

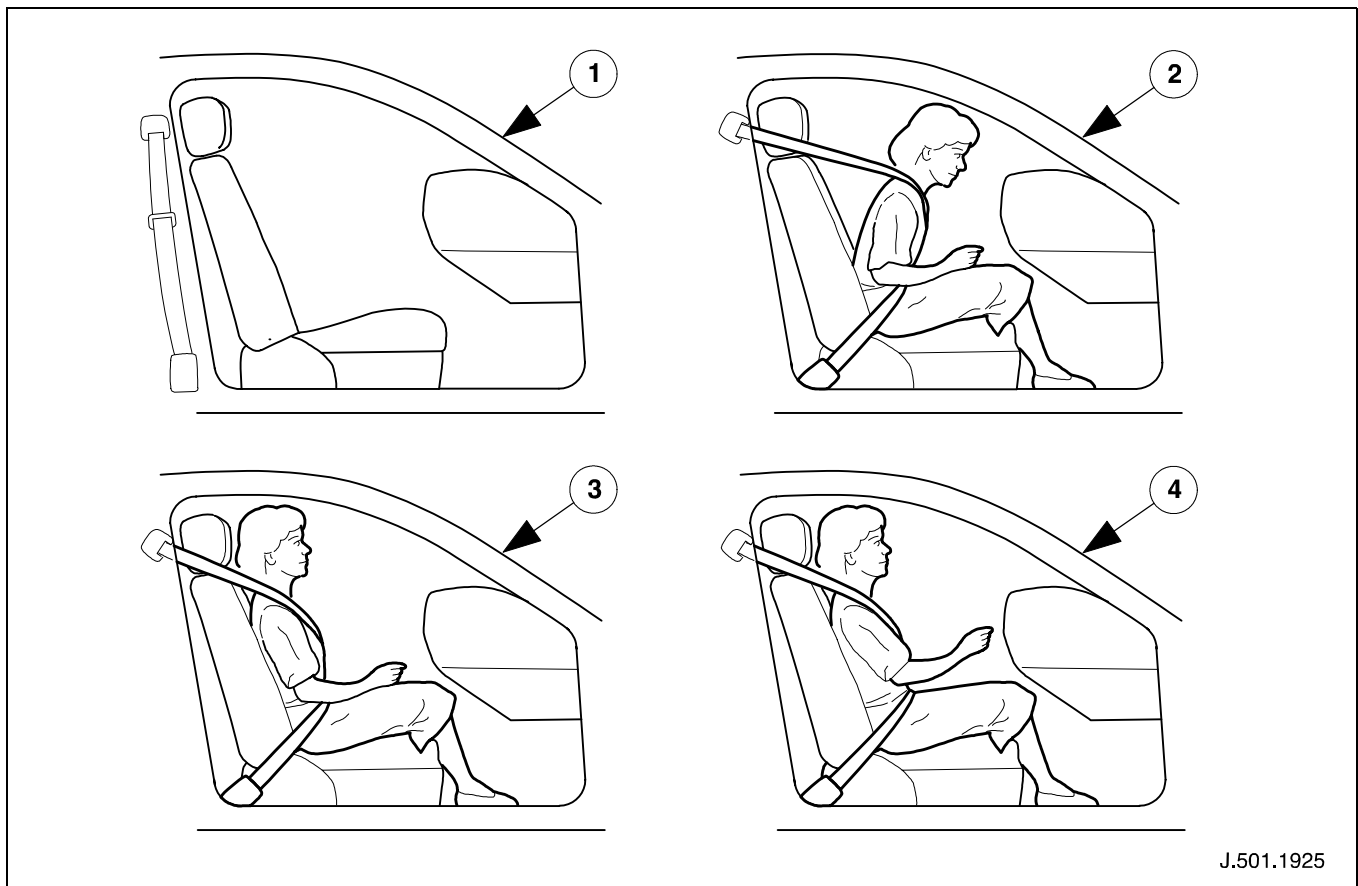
## Advanced Restraints System

### Introduction

The continued development of the 'Advanced Restraint System' provides an improved overall level of crash protection for vehicle occupants. The system analyzes the occupancy scenario and crash severity before activating the appropriate safety devices to help better protect a range of occupants in a variety of crash situations. Benefits of the system include:

- Optimization of the deployment restraint devices and the reduction in potential for air bag induced injuries.
- The significant reduction in passenger air bag deployments (particularly when passenger seats are unoccupied) and a general reduction in all air bag deployments.

Some typical passenger position scenarios are illustrated in Fig. 162.



**Fig. 162 Basic occupancy scenarios (passenger side)**

1. Empty seat - No deploy
2. Out of position- No deploy
3. In position- Deploy
4. Extremities - No effect on deployment decision

In order to support the advanced restraint system requirements, a restraint control architecture has been introduced comprising the following systems or components:

- Passenger occupancy-sensing system
- All-electronic crash sensing with including frontal crash severity sensing and advanced restraints management.
- Driver air bag with twin stage inflator.
- Passenger air bag with twin stage inflator.
- Child seat lower ISOfix anchors for rear seats.
- Safety belt system including: front belt use detection, load limiting retractors and pre-tensioners.
- Rear safety belts with pre-tensioners.
- Front seats including: driver seat-track position sensor and passenger seat weight-sensing system.
- Lower steering column.
- Front seat-mounted side air bags.
- Side curtain air bags.

The systems diagram **Fig. 163** provides an indication of how the electrical component parts interact with each other; refer to **New XJ Range Electrical Guide** for detailed information.

# Occupant Safety

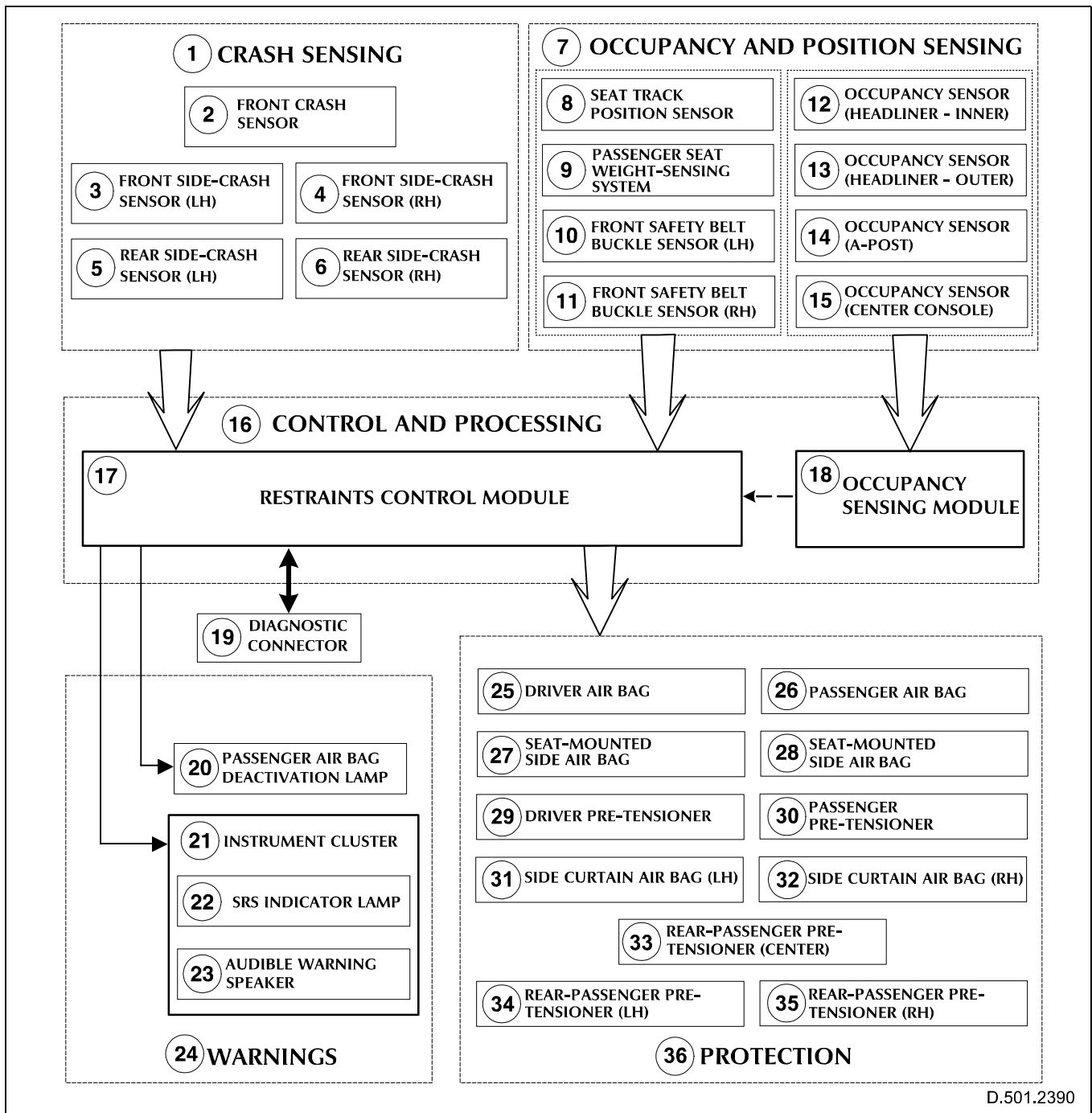


Fig. 163 Advanced restraints system diagram

## Key to Fig. 163

1. Crash sensing
2. Front crash sensor
3. Front side-crash sensor (LH)
4. Front side-crash sensor (RH)
5. Rear side-crash sensor (LH)
6. Rear side-crash sensor (RH)
7. Occupancy and position sensing
8. Seat-track position sensor
9. Passenger seat weight-sensing system
10. Front safety belt buckle sensor (LH)
11. Front safety belt buckle sensor (RH)
12. Occupancy sensor (headliner - inner)
13. Occupancy sensor (headliner - outer)
14. Occupancy sensor (headliner - A-post)
15. Occupancy sensor (center console)
16. Control and processing
17. Restraints control module
18. Occupancy sensing module
19. Diagnostic connector
20. Passenger air bag deactivation lamp
21. Instrument cluster
22. SRS indicator lamp
23. Audible warning speaker
24. Warnings
25. Driver air bag
26. Passenger air bag
27. Seat-mounted side air bag
28. Seat-mounted side air bag
29. Driver pre-tensioner
30. Passenger pre-tensioner
31. Side-curtain air bag (LH)
32. Side-curtain air bag (RH)
33. Rear passenger pre-tensioner (center)
34. Rear passenger pre-tensioner (LH)
35. Rear passenger pre-tensioner (RH)
36. Protection

## Occupant Safety

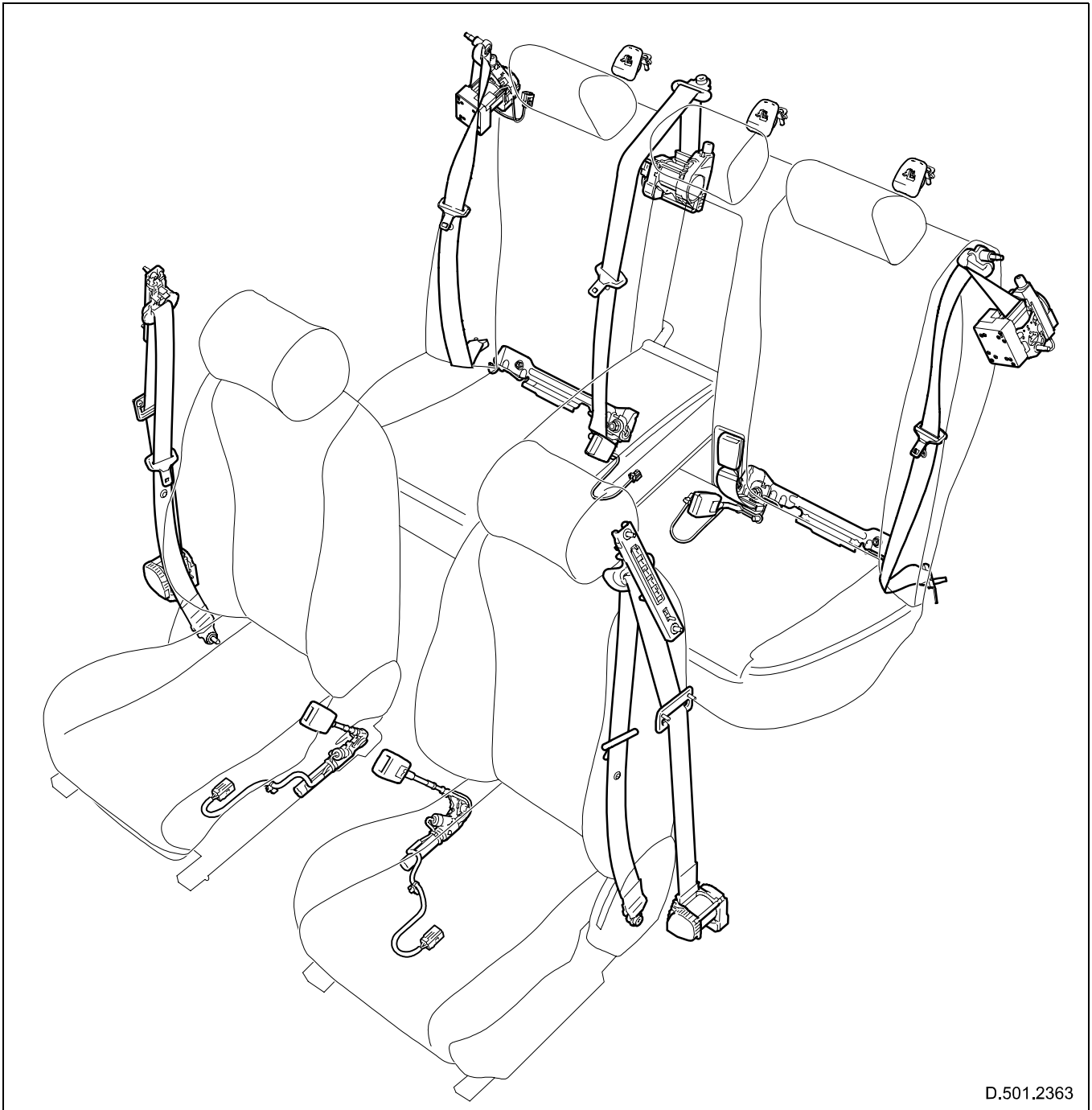
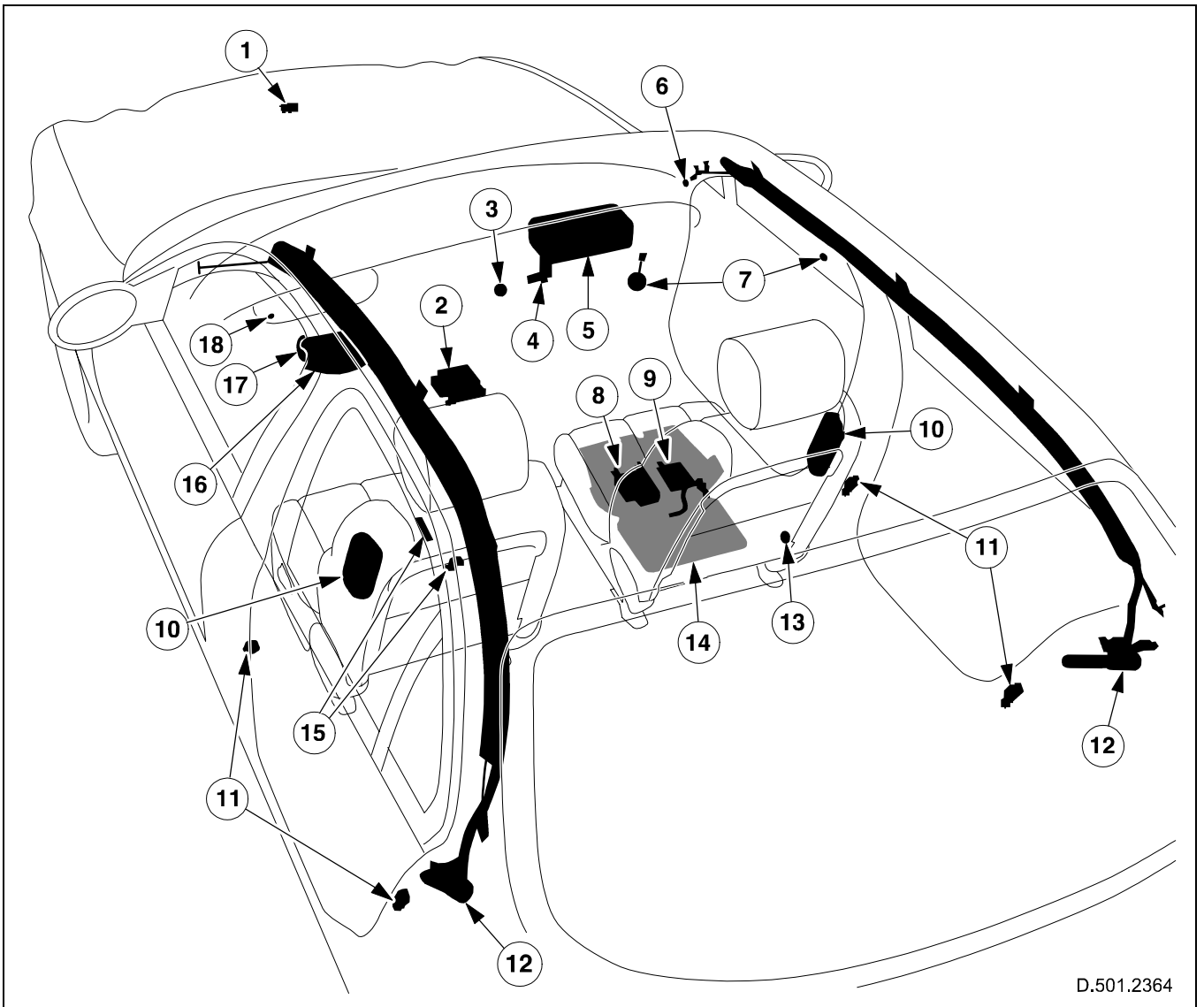


Fig. 164 Occupant restraints - location of active components



D.501.2364

**Fig. 165 Occupant restraints - location of passive components**

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

## Crash Sensing

**WARNING:** Before commencing work on any part of the restraint system, the vehicle battery should be disconnected and a period of at least one minute allowed to elapse.

- The sensors do not contain any serviceable parts.
- Serial numbers of new parts should be logged against VIN for traceability.

### Front Crash Scenario

The restraints control module (RCM), controls air bag deployment decisions by using signals from its internal accelerometer and the following sensors:

- Front crash sensor.
- Seat-track position sensor.
- Safety belt buckle sensor.
- Passenger seat weight-sensing system.
- Occupancy sensors.

### Front Crash Sensor

The front crash sensor:

- is mounted on a bracket which is located in the center of the upper mounting crossmember;
- collects acceleration data from the front of the vehicle and sends it back to the RCM as an analogue signal;
- provides the main source of data that enables the RCM to gauge the severity of a frontal impact.

## Side Crash Scenario

Data from the side crash sensors are used by the restraints control module (RCM), in conjunction with acceleration data from the RCM's 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 seat-mounted side air bag should be deployed. The decision is forwarded to the deployment handler (within the RCM) which responds appropriately; for example: in the case that the data received indicates that the passenger seat is empty, or occupied by a small person, the passenger side air bag will be disabled.

**NOTE:** The appropriate side curtain air bag will still deploy to afford protection for any corresponding rear occupant.

### Side Crash Sensors

The side crash sensors:

- Comprise accelerometer and processing circuits but do not make deployment decisions.
- The front side-crash sensor is mounted behind the B-post trim close to the safety belt retractor fixing.
- The rear side-crash sensor is mounted directly to the vehicle body at a rear mid-wheel location, close to the rear lower safety belt anchor.

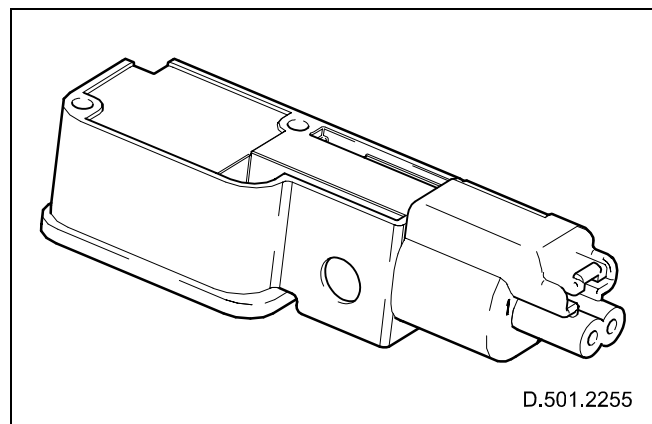
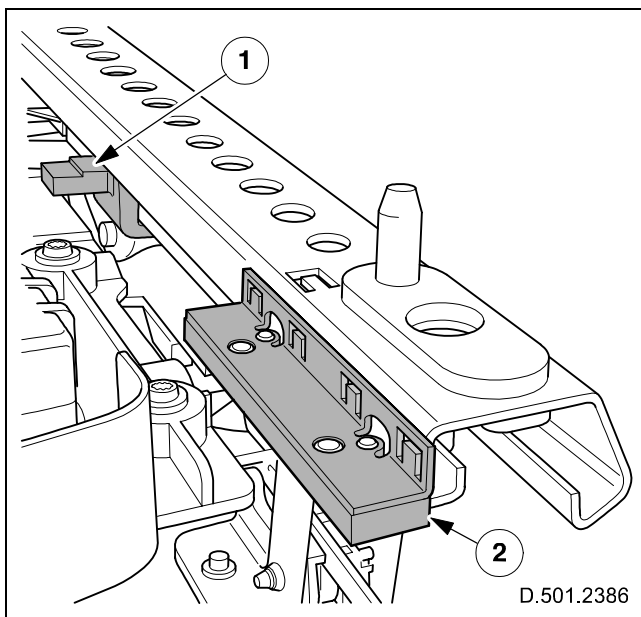


Fig. 166 Crash sensor

## Occupancy and Position Sensing

### Seat-track Position Sensor

The seat-track position sensor, a 'Hall effect' type, is fitted to the underside of the driver's seat. The sensor is actuated by the magnet that is attached to the seat slide; refer to **Fig. 167**. The magnetic field disturbance caused when the magnet passes 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. Malfunction of the sensor or associated circuits will cause the SRS indicator lamp to illuminate. Diagnosis must be undertaken using WDS.



**Fig. 167** Seat-track position sensor

1. Hall effect sensor
2. Magnet

### Safety Belt Buckle Sensor

The safety belt buckle sensor is a 'Hall effect' type, 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. Malfunction of the sensor or associated circuits will cause the SRS indicator lamp to illuminate. Diagnosis should be undertaken using WDS.

The Hall effect sensor is used in conjunction with the other components of the advanced restraint system to ensure that air bag and safety belt deployment only occurs where necessary.

### Passenger Seat Weight-Sensing System

The seat weight-sensing system forms part of a strategy to control passenger air bag deployment depending on the occupancy scenario. The strategy also takes into account the data received from the occupancy sensors; refer to **Occupancy Sensors**.

**NOTE:** The seat weight-sensing system does not comprise any serviceable items.

The following components are combined and calibrated during manufacture to form the seat weight-sensing system:

- Passenger seat cushion.
- Silicone-filled bladder (integrated into the passenger seat cushion).
- Seat weight-sensing module (mounted under the seat).
- Pressure sensor (attached to the bladder and mounted under the seat).

**NOTE:** In some markets, the belt tension sensor (an integral part of the front passenger safety belt seat-anchor) has been introduced; refer to **Belt tension sensor**.

Locations for the seat weight-sensing components are shown in **Body, Seats, Fig. 142**.



## Occupant Safety

The silicone-filled bladder responds to weight changes on the passenger seat. The pressure sensor responds to these pressure changes and provides an appropriate signal to the seat weight-sensing module. In addition, the belt tension sensor (where applicable), provides a separate input to the seat weight-sensing module; refer to **Belt tension sensor**. The module processes the input signals received from the sensors and forwards an appropriate signal to the restraints control module (RCM) via the local CAN. In addition, the module performs self-diagnostic functions on the system, with any malfunctions being notified to the RCM accordingly. Malfunction of the sensing system or associated circuits will cause the SRS indicator lamp to illuminate. Diagnosis of the system can only be undertaken using WDS; refer to **JTIS** for further information.

The seat weight-sensing system responds to the occupancy of the front passenger seat in accordance with **Table 9**. The advanced restraints system via the RCM, monitors and processes the data from the seat weight-sensing system and several other sensors, before making a deployment decision; refer to the advanced restraints system diagram **Fig. 163**. The system is designed to take account of several variables in addition to weight, including: inclination of the vehicle; exact position and structure of the weight on the seat.

**NOTE:** The seat weight-sensing system cannot discriminate between a passenger and an object.

Passenger seat status	Passenger air bag status	Passenger air bag deactivation lamp status
Empty	OFF	OFF
Occupied (small occupant)	OFF	ON
Occupied (large occupant)	ON	OFF

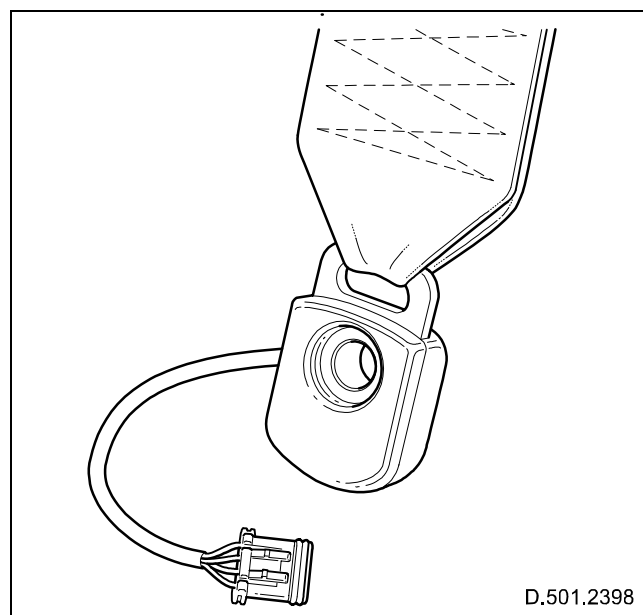
**Table 9 Passenger seat weight-sensing system**

### Service Kit

Individual components of the seat weight-sensing system are not serviceable; the system must be replaced as a complete unit. Due to the sophistication of the weight-sensing system, each replacement system requires calibration. To avoid the need to provide each dealer with calibration equipment, a pre-calibrated service kit assembly is available. The kit has two fixed connectors and a single connector to interface with the vehicle harness. After installation, the system will require initialization by WDS; refer to **JTIS** for further information.

### Belt tension sensor

The belt tension sensor (BTS) is a strain-gauge type, encapsulated within the passenger safety belt anchor. The sensor converts the force applied to the belt into an electrical signal. In the event that a child-seat is installed onto the front passenger seat (not recommended), the force applied to the passenger safety belt is reflected by the output signal from the sensor, which provides data to supplement that received from the silicon bladder. The passenger seat weight-sensing module processes the input data and makes it available to the restraints control module (RCM), which then makes the necessary adjustments in respect of passenger air bag deployment.



**Fig. 168 Belt tension sensor**

## Occupancy Sensors

The occupancy sensors form part of a strategy to control passenger air bag deployment, depending on the occupancy scenario; refer to **Fig. 162**. The strategy also takes into account the data received from the seat weight-sensing system; refer to **Passenger Seat Weight-Sensing System**.

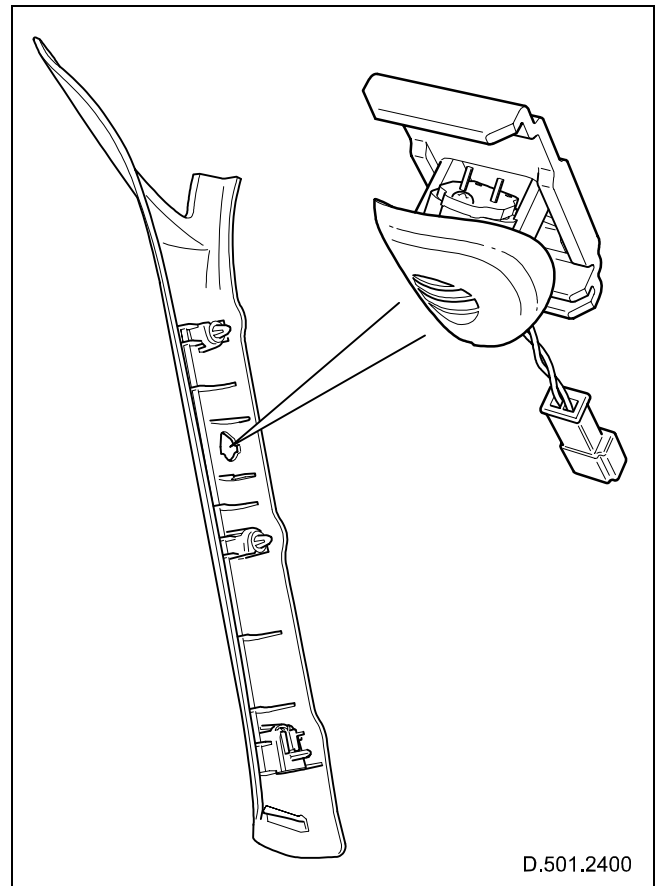
The occupancy sensor system uses ultrasound at an operating frequency of 40 kHz to monitor passenger seat occupancy.

**NOTE:** Medical studies have shown that frequencies within this range do not present any danger or discomfort.

The advanced restraints system uses four ultrasonic sensors, one at the passenger-side A-post, one in the center console and two in the headliner assembly; refer to **Fig. 165**.

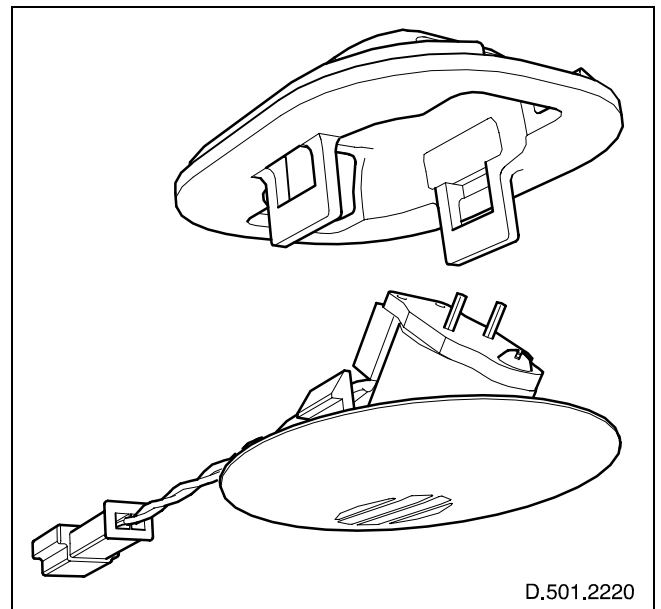
The sensors:

- are strategically placed to detect the presence and movement of the front passenger seat occupant;
- determine the presence and position of the front seat occupant with respect to the passenger air bag deployment door;
- determine air bag deployment decisions by classifying occupants as either 'in position' or 'out of position';
- are part of a system that is sophisticated enough to be unaffected by body extremities; refer to **Fig. 162**.



D.501.2400

**Fig. 169** Occupancy sensor - A-post



D.501.2220

**Fig. 170** Occupancy sensor - headliner

## Occupant Safety

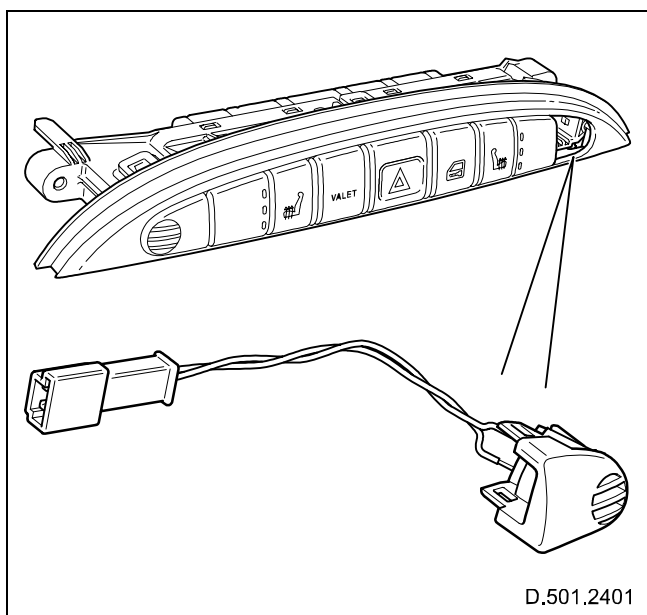


Fig. 171 Occupancy sensor - center console

The occupancy sensing module constantly monitors and processes the signals received from the occupancy sensors; refer to **Occupancy Sensing Module**. Data from the sensors is correlated by the occupancy sensing module and used to decide when the front passenger seat occupant has leaned into an area in front of the passenger air bag door, known as the 'keep-out zone'.

**NOTE:** The system is designed to ignore body extremities (hands, 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 and provide visual confirmation by illuminating the passenger air bag deactivation lamp; refer to **Passenger Air Bag Module**.

The RCM uses the data received from the occupancy sensing module, in conjunction with data from other sensors in the system (refer to **Fig. 163**), to make deployment decisions; refer to **Restraints Control Module**.

Refer to **JTIS** for sensor servicing information and to **New XJ Range Electrical Guide** for connection information.

## Control and Processing

### Restraints Control Module

Internally, the restraints control module (RCM) has two areas that determine which elements of the restraint system are to be deployed:

#### Area 1 - Crash severity evaluation

The first area evaluates crash severity by using data from the RCM's internal accelerometer, the front crash sensor and the safety-belt buckle sensor. Based on this data, the RCM decides which level of air bag deployment is required and forwards the information to the second area, the deployment handler.

#### Area 2 - Deployment handler

The status of the seat-track position sensor, occupancy sensors, seat weight-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 seat weight-sensing system indicates that the passenger seat is empty, then no restraint deployment will take place on the passenger side, even if full deployment takes place for the driver.

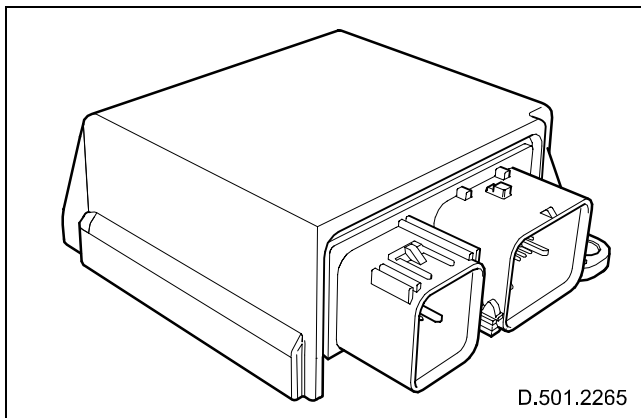


Fig. 172 Restraints control module

The restraints control module:

- Is fixed to the top of the driveshaft tunnel below the center console.

**NOTE:** Due to the importance of the module being securely fixed to the vehicle body, the ground connection is made via the fixings and is monitored by the diagnostic system. A bad connection causes a diagnostic trouble code (DTC) to be generated. Refer to **JTIS** for the correct torque figures.

- Identifies severity and direction of impact and makes decision on deployment of air bags and pre-tensioners.
- Provides firing signals to all air bags and pre-tensioners.
- Performs on-board testing of the air bag and pre-tensioner firing circuits, warning indicator circuits and module status (the front and side-crash sensors perform basic self-tests).
- Stores DTCs.
- Drives the SRS indicator lamp on the instrument cluster: if the warning lamp fails and there is an additional malfunction within the system (DTC recorded) a secondary-warning audible tone is emitted.
- In the event of a crash, sends a signal to the vehicle emergency message system (VEMS) and the ECM to indicate that a crash has occurred.
- Is connected to the diagnostic connector via the ISO data bus to enable communication with WDS or scan-tool.
- In the event of loss of battery supply in crash conditions, provides a temporary back-up power supply (100ms after the RCM loses its supply) to operate the front air bag modules and pre-tensioners.
- In the event of a crash, records certain data for subsequent access via the diagnostic connector. This data includes deceleration information, firing delay and DTCs.

**NOTE:** Diagnosis of any malfunctions relating to the adaptive restraints system must always be undertaken using WDS.

### Occupancy Sensing Module

The module:

- is located beneath the front passenger seat;
- processes signals received from the occupancy sensors; refer to **Occupancy Sensors**;
- processes signals received from the seat weight-sensing system; refer to **Passenger Seat Weight-Sensing System**;
- makes data available to the RCM via a local CAN.

# Occupant Safety

## Safety Belts

In appropriate markets, all passenger safety belts (not the driver's) have an integral automatic locking retractor (ALR), providing a 'static reel mode' for use with child seats. When activated, the static reel mode prevents further extraction of the belt and locks the child seat firmly in position.

The static reel mode is activated by pulling the belt to its full extension to engage the ratchet mechanism. After ensuring the child seat is in the required position the belt tongue should be inserted into the buckle and the belt allowed to slowly retract back onto the reel (a ratchet operation may be felt as the belt retracts) until it fits snugly around the child seat.

Unbuckling the belt and allowing the webbing to fully retract will disengage the ALR feature.

**NOTE:** Safety belts are not serviceable items. As with all electronically monitored, occupant safety components, the SRS indicator lamp will illuminate if a DTC has been stored. Diagnosis must be undertaken using WDS.

**WARNING: Prior to the removal of safety belts and before disconnecting safety belt electrical connectors, the vehicle battery should be disconnected and a period of at least one minute allowed to elapse. The same amount of care should be taken when handling and storing safety belts, as would be taken when handling and storing air bag modules.**

The front safety belt retractors incorporate a load limiting device, that allows progressive 'payout' of additional safety belt webbing when the force exerted exceeds a predetermined limit.

**NOTE:** Each front safety belt buckle assembly incorporates a 'Hall effect' sensor; refer to **Safety Belt Buckle Sensor**. In some markets, a belt tension sensor is incorporated into the front passenger, lower safety belt anchor; refer to **Belt tension sensor**.

## Front Safety Belt Warning Reminder

**NOTE:** To suit market legislation, the feature can be activated or disabled as appropriate.

- When the front passenger seat is unoccupied, the reminder will pertain only to the driver's safety belt and will cease when the belt is buckled.
- When the front passenger seat is occupied, the reminder will pertain to both safety belts and will cease only when **both** belts are buckled.

**NOTE:** The presence of a front seat passenger is detected by the **Passenger Seat Weight-Sensing System**.

Provided the reminder feature is activated, detection of an unfastened front safety belt is indicated by the illumination of the safety belt warning lamp and an audible warning.

### NAS functionality

For the first 60 seconds after the ignition key has been turned to position 'II'/'III':

- If the driver's safety belt is unfastened, the safety belt warning lamp will remain illuminated and be accompanied by a single six-second audible warning.
- Fastening the driver's safety belt will cause the warnings to cease.
- Failure to fasten the driver's safety belt will cause the audible warning to cease after 6 seconds and the warning lamp to extinguish after 60 seconds.
- After 75 seconds have elapsed, the reminder feature will operate as described for rest-of-world functionality.

### Rest-of-world functionality

An intermittent audible warning will start/resume and the safety belt warning lamp will flash under the following conditions:

- a front seat occupant is present and their safety belt is unfastened;
- the vehicle is travelling at a speed greater than 10 mile/h (16 km/h).

The warning will remain active for a 5 minute period, every 30 seconds during this period, the intermittent audible warning and flashing lamp will be evident for 10 seconds. These incremental warnings will cease when either of the following conditions are satisfied:

- front seat occupants fasten their safety belts;
- the vehicle is halted.

## Disabling the reminder

The front passenger seat must be unoccupied and the following steps completed within 60 seconds:

1. Turn the ignition key to position 'II' (do not start the engine).
2. Repeat the following actions, nine times:
  - fasten the driver safety belt buckle, check the safety belt warning lamp extinguishes and then unfasten the driver safety belt buckle, check the safety belt warning lamp illuminates.

**NOTE:** After completion of step 2, a single chime confirms that the reminder feature has been disabled.

## Enabling the reminder

The procedure for enabling the reminder is identical to the disabling procedure.

## Pyrotechnic pre-tensioners

The pre-tensioner will only be activated when the restraints control module (RCM) sends an appropriate firing signal; refer to **Control and Processing**.

The pre-tensioners are:

- designed to remove excess webbing from the safety belt in the event of a crash;
- deploy very quickly and early on in the crash before the occupant starts loading the safety belt.

**WARNING:** In the event that a pre-tensioner deploys, the complete safety belt system (front and rear) must be replaced; refer to JTIS.

The front safety belts employ buckle-type pre-tensioners; refer to Fig. 173.

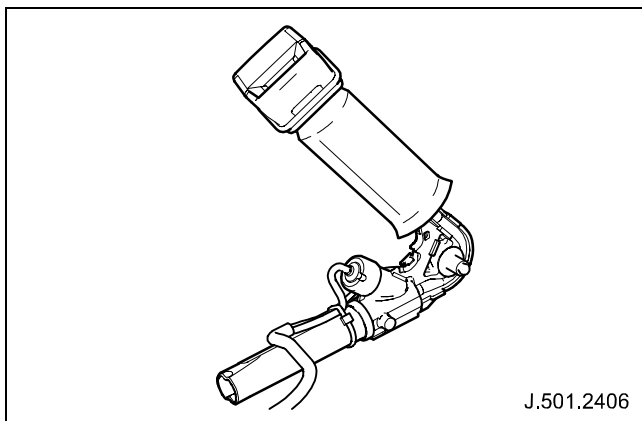


Fig. 173 Buckle-type pre-tensioner

The rear safety belts employ retractor-type pre-tensioners; refer to Fig. 174 and Fig. 175.

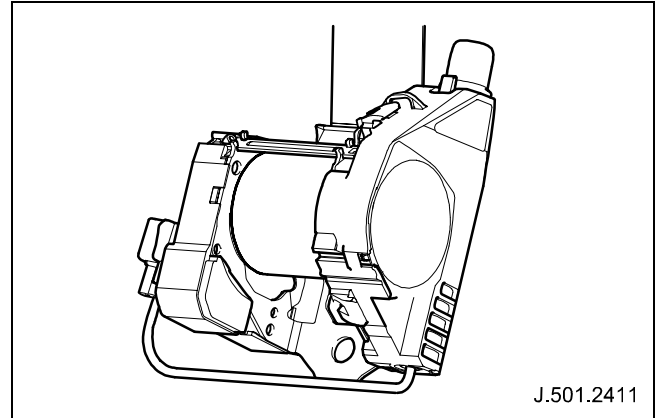


Fig. 174 Retractor-type pre-tensioner (rear center)

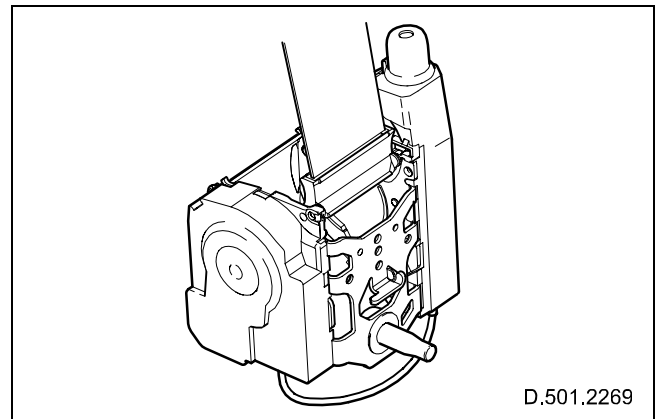


Fig. 175 Retractor-type pre-tensioner (rear left-hand)

## Rear Safety Belt Comfort System

**NOTE:** The following applies only to vehicles fitted with electrically adjustable rear seats.

The rear safety belts for the outboard positions have an integral comfort solenoid, designed to be activated when the belts are fastened. During the period that a belt remains fastened, the solenoid switches operation from the retraction spring to a comfort spring, which reduces the force exerted on the occupant by the safety belt webbing. When the belt is unfastened, the comfort solenoid disengages the comfort spring, re-engages the retraction spring and causes the force on the webbing to immediately revert to the standard retraction mode.

# Occupant Safety

## Anti-whiplash System

In order to reduce the incidence of whiplash injuries, two anti-whiplash mechanisms (one either side) are incorporated into each front seat. The mechanisms are designed to respond to rear impacts at low speeds, by controlling the rearward motion of the backrest to reduce the likelihood of neck injuries.

Depending on the weight of the seat occupant and the severity of the collision, the mechanisms begin to operate at collision speeds between approximately 8.7 and 11.2 mile/h (14 and 18 km/h).

Immediately after a rear impact, the seat forces the backrest against the occupant (Fig. 176A). At this point the mechanism is activated and progresses through a controlled phase of movement:

1. the backrest moves rearwards (but in an upright position) for a distance of approximately 50mm (Fig. 176B);
2. the backrest tilts rearwards (Fig. 176C) but is limited to an angle of approximately 15 degrees.

The combined effects of movements 1 and 2, absorb impact energy, reducing the relative acceleration of the head and body.

**NOTE:** The positioning of items behind the front seats will prevent the activation of the mechanism (Fig. 176D).

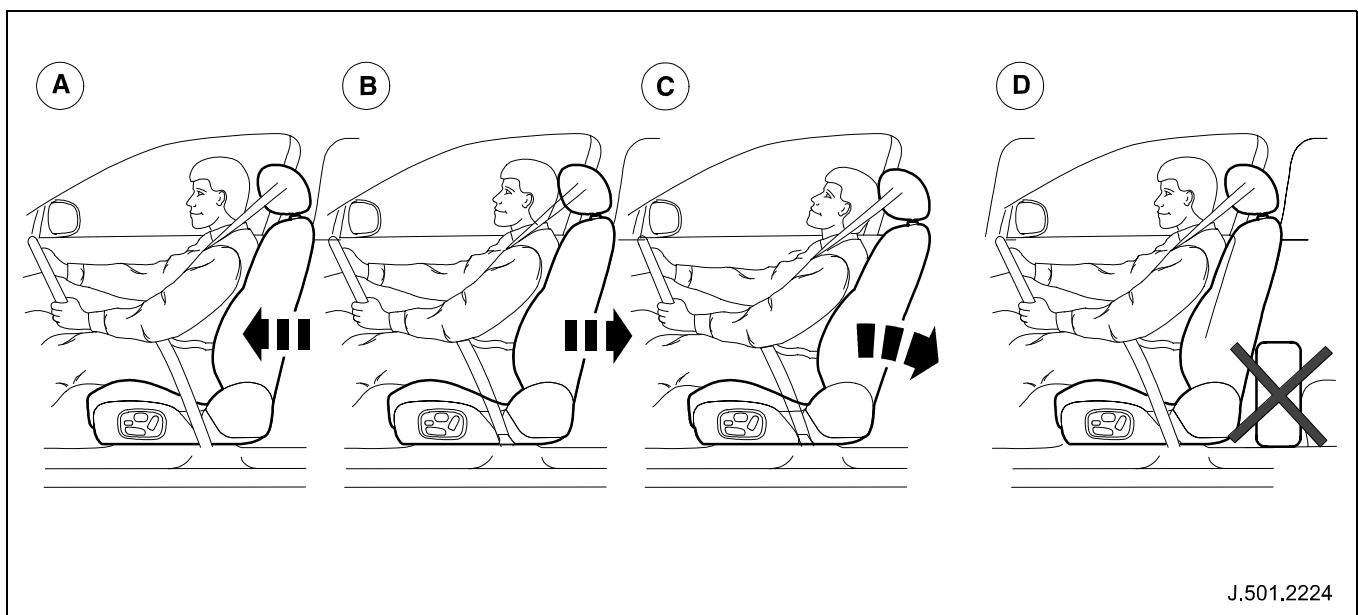


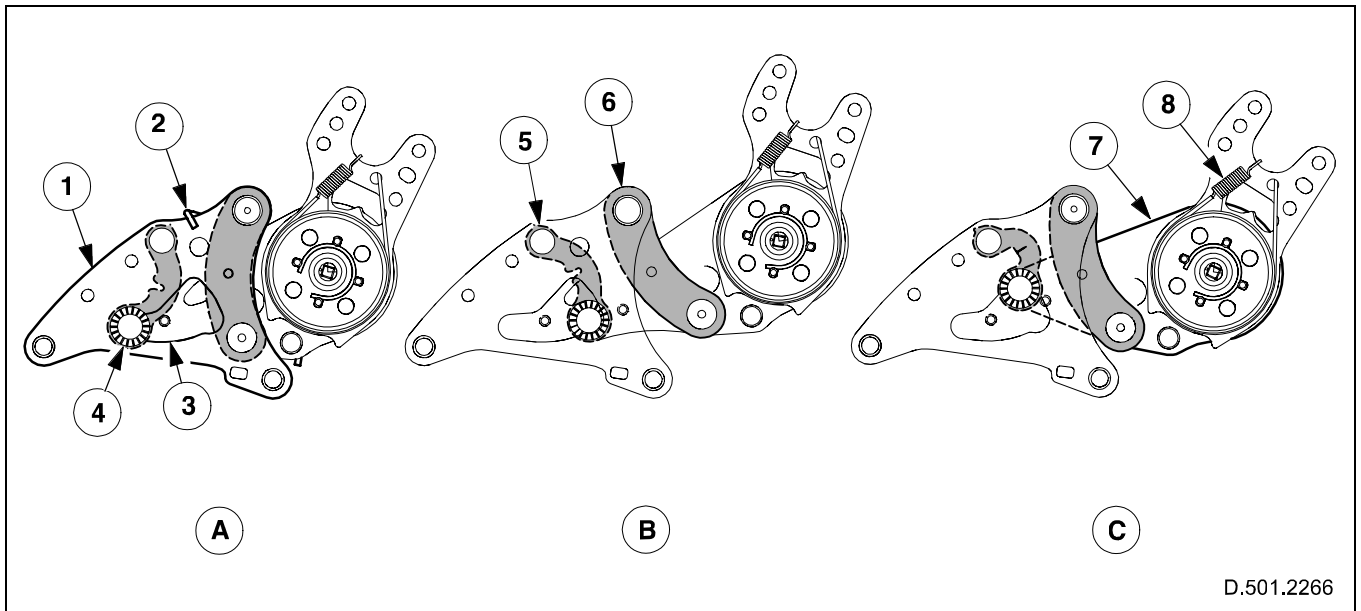
Fig. 176 Anti-whiplash feature

With reference to Fig. 177, the mechanism has been engineered so that during a rear impact collision, the movement of the recliner plate (7) and backrest, is controlled. This is achieved by constraining the movement of the guide-pin (4) within the window (3) of the outer side-plate (1).

**NOTE:** The displacement of the guide-pin in the window, will vary depending on occupant weight, occupant posture and the impact severity.

The tilting movement of the backrest is determined by the design parameters of the deformation link (5) which collapses (Fig. 177C) to provide gentle braking.

**NOTE:** The shape of the window, the angle between the two links (Fig. 177B) and the return spring (2), prevents the mechanism from being activated during normal driving.



**Fig. 177 Anti-whiplash mechanism (left-hand side)**

A. Installed condition

B. Fully rearwards condition

C. Fully deployed condition

1. Outer side-plate

2. Return spring

3. Window

4. Guide-pin

5. Deformation link

6. Rear link

7. Recliner plate

8. Brake spring

**NOTE:** The anti-whiplash mechanism has no serviceable components. In the case of a minor collision, even though the protective system has been activated, there may be no apparent change to the seat. The seat must always be inspected after a rear collision; refer to JTIS.



## Air Bag Modules

### Driver Air Bag Module

The driver air bag module is controlled by the restraints control module (RCM), which chooses between first or second stage deployment, depending on driver seat buckle usage, the seat position and crash severity.

**NOTE:** Variation in driver air bag 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 to optimize occupant protection.

The module comprises:

- A twin stage inflator as opposed to the single stage inflator.
- Separate chambers for the two inflation stages, each independently activated by the RCM.
- Two air bag connectors, that have foolproof mechanical keying and are color coded to the respective plug on the inflator.
- A non-azide propellant that reduces particulates and effluents.

The air bag deploys radially, to reduce the risk of air bag induced injury to a driver that is positioned close to the steering wheel.

**NOTE:** Disposal of twin stage air bags is different to single stage air bags; refer to JTIS.

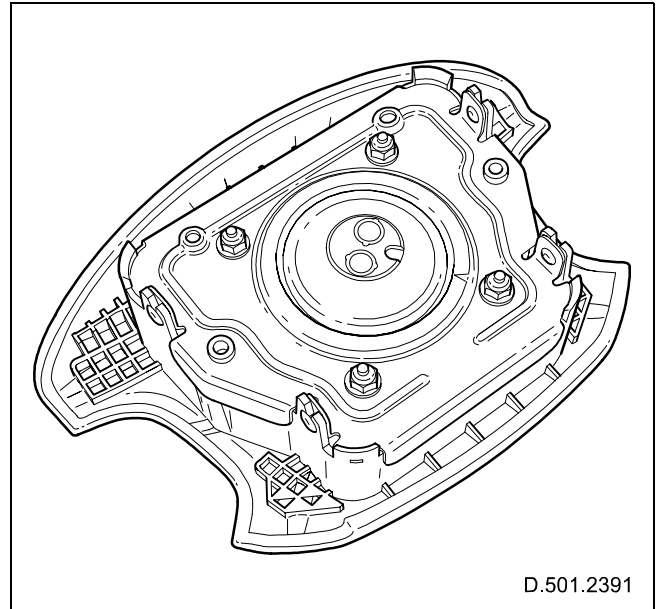


Fig. 178 Driver air bag module

## Passenger Air Bag Module

The module is attached to a mounting bracket which is in-turn attached to the cross-car beam; refer to JTIS.

The module comprises:

- A twin-stage inflator as opposed to the single-stage inflator.
- Two air bag connectors to accommodate the twin-stage inflation.

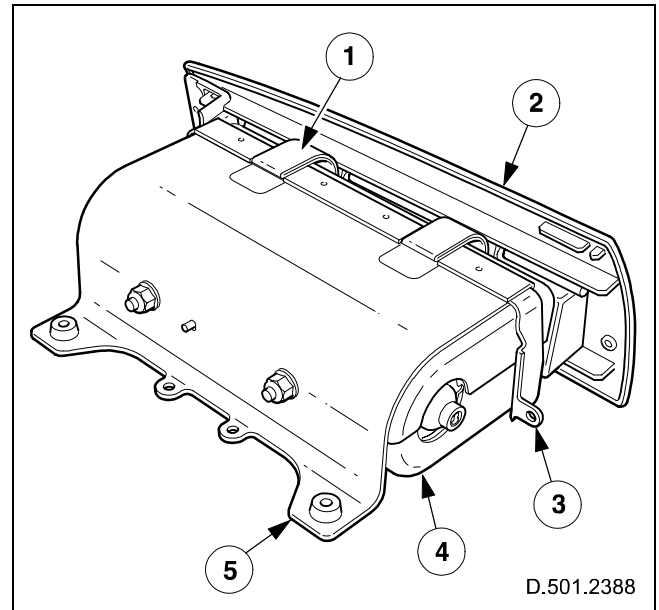
The heated gas inflator:

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

**NOTE:** Disposal of twin-stage air bags is different to single-stage air bags; refer to JTIS.

The passenger air bag module is controlled by the restraints control module (RCM), which chooses between first or second-stage deployment, depending on occupant status and crash severity.

**NOTE:** Variation in passenger air bag 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 to optimize occupant protection.



**Fig. 179** Passenger twin-stage air bag module

1. Webbing straps
2. Air bag deployment door
3. Tether bar
4. Passenger air bag module
5. Mounting bracket

# Occupant Safety

## Passenger Air Bag Deployment Door

The passenger air bag deployment door is clipped into the instrument panel and tethered to the mounting bracket via webbing straps.

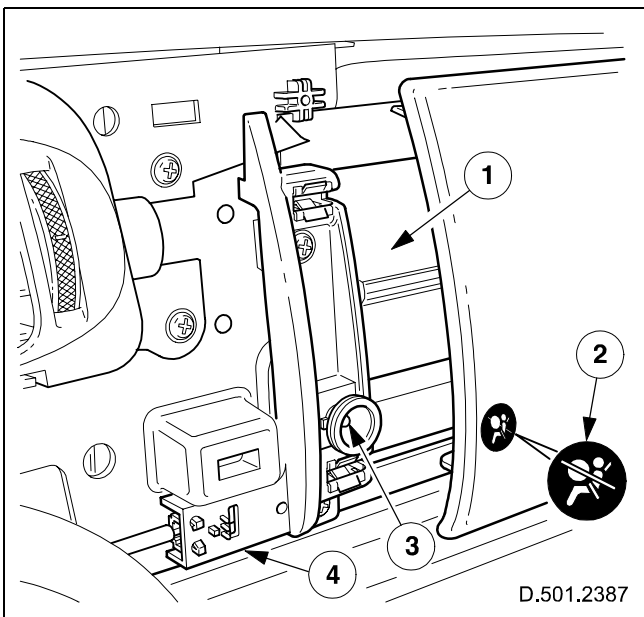
**NOTE:** Removal of the door complete with webbing straps and tether bar can only be achieved after removing the passenger air bag module; refer to JTIS.

The passenger air bag deployment door incorporates a lens that displays the air-bag deactivated symbol.

**NOTE:** In some markets, the symbol may be replaced by the phrase 'PASS AIRBAG OFF'.

The lens is backlit by the air-bag deactivation indicator lamp, which is mounted in a separate housing attached to the instrument panel. The illumination of the lens is designed to inform the front seat occupants whether or not the passenger air bag has been deactivated; refer to **Occupancy and Position Sensing**.

**NOTE:** The lamp is not a serviceable item; the complete housing must be changed; refer to JTIS.



**Fig. 180 Passenger air bag deactivation**

1. Air bag module
2. Air bag deactivation indicator lens
3. Air bag deactivation indicator lamp
4. Air bag deactivation indicator lamp housing

## Seat-Mounted Side Air Bag Module

The seat-mounted side air bag module is designed to provide protection for the thorax (the part of the torso between the neck and the abdomen). The module:

- is mounted in the outboard bolster of each front seat;
- is standard fit and specification in all markets;
- does not require routine maintenance;
- has no serviceable parts;
- uses compressed argon to inflate the bag.

**NOTE:** As with all occupant safety components, the SRS indicator lamp will illuminate if a DTC has been stored. Diagnosis must be undertaken using WDS.

In an air bag deployment situation, the air bag deploys through the stitched seam in the side bolster. A chute has been designed into the inside of the trim cover to ensure the air bag always emerges at the same point.

**WARNING:** In a service situation, the module must be correctly located in the chute. Failure to follow the service procedure could result in incorrect air bag deployment; refer to JTIS.

**NOTE:** In the event of a side impact that is sufficient to deploy the bag, it will be necessary to replace the complete seat.

## Side-Curtain Air Bag

The side-curtain air bag comprises:

- Attachment brackets (p-clips).
- Fill tube.
- Air bag.
- Housing.
- Inflator.
- Front/rear tethers.

The side-curtain air bag:

- is standard fit and specification in all markets;
- is located under the headliner and stabilized at the A-post and C-post by tethers;
- does not require routine maintenance;
- has no serviceable parts;
- uses compressed argon to inflate the air bag;
- deploys to coincide with seat-mounted side air bag deployment.

**NOTE:** If the passenger air bag is deactivated, the corresponding seat-mounted side air bag is also deactivated, however the side-curtain air bag will still deploy to afford protection to any corresponding rear occupant.

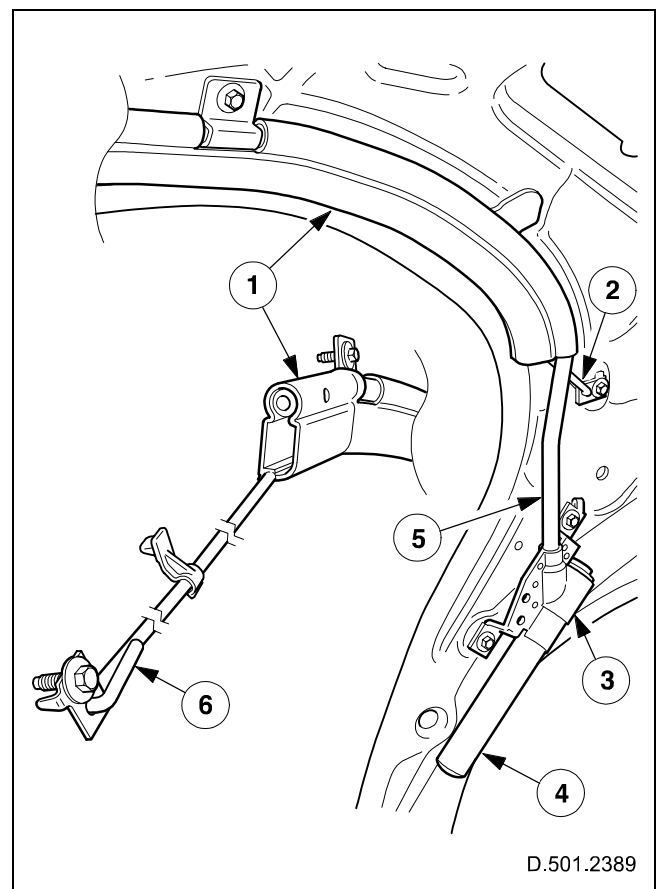
- After deployment, the side-curtain air bag extends down to approximately shoulder height providing head protection for both the front and rear occupants.

The inflator:

- generates the gas needed to fill the air bag;
- consists of a high strength steel casing filled with a solid propellant charge, an electrically activated igniter and a cold gas bottle containing pressurized gas.

When appropriate, the restraints control module (RCM) sends a signal to the igniter causing the following sequence of events:

- the propellant is ignited;
- the burning propellant opens the membrane of the cold gas bottle and heats the pressurized gas;
- the expanding gas is directed into the fill tube by the inflator housing assembly;
- the gas emerges through holes in the fill tube and enters the front and rear side-curtain air bag chambers.



**Fig. 181 Side curtain air bag**

1. Housing
2. Rear tether
3. Inflator housing assembly
4. Inflator
5. Fill tube
6. Front tether

# Occupant Safety

## Steering Column

The steering column is an integral part of the occupant safety system; refer to **Chassis, Steering System, Steering Column**.

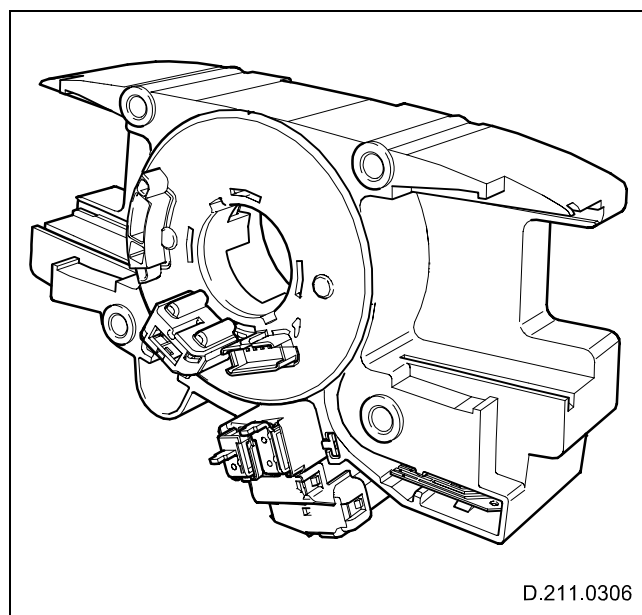
## Clockspring

The clockspring provides a flexible coupling for electrical connection of components that are attached to the steering wheel, including:

- horn;
- speed control buttons;
- telematics control buttons;
- driver air bag module.

**NOTE:** The clockspring has two electrical connectors that interface between the twin-stage driver air bag module and the restraints control module (RCM); refer to **Driver Air Bag Module**.

Vehicles installed with the heated steering wheel option have an additional power coupling; refer to **Climate Control System, Heated Steering Wheel**.



D.211.0306

Fig. 182 Clockspring