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2020.0 DEFENDER (LE), 501-20B

SUPPLEMENTARY RESTRAINT SYSTEM

**AIRBAG AND SAFETY BELT PRETENSIONER
SUPPLEMENTAL RESTRAINT SYSTEM - [+] FRONT
ROW SEATS ONLY** (G2342585)

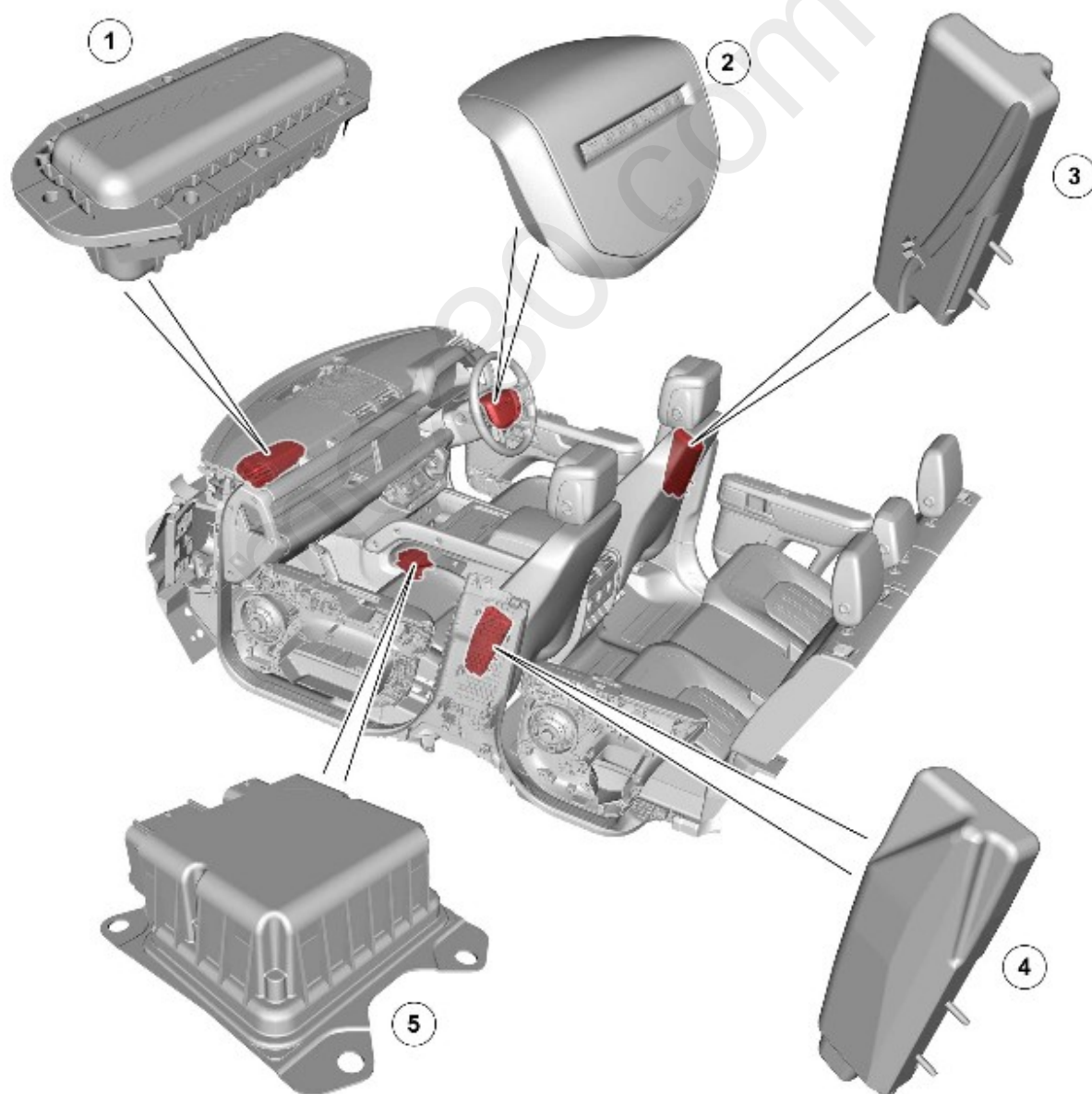
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COMPONENT LOCATION

COMPONENT LOCATION - 1 OF 4

NOTES:

- Right Hand Drive (RHD) vehicle is shown, Left Hand Drive (LHD) vehicle is similar.
- Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



ITEM	DESCRIPTION
1	Passenger airbag
2	Driver airbag
3	Driver side airbag
4	Passenger side airbag
5	Restraints Control Module (RCM)

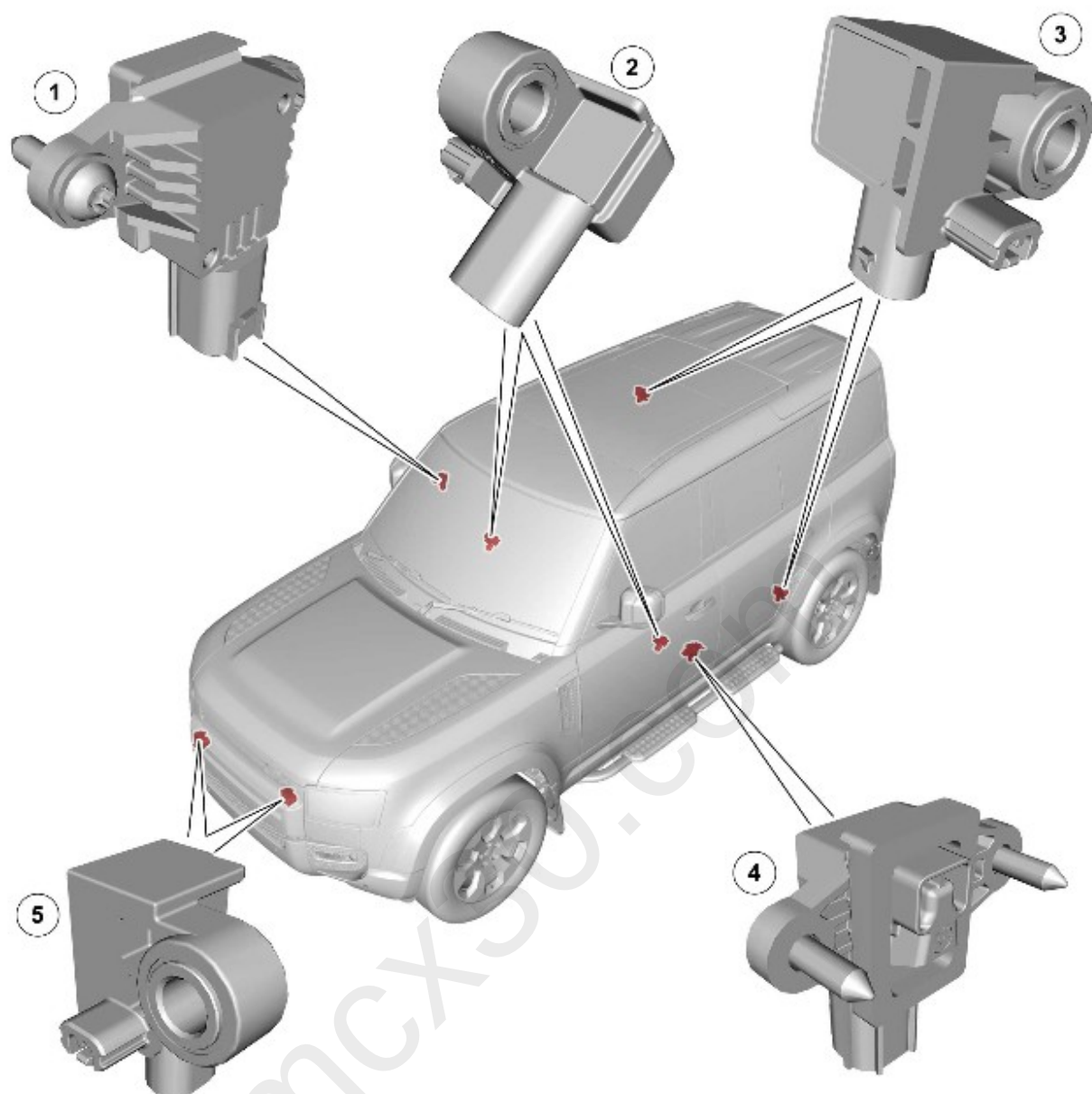
COMPONENT LOCATION - 2 OF 4



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.

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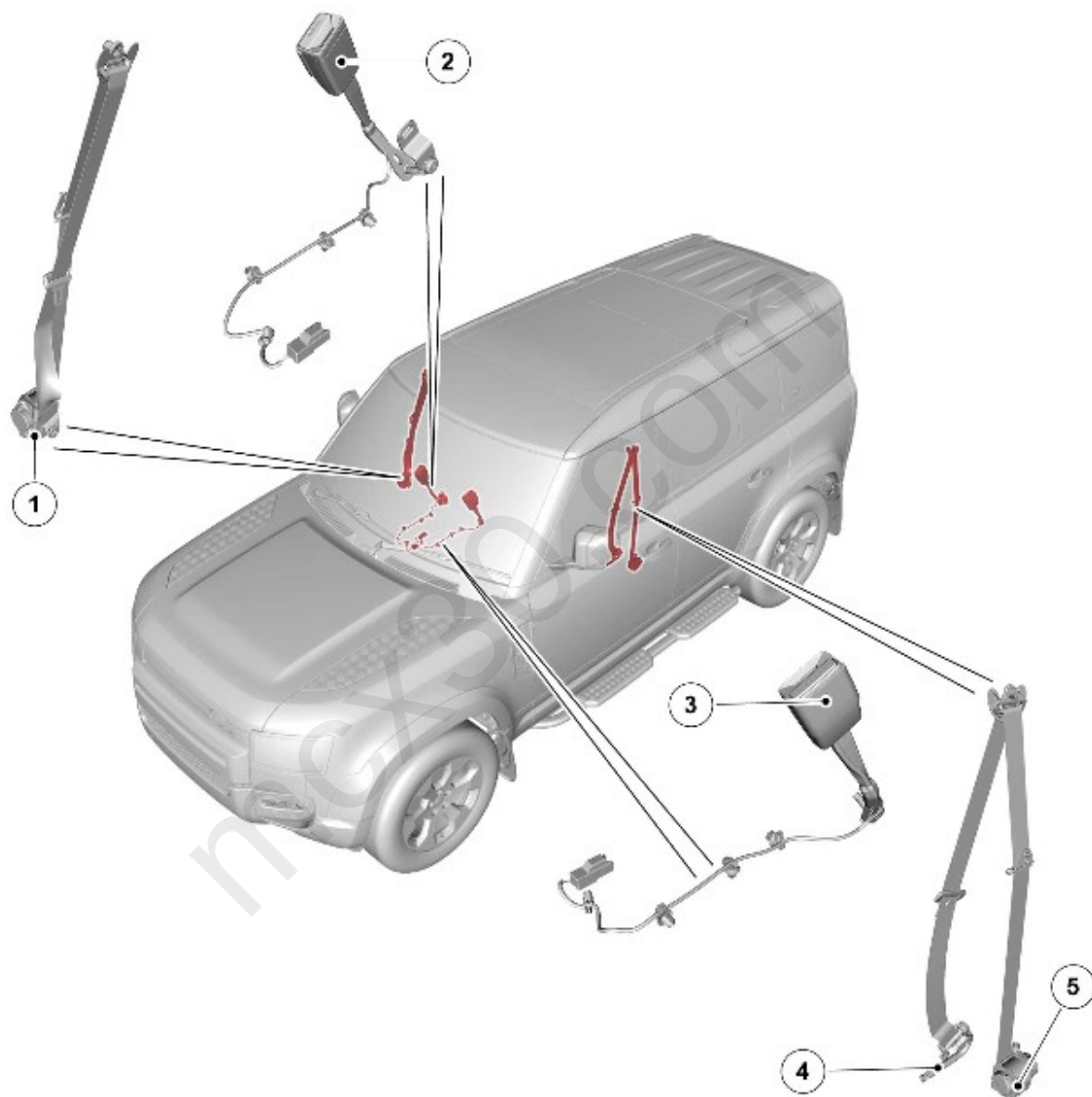


E253505

ITEM	DESCRIPTION
1	Right pressure sensor
2	Front side impact sensor (quantity 2)
3	Rear side impact sensor - (quantity 2) - vehicle with 5 doors only
4	Left pressure sensor
5	Front impact sensor (quantity 2)

 NOTES:

- LHD vehicle is shown, RHD vehicle is similar.
- Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E253506

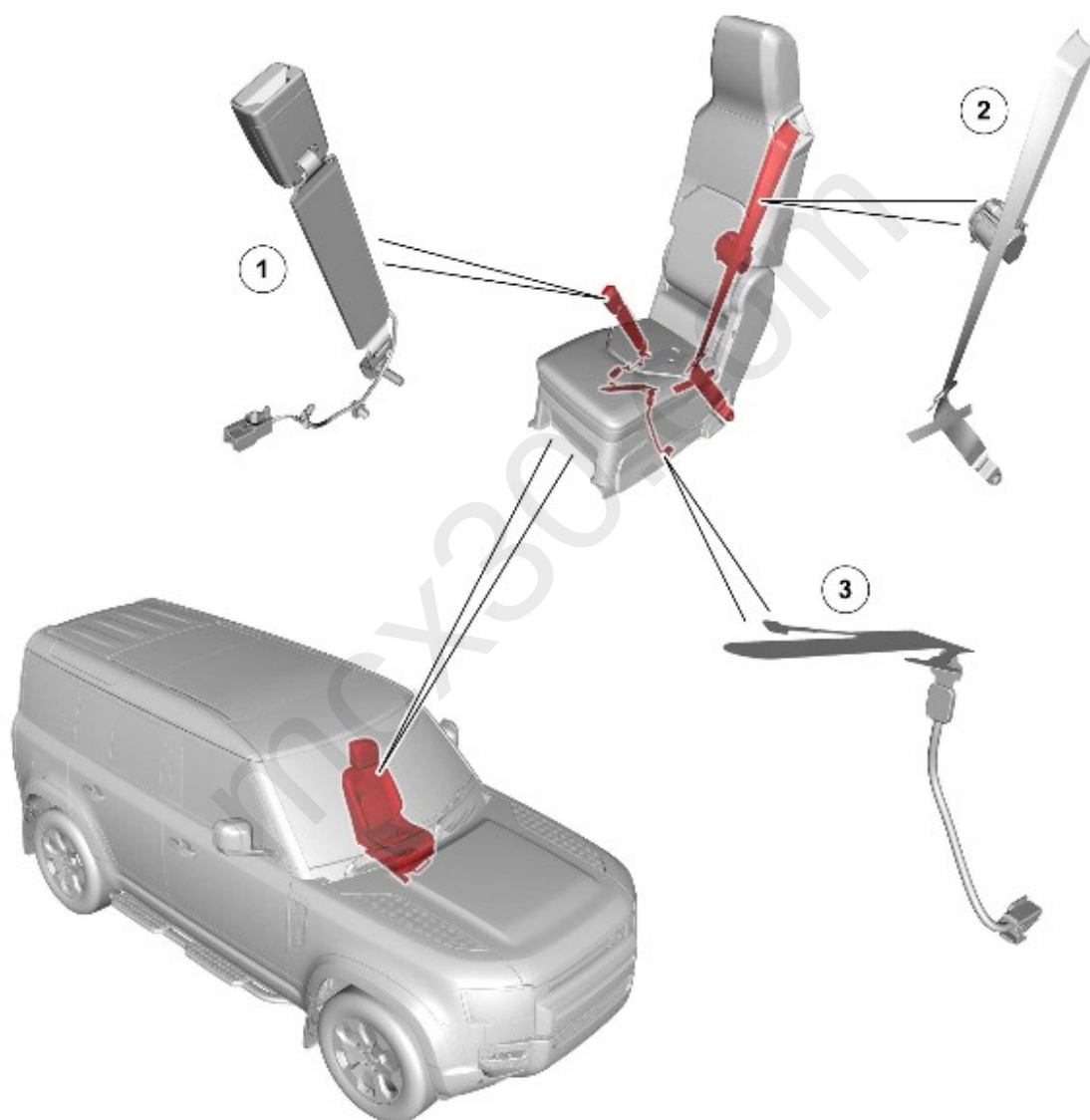
ITEM	DESCRIPTION
1	Seatbelt retractor - Passenger side
2	Seatbelt buckle - Passenger side
3	Seatbelt buckle - Driver side

ITEM	DESCRIPTION
4	Seatbelt pretensioner - North American Specification (NAS) market vehicles only
5	Seatbelt retractor - Driver side

COMPONENT LOCATION - 4 OF 4

NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E253507

ITEM	DESCRIPTION
1	Seatbelt buckle - Center seat

ITEM	DESCRIPTION
2	Seatbelt retractor - Center seat
3	Occupant detection sensor - Center seat

OVERVIEW



WARNING:

All pyrotechnic devices are dangerous. Before performing any procedures on any pyrotechnic device, read all information contained within the Standard Workshop Practices section of this manual.

For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

The RCM controls the operation of the system. The Supplementary Restraint System (SRS) provides additional protection for vehicle occupants in certain impact conditions by selective activation of:

- Driver airbag
- Passenger airbag
- Driver side airbag
- Passenger side airbag
- Seatbelt pretensioner.

The RCM receives inputs from various sensors around the vehicle to determine which devices, if any, should be activated during an accident.

The inputs are:

- An Occupant Classification Sensor Control Module (OCS) - NAS market only
- Front impact sensors
- Front side impact sensors
- Rear side impact sensors - vehicle with 5 doors only
- Right and left pressure sensors
- X, Y and Z axis acceleration sensors
- Vehicle speed
- Seat track position sensor.

On all vehicles except NAS, Australia and Japan market, the passenger airbag can be enabled and disabled. Use the vehicle setup menu in the Instrument Panel Cluster (IPC) message center to enable and disable the passenger airbag.

For additional information, refer to: [Message Center](#) (413-08 Message Center, Description and Operation).

The activation status of the passenger airbag is given by an indicator in the front overhead console. The status of the SRS is given by an airbag warning indicator in the IPC.

The airbags feature hybrid inflaters, which use a self-contained pyrotechnic device to heat a cylinder of compressed inert gas within the inflator. Above a calibrated pressure, the cylinder bursts and releases the gas into the airbag. The benefits of hybrid inflaters are a cooler inflation gas, resulting in lower airbag surface temperatures and elimination of the post-deployment effluent associated with solid pyrotechnic inflaters.

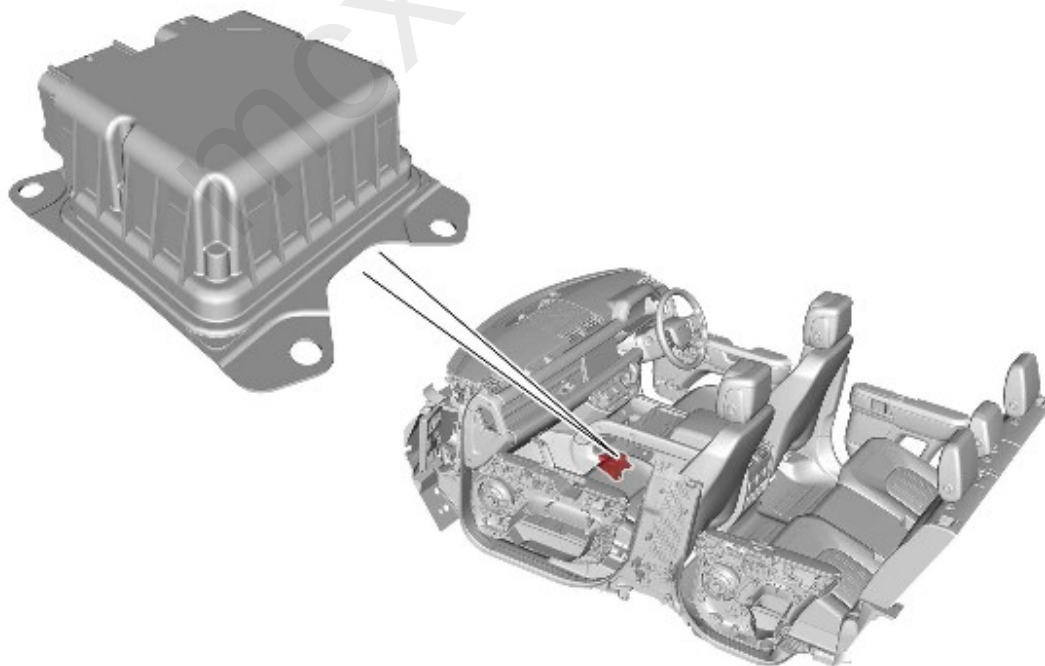
DESCRIPTION

RCM



NOTES:

- RHD vehicle is shown, LHD vehicle is similar.
- Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



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The RCM is located under the floor console and controls the operation of the SRS. The RCM receives an ignition feed from the Body Control Module (BCM)/ Gateway Control Module (GWM).

The RCM includes the following functions:

- Impact detection and recording.
- Airbag and seatbelt pretensioner firing.
- Self-test and system monitoring, with status indication through the airbag warning indicator and non volatile storage of fault information.
- Supply of yaw rate and lateral acceleration data for the Anti-Lock Brake System Control Module (ABS) and other modules requiring vehicle motion information.

The RCM determines which elements of the SRS are to be deployed by using 2 internal areas:

- Impact severity evaluation
- Deployment handler.

Impact severity evaluation uses data from the RCM internal accelerometer, the front impact sensors and the seatbelt buckle switches. Based on this data, the RCM decides which level of airbag module deployment is required and sends the information to the second area, the deployment handler.

The deployment handler evaluates the status of the seat track position sensor, seatbelt buckle switches and, on NAS market vehicles, the occupant classification sensor system.

The RCM has the ability to detect roll-over condition and apply the relevant airbag deployment strategy. The RCM processes the acceleration data and, subject to an impact being of high enough severity, decides which airbags should be deployed.

Pitch/roll/yaw rate and longitudinal/lateral/vertical accelerations for the ABS and all other modules requiring vehicle motion data are derived from the internal accelerometer. The data is transmitted on the FlexRay.

On board testing of the airbag and pretensioner firing circuits, the warning indicator circuits and the RCM status is done by the RCM. The RCM can store Diagnostic Trouble Code (DTC)s. The impact and pressure sensors do basic self-tests and faults are reported by the RCM.

The RCM drives the airbag warning indicator through FlexRay. When the warning indicator fails, a DTC is recorded and a warning tone is sounded in place of the indicator if a further fault occurs. In the event of an impact, the RCM records certain data which can be accessed through the diagnostic connector.

A sensor in the RCM provides confirmation of an impact to verify when airbag and pretensioner activation is necessary. A roll-over sensor monitors the lateral attitude of the vehicle. Various firing strategies are employed by the RCM to make sure that during an accident only the appropriate airbags and pretensioner are deployed. The firing strategy used also depends on the inputs from the seatbelt buckle switches.

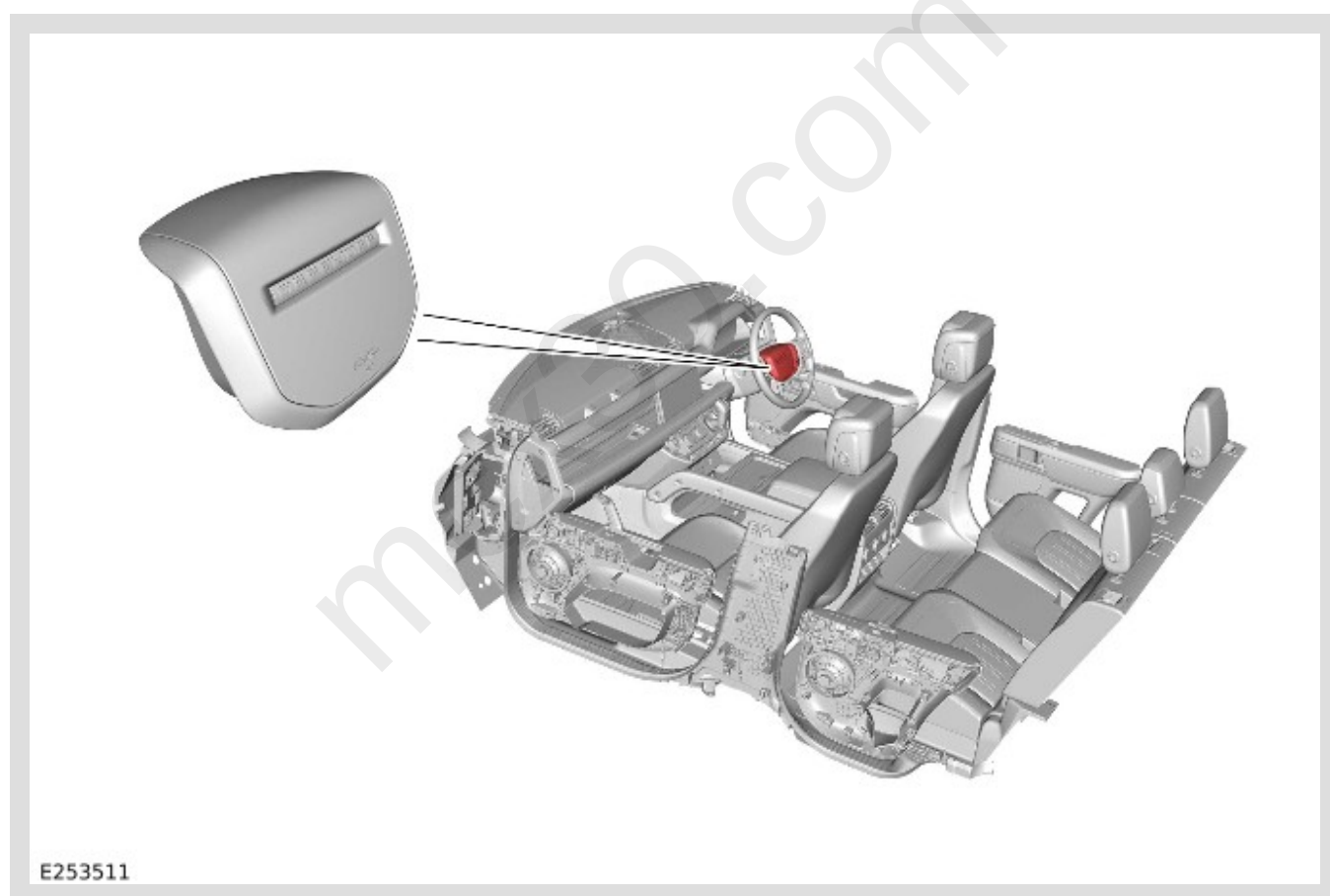
An energy reserve in the RCM makes sure there is always a certain amount of electric energy available. The electric energy is available for the total time of 150 milliseconds when the power supply from the ignition circuit is disrupted during an impact. The stored energy is sufficient to produce deployment signals for the driver airbag, the passenger airbag and the seatbelt pretensioner.

When in Power Mode 6 (ignition ON), the RCM does a self-test and then does cyclical monitoring of the system. When a fault is detected, the RCM stores a related DTC and illuminates the airbag warning indicator. The faults can be retrieved by Jaguar Land Rover (JLR) approved diagnostic equipment. When a fault that could cause a false fire signal is detected, the RCM disables the respective firing circuit and keeps it disabled during an impact event.

DRIVER AIRBAG

NOTES:

- RHD vehicle is shown, LHD vehicle is similar.
- Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



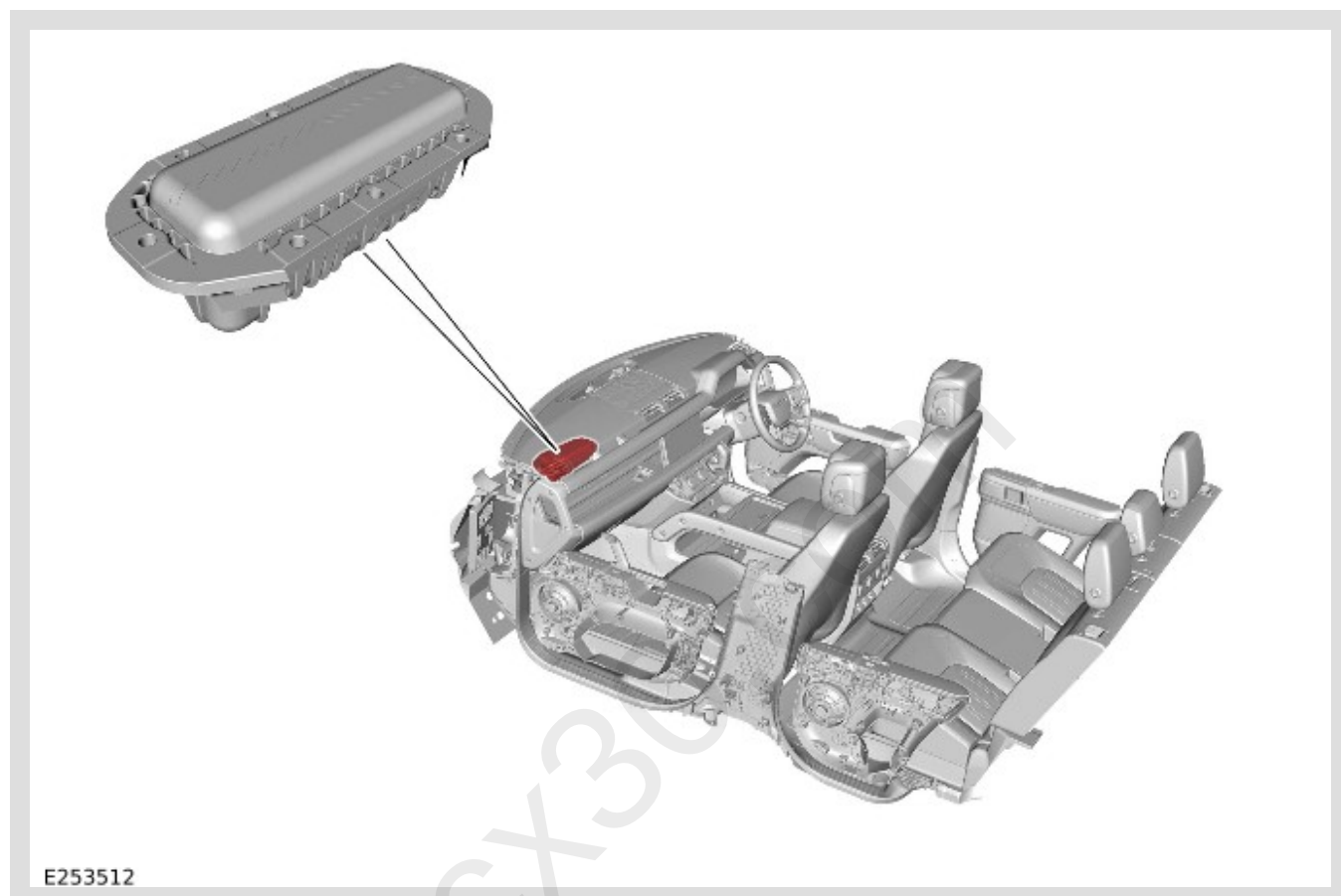
The driver airbag is located in the center of the steering wheel. The driver airbag provides head and chest protection for the driver when deployed during a front or rear impact.

Lines, molded into the inner surface of the airbag cover, provide weak points that split open in a controlled manner when the airbag deploys. The driver airbag has a single stage inflator with 1 connection.

PASSENGER AIRBAG

NOTES:

- RHD vehicle is shown, LHD vehicle is similar.
- Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



The passenger airbag is located in the instrument panel, behind the upper glovebox. The passenger airbag provides head and chest protection for the passenger when deployed during a front or rear impact.

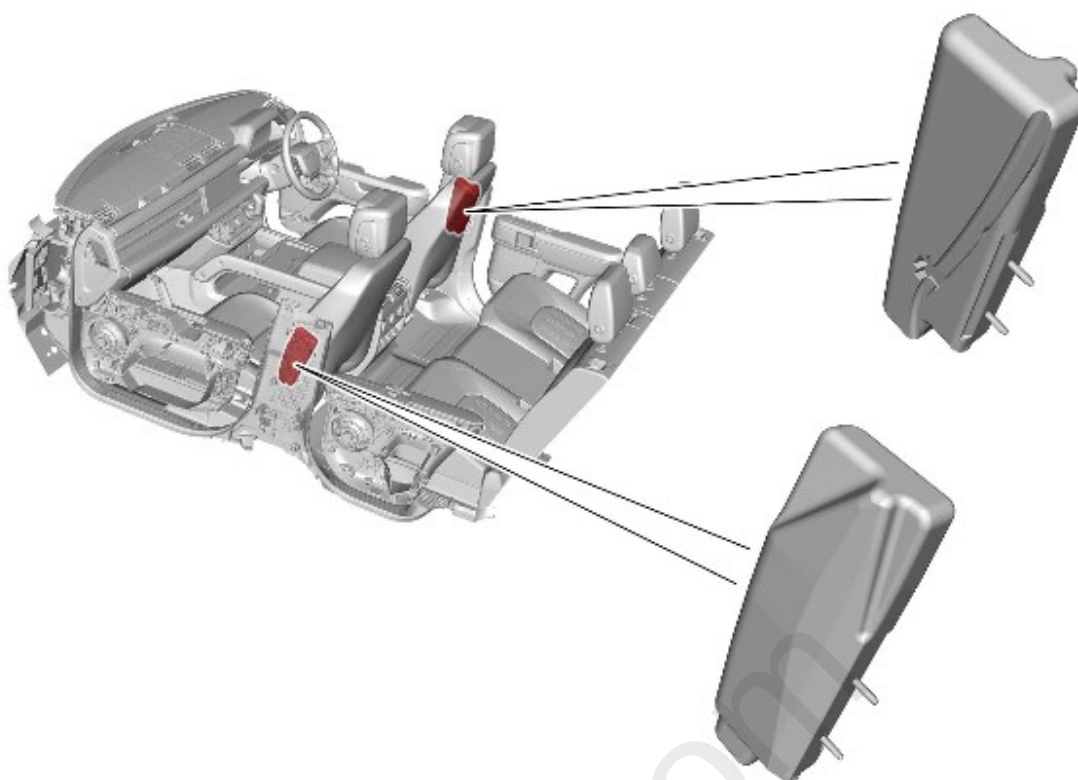
The top of the passenger airbag is attached to a channel chute underneath the top pad of the instrument panel. Doors in the top of the channel chute are forced open and split the top pad when the airbag deploys.

On all vehicles except NAS market, the passenger airbag has a single stage inflator. On NAS market vehicles the passenger airbag has a 2 stage inflator.

SIDE AIRBAGS

NOTES:

- RHD vehicle is shown, LHD vehicle is similar.
- Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



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The side airbags are attached to the outside of each front row seat backrest frame, under the backrest cover. The side airbags provide protection for the thorax, rib and pelvis when deployed during a side impact.

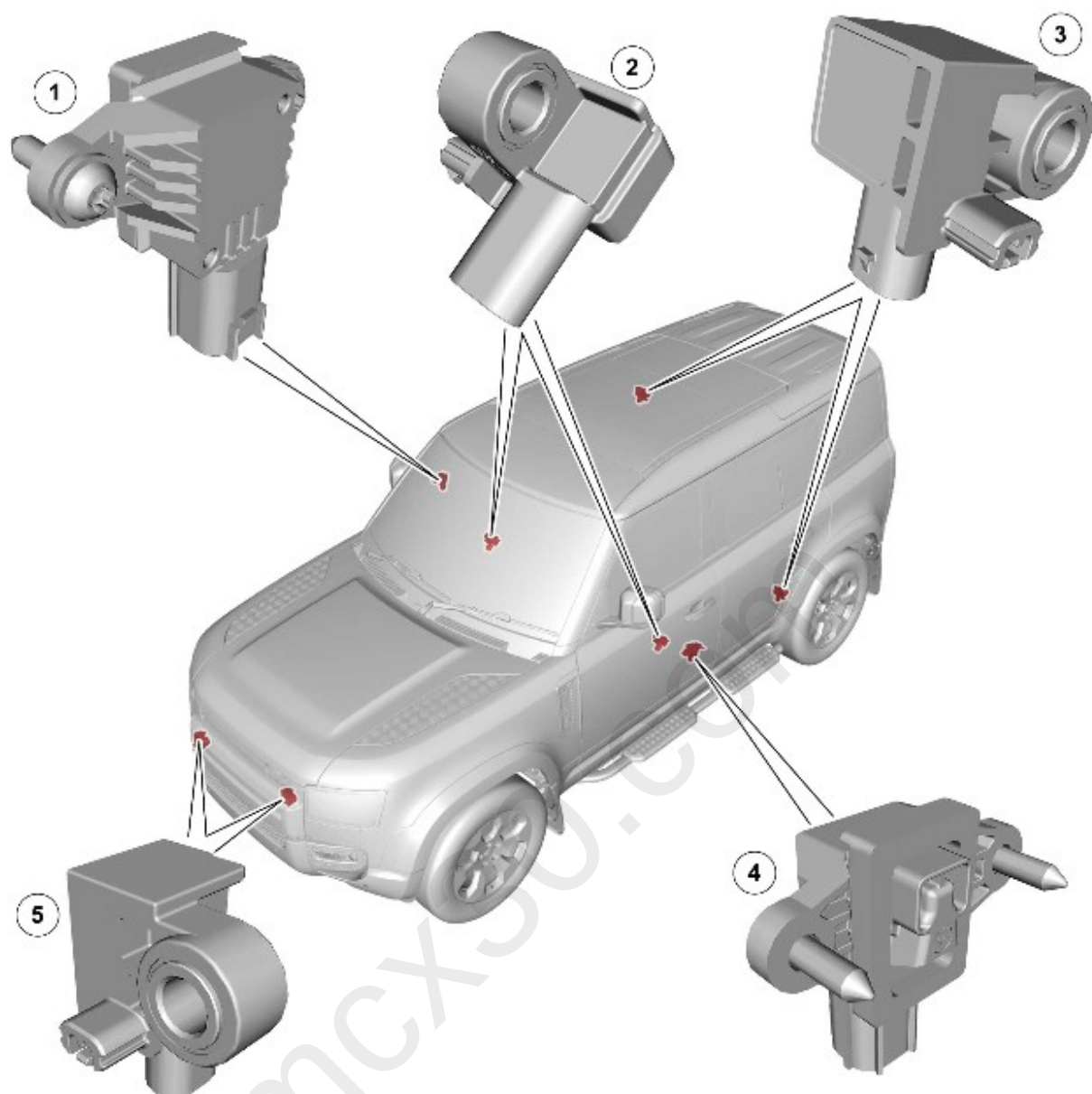
Each side airbag consists of a folded airbag and an inflator in a soft cover/wrapper. The airbag deploys and fills within a deployment chute integrated into the seat trim, and splits open the airbag deployment seam in the backrest cover.

IMPACT SENSORS AND PRESSURE SENSORS



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E253505

ITEM	DESCRIPTION
1	Right pressure sensor
2	Front side impact sensor (quantity 2)
3	Rear side impact sensor - (quantity 2) - vehicle with 5 doors only
4	Left pressure sensor
5	Front impact sensor (quantity 2)

The impact sensors are installed in the front and both sides of the vehicle. The 2 front impact sensors are attached to the front end carrier, behind the inboard edge of each headlamp. The 2 front side impact sensors are attached to the lower B-pillars, behind the pillar trim panels. The 2 rear side impact sensors are attached to the base of C-pillars, adjacent to the rear door latch strikers. The 2 rear side impact sensors are only equipped on the vehicles with 5 doors.

The impact sensors are accelerometers that allow the RCM to detect the sudden vehicle acceleration that occurs during an impact.

A pressure sensor is installed in each front door, attached to the door closing panels. The pressure sensors allow the RCM to detect any sudden pressure pulse that occurs in the front door during a side impact.

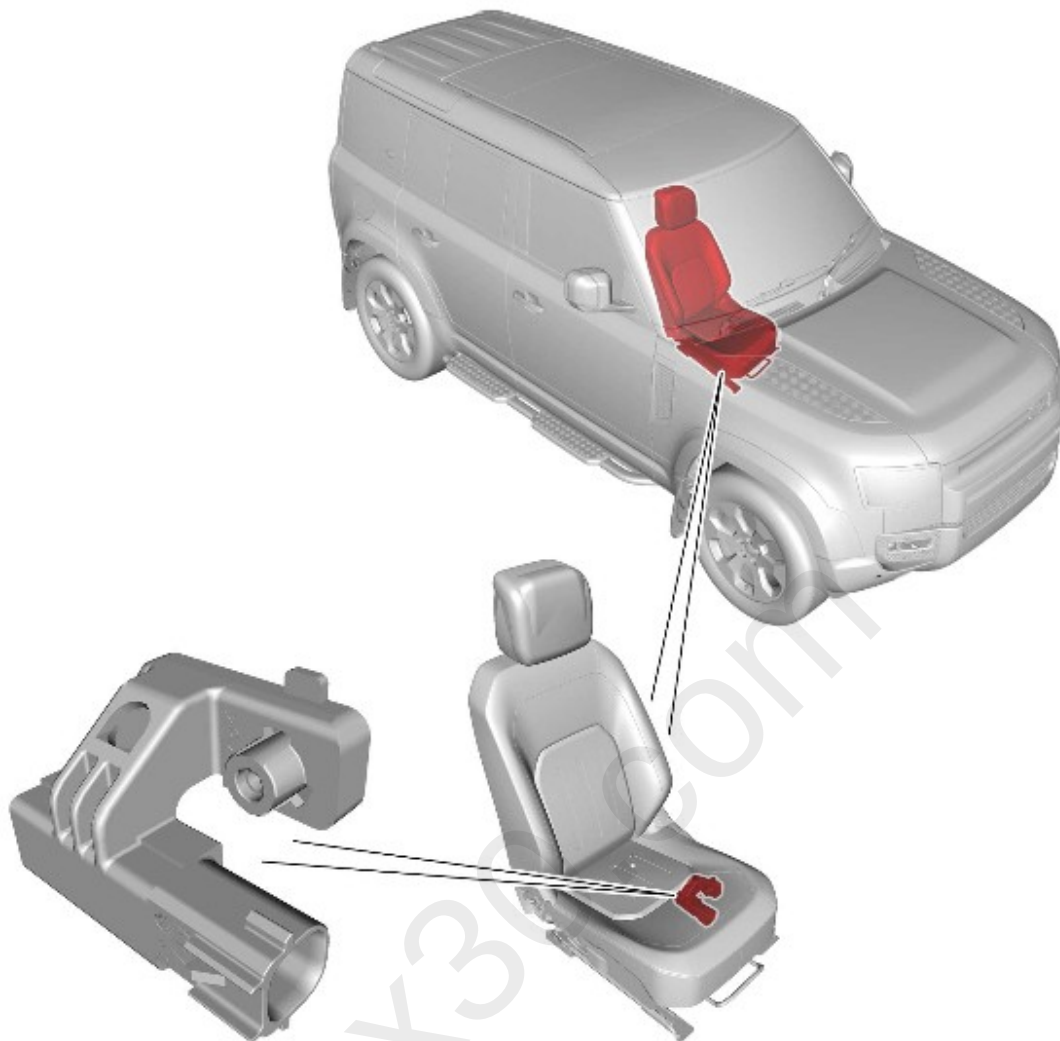
SEAT TRACK POSITION SENSOR – NAS MARKET ONLY



NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.

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The seat track position sensor allows the RCM to detect when the seat is forward of a given point on the seat track. The seat track position sensor is equipped on the passenger side on NAS market only.

The seat track position sensor consists of a hall effect sensor attached to the seat frame. When in Power Mode 6 (ignition ON), the RCM supplies the sensor with power, and monitors the return current. When the seat frame moves forward, the sensor moves over the edge of the seat track, which changes the reluctance of the sensor. The change of current is detected by the RCM and used as a switching point. The switching point is when the center of the sensor is 3 - 4 mm from the leading edge of the seat track.

OCCUPANT MONITORING

Occupant detection sensor

 NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.

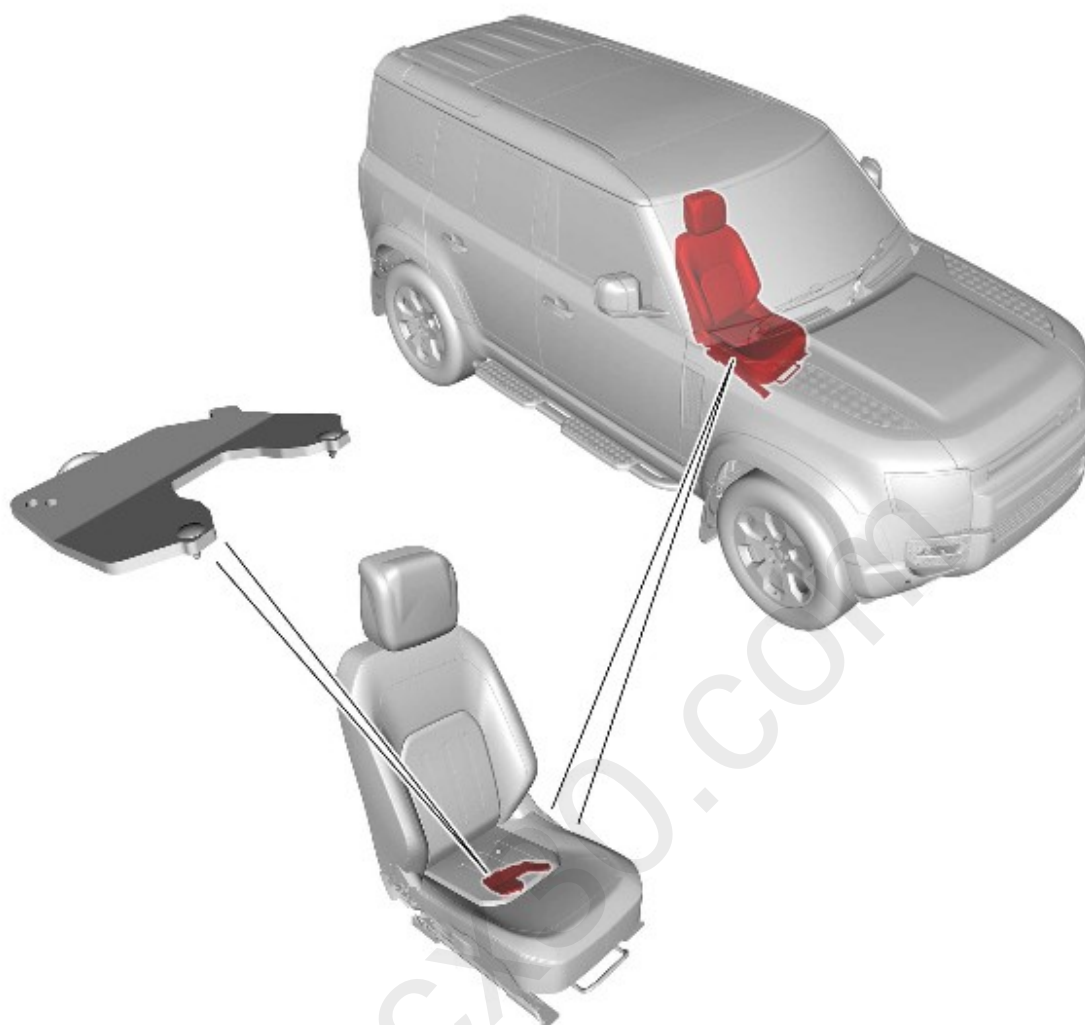


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The occupant detection sensors are installed in the cushions of the front outer and center passenger seats (6 seats), between the foam padding and the cover. The sensor consists of a foil contact circuit, embedded in a plastic sheet. Weight on the sensor reduces the resistance of the circuit, which is detected by the BCM/ GWM.

The occupant detection sensor has no interface with the SRS. The occupant detection sensor only provides an input to the BCM/ GWM for the seatbelt reminder function.

Occupant classification sensor - NAS market only



E253509

The occupant classification sensor is equipped on the NAS market vehicles.

For additional information, refer to: [Seatbelt System](#) (501-20A Seatbelt System, Description and Operation).

PASSENGER AIRBAG DEACTIVATION WARNING INDICATOR



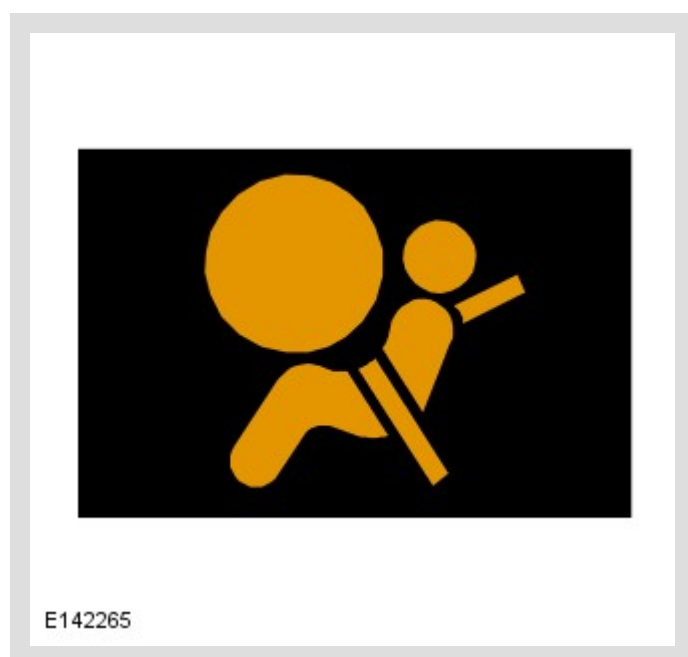
ITEM	DESCRIPTION
1	Front overhead console
2	Passenger airbag deactivation warning indicator

The passenger airbag deactivation warning indicator is installed in the front overhead console. When appropriate, the indicator illuminates to advise front seat occupants that the passenger airbag is disabled. Operation of the indicator is controlled by the RCM.

The RCM illuminates the indicator when:

- There is a fault with the passenger airbag firing circuit(s).
- The passenger airbag is disabled in the IPC and the front passenger seat is occupied.

AIRBAG WARNING INDICATOR



Operation of the airbag warning indicator in the IPC is controlled by a FlexRay message from the RCM. The RCM sends the signal to illuminate the airbag warning indicator when a fault is detected. The airbag warning indicator displays for approximately 6 seconds during the bulb check at the beginning of each ignition cycle.

OPERATION

In a collision, the force of the impact is measured by the impact sensors, pressure sensors and the RCM internal accelerometer. The RCM evaluates the readings to determine the impact point on the vehicle. The RCM also determines if the readings exceed the limits for firing any of the airbags and pretensioner. During a collision, the RCM only fires the airbags and pretensioner if the safing function confirms that an impact limit exceeds.

The RCM incorporates the following impact thresholds to cater for different accident scenarios:

- Front impact, pretensioner.
- Front impact, driver and passenger airbags stage 1, belt unfastened.
- Front impact, driver and passenger airbags stage 1, belt fastened.
- Front impact, passenger airbag stage 2, belt unfastened (NAS market only).
- Front impact, passenger airbag stage 2, belt fastened (NAS market only).
- Rear impact.
- Driver side impact.
- Passenger side impact.

FIRING STRATEGIES

The seatbelt pretensioner is fired when the pretensioner impact limit is exceeded. The RCM only fires the pretensioner when the related seatbelt is fastened.

The driver and passenger airbags are only fired in a frontal impact. When an impact exceeds a stage 1 limit, but is less than the corresponding stage 2 limit, only 1 inflator in each airbag is fired. Stage 2 is still fired, for airbag disposal purposes, after a delay of 100 ms. When an impact exceeds the stage 2 limit, the 2 inflators in each airbag are fired simultaneously.

On NAS market vehicles, the passenger airbag is disabled unless the front row passenger seat is occupied by a person. On all vehicles except NAS, Australia and Japan market, the passenger airbag can be selected OFF in the IPC . Use the vehicle setup menu in the IPC to enable and disable the passenger airbag.

When a seatbelt buckle switch fails, the RCM assumes the related seatbelt is fastened for the pretensioner firing strategy and unfastened for the driver and passenger airbag firing strategies. When there is a fault with the passenger airbag deactivation switch, the RCM disables the passenger airbag.

On NAS market vehicles, when the side impact limit on the front row passenger side is exceeded, the RCM also evaluates the input from the occupant classification sensor system. In that case the RCM also deploys the side airbag only when the front row passenger seat is occupied by a person.

When multiple impacts occur during an impact event, the RCM responds to the primary impact. Then the RCM sends the appropriate fire signals in response to any further impacts when unfired units are available.

Front and Rear Impact Firing Strategy - All markets except NAS market

SEATBELT STATUS		STRATEGY		
DRIVER	FRONT PASSENGER	APPLICABLE PRETENSIONER	DRIVER AIRBAG	PASSENGER AIRBAG
Fastened	-	Fired at pretensioner threshold	Fired at belt fastened threshold	-
Unfastened	-	Not fired	Fired at belt unfastened threshold	-
-	Fastened	Fired at pretensioner threshold	-	Fired at belt fastened threshold
-	Unfastened	Not fired	-	Fired at belt unfastened threshold

Front and Rear Impact Firing Strategy - NAS market

SEATBELT STATUS		PASSENGER SEAT CLASSIFICATION	STRATEGY		
DRIVER	PASSENGER		APPLICABLE PRETENSIONER	DRIVER AIRBAG	PASSENGER AIRBAG
Fastened	-	-	Fired at	Fired at seatbelt	-

SEATBELT STATUS		PASSENGER SEAT CLASSIFICATION	STRATEGY		
DRIVER	PASSENGER		APPLICABLE PRETENSIONER	DRIVER AIRBAG	PASSENGER AIRBAG
			pretensioner threshold	fastened threshold	
Unfastened	-	-	Not fired	Fired at seatbelt unfastened threshold	-
-	Fastened	Occupied allow	Fired at pretensioner threshold	-	Fired at seatbelt fastened threshold
-	Fastened	Occupied inhibit or empty	Fired at pretensioner threshold	-	Not fired
-	Unfastened	Occupied allow	Not fired	-	Fired at seatbelt unfastened threshold
-	Unfastened	Occupied inhibit or empty	Not fired	-	Not fired

IMPACT SIGNAL

When the RCM outputs any of the fire signals it also outputs an impact signal to the BCM/ GWM through FlexRay.

The impact signal is also hardwired to:

- The Powertrain Control Module (PCM)
- Electric Power Inverter Converter Control Module (EPIC) - Plug-in Hybrid Electric Vehicle (PHEV) only
- Battery Energy Control Module (BECM) - PHEV only
- Belt Integrated Starter Generator (BISG) - Mild Hybrid Electric Vehicle (MHEV) only
- All door modules
- Telematics Control Module (TCU) (if equipped).

On receipt of the impact signal, the PCM cuts the power supply to the fuel pump relay and the BCM/ GWM switches into impact mode.

In the impact mode, the BCM/ GWM:

- Activates all of the unlock signals of the vehicle locking system, even when the vehicle is already unlocked.
- Ignores all locking/superlocking inputs until it receives an unlock input, when it returns the locking system to normal operation.
- Activates the interior lamps. The interior lamps remain ON permanently until they are manually switched OFF at the lamp unit. Additionally, the interior lamps return to normal operation after the impact mode is switched OFF.
- Disables the rear window child lock input until the impact mode is switched OFF.

- Activates the hazard warning lamps. The hazard warning lamps remain ON until canceled by the hazard warning switch or the impact mode is switched OFF.

The BCM/ GWM impact mode is switched OFF by a valid locking and unlocking cycle of the locking system.

DIAGNOSTICS

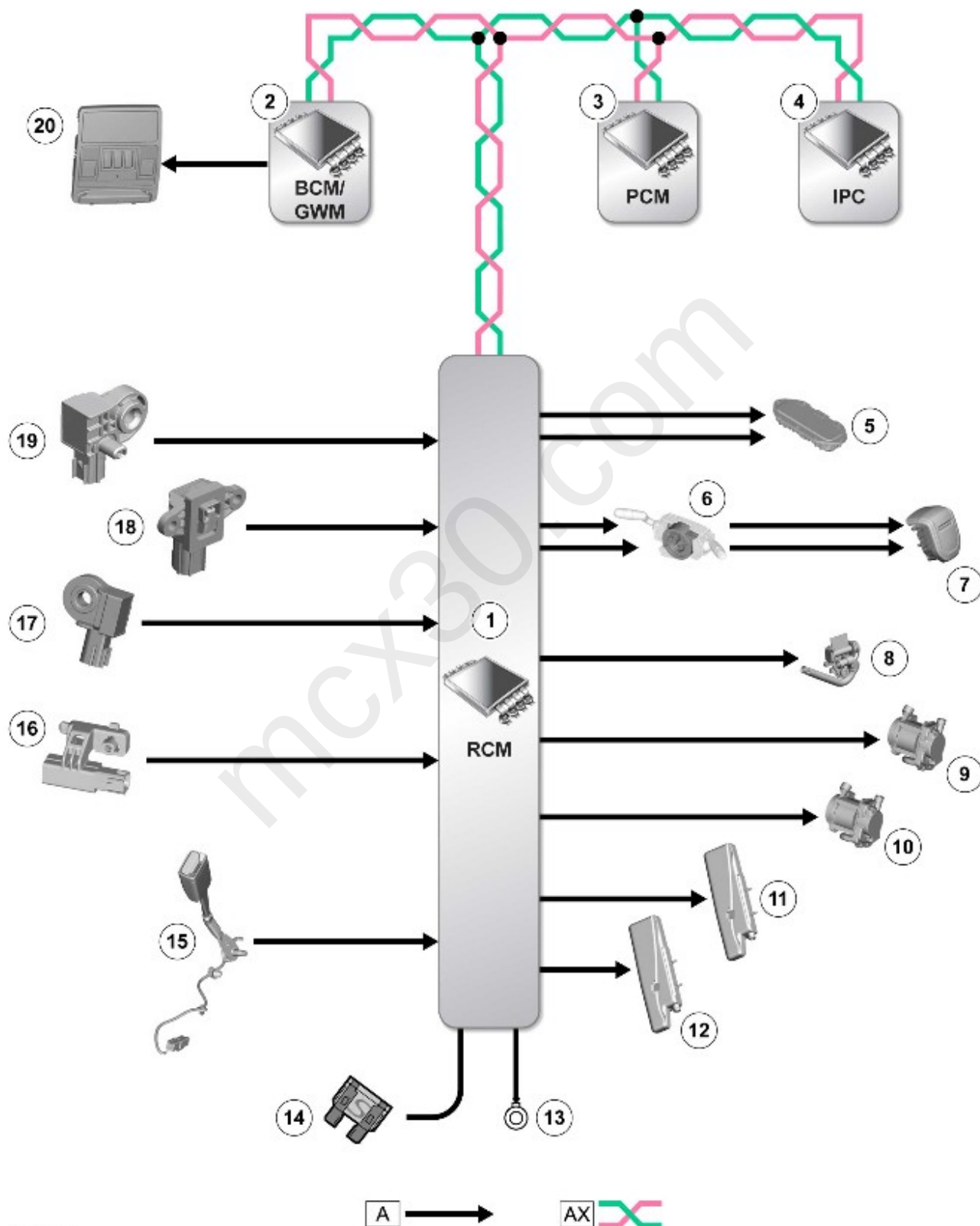
The RCM records any DTCs and related data. The DTCs and related data are read using the JLR approved diagnostic equipment.

The JLR approved diagnostic equipment enables certain components to be activated and also read live data.

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CONTROL DIAGRAM

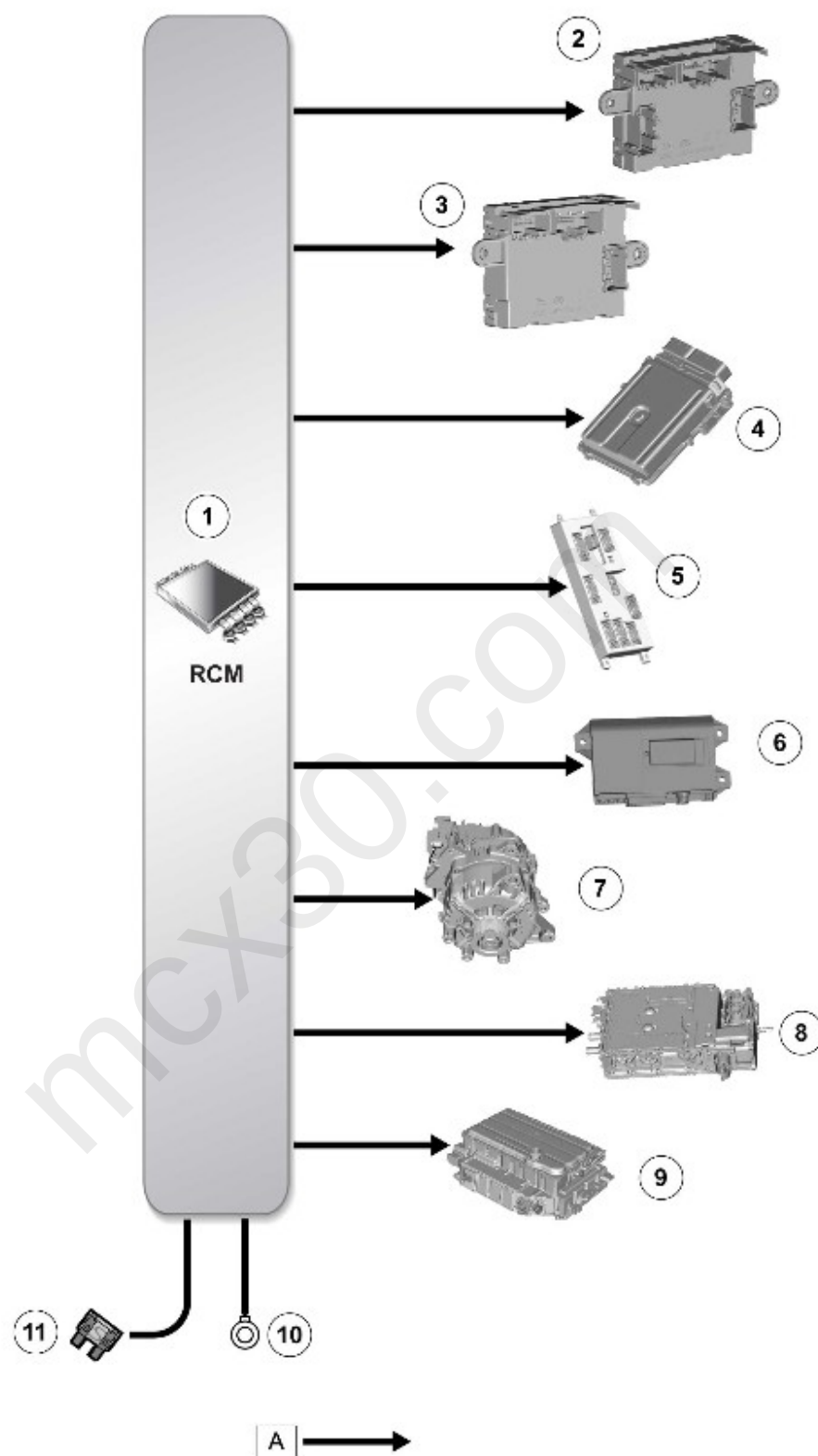
CONTROL DIAGRAM - 1 OF 2



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A = HARDWIRED: AX = FLEXRAY.

ITEM	DESCRIPTION
1	RCM
2	BCM/ GWM
3	PCM
4	IPC
5	Passenger airbag
6	Clockspring
7	Driver airbag
8	Driver seatbelt pretensioner - NAS only
9	Passenger seatbelt retractor
10	Driver seatbelt retractor
11	Driver side airbag
12	Passenger side airbag
13	Ground
14	Power supply
15	Front seatbelt buckle switch (quantity 2)
16	Seat track position sensor
17	Front impact sensor (quantity 2)
18	Pressure sensor - Left and right (quantity 2)
19	Side impact sensor (quantity 4 on 5 doors vehicle/quantity 2 on 3 doors vehicle)
20	Passenger airbag deactivation indicator - Front overhead console



A = HARDWIRED.

ITEM	DESCRIPTION
1	RCM
2	Driver Door Control Module (DDM) and Passenger Door Control Module (PDM)
3	Rear door module (quantity 2 on 5 doors vehicle)
4	PCM
5	BCM/ GWM
6	TCU
7	BISG - MHEV only
8	BECM - PHEV only
9	EPIC - PHEV only
10	Ground
11	Power supply

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