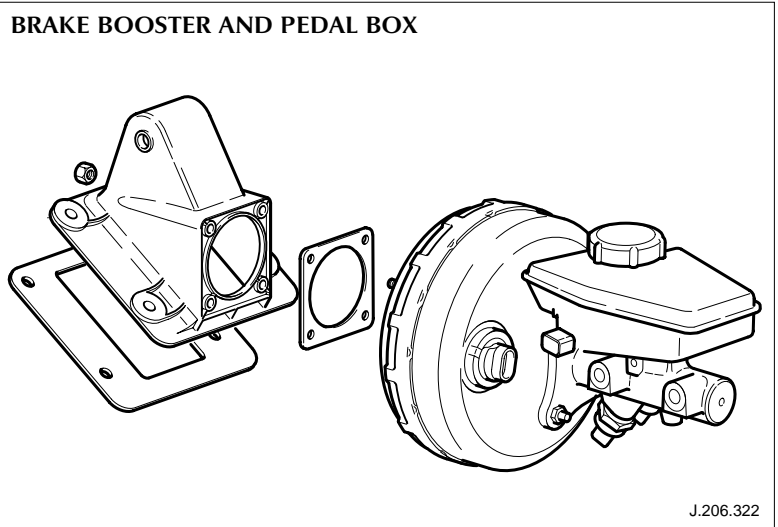
ABS and Traction Control

Traction control and a new anti-lock braking system, ABS Plus, are now fitted as standard features on XK and XJ Series vehicles: automatic stability control only is not available. One type of brake control modulator is therefore required with a separate hydraulic pipe to each rear wheel.

ABS Plus System

ABS Plus is an enhanced anti-lock brake system which is designed to improve dynamic stability when braking. The system uses the existing sensors and braking hardware but the brake control modulator software is modified to provide a more detailed analysis of the input sensor data. This allows the system to recognize any differences in speed between the four wheels due to slip angle and load changes, caused by critical situations on bends, varying road surfaces or abrupt steering movements. Under these conditions, the system reduces or increases braking on individual wheels to provide compensating yaw movements which stabilize the course of the vehicle. Note that the ABS Plus system is only active when the brakes are applied (unlike traction control).

The modified brake control modulator is physically unchanged from the previous unit except that the valve block is keyed to the ABS/traction control module to ensure that only ABS Plus components are assembled together.



Wheels and Tyres

New wheel styles are introduced for XK and XJ Series vehicles.

16 inch Winter Wheels and Tyres

All XK8, XKR and supercharged XJ Series vehicles are fitted with 325mm diameter front brakes and cannot be fitted with the accessory 16 inch winter wheel and tyre. Recommended winter tyres in the larger wheel sizes should be used.

Standard Wheels

XJ Series

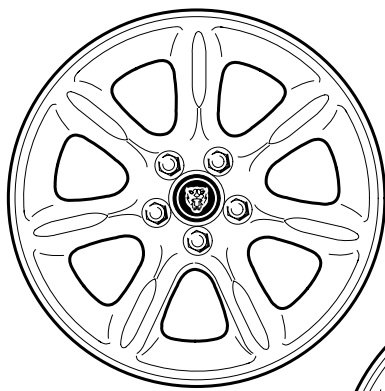
Five wheel styles are deleted: 20 Spoke and Dimple, both in 7J and 8J sizes and the Penta style. Three new styles are introduced:

- Corona and Lunar alloy wheels are added to the 7J x 16 size range with no change to tyre specification
- Asteroid is an 8J x 18 alloy wheel with no change in tyre specification

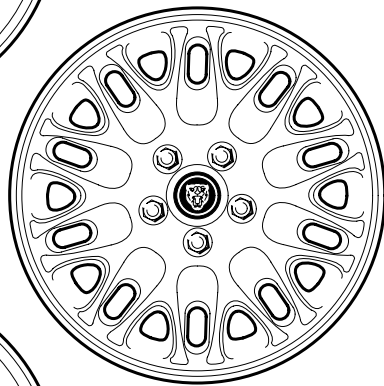
XK Series

A new 8J x 7 wheel, Lamina, is introduced. Tyre specification is unchanged.

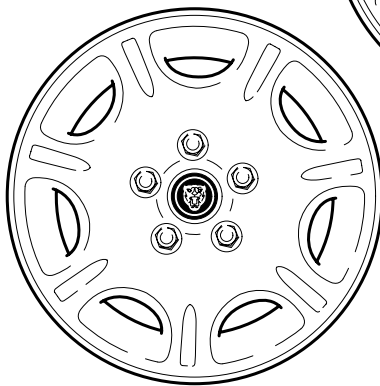
XJ SERIES NEW WHEELS



Asteroid



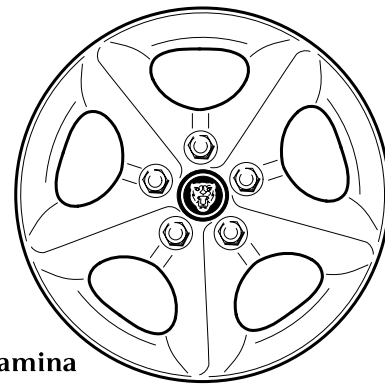
Corona



Lunar

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XK SERIES NEW WHEEL



Lamina

J.501.1813

XK Series Electrical Seat Belt Pre-tensioners

Front seat belts on all XK Series vehicles are fitted with electrically triggered pre-tensioners. The pre-tensioners are fired by electrical signals from an impact sensing/control module mounted on the transmission tunnel and the system operates completely independently of the airbag system. The pre-tensioner reel assemblies provide the standard emergency locking retraction (ELR) for normal braking conditions. Automatic locking retraction (ALR), enabling children's seats to be properly restrained by the seat belt, is now a standard feature in all markets.

Operation

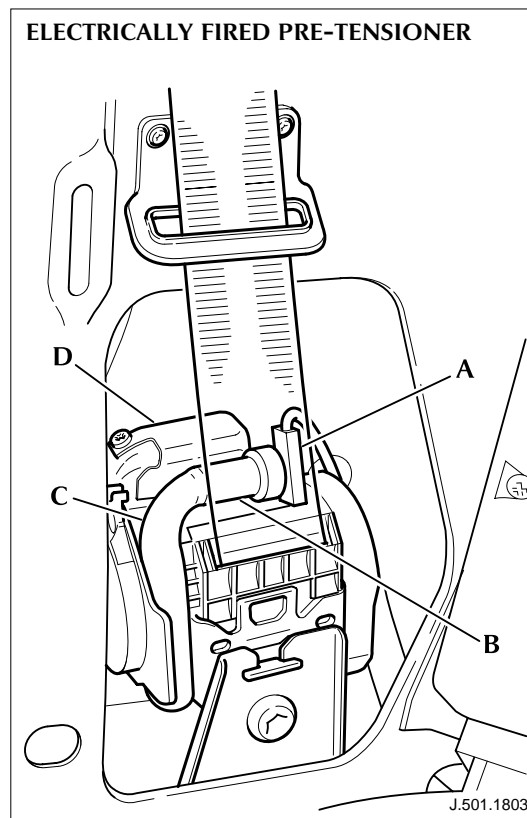
The pre-tensioner control module incorporates an accelerometer which senses a frontal impact to the vehicle as transmitted through the body structure. At a preset deceleration level, the control module generates 12V firing signals to each pre-tensioner reel assembly. The firing signals are fed via a 2-pin connector (A) on the pre-tensioner and directly trigger the pyrotechnic igniter unit (B). Detonation propels a train of steel balls inside tube (C) towards a ball trap (D), causing an impeller on the reel spindle to rotate and retract the seat belt which then locks, preventing forward movement of the occupant.

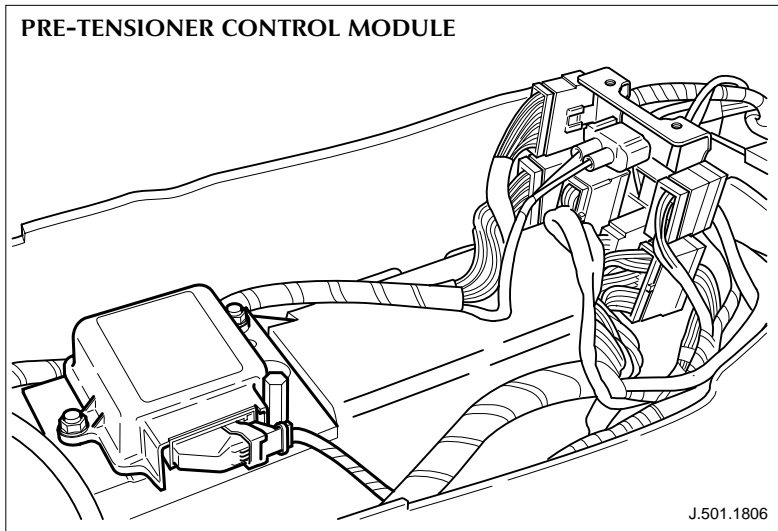
A torsion load limiter is incorporated within the reel spindle. If the impact causes this load to be exceeded after the belt has locked, the belt will slacken to avoid chest injuries to the occupant.

The pre-tensioner action takes approximately 10mS after triggering and occurs at or slightly before the airbag deployment. However the pre-tensioner system is totally independent of the airbag system except that it shares the airbag instrument panel warning light.

Pre-tensioner Assembly

The pre-tensioner assembly is a compact, self contained unit mounted to a body bracket by a single bolt and anti-rotation fixing. The assembly is not serviceable and must be replaced if the pyrotechnic is discharged. While the pre-tensioner assembly is intrinsically safer than the mechanically triggered type, the normal safeguards and procedures applicable to the storage, handling and disposal of pyrotechnic devices must be followed.





Pre-tensioner Control Module

The pre-tensioner control module is bolted to a new bracket welded to the top of the transmission tunnel and replaces the telephone electronics module which is now located in the trunk. Note that the fixing bolts must be tightened to the correct torque to ensure the proper operation of the impact sensor (accelerometer).

Diagnostics

The pre-tensioner control module performs self diagnostics including pre-tensioner firing circuit checks (open and short circuits and shorts to supply or ground) but does not generate accessible fault codes. Faults may be recorded during the pre-tensioner self test after ignition switch on or during the driving cycle and in either case will cause the airbag warning indicator to light. With the airbag warning light on, the fault may be due to either the pre-tensioner or airbag system (if the intermittent audible warning is also present, the warning light is faulty). The pre-tensioner system is not linked to the vehicle diagnostic connector or bus systems and cannot therefore be accessed by the portable diagnostic unit (PDU). To determine which system is at fault, reference must be made to a special diagnostic procedure (see service literature).

XK Series Rear Seatbelts

All XK Series vehicles are fitted with ALR seat belts in the rear for the secure fitting of child seats.

Depowered Airbags

Depowered driver and front passenger airbags are introduced for all XJ and XK Series vehicles. These airbags use a reduced charge which allows the bag to fill more slowly, giving a slightly softer impact when deployed. Airbag fittings and operation are unchanged.

Child Restraints

Top tethered child seat anchorage points are introduced for XJ Series and XK Series vehicles. When selecting a child restraint system, ensure that it conforms to any relevant legislation and recommendations and carefully follow the manufacturers instructions. Reference should also be made to the safety information provided in the Drivers Handbook.

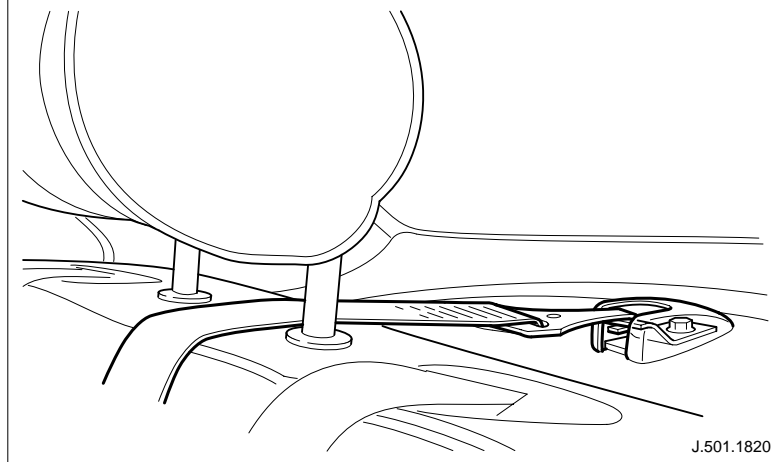
XJ Series Child Seat Anchorage

Anchorage brackets are screwed directly to the topside of the rear parcel tray. Three brackets are fitted with bench seats and two with electrically adjusted seats. The brackets are finished by plastic enclosures with removable covers to allow the restraint harnesses to be attached.

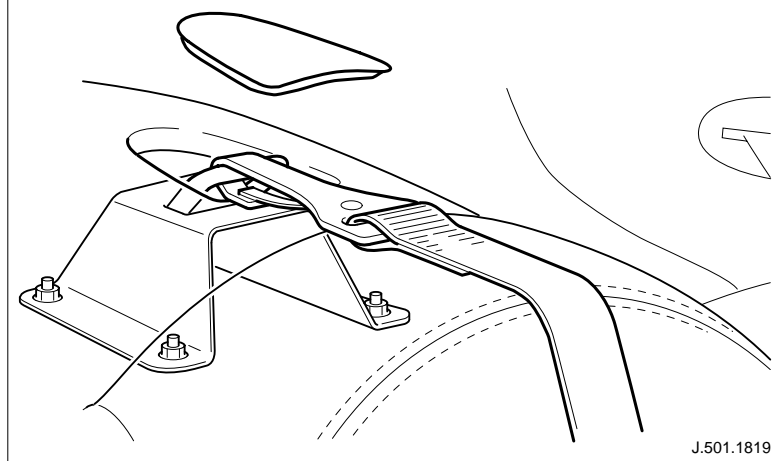
XK Series Child Seat Anchorage

On the coupe, two anchor points are provided at the centre lines of the rear seats. Each anchorage consists of a tower bracket which is fixed to the parcel tray and a strengthening plate on the underside of the tray via four bolts. A hoop welded to the top of the bracket provides the attachment point for the child restraint harness. The hoop is slightly below the level of the parcel tray trim and when child restraints are not required, a flush fitting cover allows the hoop to be hidden.

XJ SERIES CHILD SEAT ANCHORAGE



XK SERIES CHILD SEAT ANCHORAGE



Audio System

New Alpine audio systems are introduced for XK and XJ Series vehicles and are available as standard or premium options, the premium system having a remote power amplifier located in the trunk. The CD-changer is the only unit carried over for all cars and becomes a standard fit on the XKR. The audio units are similar in dimensions and fitting to the previous units.

XJ Series Audio and Navigation Unit

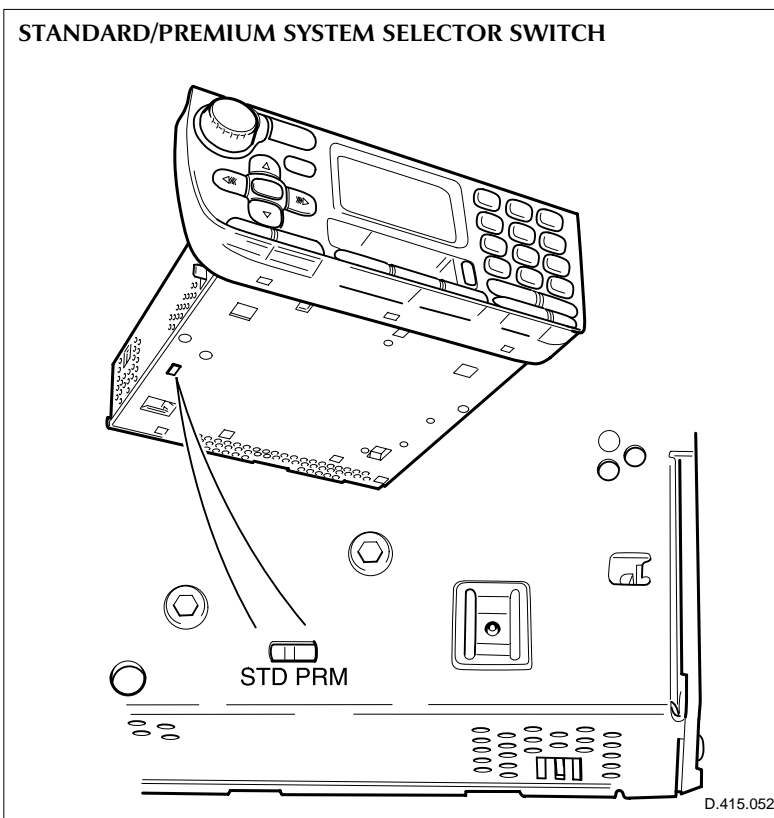
The new audio unit fitted to the XJ Series vehicles is a dual function unit which incorporates the navigation system controls and a shared radio and navigation LCD display (see **Navigation System** on Page 21). The same unit is used, unchanged, where the optional navigation system is not fitted. The audio unit controls and functions are similar to those of the superseded unit but the MODE switch now has an extended menu which includes navigation functions and new premium system sound effects (see below).

XK Series Audio Unit

The new XK Series audio unit provides similar audio facilities and operation to the XJ Series but does not have any navigation system functions, except voice guidance volume control. A separate navigation display/control unit supports these functions (see **Navigation System** on Page 21). The audio unit front panel has the same controls and layout as the previous unit.

Audio Standard/Premium Selector

Both types of audio unit are used for standard and premium systems but each unit has a selector switch which must be in the correct position to allow operation in the system fitted. The switch is fitted to the underside of the audio unit chassis with two marked positions STD (standard system) and PRM (premium system). The switch illustrated is on the XJ Series audio unit but is located in the same position on the XK Series unit. Note that a screwdriver or similar implement may be required to slide the switch from one position to the other.



Premium Audio Amplifier

The premium audio system includes a new amplifier unit, common to XK and XJ Series, which is located at the top of the audio/navigation stack in the trunk. In addition to an increase in power from 240W to 320W, the amplifier unit includes a new feature, digital signal processing (DSP). The DSP system provides five selectable occupancy settings for LH or RH driver, front seats, rear seats and all seats. At each setting the signals are delayed to particular speakers to produce a synchronised sound effect.

Speakers

New speakers are fitted to both XJ and XK Series vehicles and are a direct replacement for the previous units. The two speakers fitted at each rear quarter location on the XK Series convertible are replaced by single units consisting of two split 160mm sub-woofers. The XK Series base system also has two extra speakers in the top fascia positions used for the premium system.

Navigation System

Both the XJ and XK Series vehicles may be fitted with optional fully integrated navigation systems which provide various types of route guidance information to aid the driver, using visual displays and voice commands. The navigation system uses signals from the global positioning satellite (GPS) system together with ground map data, vehicle road speed and yaw rate to calculate the position of the vehicle to an accuracy of several metres. After entering the desired destination and route information, the driver is guided by both visual and/or voice instructions and if, for example, a wrong turn is made, the navigation system re-calculates the route.

The XJ Series navigation display and controls are integrated into the audio unit while the XK Series has a separate integral display and controls panel located in the central fascia. The remaining equipment is common to both types of vehicle and consists of the navigation control module, the GPS antenna and the vehicle speed module. Map and associated data for a particular country or region are stored on the new technology digital versatile disc (DVD) which is loaded into the navigation system DVD reader.

System Features

A description of the navigation system facilities and operating instructions is given in the Navigation Handbooks provided with the vehicle. A brief overview of these facilities is provided here.

Destination and Route

Various types of destination information may be input by the driver using screen menus and panel controls to make selections and input text characters. Addresses may be entered or selections made from the DVD database listing 'points of interest' such as hotels, bus stations, amusement parks and other places. Other types of destination which may be requested include road intersections, map cursor locations, recent destinations or local points of interest, that is, locations within a specified radius. As well as this DVD stored data, the user may create 'memory points' which are map locations for subsequent selection as route destinations or way points.

The user can also specify route modifications to a particular destination by defining way points to split a route into sections. After a destination has been selected, roads to be avoided or utilized (e.g. all major highways) may also be specified. Further route parameters include shortest distance or time and re-route calculations.

Route Guidance

On XK Series vehicles, three types of screen guidance are available: map, arrow view or hybrid.

- The map view shows the relevant map area with the route highlighted and the arrowed vehicle: the map scrolls automatically to keep the vehicle on screen.
- The arrow view shows a diagrammatic display: as the vehicle approaches the next manoeuvre point, a detailed view of the junction is displayed with a direction arrow and distance information.
- With hybrid selected, the map and highlighted route are shown until a manoeuvre point is reached when the arrow view appears.

On XJ Series vehicles, only the arrow view type guidance display is available, though it may also be shown together with radio/audio information.

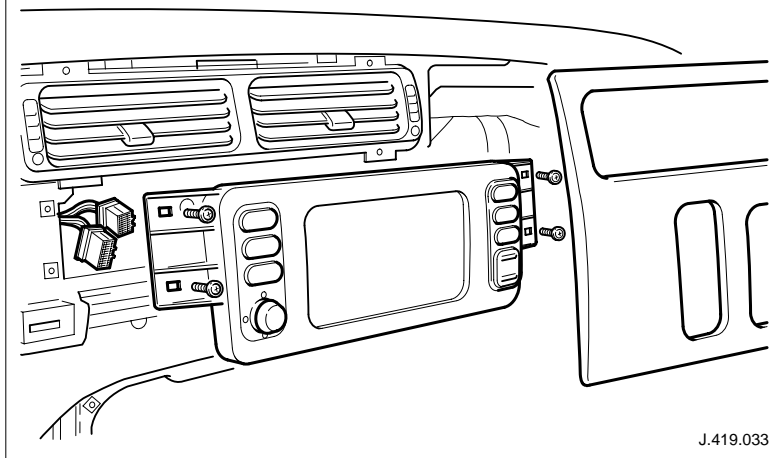
Voice Guidance

A main feature of the navigation system is the synthesised voice guidance which enables the driver to receive verbal instructions about the next manoeuvre (e.g. 'turn left'). A button on the control panel allows the user to ask the system to repeat the last instruction. The voice guidance instructions are broadcast via the audio system and may be adjusted using the MODE buttons and volume controls on the audio unit. The settings available allow the relative balance of volume between voice guidance and audio system to be varied.

Clock

A digital clock is displayed in the lower left-hand corner of the screen and is in 12-hour format. The correct time is maintained automatically from the GPS satellite signals and no adjustment is provided. Time zone and summer time settings are selectable via a screen menu and must be adjusted according to vehicle location and time of year.

XK SERIES NAVIGATION DISPLAY AND CONTROLS PANEL



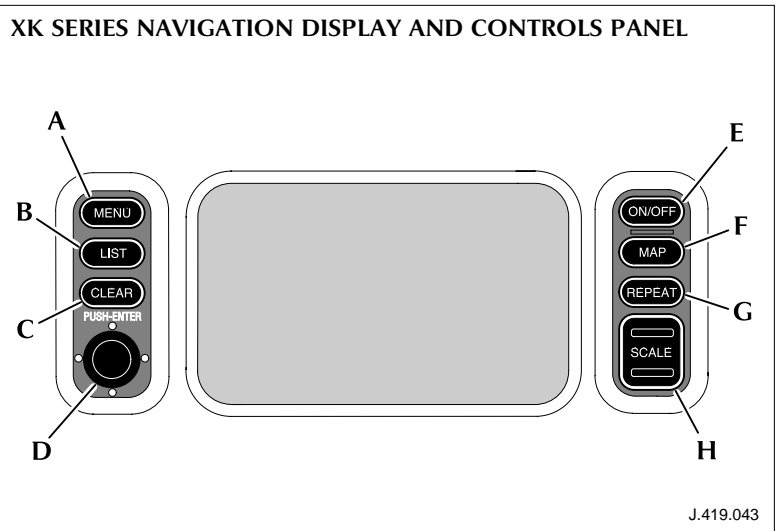
XK Series Navigation Display and Controls Panel

The drivers navigation display and controls are provided by a single integral panel which is non-serviceable. The panel fits into the central fascia area otherwise occupied by the clock, oil pressure and battery condition instruments: oil pressure and battery condition are indicated by icons on the main instrument cluster. The panel is fixed by four screws, accessible from the front, and is finished by a new clip in veneer panel with cut-outs.

Controls

All navigation information is shown in full color on the large display screen. The navigation controls are located on both sides of the screen and are as follows:

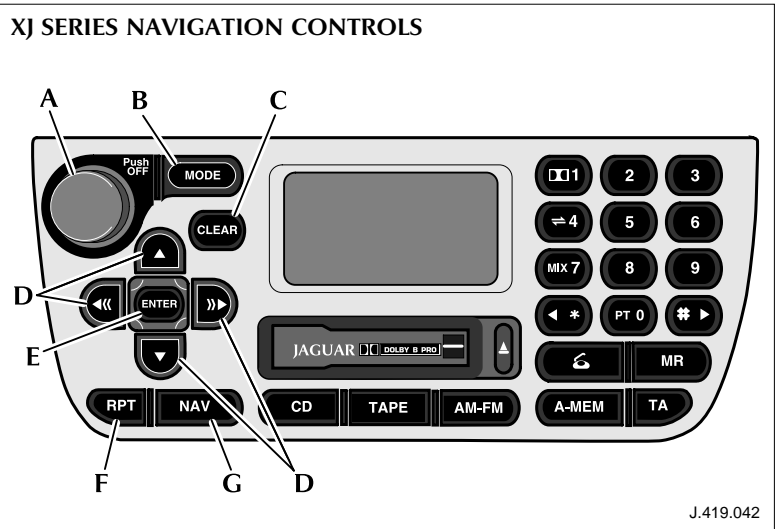
- main MENU (A) – display choice of Destination, Set-up, Options, Route
- LIST (B) – list turn information for calculated route
- CLEAR (C) – return to previous screen or change map orientation
- joystick/enter (D) – highlight menu items, characters and scrolls map: enter commands and selections
- ON/OFF (E) – turn screen on or off
- MAP (F) – switch to, or return from map display and toggle map/arrow view when under guidance
- REPEAT (G) – repeat last voice instruction
- SCALE (H) – change map scale and scrolls previous or next page



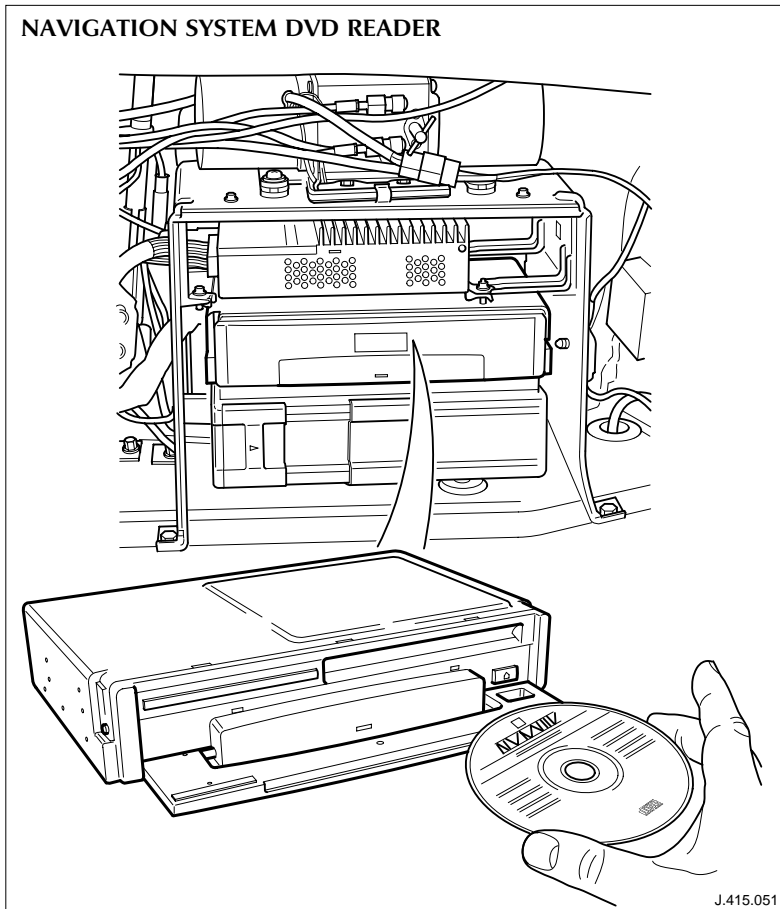
XJ Series Navigation Display and Controls

The XJ Series navigation controls and screen display are integrated with the audio unit which is physically similar to the previous unit. The LCD screen shows navigation and/or radio and audio information and is displayed in monochrome only. Navigation system controls are to the left of the screen and are as follows:

- volume control (A) – adjust audio system volume and audio/navigation voice guidance balance
- MODE button (B) – select navigation volume adjust (also audio system sound effects)
- CLEAR (C) – return to previous menu, character or text: clear screen at end of route
- four cruciform scroll keys (D) – cursor up/down and left/right
- ENTER (E) – enter command for selected menu, character or prompt acknowledge
- RPT (F) – repeat last voice instruction
- NAV (G) – activate navigation system



NAVIGATION SYSTEM DVD READER



Navigation System DVD Reader

The navigation system DVD reader is mounted between the CD changer and optional power amplifier on a modified bracket in the trunk. The DVD reader provides data storage, processing and system control and incorporates a gyrometer to measure yaw rate. The unit also receives and processes satellite information from the GPS antenna to determine the absolute position of the vehicle.

The navigation system DVD reader incorporates a digital versatile disc (DVD) drive to provide the interchangeable map data. The DVD represents the latest technology, providing approximately eight times more data on a single disc than a standard CD-ROM. This amount of data storage is an advantage in reducing the number of discs required to cover the current navigable countries: USA (1 disc), Europe (5 discs), Japan (1 disc, XK Series only).

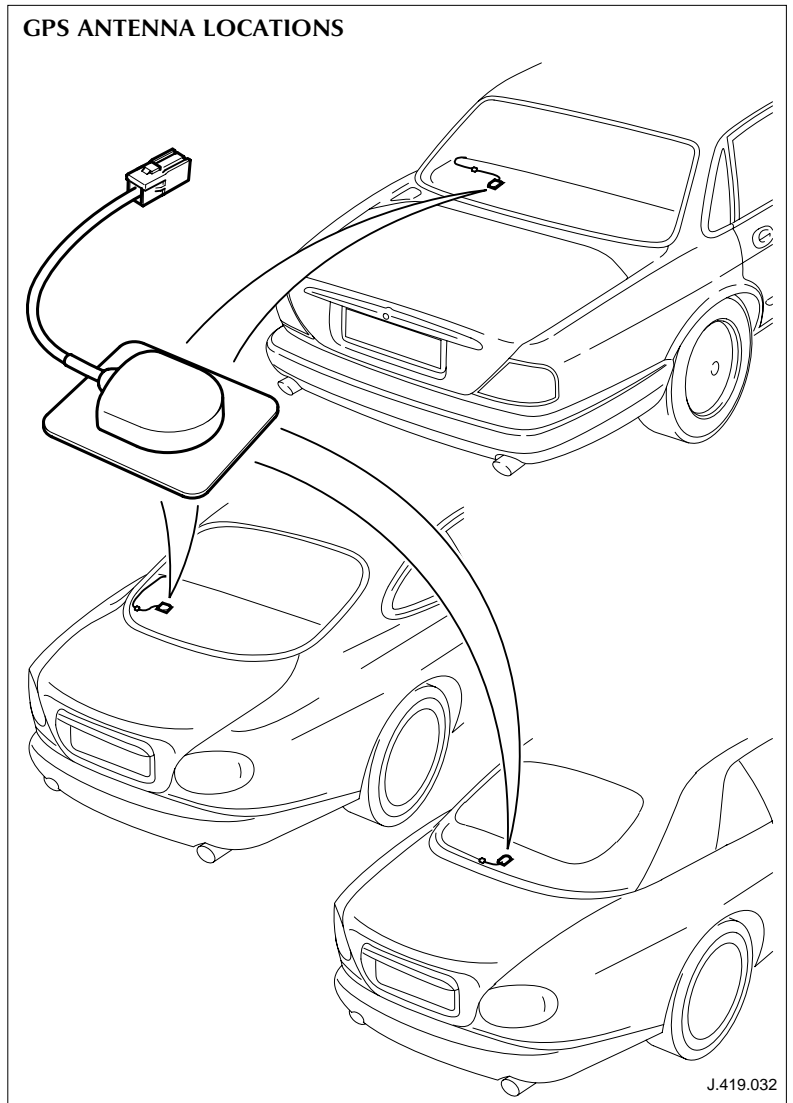
There are no controls on the DVD reader. To load the unit, the front panel is pulled down (bottom hinge) and the disc is inserted directly into the slot. Before loading a disc, always press the eject button to check if a disc is already present so as to avoid possible damage.

GPS Antenna

The satellite global positioning system (GPS) antenna is common to all models and is mounted on the rear trim shelf, as shown, to obtain best reception. The antenna output signals are connected by co-axial cable to the navigation system DVD reader. Since the antenna module contains active receiver circuits, the inner co-axial conductor also carries a 5V dc power supply from the DVD reader.

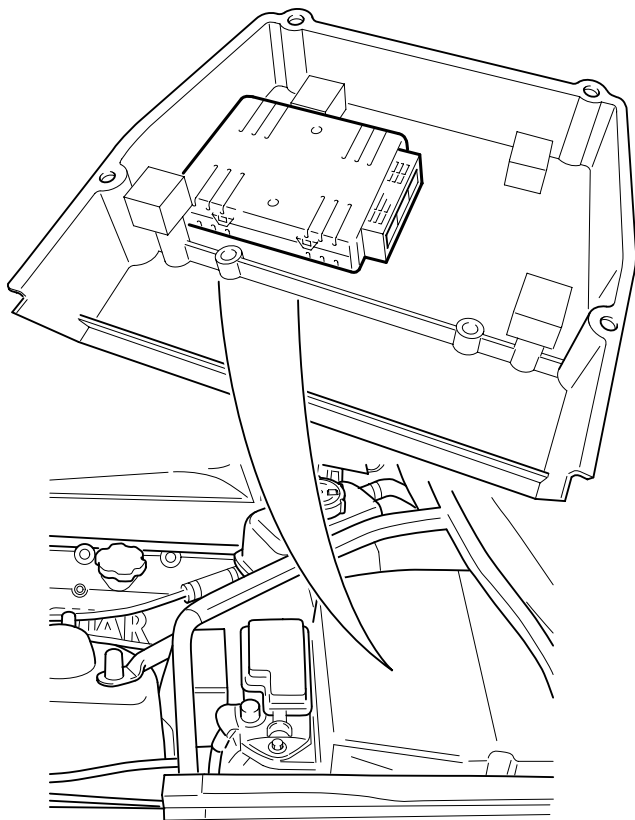
The antenna is fixed to the rear trim shelf via a self adhesive coating on the antenna mounting plate. Signal reception may be affected by the presence of metal objects or foil on or near the rear shelf or rear screen.

GPS ANTENNA LOCATIONS



J.419.032

XK SERIES VEHICLE SPEED INTERFACE MODULE



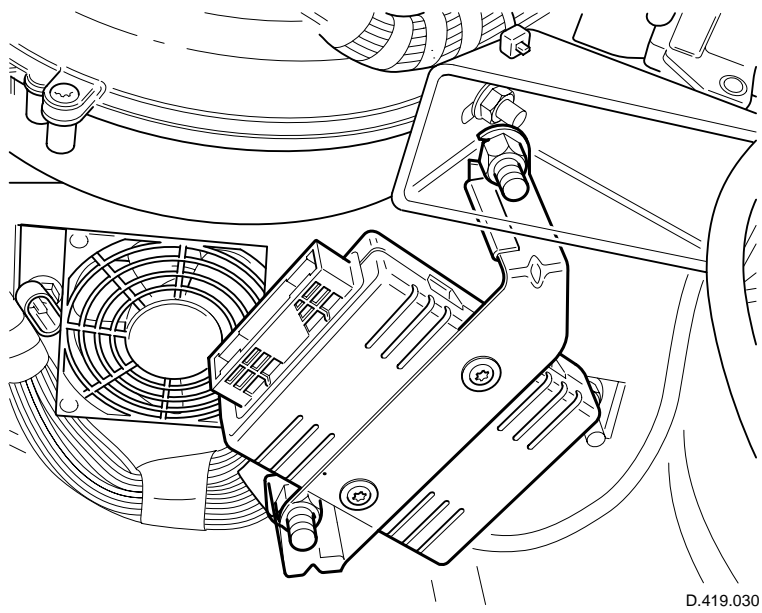
J.419.031

Vehicle Speed Interface Module

One type of data required by the navigation system is the current vehicle road speed. The ABS/traction control module calculates the vehicle speed from wheel speed sensor inputs and broadcasts the speed over the CAN data bus. To access this data, the new navigation system vehicle speed interface module is connected to the CAN bus and sends a signal with a frequency proportional to vehicle speed to the navigation system DVD reader.

The navigation vehicle speed interface module is an integral electronic unit common to both XK and XJ Series vehicles. On XK Series, the module is fixed by Velcro to the underside of the engine bay coolbox cover. On the XJ Series, the module is fitted with a bracket which is fixed to two threaded studs on the underside of the coolbox mounting plate. The bracket has fixing slots, enabling the module to be removed or fitted without fully unscrewing the securing nuts.

XJ SERIES VEHICLE SPEED INTERFACE MODULE



D.419.030

Audio and Navigation Systems Interconnections

The new audio units and navigation system DVD reader have different connectors and interface cables compared to the previous systems. The units are interconnected using new vehicle harnesses and a separate cable network unique to the Alpine system. Detailed signal routing and the various system combinations (standard or premium, with or without navigation, vehicle type) are supplied in the Electrical Guide and a brief description only of the connector functions is given here.

Audio Units

The audio units on both XK and XJ Series vehicles have the same rear panel connectors and layout:

- coaxial radio antenna input (A)
- 26-way connector (B) to telephone module and navigation system DVD reader
- 12-way connector (C) to speakers on standard audio system
- 8-way Alpine net connector (D) to navigation system DVD reader

Navigation System DVD Reader

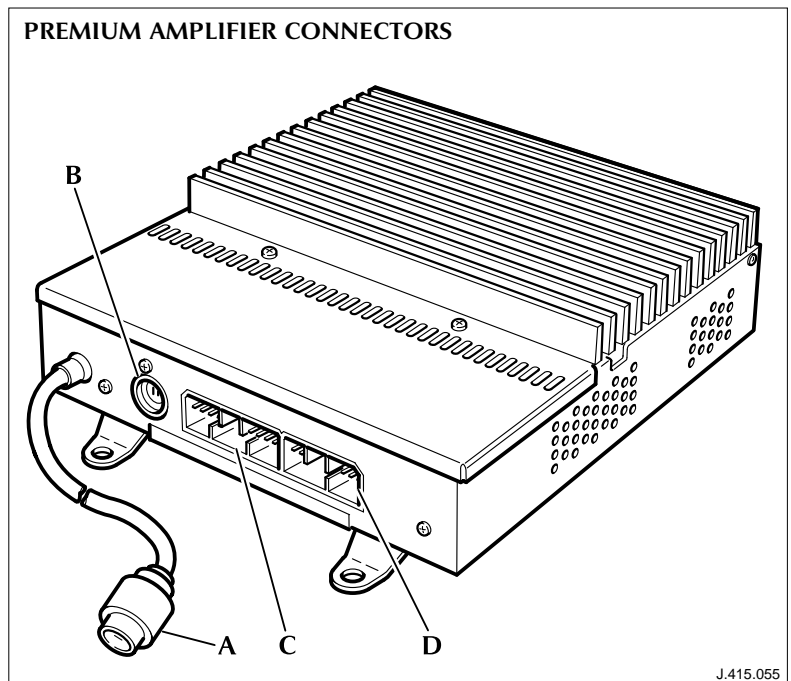
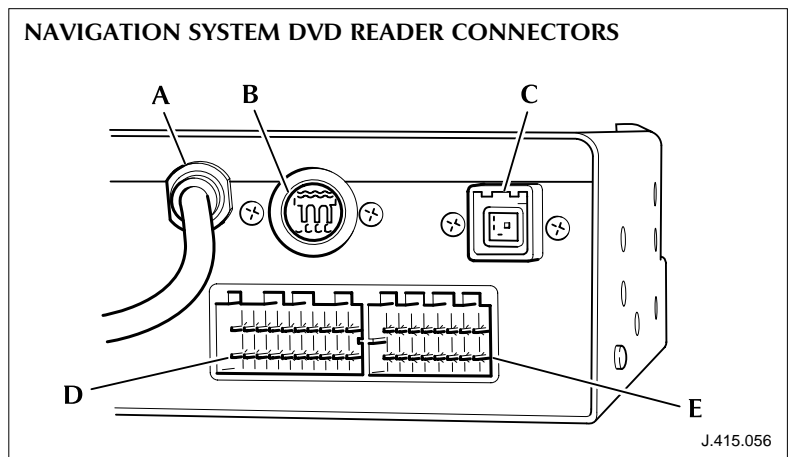
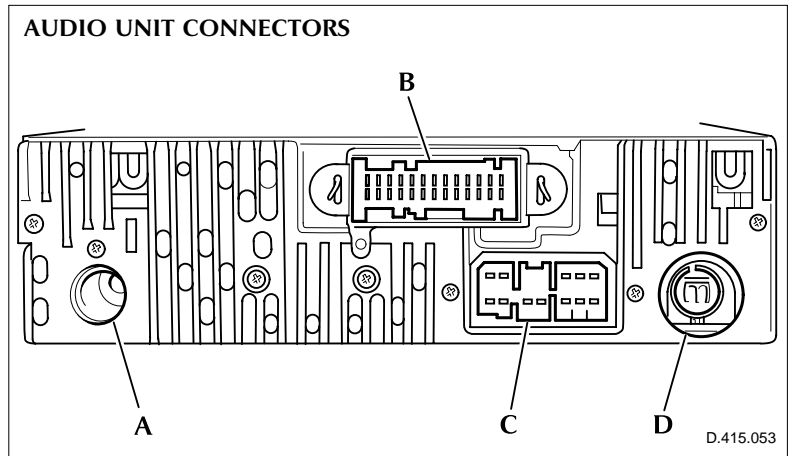
Navigation system DVD reader connectors are:

- Alpine net cable (A) to CD changer, standard system or power amplifier, premium system
- Alpine net connector (B) to audio units
- coaxial connector (C) for GPS antenna
- 20-way connector (D) – control/display interface with XK display and controls panel or XJ audio/navigation panel
- 16-way connector (E) – battery supply, audio interface with audio unit (standard system or power amplifier (premium system)

Premium Power Amplifier

The power amplifier connectors are:

- Alpine net cable (A) to the CD changer
- Alpine net connector (B) to navigation system DVD reader or to audio unit if navigation not fitted
- 18-way connector (C) to speakers
- 12-way connector (D) to battery supply, audio unit and navigation system DVD reader



Rain Sensing

The rain sensing system provides an automatic wiper action when rain is detected on the windshield. Different amounts of rain can be detected, causing a corresponding variation in wiper speed from slow intermittent to maximum continuous rate. The facility is selected at the wiper stalk by the driver and does not replace normal manual control of the wipers. The system is a common, optional feature for XJ and XK Series vehicles but note that while it is functionally similar to that fitted on the S-TYPE sedan, different components are used.

The system consists of the rain sensor, a separate rain sensing control module (RSCM) and the wiper stalk selector switch.

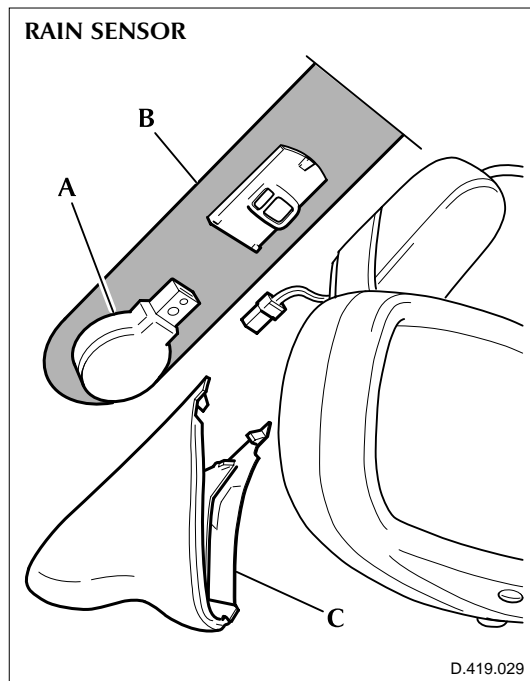
Operation

The rain sensor is an optical transducer which senses changes to infra-red light caused by the refractive effects of water droplets on the windshield. The sensor is fixed to the inside of the windshield with the sensing elements looking outwards through the glass (see above). The sensor elements consist of two groups of light emitting diodes (LED) which alternately produce the infra-red light, and a photodiode which receives the infra-red reflections from the windshield. With no moisture on the windshield, all of the infra-red light is reflected back and the sensor produces a constant 5V output.

Any rain drops falling on the sensing area of the windshield cause some of the light to be refracted and scattered via the droplets and produce a reduction and imbalance in the light received by the photodiode. These signals are analyzed in the sensor and output as low going pulses. Pulse duration is a measure of droplet size and the number of pulses is related to the number of droplets. The output from the rain sensor is taken to the rain sensing control module.

The rain sensor is an active device and incorporates the optical elements and electronic control and processing circuits. A 12V power input is supplied from the rain sensing control module.

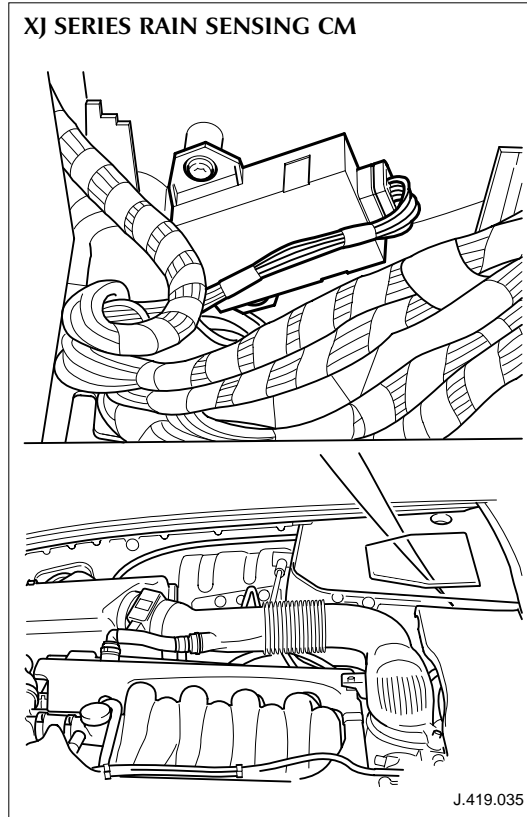
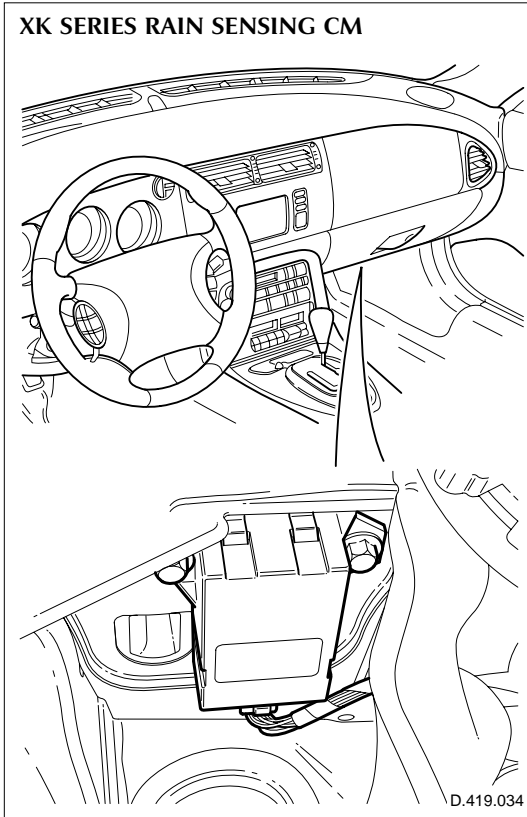
The output signals from the rain sensor are processed in the rain sensing control module to mimic the column switchgear. The module output signals are spliced to the wires from the stalk switch positions and input to the body processor module (BPM). The BPM therefore 'sees' no difference in wiper speed requests between the manual controls and the rain sensor signals.



Rain Sensor

The rain sensor (A) is fixed to the windshield by adhesive but can be easily removed if it is to be replaced. The sensor must be located within the clear circle in the obscuration band (B). The mirror assembly is modified and now has a sliding cover (C) to enclose the rain sensor.

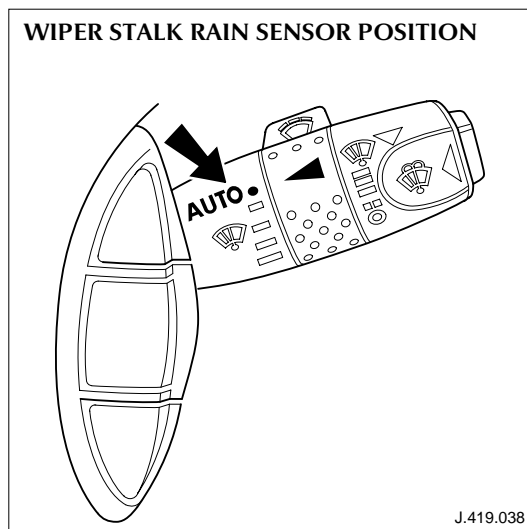
Rain Sensing Control Module



The rain sensing control module (RSCM) is an integral non-serviceable electronic unit with connections to the rain sensor and the body processor module (BPM). On the XK Series, the module is mounted on the passenger side dash panel. On the XJ Series, the module is fitted inside the engine bay cool box.

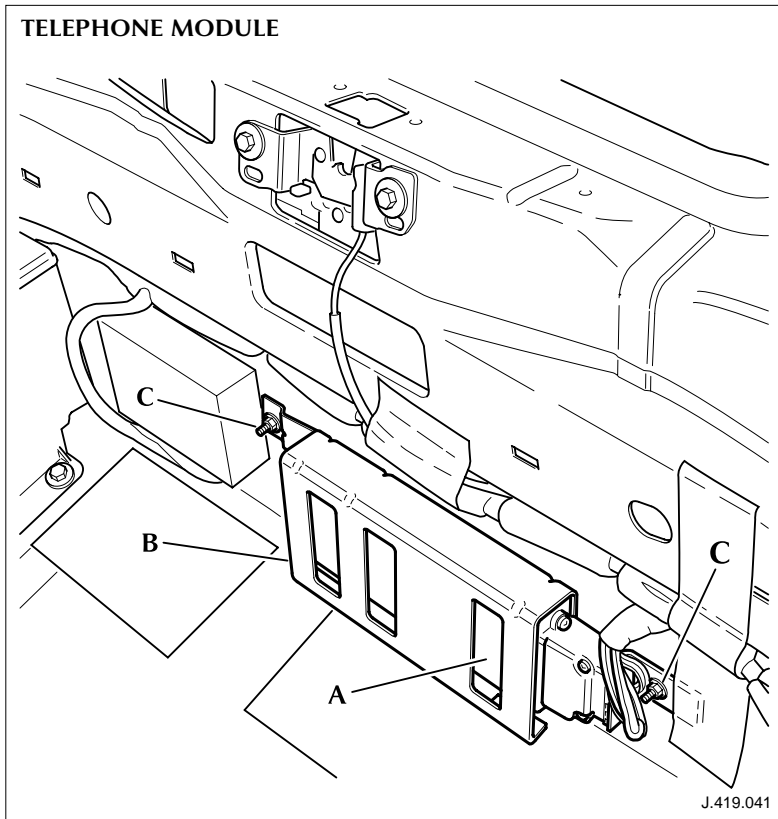
Column Stalk

The rain sensing feature is identified on the column stalk by the marked AUTO position which takes the place of the first intermittent wipe position on vehicles without rain sensing.



Telephone

Introduction of seat belt electrical pretensioners on XK Series vehicles (see **Occupant Protection** on Page 17) has required the positioning of the pretensioner control module on the transmission tunnel for optimal impact sensing. The telephone portable support electronics module is therefore re-located from the transmission tunnel to the trunk of the vehicle. The module (A) is semi-enclosed in a mounting bracket (B) fixed by two screws (C) to the trunk lower rear panel.



Security

The key head transponder now receives a rolling code to prevent any possible scanning. When the key is removed from the ignition barrel, the encrypted code within the system automatically rolls on.

