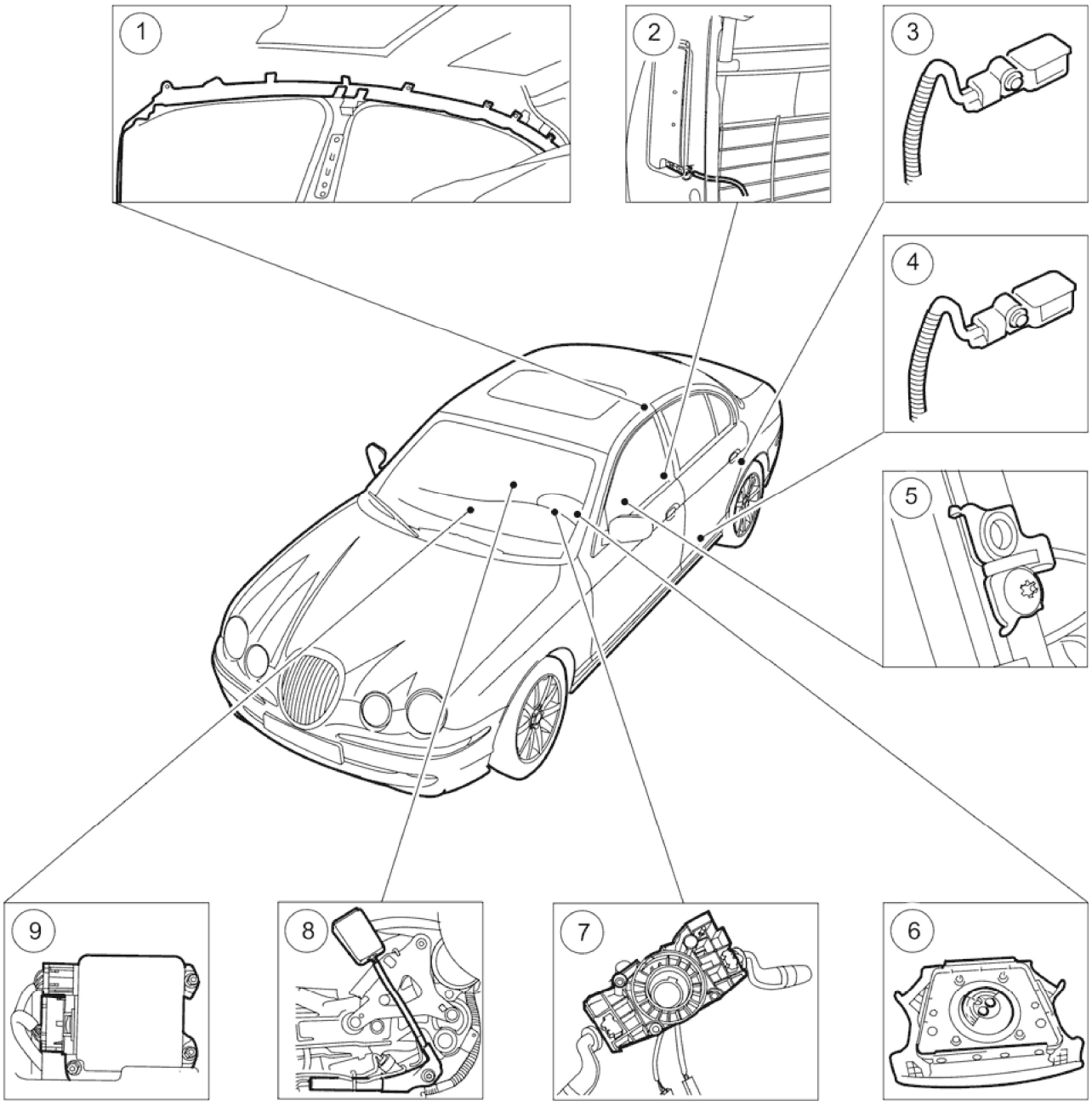
Air Bag Supplemental Restraint System (SRS)

The air bag supplemental restraint system (SRS) is designed to provide increased collision protection for vehicle occupants in addition to that provided by the three-point safety belt system. Safety belt use is necessary to obtain the best occupant protection and to receive the full advantages of the SRS.

The air bag supplemental restraint system (SRS) components are shown in the following illustrations.

Air Bag Supplemental Restraint System (SRS) Components

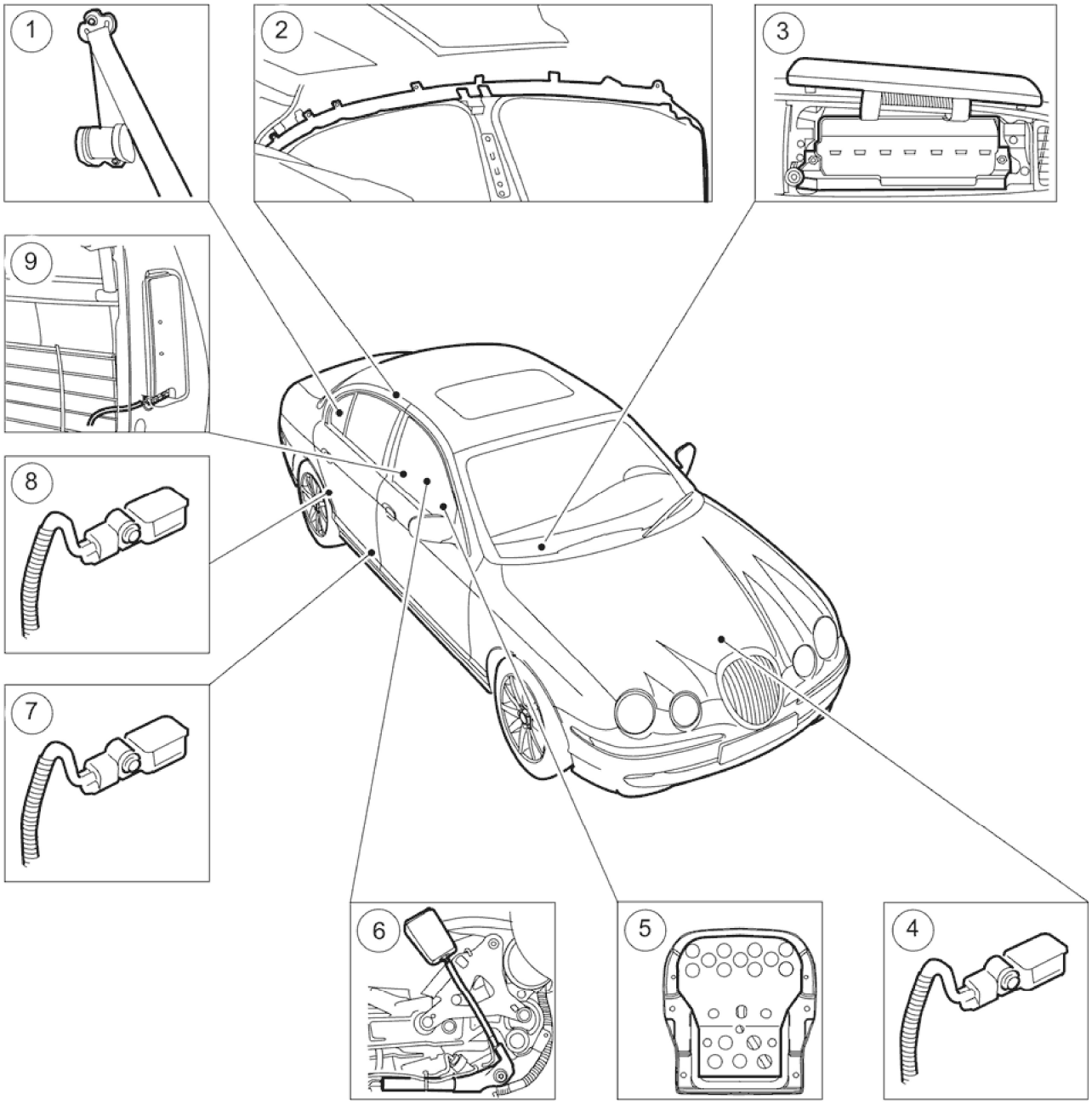


VUJ0005714

Item	Description

1	Side air curtain module
2	Side air bag module
3	C-Pillar side impact sensor
4	B-Pillar side impact sensor
5	Seat position sensor
6	Driver air bag module
7	Clockspring
8	Safety Belt pretensioner
9	Restraints control module (RCM)

Air Bag Supplemental Restraint System (SRS) Components



VUJ0005715

Item **Description**

1	Rear safety belt retractor and pretensioer
2	Side air curtain module
3	Passenger air bag module
4	Crash sensor
5	Front passenger seat occupant classification sensor
6	Front safety belt pretensioner
7	B-Pillar side impact sensor
8	C-Pillar side impact sensor
9	Side air bag module

Sensors

WARNING:
PRIOR TO THE REMOVAL OF ANY SRS SENSORS AND BEFORE DISCONNECTING ANY SRS SENSOR ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE MUST BE DISCONNECTED AND A PERIOD OF ONE MINUTE ALLOWED TO ELAPSE.

NOTE:
The SRS sensors do not contain any serviceable components.

The SRS consists of the following sensors:

Occupant Position Sensors

The four sensors are strategically placed to detect the presence and movement of the passenger front seat occupant.

The occupant position sensor system uses ultrasound at an operating frequency of 40 kilohertz to monitor the passenger front seat occupant. The SRS uses four ultrasonic sensors, one in the A-pillar, one at the top of the instrument panel console and two in the headliner. The sensors determine the presence and position of the passenger front seat occupant with respect to the passenger air bag deployment door. The sensors determine passenger air bag module deployment decisions by classifying occupants as either 'in position' or 'out of position' according to the predetermined 'keep out zone'. 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.

Crash Sensor

The crash sensor is attached to the body behind the radiator grille. The restraints control module (RCM) processes the crash data sent by the crash sensor against stored data, and deploys the front air bags.

Side Impact Sensors

The side impact sensors are mounted at the base of the B-pillars and C-pillars to facilitate lateral impact sensing. In the event of a side impact, the RCM processes the crash data against the stored data. The RCM will deploy the side air bag module, safety belt pretensioners and side air curtain module on the side the deployment request was initiated.

Seat Position Sensor

The seat position sensor is located on the driver seat track. The seat position sensor determines the position of the driver seat, which is then communicated to the RCM. If the driver seat is in the forward position, the driver air bag module second stage is disabled.

Front Passenger Seat Occupant Classification Sensor

NOTE:

The front seat occupant classification sensor is serviced as a calibrated assembly.

Individual components of the front seat passenger weight 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 seat passenger weight sensing system:

- Passenger seat cushion
- Silicone filled bladder
- Weight sensing control module
- Pressure sensor

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

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

- Passenger front seat status 'EMPTY' — Passenger air bag 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 seat passenger weight sensing system and several other sensors before making a deployment decision. Malfunction of the sensing system or associated circuits will cause the SRS indicator to illuminate.

Front Safety Belt Buckle Sensors

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 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 air bag module and safety belt pretensioner deployment only occurs where necessary. **<<501-20A>><<501-20B>>** . Malfunction of the sensor or associated circuits will cause the SRS indicator to illuminate.

Modules

WARNING:
PRIOR TO THE REMOVAL OF ANY SRS MODULE AND BEFORE DISCONNECTING ANY SRS MODULE ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE MUST BE DISCONNECTED AND A PERIOD OF 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)

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

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

- Crash sensor
- Side impact sensors
- Occupant position sensors
- Front safety belt buckle sensor
- Seat position sensor
- Front passenger seat occupant classification system

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 deployment handler.
- Deployment handler — The status of the seat track position sensor, occupant position sensors, front passenger seat occupant classification sensor and safety belt buckle sensors are examined before a decision is made about which restraints should finally be deployed. For instance, if the occupant position sensors and front passenger seat occupant classification sensor indicate that the front passenger 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 crash 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 sensor 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 module status (the crash and side impact sensors 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 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 two stage inflator with separate chambers for the two inflation stages, each being independently activated by the RCM. It has two electrical connectors that 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 two stage inflator with two air bag electrical connectors to accommodate the two 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 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). 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.

Side Air Curtain Module

NOTE:
In the event of a side impact that is sufficient to deploy the side air curtain module, it will be necessary to replace the headliner, A-pillar and C-pillar trim panels and the B-pillar upper trim panel will require thorough examination for visible damage or deformation before it can be used again on the vehicle.

NOTE:
The side air bag module does not contain any serviceable components.

The side air curtain modules are located under the headliner between the A and C-pillar and deploy at the same time as the corresponding side air bag module. If the passenger air bag module is deactivated the corresponding side air bag module is also deactivated, however the side air curtain module will still deploy to afford protection to any corresponding rear occupant. When deployed, the side air curtain extends down to approximately shoulder height to protect both the front and rear occupants heads. Both the front and rear of the side air curtain modules are retained to the A and C-pillar respectively by tethers.

Pretensioners

WARNING:
PRIOR TO THE REMOVAL OF ANY SRS PRETENSIONERS AND BEFORE DISCONNECTING ANY SRS PRETENSIOER ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE MUST BE DISCONNECTED AND A PERIOD OF ONE MINUTE ALLOWED TO ELAPSE.

NOTE:
The SRS pretensioners do not contain any serviceable components.

The SRS consists of the following pretensioners:

Safety Belt Buckle Pretensioners

The front safety belt buckle and pretensioners are seat mounted and incorporate a safety buckle switch. In the event of a front or side impact the RCM will deploy the pretensioners provided the safety belt buckles are fastened. The safety belt buckle pretensioners have a lower deployment threshold than that required by the air bags. Hence it is possible during a minor collision, which exceeds the deployment threshold, that only the safety belt buckle pretensioners will deploy. The RCM receives information on the status of the safety belt buckles from a switch contained in the buckle. **<<501-20A>><<501-20B>>**

Rear Safety Belt Pretensioners

Each rear safety belt incorporates a pretensioner device. In the event of low/high speed frontal impact, these provide additional occupant protection by removing any excess slack from the safety belts. Safety belt pretensioners activate when a frontal impact of sufficient force occurs. Under such an impact, the restraints control module installed on the transmission tunnel sends a firing signal to each pretensioner. Receipt of this signal by each pretensioner directly triggers a pyrotechnic igniter unit. The resulting detonation propels a train of steel balls through a tube and directed onto an impeller mounted on the reel spindle. Rapid rotation of the impeller simultaneously rotates the seat belt reel, retracting any slack. The seat belt retractors and pretensioners are not serviceable components and dismantling must not be attempted as active pretensioning components contain a solid, flammable material. **<<501-20A>><<501-20B>>**

Indicators

WARNING:
PRIOR TO THE REMOVAL OF ANY SRS INDICATORS AND BEFORE DISCONNECTING ANY SRS INDICATOR ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE MUST BE DISCONNECTED AND A PERIOD OF ONE MINUTE ALLOWED TO ELAPSE.

NOTE:
The SRS indicators do not contain any serviceable components.

The SRS consists of the following indicators:

SRS Indicator

The SRS indicator is located in the instrument cluster 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 Module Deactivation (PAD) Indicator

The passenger air bag deployment door 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 instrument panel. 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 THE REMOVAL OF THE SRS CLOCKSPRING AND BEFORE DISCONNECTING ANY SRS CLOCKSPRING ELECTRICAL CONNECTORS, THE BATTERY GROUND CABLE MUST BE DISCONNECTED AND A PERIOD OF ONE MINUTE ALLOWED TO ELAPSE.

NOTE:
The SRS clockspring does not contain any serviceable components.

The clockspring is designed to carry signals between the RCM and the driver air bag module. The clockspring is fitted to the steering column , and consists of fixed and moving parts connected by a coiled tape with integral conducting tracks. The tape is able to 'wind up' and 'unwind' as the steering wheel (to which the moving part is attached) is turned, maintaining electrical contact at all times between the RCM and the driver air bag module.