

### SUPPLEMENTARY RESTRAINT SYSTEMS (SRS)

The SRS system is basically carry over from S-Type 2002.5 MY. The main changes are:

- Increased volume of passenger air bag
- The inflators of the side curtain air bags are located on the D-E pillars
- Rear outer seat belt retractors have a comfort feature which reduces the retraction tension of the seat belt when it is fastened. (Vehicles fitted with rear electric seats only)
- Front passenger seat belt retractor has automatic locking retraction (ALR) and a seat belt tension sensor.

#### System Overview

The supplementary 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.

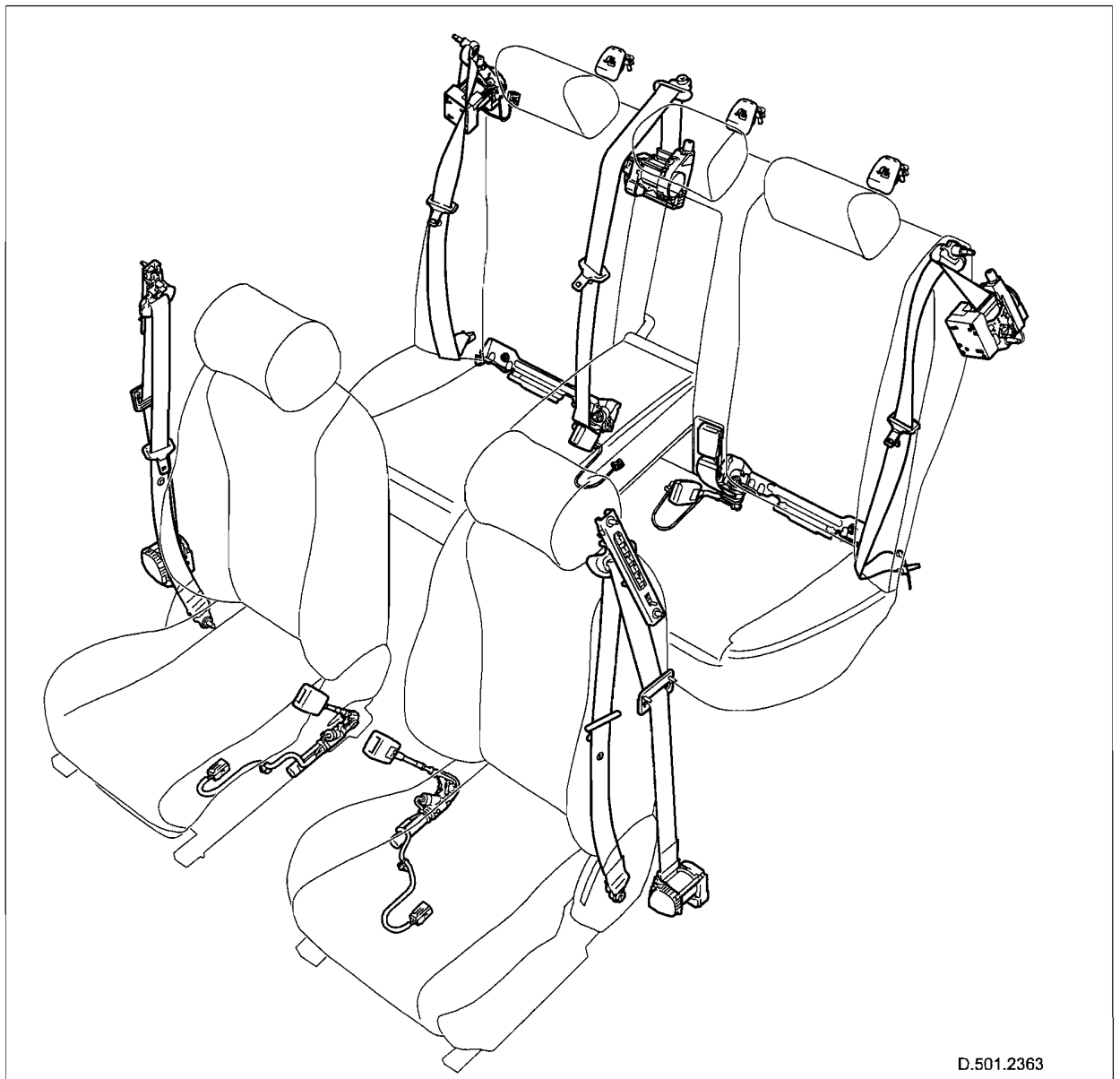
The SRS components for the XJ-range are similar to 2002.5 MY S-TYPE.

#### WARNING:

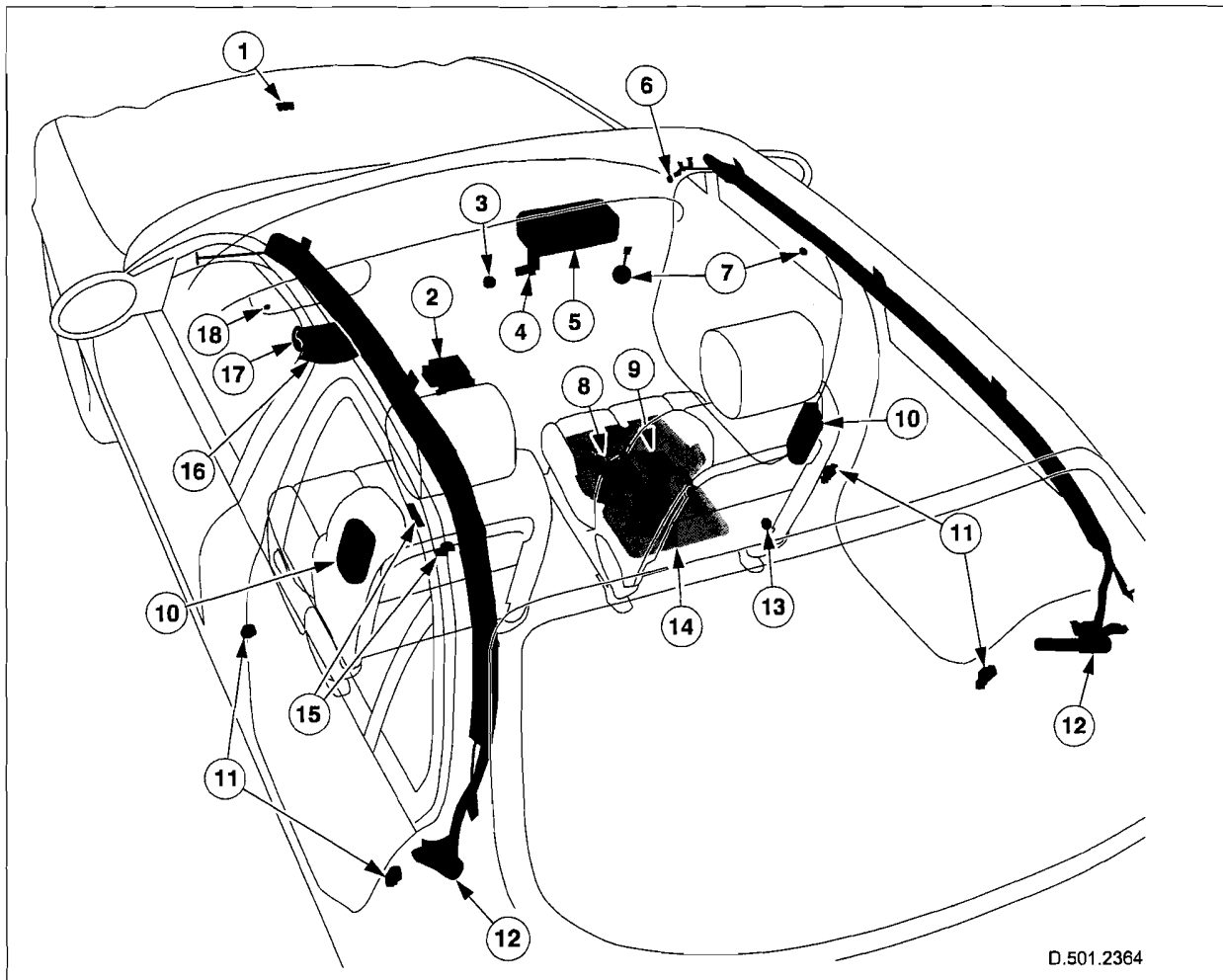
Prior to removal of any SRS components and before disconnecting any SRS sensor electrical connectors, the battery ground cable should be disconnected and a period of two minutes allowed to elapse.

#### NOTE:

The SRS components do not contain any serviceable components



**Fig. 14 Active restraint component location**



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**Fig. 15 Passive restraint component location**

- |  |                           |
|--|---------------------------|
| 1. Front crash sensor                            | 16. Driver air bag module |
| 2. Restraint control module                      | 17. Clock spring          |
| 3. Occupancy sensor - center console             | 18. SRS indicator lamp    |
| 4. Passenger air bag deactivation indicator lamp |                           |
| 5. Passenger air bag module                      |                           |
| 6. Occupancy sensor - A-post                     |                           |
| 7. Occupancy sensors - headlining                |                           |
| 8. Occupancy sensing module                      |                           |
| 9. Passenger seat weight-sensing module          |                           |
| 10. Seat-mounted side air bag module             |                           |
| 11. Side-impact sensors                          |                           |
| 12. Side-curtain air bag                         |                           |
| 13. Belt tension sensor (where applicable)       |                           |
| 14. Passenger seat weight-sensing bladder        |                           |
| 15. Seat-track position sensor                   |                           |

### Occupancy sensing system

The front passenger seat is continually monitored by four ultra sonic sensors and a seat weight sensor to determine the seat occupancy. Where no seat occupancy is determined then the passenger seat air bag will be deactivated.

### Occupant position sensor

There are four occupant position sensors strategically placed to confirm that the front passenger is properly seated as recommended. They will detect movement of the passenger front seat occupant.

The occupant position sensor system uses ultrasound at an operating frequency of 40 kHz to monitor the seating position of the passenger front seat occupant.

The recommended seating position of the front passenger occupant is:

- Always sit centrally in the seat, remaining in contact with the back of the seat
- Adjust the seat as far back from the instrument panel as is practical
- Always wear a seat belt.

The SRS occupant position sensors are located as follows:

- One in the passenger A-pillar
- One at the top of the instrument panel console
- Two in the headliner.

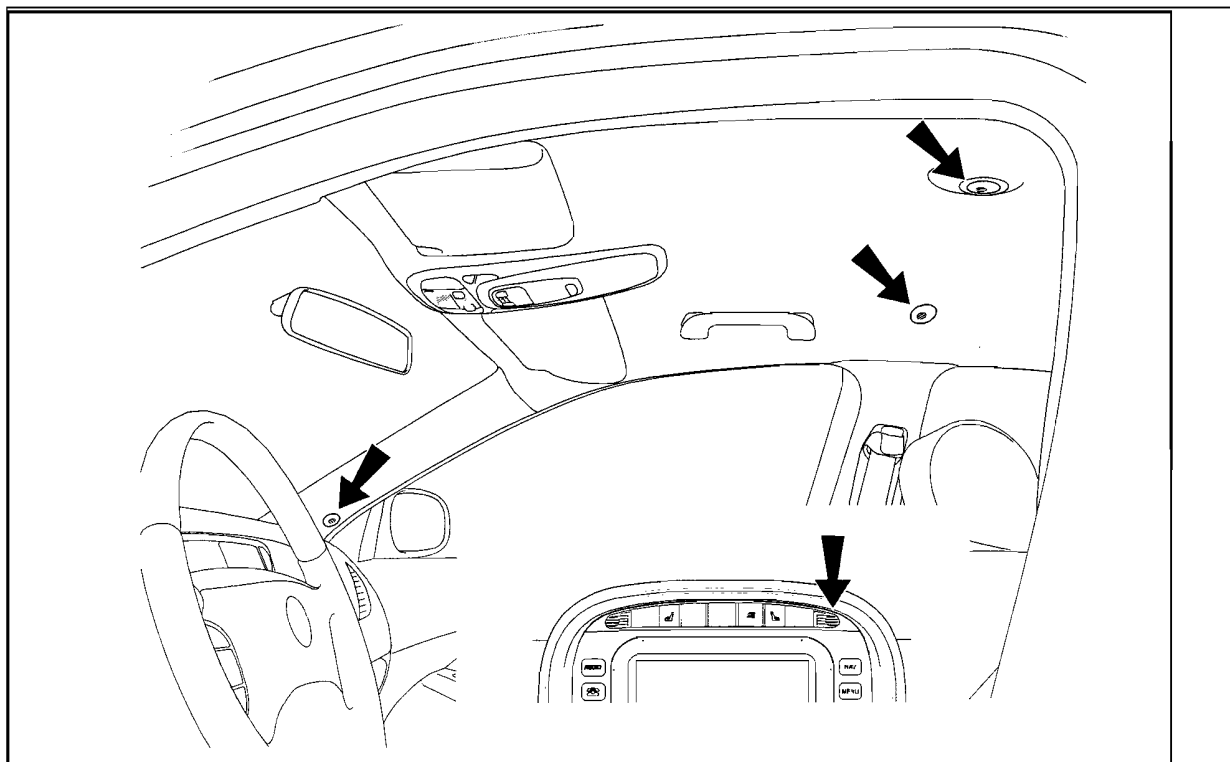
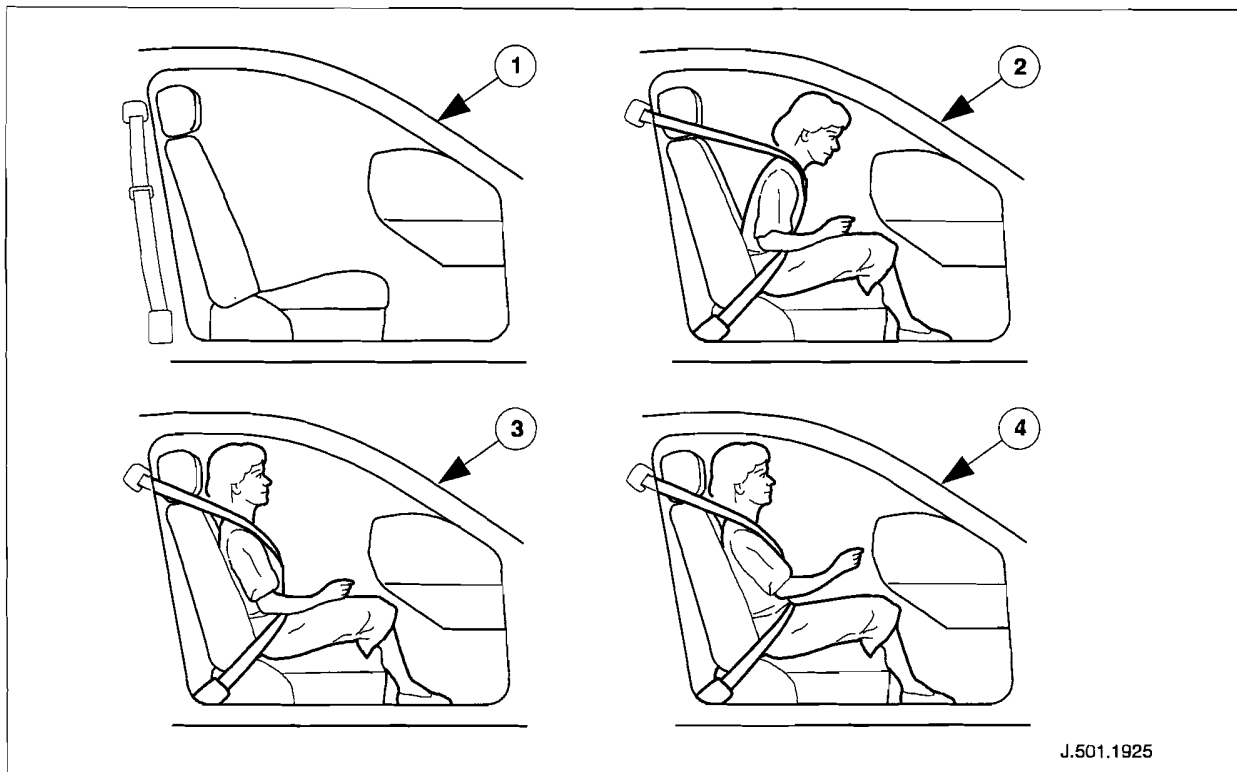


Fig. 16 Occupant position sensor location

The sensors determine the presence and position of the front seat occupant and will relay a signal back to the system control module. The control module evaluates these signals to determine if the passenger is in position or out of position relative to the passenger air bag door (The keep out zone). The decision is then transmitted, via a CAN link to the vehicle RCM.

Based on these decisions the air bag will or will not be deployed in the event of an impact.

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.



**Fig. 17 Basic Occupancy Scenarios (Passenger Side)**

1. Empty seat – No deployment of air bag
2. Out of position – No deployment of air bag
3. In position – Deploy
4. Extremities – No effect on deployment decision

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

### **NOTE:**

It is important that the passenger seat position sensors are not blocked or obscured in any way which could affect airbag deployment. Example: installation of non approved accessories

### **Passenger Airbag Deactivation Warning Lamp (PAD)**

The airbag warning lamp located on the passenger airbag door indicates the deployment state of the passenger airbag:

- If the passenger front seat is empty the passenger airbag will not be active and the warning lamp will not be illuminated
- If the passenger front seat is occupied by a small child the airbag will not be active and the warning lamp will not be illuminated
- If the passenger front seat is occupied by a larger child or an adult seated in the 'in position' then the airbag will be active and the warning lamp will not be illuminated
- If the passenger front seat occupant adopts a posture or position into the Keep Out Zone 'out of position', then the airbag will be deactivated and the warning lamp will be illuminated.

### **NOTE:**

Whenever the airbag warning light, located on the airbag door, remains illuminated, the front passenger airbag will not deploy if required in the event of an impact.

### **Front Passenger Seat Occupant Classification Sensor**

### **NOTE:**

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

The system must be replaced as a complete unit and due to its sophistication, each replacement system requires calibration. 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 CAN bus. In addition, the weight sensing control module performs self-diagnostic functions on the system, with any malfunctions being notified to the RCM accordingly.

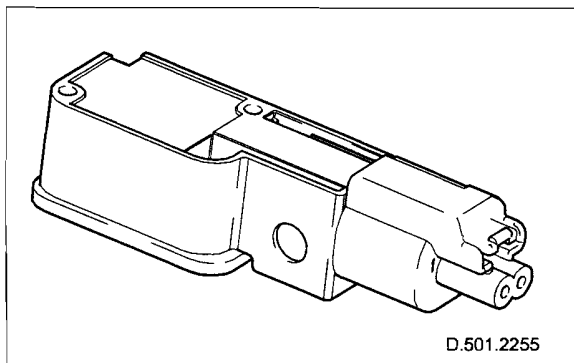
The front seat, passenger weight sensing system responds to the occupancy of the passenger front seat in accordance with the following:

- Passenger front seat status empty - Passenger air bag deactivated - Passenger air bag deactivation (PAD) indicator off
- Passenger front seat status occupied (small occupant) - passenger air bag deactivated - PAD indicator on
- Passenger front seat status occupied (large occupant) - Passenger air bag active - 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.

### Crash sensors

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 and the seat belt pre-tensioners as required.



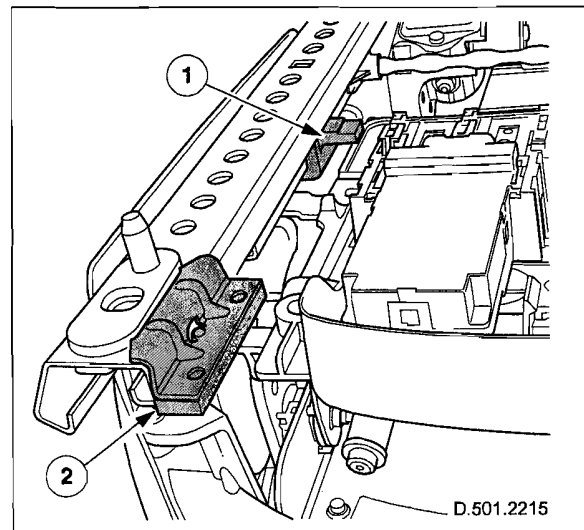
**Fig. 18 Front Crash Sensor**

### Side impact sensors

The side impact sensors are mounted at the base of the B-C pillars and D-E-pillars to facilitate lateral impact sensing. In case 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 pre-tensioners and side air curtain module on the side the deployment request was initiated.

### Seat position sensor

The seat position sensor is located under 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's seat is in the forward position, the driver air bag module second stage is delayed.



**Fig. 19 Seat Position Sensor**

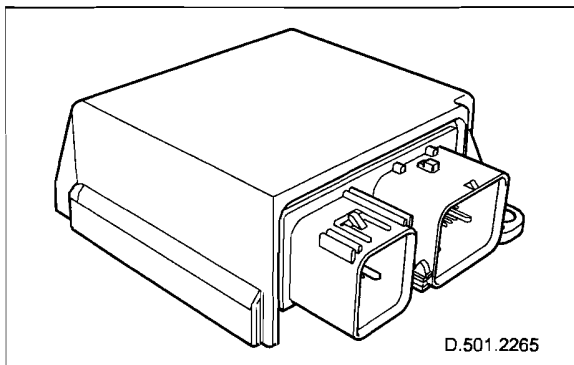
- A. Hall effect sensor
- B. Magnet

### 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. The information from the buckle sensors is used in conjunction with other components of the SRS to make sure air bag module and safety belt pre-tensioner deployment only occurs where necessary.

### The Restraints Control Module (RCM)

The RCM is mounted on top of the drive shaft tunnel below the J-Gate console. The RCM identifies crash severity and direction of impact and makes decisions on deployment of the air bag modules and safety belt pre-tensioners. It also provides firing signals to all air bag modules and safety belt pre-tensioners.



**Fig. 20 Restraints control module**

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

- Crash sensor
- Side impact sensors
- Occupant position sensors
- Front seat belt buckle 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 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 sensor and front seat occupant classification sensor indicate that the front seat is empty. Then no restraints deployment will take place on the passenger side, even if full deployment takes place on the drivers 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, safety belt pre-tensioner 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. It also records fault codes for subsequent access via the diagnostic connector.

### NOTE:

When installing the RCM it is important that the correct tightening torque is adhered to. For additional information refer to JTIS.

### Driver Air Bag Module

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 colour coded to the respective connector on the inflator.

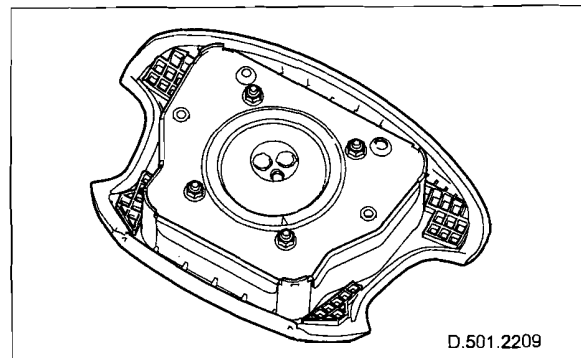


Fig. 21 Driver Air Bag Module

### Passenger Air Bag Module

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.

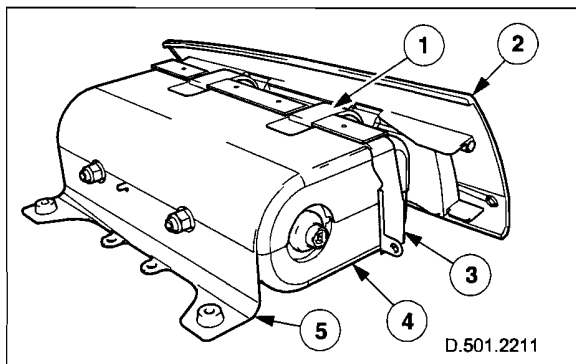


Fig. 22 Passenger Air Bag Module

### Side Air Bag Modules

The side air bag module is mounted in the outboard bolster of each front seat and is inflated using mainly compressed argon. 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 front 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

The side air bag curtain module is similar to X-TYPE with the inflator mounted at the base of the D-E pillar.

The side air curtain modules are located under the headliner between the A and D-E-pillar and deploy at the same time as the corresponding seat side air bag module. If the passenger air bag module is deactivated (due to the seat weight sensor showing either no occupancy of the seat or that a small occupant is present) the corresponding side air bag module is also deactivated.

The side air bag curtain however will still deploy to afford protection to any corresponding rear occupants. When deployed the side air curtain extends down to approximately shoulder height to protect both the front and rear occupant heads. Both the front and rear of the side curtain modules are retained to the A and D-E pillars respectively by tethers.

#### CAUTION:

**If on removing or refitting the curtain module any damage is found to the tethers or the tape retaining the fasteners, the module must be replaced.**

#### 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, B-C and the D-E pillar trim panels.

### Seat Belt Warning Reminder

There are two seat belt warning reminders:

- Seat belt warning reminder lamp
- Audible seat belt reminder warning tone

The new seat belt warning reminder lamp will allow the seat belt warning lamp to constantly illuminate if either or both of the front seat occupants do not fasten their seat belts.

#### NOTE:

The seat belt reminder does not pertain to the passenger seat in Japanese markets.

### Seat belt warning reminder lamp

The seat belt warning reminder lamp will be constantly illuminated if either or both of the front seat occupants do not fasten their seat belts.

If only the driver is present the seat belt warning reminder lamp will pertain only to the driver and extinguish when the driver seat belt buckle becomes fastened.

If the front passenger is present also, the warning lamp will pertain to both front occupants and the warning lamp will only extinguish when both the driver and front passenger seat belts become fastened.

In addition the seat belt warning reminder lamp there is a audible seat belt reminder.

The passenger seat weight sensor will be used to determine whether the front passenger seat is occupied.

### Seat belt reminder Audible warning Tone (Europe)

The warning tone is an additional warning to the seat belt warning reminder lamp. When the ignition switch is in position II, under the conditions where a front occupant is present and unbelted or becomes unbelted when the vehicle is moving above 10 mph, (16 kmh.) then an intermittent warning tone will start or resume accompanied by the seat belt warning lamp flashing. The intermittent tone and flashing warning lamp will last for 10 seconds and repeat every 30 seconds for a period of five minutes.

The seat belt warnings will stop when all front occupants of the vehicle have their seat buckles fastened or the vehicle is stopped.

### Seat belt reminder Audible warning Tone (NAS)

When the ignition switch is in position II with the driver's seat belt not fastened, the seat belt warning reminder lamp will be constantly illuminated for 60 seconds and a single warning tone will be sounded for six seconds.

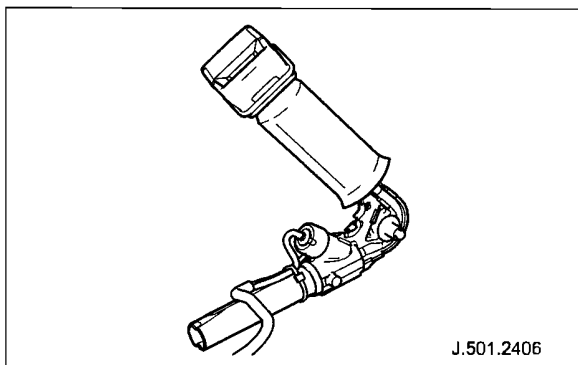
The warning tone and the warning lamp will be extinguished before these time periods, once the driver's seat belt is fastened.

If the driver's seat belt remains unfastened, after 75 seconds the intermittent warning tone will start or resume, accompanied by the seat belt warning lamp flashing. The intermittent tone and flashing warning lamp will last for 10 seconds and repeat every 30 seconds for a period of five minutes, or until the drivers seat belt becomes fastened.

### Front Safety Belt Buckle Pre-tensioners

The front safety belt buckle and pre-tensioners are seat mounted and incorporate a safety buckle switch. In case of a front impact the RCM will deploy the pre-tensioners provided the safety belt buckles are fastened. The safety belt buckle pre-tensioners 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 belts buckle pre-tensioners will deploy.

The RCM receives information on the status of the safety belt buckles from a switch contained in the buckle.



**Fig. 23 Front buckle type pre-tensioner**

### Front Passenger Safety Belt Retractor

The front passenger safety belt is now fitted with ALR and a seat belt tension sensor. When ALR is active, the increased tension on the belt webbing is detected and the passenger air bag is de-activated. This will prevent the passenger air bag from being deployed in the event of an impact when a child seat is installed in the front passenger seat.

### Rear Safety Belt Pre-tensioners (Retractor)

Each rear safety belt incorporates a pre-tensioner device. In case of a low or high speed frontal impact, these provide additional occupant protection by removing any slack from the safety belts.

The rear safety belt pre-tensioners activate when a frontal impact of sufficient force occurs. Under such an impact, the RCM sends a firing signal to each pre-tensioner. The pre-tensioner then works to remove any slack seatbelt webbing in the seatbelt system.

The rear seat belt pre-tensioners are incorporated into the belt reel (retractors).

The rear outer safety belt retractors have a comfort feature which reduces the retraction tension of the seat belt once it is fastened.

#### NOTE:

All of the rear seat belt pre-tensioners will deploy regardless of whether the belt is fastened or not. (All three rear belts will require changing if they have been deployed).

### SRS Indicators

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

### Passenger air bag module deactivation indicator (PAD)

The passenger air bag deployment door has a built in lens that displays the passenger air bag module deactivation symbol. The deactivation symbol is back-lit by the PAD indicator, which is attached to the instrument panel. The illumination of the symbol informs the front seat occupant whether the passenger air bag module has been deactivated by the occupancy sensing system. Each time the ignition switch is moved to position II, the PAD warning lamp is activated while the system carries out a self test. Providing there are no faults detected with the system, the PAD warning lamp will be extinguished after approximately six seconds, providing; a child is not detected in the passenger front seat, or the occupant is not classified as being incorrectly seated.

### Clockspring

The clockspring is designed to carry signals between the RCM and the drivers air bag module. The clock spring is fitted to the steering column, which consists of fixed and moving parts. The clock spring contains a coiled tape with integral conducting tracks.

The tape is able to wind up and unwind as the steering wheel is turned, maintaining electrical contact at all times between the RCM and driver air bag module. To cater for the electrically heated steering wheel, a housing containing set of spring loaded contacts are attached to the clockspring cassette.

#### NOTE:

Always follow the correct removal and fitting instructions as outlined in JTIS. A replacement clockspring is held in the midway position by a plastic holding tool in order to prevent damage to the clockspring tape during transit.

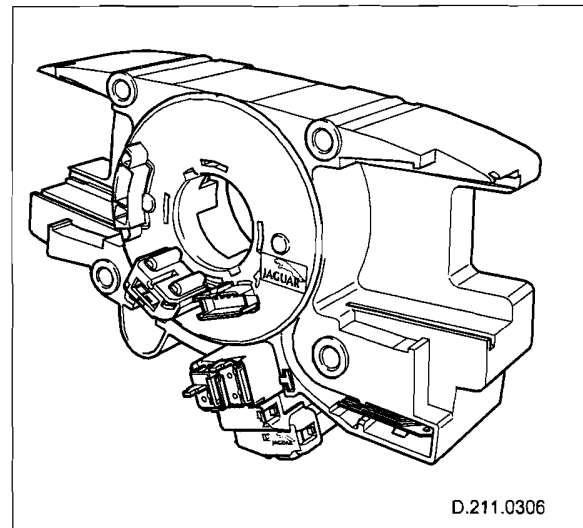
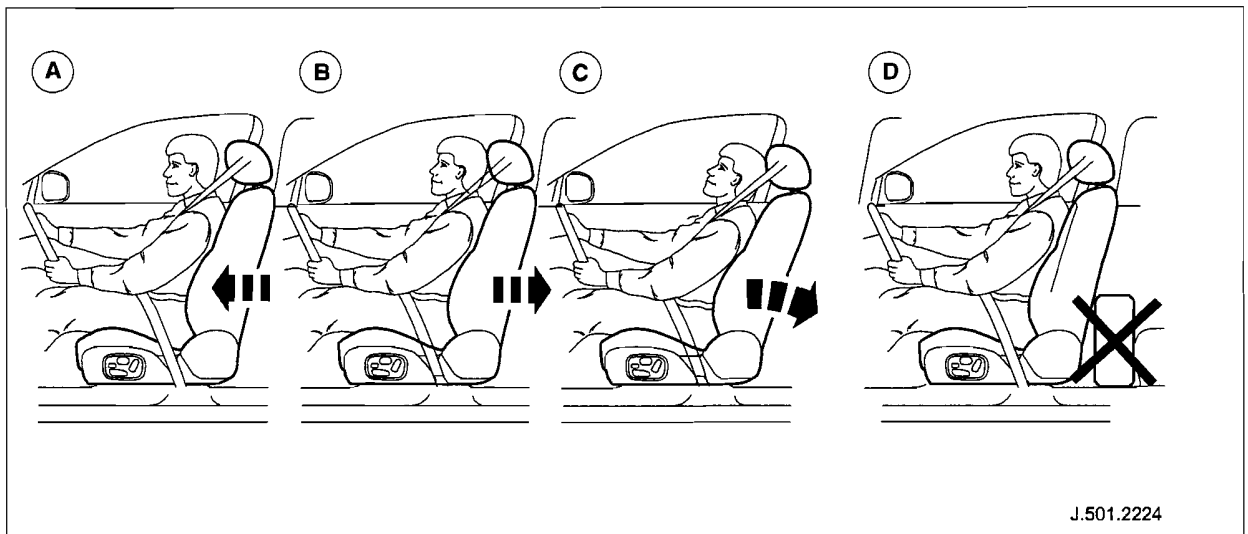


Fig. 24 Clockspring

### Anti-Whiplash System (AWS)

Most whiplash injuries occur at less than 20 mph (32 kmh). 50% of all vehicle crash injuries are whiplash complaints. Whiplash injuries occur when the seat assembly force is imposed onto the occupant, the torso moves forward with the seat back and the unrestrained head lags behind. The occupant's neck changes shape, firstly into an 'S' then bending backwards. Eventually the forces on the neck accelerated the head and the head catches up with and then passes that of the torso.

The Anti-whiplash system (AWS) is designed to reduce the risk of neck injuries in rear end collisions. The AWS is based on an energy-absorbing element, which is integrated into the recliner. AWS gives a controlled rearward motion of the seat back; this motion is divided into two phases.



**Fig. 25 AWS feature**

**Phase one** The lower part of the backrest moves rearward. The purpose is to reduce the distance between the occupant's head and reduce the acceleration of the occupant's head relative to the torso during impact.

**Phase two** The backrest folds rearwards. The purpose is to keep the acceleration of the occupant at a low level and to absorb energy in a controlled way.

The two phases overlap to some extent and are dependant on such factors as the occupant's weight, posture and the impact severity.

In phase one the AWS is controlled by two links which rotate around the two pivots. In the second phase the forward link deforms while absorbing energy. The shape of the forward link progressively deforms in relation to the severity of the impact, the occupant size and weight. A guide pin on the moving bracket moves within the bracket window and controls the mix of the two phases.

The AWS is prevented from being activated during normal driving by the shape of the window, the angle between the two links and the return spring.

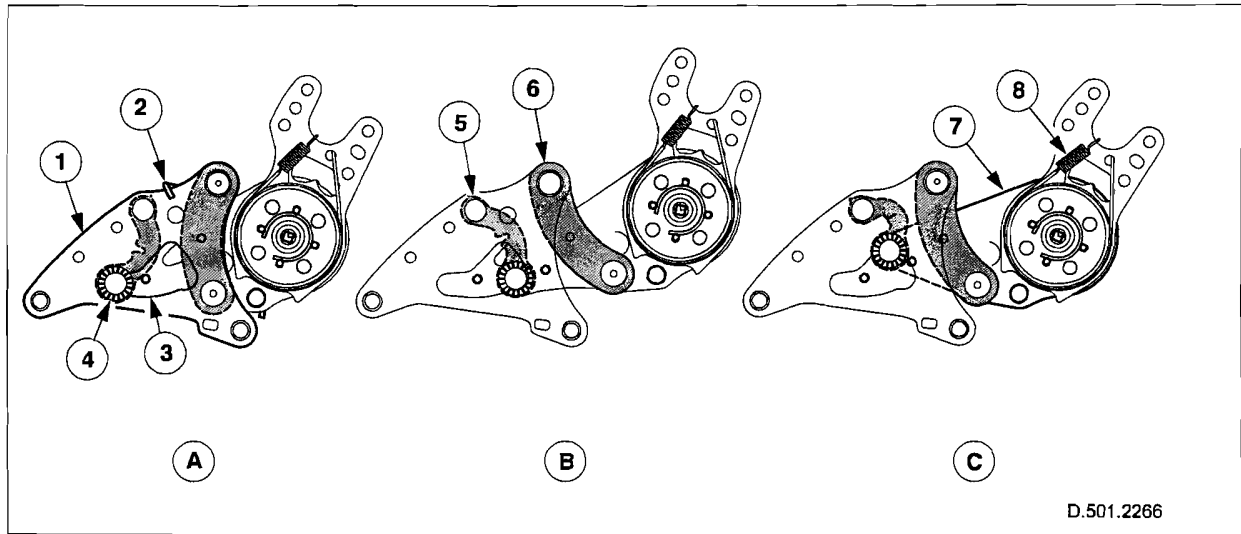


Fig. 26 AWS mechanism

Table 11

A	B	C
1. Outer side plate	5. Deformation link	7. Recliner plate
2. Return spring	6. Rear link	8. Brake spring
3. Window		
4. Guide pin		

**NOTE:**

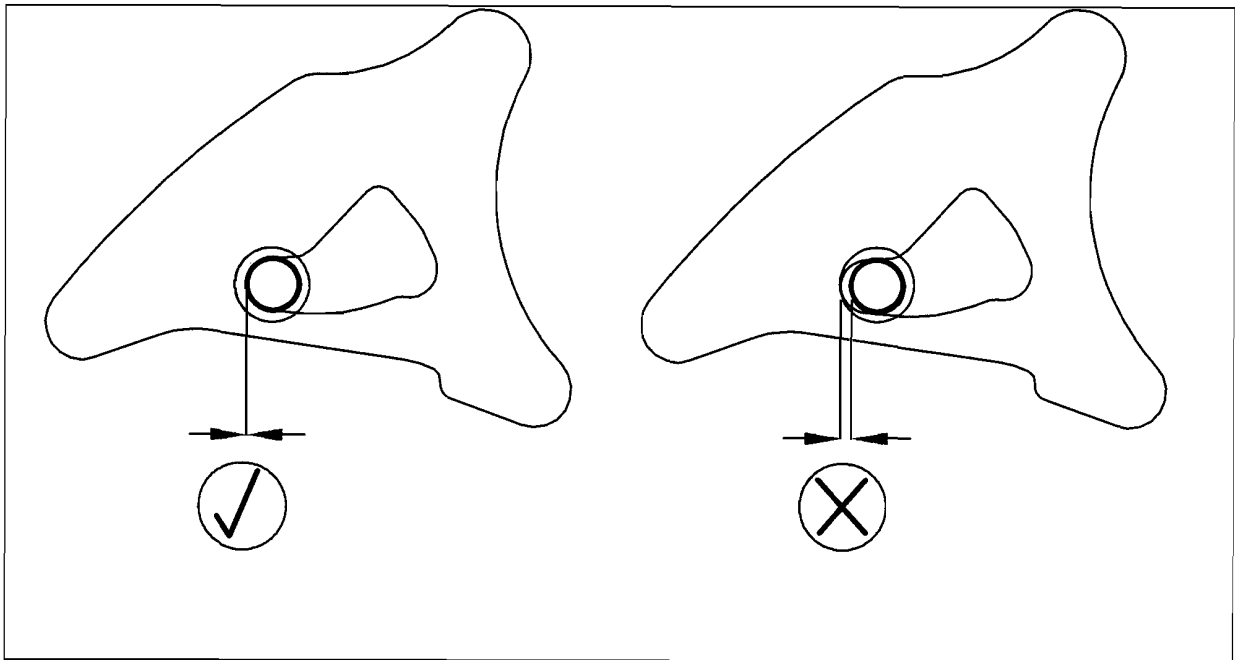
In the event of the AWS system operating, there are no serviceable components within the mechanism. The amount of backrest movement depends on the severity of the impact and for a minor collision there may be no apparent change to the seat even where the protective system has been activated. After any rear collision, therefore, the seat must always be inspected.

**AWS System Inspection**

The AWS system must be inspected following any rear collision of the vehicle:

- Remove the front seat. For additional information, refer to JTIS

- Remove the AWS seat trim covers
- Visually inspect the AWS mechanism. If any clearance is found between the pin and the bracket then the AWS system has been deployed



**Fig. 27 AWS inspection**

**NOTE:**

If the AWS system has been deployed, (regardless of how slight) the seat back frame and the two AWS mechanisms must be replaced.