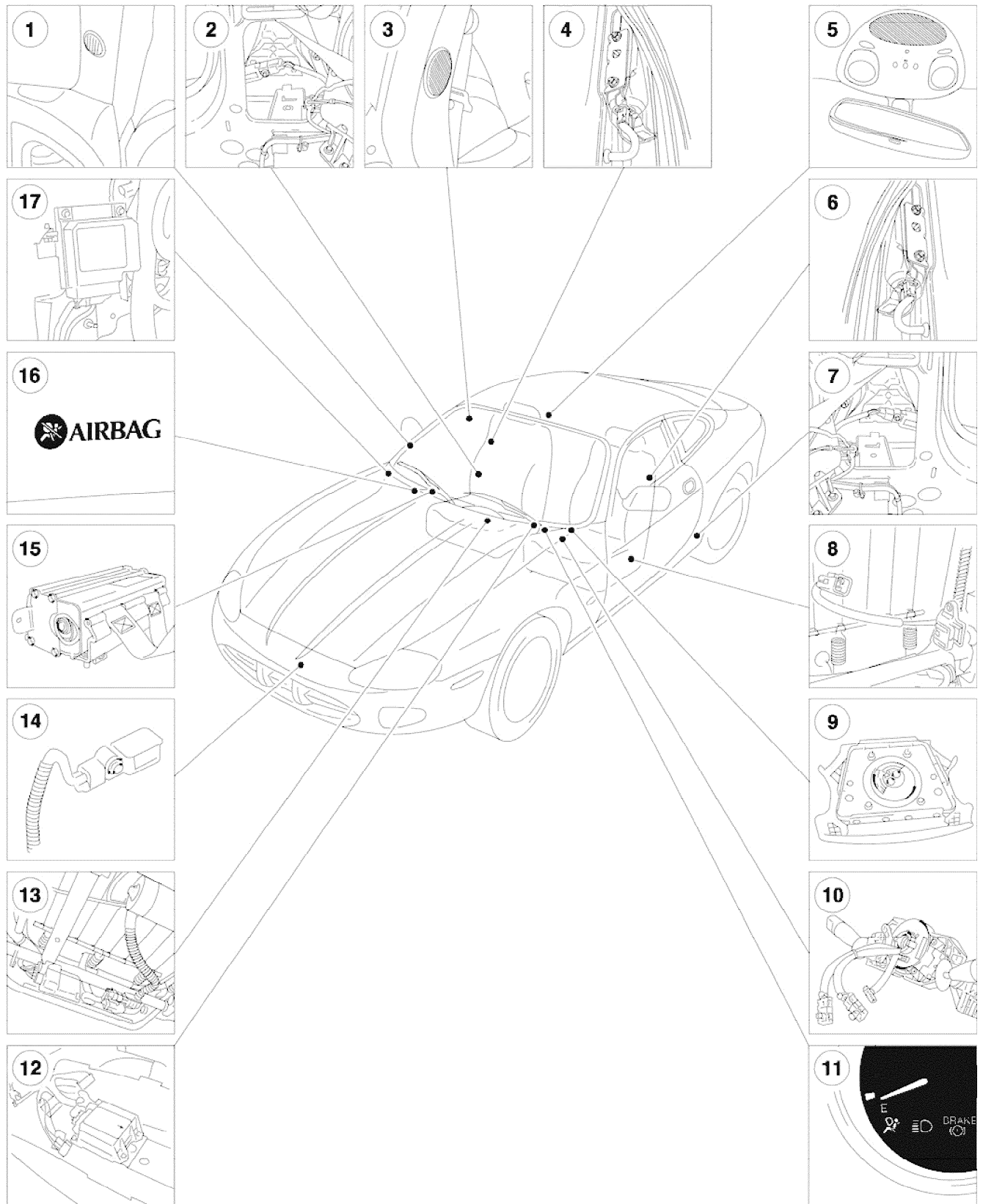


**Air Bag Supplemental Restraint System (SRS)**



E33667

**Item Description**

## 2004 XK RANGE - Supplemental Restraint System - 501-20B

1	A-Pillar occupancy sensor
2	Side impact sensor
3	B-Pillar occupancy sensor
4	Side air bag module
5	Overhead console occupancy sensors
6	Side air bag module
7	Side impact sensor
8	Driver seat track position sensor
9	Driver air bag module
10	Clock spring
11	Air bag supplemental restraint system (SRS) indicator
12	Restraint control module (RCM)
13	Front passenger seat occupant classification sensing system
14	Front crash sensor
15	Passenger air bag module
16	Passenger air bag deactivation (PAD) indicator
17	Air bag control module



### **WARNING:**

**PRIOR TO REMOVAL OF ANY SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS AND BEFORE DISCONNECTING ANY SRS ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE SHOULD BE DISCONNECTED AND A PERIOD OF AT LEAST ONE MINUTE ALLOWED TO ELAPSE. CARE SHOULD BE TAKEN WHEN HANDLING AND STORING AIR BAG MODULES.**

The SRS provides an additional level of frontal crash protection for front seat occupants. The system analyzes the occupancy scenario and crash severity before activating the appropriate safety devices to help protect a range of occupants in a variety of frontal crash situations. The system will only be activated when the ignition switch is in position II or III.

The system optimizes deployment of its components, therefore reducing the potential for air bag induced injuries, passenger air bag module deployments (particularly when the passenger front seat is unoccupied), driver air bag module deployments and side air bag module deployments.

## **Sensors**



### **WARNING:**

**PRIOR TO REMOVAL OF ANY SRS SENSORS AND BEFORE DISCONNECTING ANY SRS SENSOR ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE SHOULD BE DISCONNECTED AND A PERIOD OF AT LEAST ONE MINUTE ALLOWED TO ELAPSE.**

### **NOTE:**

The SRS sensors do not contain any serviceable components.

The SRS consists of the following sensors:

## **Occupancy Sensors**

The occupancy sensor locations are identical for both the coupe and convertible, except that since the convertible has no B-pillar the equivalent sensor is mounted in the rear quarter trim capping. The four sensors are strategically placed to detect the presence and movement of the passenger front seat occupant.

The occupancy sensor system uses ultrasound at an operating frequency of 40 kHz to monitor passenger front seat occupancy. The SRS uses four ultrasonic sensors, one at the A-pillar, one at the B-pillar and two in the overhead console. The sensors determine the presence and position of the passenger front seat occupant with respect to the passenger air bag module finish panel. The sensors determine air bag module deployment decisions by classifying occupants as either 'in position' or 'out of position'. The sensors are part of a system that is sophisticated enough to be unaffected by body extremities (hands and feet) and respond only to head or body movements.

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Obstruction of any sensor for an extended period of time, or repeated key cycles will cause the system to log a 'blocked' code and will illuminate the SRS indicator. Subsequent clearance of the obstruction will reinstate the SRS indicator, but the code will remain logged.

## Side Impact Sensors

The side impact sensors are mounted on a bracket attached to the vehicle body, behind each front safety belt retractor. They consist of processing circuits and an accelerometer. They do not make deployment decisions.

## Seat Position Sensor

The seat position sensor is a 'hall effect' type sensor and is mounted on the underside of the driver seat. It is actuated by a steel blade that is attached to the seat slide. The magnetic field disturbance caused, when the steel blade passes through the sensor, creates an output signal for the RCM. On receipt of this signal, which indicates when the seat is forward of a defined point in its travel, the RCM disables the second stage output of the driver air bag module. Malfunction of the sensor or associated circuits will cause the SRS indicator to illuminate.

## Front Passenger Seat Occupant Classification Sensing System

### NOTE:

The front passenger seat occupant classification sensing system does not contain any serviceable components.

Individual components of the front passenger seat occupant classification sensing system are not serviceable. The system must be replaced as a complete unit and due to its sophistication, each replacement system requires calibration, so to avoid the need to provide calibration equipment to each dealer, a pre-calibrated service kit is available. The following components are combined and calibrated during manufacture to form the front passenger seat occupant classification sensing system:

- Front passenger seat cushion
- Silicone filled bladder
- Front passenger seat occupant classification sensor control module
- Front passenger seat occupant classification sensor

The front passenger seat occupant classification sensor control module is mounted under the passenger front seat. The silicone filled bladder is integrated into the seat cushion and the front passenger seat occupant classification sensor, which is attached to the bladder, is mounted under the seat.

The silicone filled bladder responds to weight changes on the passenger front seat. The front passenger seat occupant classification sensor responds to these pressure changes and provides an appropriate signal to the front passenger seat occupant classification sensor control module. The front passenger seat occupant classification sensor control module processes the input signal received from the front passenger seat occupant classification sensor and makes it available to the RCM via the controller area network (CAN). In addition, the front passenger seat occupant classification sensor control module performs self-diagnostic functions on the system, with any malfunctions being notified to the RCM accordingly.

The front passenger seat occupant classification sensing system responds to the occupancy of the passenger front seat in accordance with the following:

- Passenger front seat status 'EMPTY' — Passenger air bag module status 'OFF' — Passenger air bag deactivation (PAD) indicator 'OFF'
- Passenger front seat status 'OCCUPIED' (small occupant) — Passenger air bag status 'OFF' — PAD indicator 'ON'
- Passenger front seat status 'OCCUPIED' (large occupant) — Passenger air bag status 'ON' — PAD indicator 'OFF'

The SRS via the RCM, monitors and processes data from the front passenger seat occupant classification

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sensing system and several other sensors before making a deployment decision. Malfunction of the front passenger seat occupant classification sensing system or associated circuits will cause the SRS indicator to illuminate.

## Crash Sensor

The crash sensor is mounted on a bracket which is located on the left-hand side of the radiator upper mounting member. It collects acceleration data from the front of the vehicle and sends it back to the RCM as an analogue signal. It provides the main source of data that enables the RCM to gauge the severity of a frontal impact.

## Safety Belt Buckle Sensor

The safety belt buckle sensor is a 'hall effect' type sensor which provides an output signal in response to the magnetic field disturbance caused by the insertion of the safety belt tongue into the buckle. The output signal from the safety belt buckle sensor is used by the RCM to determine whether the front seat occupants are correctly restrained. It is used in conjunction with other components of the SRS to ensure that relevant air bag module and safety belt pretensioner deployment only occurs where necessary. It also forms an integral part of the electrical comfort system. <<501-20A>><<501-20B>> Malfunction of the sensor or associated circuits will cause the SRS indicator to illuminate.

## Modules



### **WARNING:**

**PRIOR TO REMOVAL OF ANY SRS MODULES AND BEFORE DISCONNECTING ANY SRS MODULE ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE SHOULD BE DISCONNECTED AND A PERIOD OF AT LEAST ONE MINUTE ALLOWED TO ELAPSE.**

### **NOTE:**

The SRS modules do not contain any serviceable components.

The SRS consists of the following modules:

## Restraints Control Module (RCM)

### **NOTE:**

Due to the importance of the RCM being securely fixed to the vehicle body, the ground connection is made via the fixings and is monitored by the diagnostic system.

The RCM is mounted on the top of the drive shaft tunnel below the center console. It identifies crash severity, the direction of impact and makes decisions on deployment of air bag modules and front safety belt pretensioners. It also provides firing signals to all air bag modules and front safety belt pretensioners.

The RCM controls air bag deployment decisions by using signals from its internal accelerometer and the following:

- Crash sensor
- Occupancy sensors
- Front safety belt buckle sensor
- Seat position sensor
- Front passenger seat occupant classification sensing system
- Air bag control module

Internally, the RCM has two areas that determine which elements of the SRS are to be deployed:

- Crash severity evaluation — This area evaluates crash severity by using data from the RCM internal accelerometer, the crash sensor and the safety belt buckle sensor. Based on this data, the RCM decides which level of air bag module deployment is required and forwards the information to the second area, the

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deployment handler.

- Deployment handler — The status of the seat position sensor, occupancy sensors, front passenger seat occupant classification sensing system and safety belt buckle sensors are examined before a decision is made about which restraints should finally be deployed. For instance, if the occupancy sensing and front passenger seat occupant classification sensing system indicate that the passenger front seat is empty, then no restraint deployment will take place on the passenger side, even if full deployment takes place on the driver side.

Data from the side impact sensors is used by the RCM in conjunction with acceleration data from the RCM internal accelerometer to make a deployment decision. The RCM processes the acceleration data and subject to an impact being of high enough severity, decides whether the side air bag module should be deployed. The decision is forwarded to the deployment handler (within the RCM) which responds appropriately. For example, in the case that the front passenger seat occupant classification sensing system calculates that the seat is empty, or occupied by a small person, the passenger side air bag module will be disabled.

On board testing of the air bag modules, front safety belt pretensioner firing circuits, warning indicator circuits and air bag module status (the crash sensor and side impact sensor perform basic self-tests) is performed by the RCM together with the storing of fault codes.

The RCM drives the SRS indicator on the instrument pack. If the warning lamp fails, a fault code is recorded and a warning tone is sounded. It also provides a temporary back-up power supply to operate the air bag modules in the event that in crash conditions, the battery supply is lost. In the event of a crash, it records certain data such as deceleration information, firing delay and fault codes for subsequent access via the diagnostic connector.

## Driver Air Bag Module

### NOTE:

Variation in the driver air bag module deployment is determined by the timing of the first and second stage ignition signals. This facilitates adaptation of the stiffness and timing of the air bag module to optimize occupant protection.

The driver air bag module is controlled by the RCM which chooses between first or second stage deployment, depending on the occupant position and the crash severity. To reduce the risk of an air bag module induced injury to a driver that is positioned close to the steering wheel, the air bag module deploys radially. It has a non-azide propellant that reduces particulates and effluents. It consists of a twin stage inflator (as opposed to a single stage inflator) with separate chambers for the two inflation stages, each being independently activated by the RCM. It has two air bag electrical connectors that have foolproof mechanical keying and are color coded to the respective connector on the inflator.

## Passenger Air Bag Module

### NOTE:

Variation in the passenger air bag module deployment is determined by the timing of the first and second stage ignition signals. This facilitates adaptation of the stiffness and timing of the air bag module to optimize occupant protection.

The passenger air bag module is controlled by the RCM which chooses between first or second stage deployment, depending on the occupant status and the crash severity. It consists of a twin stage inflator (as opposed to a single stage inflator) with two air bag electrical connectors to accommodate the twin stage inflation.

The heated gas inflator consists of a high-pressure mix of clean air and hydrogen gas, triggered by two separate ignition squibs. It produces a controlled generation of clean gas to rapidly fill the air bag. It is classified as a stored flammable gas (not as an explosive) and as such, has less restrictive storage and transportation requirements. It produces a very clean burn and almost no particulates and is almost free of any toxins, making disposal or recycling much easier.

## Side Air Bag Module

### NOTE:

In the event of a side impact that is sufficient to deploy the side air bag module, it will be necessary to

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replace the complete seat. The side air bag module does not contain any serviceable components.

The side air bag module is mounted in the outboard bolster of each front seat and uses compressed argon to inflate. It provides protection for the thorax (the part of the trunk between the neck and the abdomen) and head. In an air bag deployment situation, it deploys through the stitch seam in the side bolster. To ensure the air bag always emerges at the same point, a chute is attached to the inside of the trim cover and wrapped around the air bag module.

## Air Bag Control Module

The air bag control module is located on the right-hand side of the instrument panel. It constantly monitors and processes signals received from the occupancy sensors and makes data available to the RCM, via the CAN network.

Data from the sensors is correlated by the air bag control module and used to decide when the passenger front seat occupant has leaned into an area in front of the passenger air bag deployment door, known as the 'keep-out zone'. The system is sophisticated enough to be unaffected by body extremities (hands and feet) and respond only to head or body movements. When the passenger leans forward into the zone, the system will disable the passenger air bag module and provide visual confirmation by illuminating the PAD indicator.

## Indicators



### **WARNING:**

**PRIOR TO REMOVAL OF ANY SRS INDICATORS AND BEFORE DISCONNECTING ANY SRS INDICATOR ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE SHOULD BE DISCONNECTED AND A PERIOD OF AT LEAST ONE MINUTE ALLOWED TO ELAPSE.**

### **NOTE:**

The SRS indicators do not contain any serviceable components.

The SRS consists of the following indicators:

## Supplemental Restraint System (SRS) Indicator

The SRS indicator is located in the instrument pack and is driven by the RCM. Malfunction of SRS components or associated circuits will cause the SRS indicator to illuminate. If the warning lamp fails, a fault code is recorded and a warning tone is sounded.

## Passenger Air Bag Deactivation (PAD) Indicator

The passenger air bag module finish panel has a built in lens that displays the passenger air bag module deactivated symbol. The symbol is backlit by the PAD indicator, which is attached to the passenger air bag module finish panel mounting bracket. The illumination of the symbol informs the front seat occupants whether or not the passenger air bag module has been deactivated by the occupancy sensing system.

## Clockspring



### **WARNING:**

**PRIOR TO REMOVAL OF THE CLOCKSPRING AND BEFORE DISCONNECTING ANY CLOCKSPRING ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE SHOULD BE DISCONNECTED AND A PERIOD OF AT LEAST ONE MINUTE ALLOWED TO ELAPSE.**

### **NOTE:**

The clockspring does not contain any serviceable components.

The clockspring is located on the steering column, behind the steering wheel and it transfers electrical signals from the SRS system to the driver air bag module.