

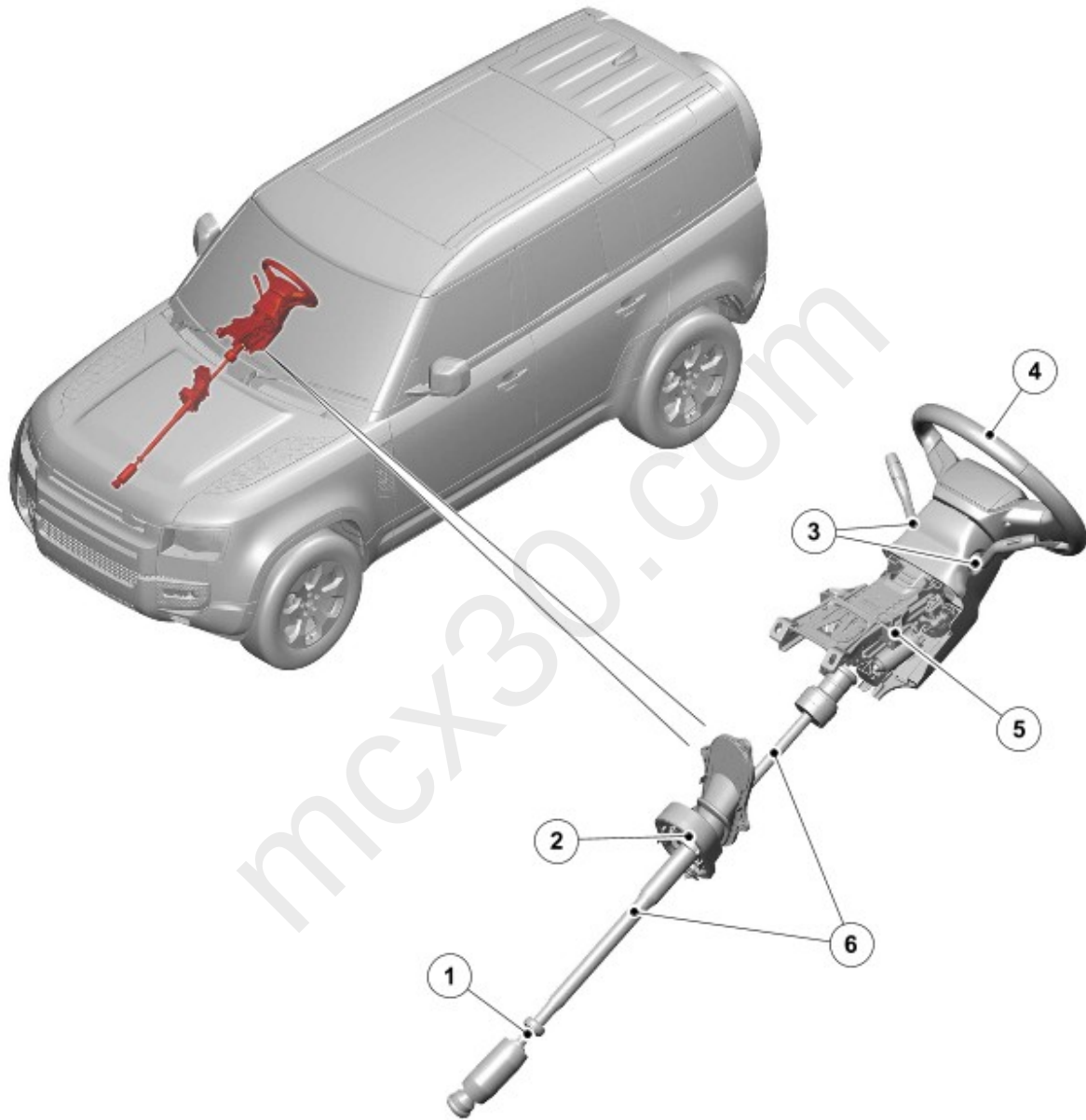
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STEERING COLUMN (G2341736)

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DESCRIPTION AND OPERATION

COMPONENT LOCATION



E252336

ITEM	DESCRIPTION
1	Steering column lower shaft
2	Steering bulkhead seal
3	Steering column multifunction switch (left/right)

ITEM	DESCRIPTION
4	Steering wheel
5	Steering column
6	Steering column upper shaft

OVERVIEW

The steering column consists of the upper and lower shafts, the steering column and the steering wheel. These components are connected together to transfer driver steering inputs to the steering gear.

The steering column incorporates either manual or electric tilt and reach adjustment. An adjustment switch (electric) or lever (manual) for tilt and reach adjustment is installed in the lower cowl of the upper column.

Depending on market specification, the steering wheel also incorporates a steering wheel heater, and the steering column incorporates an Electric Steering Column Lock (ESCL).

Steering wheel switchpacks are located each side of the driver airbag and are connected to the Steering Wheel Module (SWM) through the Clockspring.

The steering wheel switchpacks allow for operation of the following vehicle systems:

- Speed control
- Audio system
 - For additional information, refer to: [Audio System](#) (415-01 Information and Entertainment System, Description and Operation).
- Mobile phone
 - For additional information, refer to: [Mobile Phone](#) (415-01 Information and Entertainment System, Description and Operation).
- Voice control
 - For additional information, refer to: [Voice Control](#) (415-01 Information and Entertainment System, Description and Operation).
- Vehicle information and settings menu
 - For additional information, refer to: [Message Center](#) (413-08 Message Center, Description and Operation).
- Heated steering wheel (if equipped).

The steering column multifunction switch (left/right) located on the steering column allows for operation of the following vehicle systems:

- Exterior lighting
 - For additional information, refer to: [Exterior Lighting](#) (417-01 Exterior Lighting, Description and Operation).
- Wipers and washers.

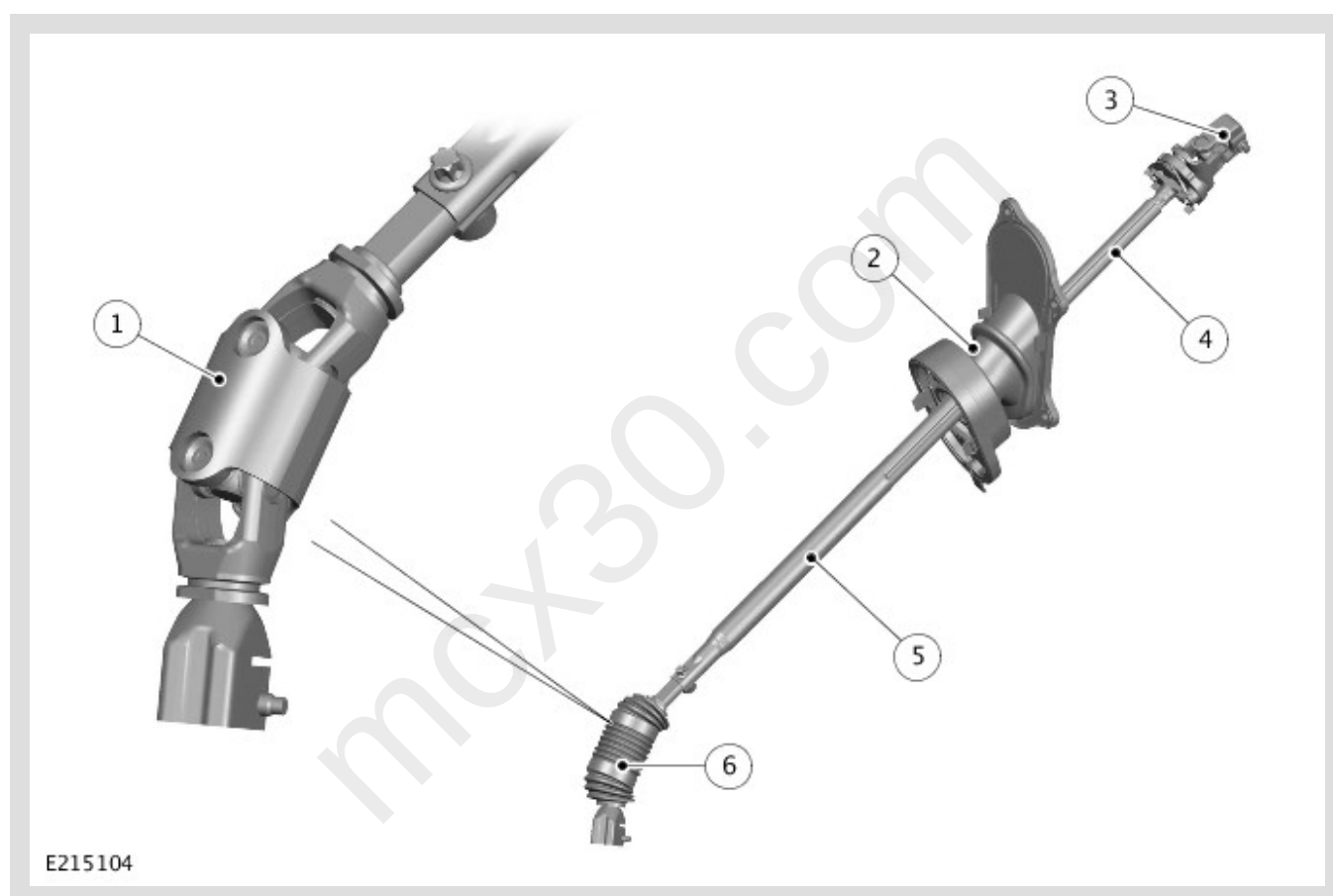
- For additional information, refer to: [Wipers and Washers](#) (501-16 Wipers and Washers, Description and Operation).

The steering wheel also incorporates the driver airbag, with the integrated horn switch.

For additional information, refer to: [Airbag and Safety Belt Pretensioner Supplemental Restraint System - \[+\] Vehicles with 2nd / 3rd Row Seats](#) (501-20B Supplementary Restraint System, Description and Operation).

DESCRIPTION

UPPER AND LOWER SHAFTS



ITEM	DESCRIPTION
1	Universal joint
2	Steering bulkhead seal
3	Universal joint
4	Inner shaft
5	Outer shaft
6	Boot

The upper shaft consists of inner and outer pipes that can move telescopically to:

- Permit system assembly.
- Allow steering wheel adjustment.
- Isolate the steering wheel from any movement of the steering gear during an impact.

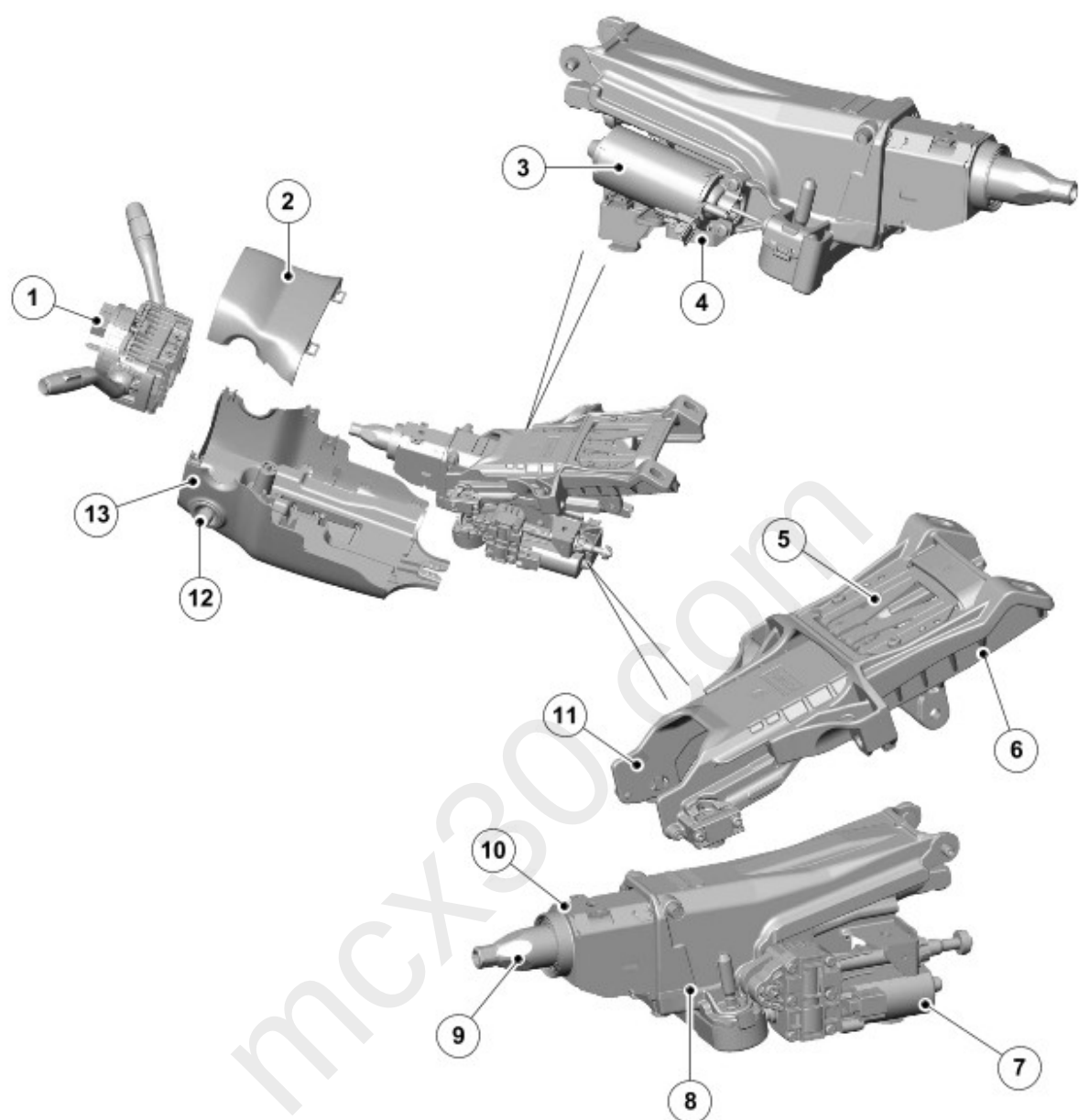
The universal joint connects the inner pipe to the steering column. An isolator disc, between the universal joint and the inner pipe, reduces Noise, Vibration and Harshness (NVH) in the steering column.

A steering bulkhead seal is installed on a bearing sleeve on the outer shaft. It seals the upper shaft where it passes through the engine and secondary bulkheads. A bearing allows the upper shaft to rotate within the seal assembly.

The lower shaft consists of a double universal joint with a stub shaft and pinion extension. This provides the connection to the upper shaft and the steering gear respectively. The universal joint is equipped with a corrugated boot.

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UPPER COLUMN - ELECTRIC ADJUSTMENT



E252338

ITEM	DESCRIPTION
1	Steering Wheel Module (SWM) and Clockspring assembly
2	Upper cowl
3	Steering column adjustment motor - Tilt
4	Electric Steering Column Lock (ESCL) (if equipped)
5	Energy management plate
6	Outer bracket
7	Steering column adjustment motor - Reach

ITEM	DESCRIPTION
8	Swing bracket
9	Steering column spindle
10	Steering column jacket
11	Inner bracket
12	Steering column adjustment switch
13	Lower cowl

The steering column spindle is part of the steering column jacket assembly, that is installed in the swing bracket. An electric motor on the swing bracket drives the steering column jacket assembly axially within the swing bracket. This provides the reach adjustment of the steering column.

The swing bracket is attached to the inner bracket with 2 pivot pins at the front and 2 threaded spindles at the rear. A second electric motor on the swing bracket drives the spindles to raise and lower the rear of the swing bracket, relative to the inner bracket. This provides the tilt adjustment of the steering column.

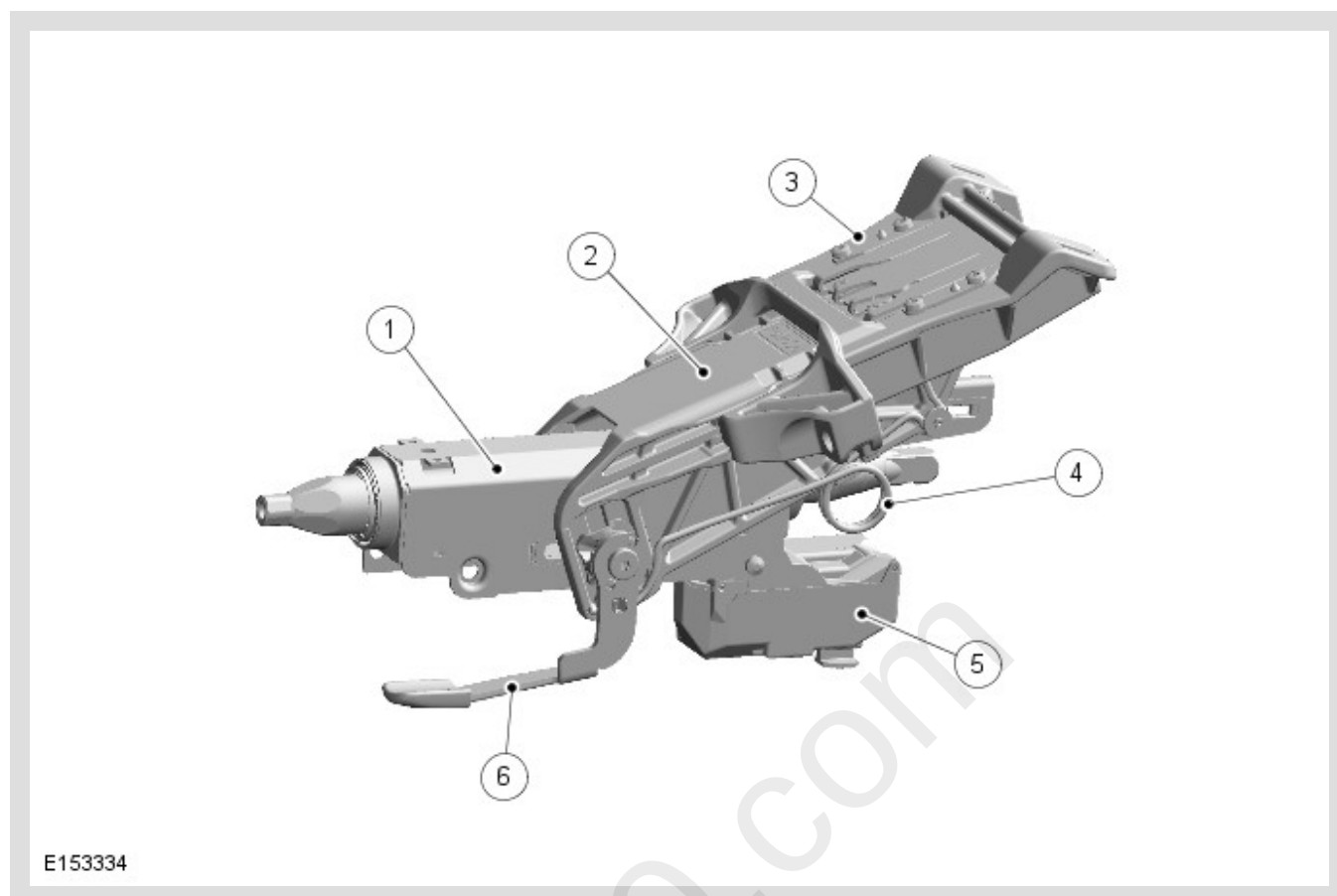
The inner bracket is located on rails in an outer bracket, which is attached to the cross-car beam. The inner and outer brackets are locked together by an energy management plate, which is attached to both brackets with screws. In a serious impact, the inner bracket progressively moves forward on the rails in the outer bracket. This is provided to prevent excessive force causing injury as the driver strikes the airbag. The movement is controlled by sections of the energy management plate that peel back in a controlled manner. This is provided to absorb energy and to allow the steering wheel to move with the driver.

The Steering Wheel Module (SWM) and Clockspring assembly is attached to the top of the steering column jacket by 2 screws. The assembly includes the multifunction switches for the exterior lighting and for the windshield wipers and washers.

Upper and lower cowls cover that part of the steering column not concealed by the instrument panel. The steering column adjustment switch, for control of the tilt and reach adjustment motors, is installed in the right side of the lower cowl. The lower cowl may also contain an Immobilizer Antenna Unit (IAU) for the Passive Entry Passive Start (PEPS) system.

For additional information, refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

UPPER COLUMN – MANUAL ADJUSTMENT



ITEM	DESCRIPTION
1	Column jacket
2	Inner bracket
3	Outer bracket
4	Counterbalance spring (quantity 2)
5	Electric Steering Column Lock (ESCL) or dummy lock
6	Steering column manual adjustment lever

The shaft of the upper column is installed in a bearing housing. The housing is attached to an inner bracket with a pivot pin and an adjustment locking mechanism. Slots at the attachment points, in the bearing housing and the inner bracket. This allows the bearing housing to move axially and tilt in the inner bracket and provides the tilt and reach adjustment of the steering wheel. The locking mechanism is a friction lock, operated by a lever, which turns a cam disc.

ELECTRIC STEERING COLUMN LOCK – IF EQUIPPED

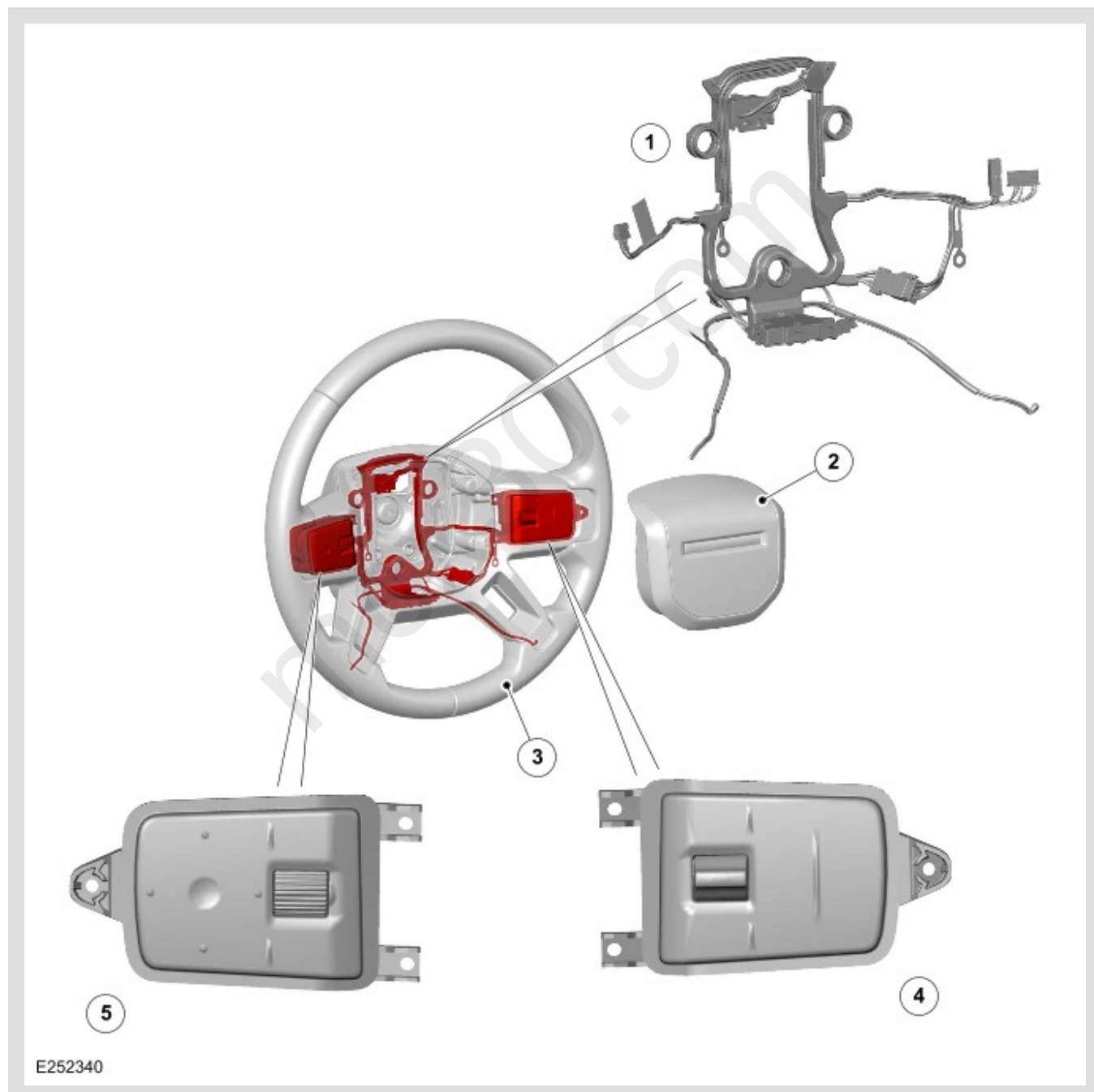
The Electric Steering Column Lock (ESCL) is attached to the underside of the steering column lower cowl. The ESCL engages with a locking sleeve on the shaft of the steering column to lock the steering. A tolerance ring is installed between the locking sleeve and the spindle of the steering column. The tolerance ring allows the spindle to turn in the

locking sleeve if a high torque is applied to the steering wheel when the lock is engaged. This prevents the locking bolt from being sheared by someone forcibly turning the steering wheel while the steering lock is engaged, while still effectively locking the steering. Engagement and disengagement of the ESCL is controlled by the passive anti-theft system.

For additional information, refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

In markets where an ESCL is not equipped, a dummy lock is installed. This provides a forward attachment point for the steering column lower cowl, and the ESCL is disabled in the car configuration files.

STEERING WHEEL



ITEM	DESCRIPTION
1	Steering wheel wiring harness

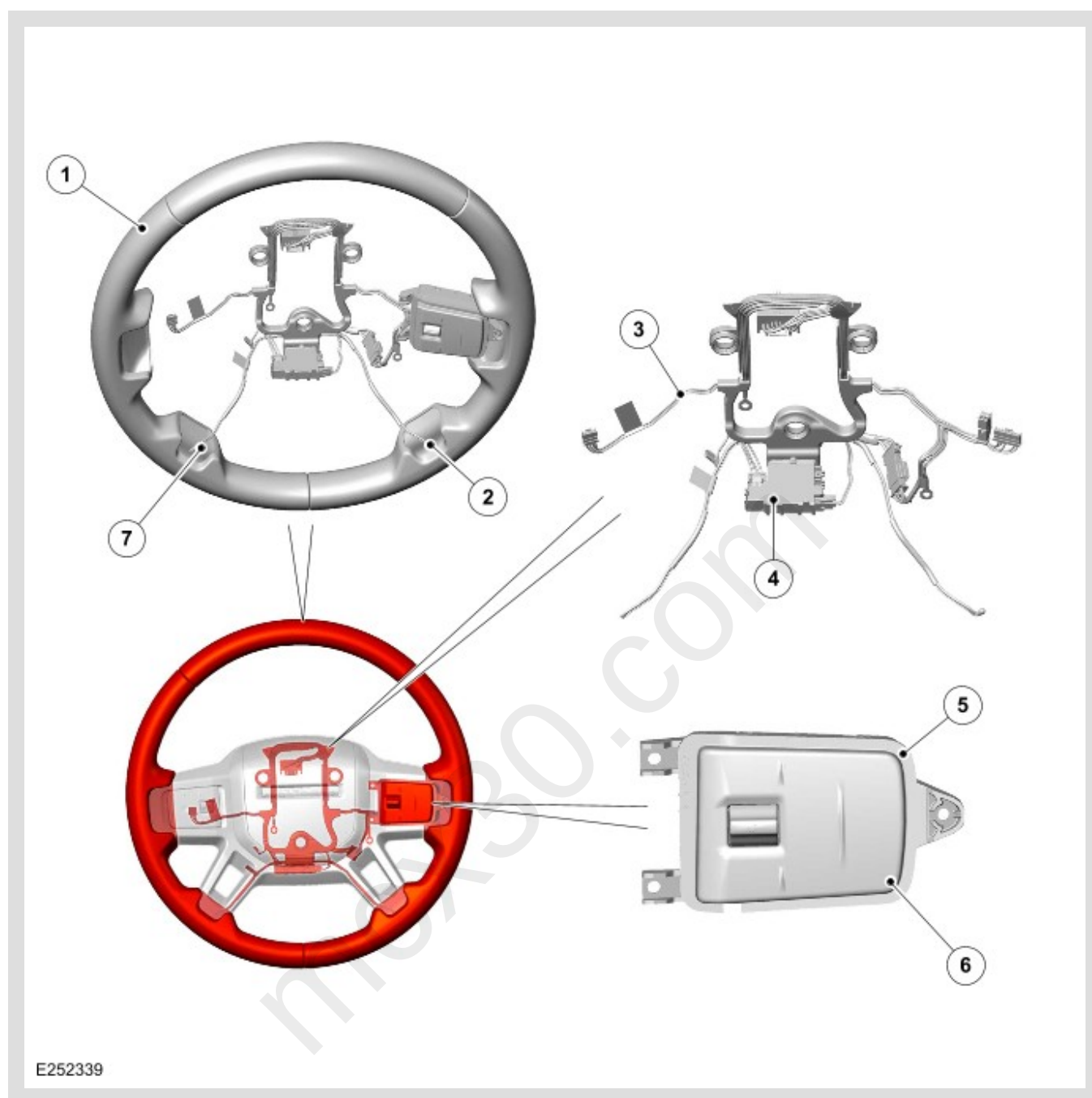
ITEM	DESCRIPTION
2	Driver airbag
3	Steering wheel
4	Steering wheel switchpack - Right
5	Steering wheel switchpack - Left

The steering wheel is located on the input shaft of the steering column and secured with a screw. The end of the input shaft is marked to indicate the straight ahead position.

The driver airbag is located in the center of the steering wheel. 2 steering wheel switchpacks are located each side of the driver airbag. A wiring harness link connects the steering wheel components to the Clockspring.

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HEATED STEERING WHEEL - IF EQUIPPED



E252339

ITEM	DESCRIPTION
1	Heater mat
2	Steering wheel heater
3	Steering wheel wiring harness
4	Steering wheel heater control module
5	Steering wheel switchpack - Right
6	Steering wheel heater switch
7	Steering wheel heater temperature sensor

The heated steering wheel consists of a heater mat and a Negative Temperature Coefficient (NTC) type steering wheel heater temperature sensor. The steering wheel heater temperature sensor and the heater mat are installed around the rim of the steering wheel under the trim. The heater mat and the temperature sensor are connected to a steering wheel heater control module integrated in the wiring harness link under the driver airbag.

A heater symbol on the right steering wheel switchpack is illuminated amber when the steering wheel heater is switched on. When the steering wheel heater is switched off, the symbol is either not illuminated or, if the exterior lighting is switched on, illuminated green.

OPERATION

STEERING COLUMN ADJUSTMENT

The Body Control Module/Gateway Module (BCM/GWM) controls the steering column adjustment from the following inputs:

- Steering column adjustment switch
- Driver Front Seat Module (DSM) - If seat memory feature is available.

2 operation modes are available, dependent on the position of the steering column adjustment switch:

- **COLUMN** position - Forward, rearward, up and down selections on the switch complete a reference voltage circuit with the BCM/GWM, through different elements of a resistive ladder in the switch. The BCM/GWM relates the different reference voltages produced to the individual switch selections, then outputs a voltage to the appropriate steering column adjustment motor. The appropriate steering column adjustment motor then adjusts the steering column in the required direction. Each steering column adjustment motor incorporates a Hall effect sensor, which allows the BCM/GWM to determine the position of the steering column.
- **AUTO** position - The switch completes a reference voltage circuit with the BCM/GWM that bypasses the resistive ladder. When the BCM/GWM detects that the steering column adjustment switch is in the **AUTO** position, it enables the easy exit/entry mode. This provides an easier exit from, and an easier entry to the vehicle. When the driver door is opened, the steering column moves to the uppermost tilt position. When the driver door is closed and the ignition is selected on, the steering column moves to the driving position associated with the smart key being used.

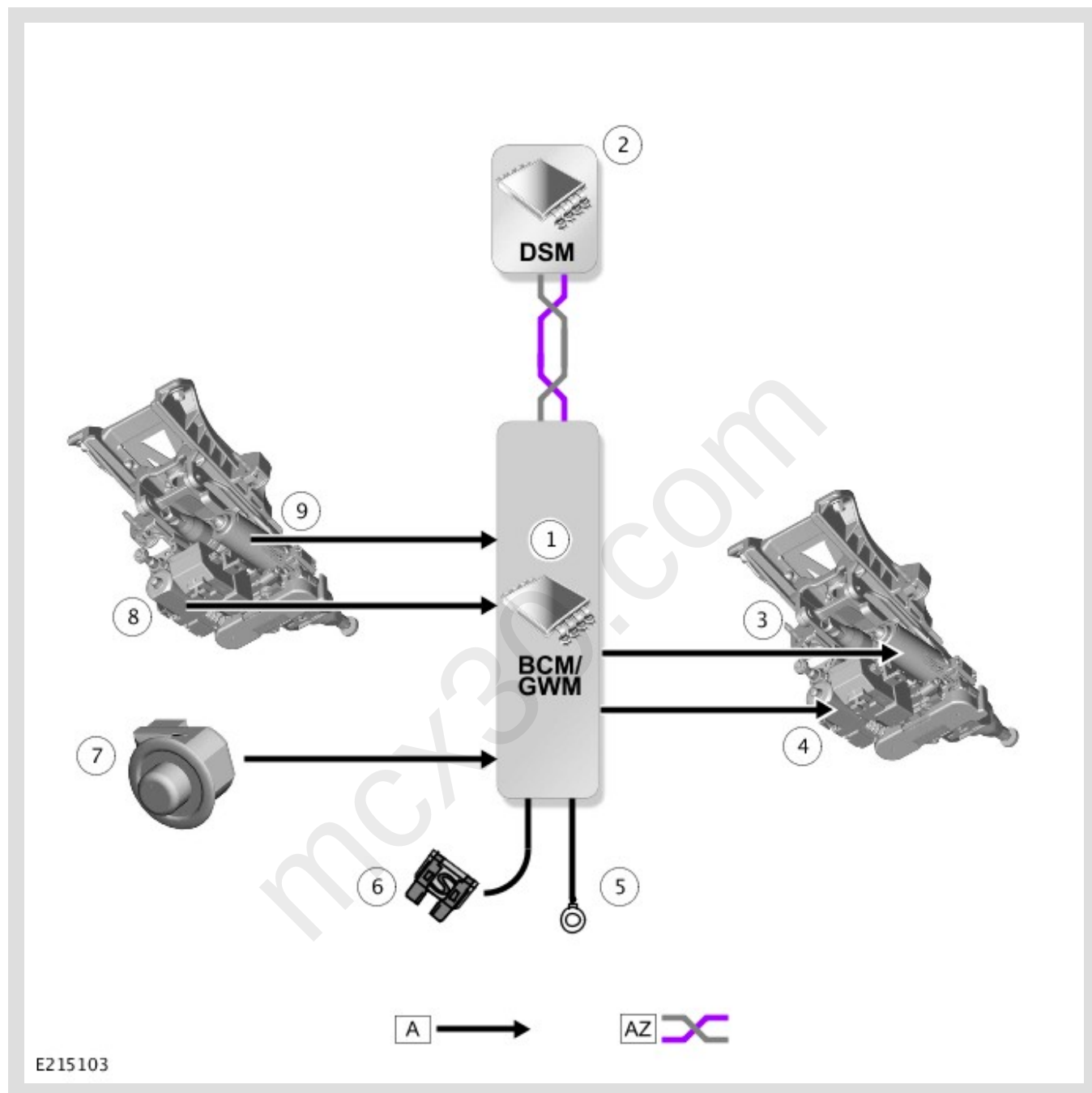
The memory function for the driver seat also stores the position of the steering column for each memory setting.

HEATED STEERING WHEEL – IF EQUIPPED

Power for the heated steering wheel is supplied to the steering wheel heater control module from the Passenger Junction Box (PJB) through the Clockspring. Operating the steering wheel heater switch provides a ground signal to the steering wheel heater control module. The steering wheel heater control module then supplies power to the heater mat and the steering wheel heater temperature sensor. The steering wheel heater control module monitors the

temperature of the heater mat using the input from the steering wheel heater temperature sensor. The steering wheel heater control module regulates the power supply to the heater mat accordingly to maintain it at the optimum temperature.

CONTROL DIAGRAM - 1 OF 2 - STEERING COLUMN ADJUSTMENT

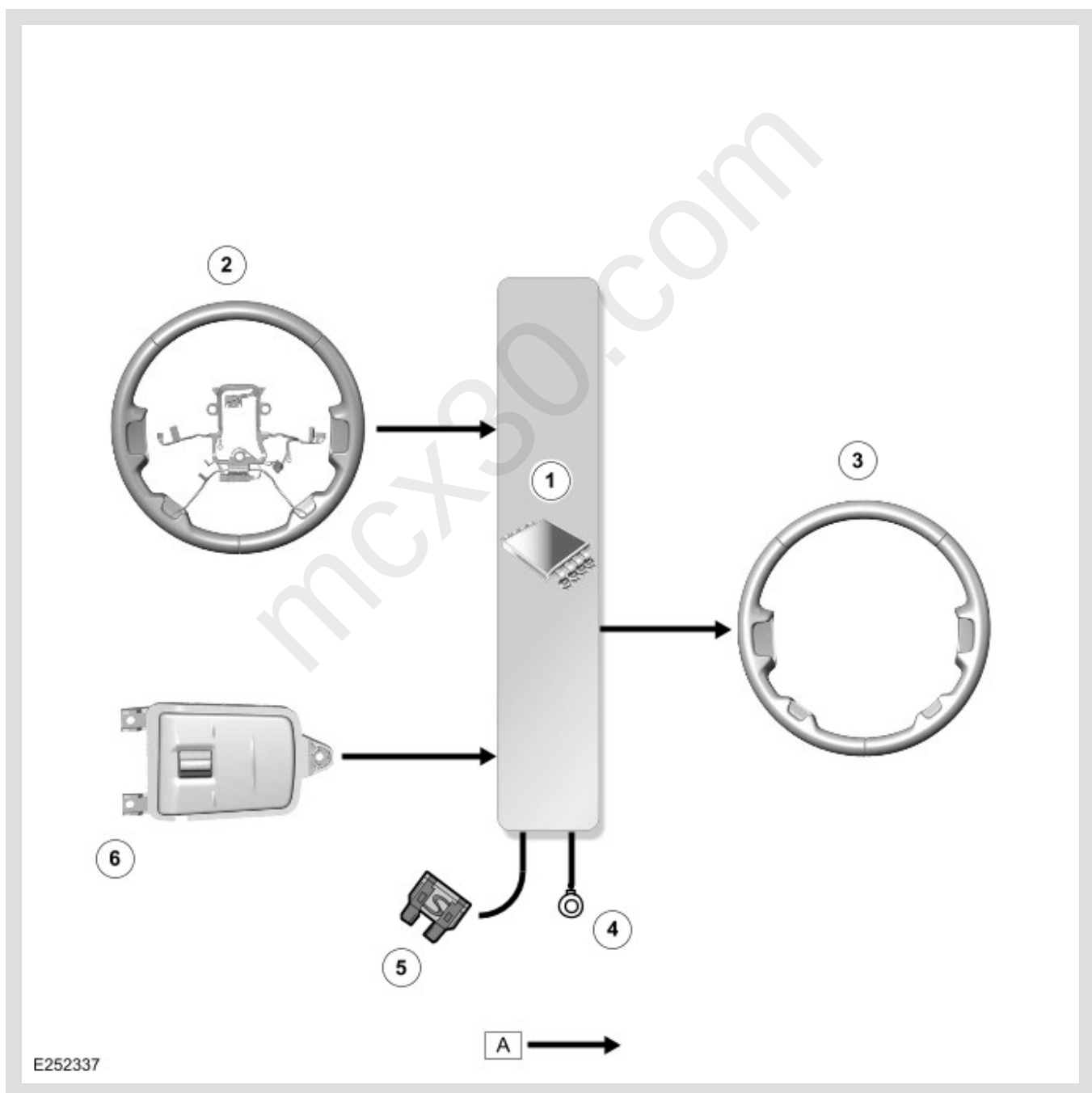


A = HARDWIRED: AZ = HIGH SPEED (HS) CONTROLLER AREA NETWORK (CAN) BODY SYSTEMS BUS.

ITEM	DESCRIPTION
1	Body Control Module/Gateway Module (BCM/GWM)
2	DSM
3	Steering column adjustment motor - Tilt

ITEM	DESCRIPTION
4	Steering column adjustment motor - Reach
5	Ground
6	Power supply
7	Steering column adjustment switch
8	Position sensor - Steering column adjustment motor - Reach
9	Position sensor - Steering column adjustment motor - Tilt

CONTROL DIAGRAM - 2 OF 2 - STEERING WHEEL HEATER



A = HARDWIRED.

ITEM	DESCRIPTION
1	Steering wheel heater control module
2	Steering wheel heater temperature sensor
3	Heater mat
4	Ground
5	Power supply
6	Steering wheel heater switch

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